Technical Paper No. 14

GUIDELINES FOR THE DESCRIPTION AND CODING OF SOIL DATA

E.J. van Waveren and A.B. Bos

Revised edition
July 1988

ATIONAL SOIL REFERENCE AND INFORMATION CENTRE

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- Technical Paper 15. ISRIC Soil Information System - user and technical manuals. Revised edition, July 1988

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FOREWORD

ISRIC's Soil Information System (ISIS) was developed to enable the storage of site and profile descriptions and analytical data of our soil profile collection in a computerized database.

The basis for ISIS and the present Technical Papers 14 and 15 was laid by Mr. E. van Waveren. The programme was subsequently improved by Mr. A.B. Bos, aided by Mr. J. Verhagen, making use of many suggestions received since the first draft was made available last year.

ISIS is suitable for personal and micro-computers using MS-DOS and is available for IBM and compatible computers. The system uses dBASEIII.

Although developed to serve ISRIC's internal needs, due to its flexibility ISIS can also be employed as a prototype for the development of a soil database at any soil centre.

ISRIC is very willing to cooperate with national soil centres, especially in developing countries, at such an undertaking.

No computer programme is perfect; we look forward to receiving comments for improvements.

Dr. W.G. Sombroek
Director

CONTENTS

INTRODUCTION

The guidelines presented here were developed to enable the storage of the site and profile descriptions of the soils of the ISRIC reference collection in a computerized soil database ISRIC Soil Information System (ISIS).
They are based on the FAO Guidelines for soil profile description (1977) and are in fact a more schematic presentation of the former ISRIC (ISM) guidelines (Spaargaren,1980).

The major points of difference with the former ISRIC guidelines are:
- The number of site variables increased considerably due to the more schematic approach.
- The majority of the non numerical site information is recorded in classes to increase the uniformity of the descriptions in order to optimize selection procedures and to reduce the size of the database.
- Numerical class codes were omitted to increase the readability and to simplify the filling in of the forms.

These guidelines should be used with the ISRIC SOIL DESCRIPTION FORM FOR CODED INFORMATION (see appendix C).

Please note that the information on the soil can only be entered in ISIS if these guidelines are strictly followed. Please do not make any modifications in the classification of the variables or the coding of the classes, and do not add new variables.
Please note that in this report **the letter capital o = 'O' and zero = 'Ø'.**
If the description according the guidelines is not fully satisfactory use the descriptive part at the end of the site description form for additional information or remarks.

Terms marked with * are explained in appendix A.

ISIS

ISIS is a computerized soil database developed for micro computers. It uses dBASEIII, a well known relational database management system (ASHTON-TATE).
It is primarily developed to handle the documentation of the ISRIC soil reference collection. Due to its flexibility ISIS can also be used as a prototype for the development of a soil database in a non-ISRIC environment.

Write to ISRIC, P.O.Box 353, 6700 AJ Wageningen, the Netherlands to obtain further information and/or ISIS programs.

SITE DESCRIPTION

DATE — Enter month and year.

COUNTRY — Enter country code. (see appendix B 1.)

ISRIC CODE — Enter ISRIC soil code.

AUTHOR — Upto 20 characters.

Location of the site

LOCATION — Upto 70 characters. Indicate as detailed as possible.

LATITUDE — Enter N or S/degrees/minutes/seconds.

LONGITUDE — Enter E or W/degrees/minutes/seconds.

ALTITUDE — In m.a.s.l.. When below sea level, add - (minus sign)

Classification:

FAO/UNESCO (1974)

FAO SOIL UNIT — Enter soil unit code (see appendix B 2).

PHASE — Enter phase:

st	*stony*	*x*	*fragipan*
pe	*petric*	*mq*	*duripan*
mk	*petrocalcic*	*z*	*saline*
li	*lithic*	*so*	*sodic*
my	*petrogypsic*	*ce*	*cerrado*
ph	*phreatic*	*ms*	*petroferric*

SOIL TAXONOMY (USDA/SCS,1975)

GREAT GROUP — Enter great group code (see appendix B 3).

SUB GROUP — Enter sub group code (see appendix B 3).

TEXTURE — Enter texture class (see appendix B 4).

MINERALOGY — Enter mineralogy class (see appendix B 4).

STR — Enter soil temperature regime:

pg	*pergelic*	*ht*	*hyperthermic*
cr	*cryic*	*if*	*isofrigid*
fr	*frigid*	*im*	*isomesic*
me	*mesic*	*it*	*isothermic*
th	*thermic*	*ih*	*isohyperthermic*

SMR — Enter soil moisture regime:

aq aquic	*ud udic*
pq peraquic	*pu perudic*
ar aridic	*us ustic*
to torric	*xe xeric*

Other diagnostic criteria according to FAO/UNESCO (1974) and USDA/SCS (1975).

DIAGNOSTIC HORIZONS — Enter diagnostic horizons. There is space for three entries:

al albic	*pc petrocalcic*	*an anthropic*
ag agric	*pg petrogypsic*	*hi histic*
ar argillic	*pl placic*	*mo mollic*
cl calcic	*sa salic*	*oc ochric*
ca cambic	*so sombric*	*um umbric*
gy gypsic	*sp spodic*	*pa plaggen*
na natric	*su sulfuric*	*du duripan*
fr fragipan	*ox oxic*	

DIAGNOSTIC CRITERIA — Enter (other) diagnostic criteria. There is space for two entries:

at abrupt textural change	*li lithic contact*
al albic material	*mo mottles with chroma<2*
am exchange complex dom. by amorphous material	*Nv n - value*
	pf permafrost
cl paralithic contact	*sq plinthite*
cf petroferric contact	*sl slickensides*
co COLE	*sc smeary consistence*
du durinodes	*k soft powdery lime*
fa ferralic properties	*su sulfidic material*
fe ferric properties	*ta takyric*
gl gilgai	*tx thixotropy*
or high org matter in B	*ir thin iron pan*
sa high salinity	*to tonguing*
hy hydromorphic properties	*ve vertic properties*
if interfingering	*we weatherable minerals*

LOCAL CLASSIFICATION — Local classification or soil name. Descriptive upto 30 characters. If more space is required use general description

CLIMATE

KÖPPEN — Enter climate classification according to Köppen: *(Trewartha, 1968)*

Af tropical wet climate
Am tropical monsoon climate
Aw tropical "wet-and-dry" climate (savanna)

BW arid (desert) climate
BS semi-arid (steppe) climate

Cf mild temperate rainy climate with no distinct dry season
Cw mild temperate rainy climate with dry winters
Cs mild temperate rainy climate with dry summers

Df cold snow-forest climate with humid winters
Dw cold snow-forest climate with dry winters

ET polar tundra climate
EF polar perpetual frost climate

Other lower case characters used, with:

A climates:	*w'*	*rainfall maximum in autumn*
	w"	*two distinct rainfall maxima*
	s	*dry season during high-sun period*
	i	*temperature range between warmest and coolest month < 5°C*
B climates	*h*	*hot climate*
	k	*cool climate*
	k'	*cold climate*
	s	*dry summers*
	w	*dry winters*
	n	*frequent fog*
C climates	*a*	*hot summers*
	b	*cool summers*
	i	*temperature range between warmest and coolest month < 5°C*
	x	*rainfall maximum late spring; drier in late summer*
	n	*frequent fog*
D climates	*d*	*extremely cold winter month*
	f, s, w, a, b, c:	*see C climate*

Entry of climatic data: on the description form is space for data of at most three climatic variables recorded on one single climate station. The ISIS database itself has no limitations in number of stations or number of variables per station.

STATION — Enter name of climate station; up to 20 characters.

LATITUDE — Latitude of station. Enter: N or S / degrees / minutes.

LONGITUDE — Longitude of station. Enter: E or W / degrees / minutes.

ALTITUDE — Enter altitude of station in m.a.s.l.; when below sea level, enter - (minus sign)

DISTANCE — Enter distance in km between site and climate station.

DIRECTION Enter direction site --> climate station:

```
          NNW   N   NNE
        NW      |      NE
      WNW       |       ENE
      W ----- site ------ E
      WSW       |       ESE
        SW      |      SE
          SSW   S   SSE
```

RELEVANCE Relevance of station's data to soil site (DAY (ed),1983):

v very good: site of station is identical to soil site
g good: site of station and soil site are sufficiently similar to allow for macro and intermediate levels of climatic interpretations
m moderate: sufficiently similar to allow for macro climatic interpretations
p poor: no reliable climatic interpretations possible

CLIMATIC DATA Enter mean monthly and annual figures for each variable.

DATA KIND Enter kind of variable:

CAUTION !! CODE SHOULD BE ENTERED EXACTLY AS LISTED BELOW !!

T mean temperature in degrees Celcius
Ti min temp *Ta max temp*
P precipitation in mm
Pd number of rain days
E potential evapotranspiration in mm
Et thornthwaite *Ep penman*
Ef frere,popov *Eb blaney-criddle*
Ea papadakis *Eu turc*
A actual evaporation in mm
Ao class A pan *Ac colorado pan*
Ap piche
H relative humidity (%)
U wind speed in m/sec at 2 m height

If the wind speed is measured at different height, it should be corrected to wind speed at 2 m height with the following factor:(Doorenbos and Pruitt, 1975)

Measuring height(m):	0.5	1	1.5	2	3	4	5	6	8	10
Correction factor:	1.35	1.15	1.06	1.0	0.93	0.88	0.85	0.83	0.81	0.80

n hours of bright sunshine (hours/day)
nN percentage bright sunshine (%)
R total global radiation (MJ.m-2.day-1)
Re estimated total global radiation(MJ.m-^{2}.day-1)
x other data specify in remarks

1MJ.m^{-2} = 23.885cal/cm^{-2} = 23.885 langley
= 27.778mWhr.cm^{-2}
= 0.404mm water

If variable and/or method of recording is not included in the table: give a full description of variable and/or method in descriptive part.

PERIOD Number of years of record.

Parent material/Parent rock

Parent material is defined as the unconsolidated mineral or organic material from which the true soil develops.
Parent rock is defined as the rock mass from which the parent material is derived (PARKER (eds),1984).

There is space available for a sequence of at most two types of parent material/rock. Use the descriptive part if more space is required (REMARKS).

MODE

Mode of accumulation or deposition of parent material. (after USDA/SCS,1979):

a alluvium
e eolian mixed/undifferentiated
w loess
s eolian sand
h volcanic ejecta
l lacustrine, inclusive fluvio and glacio lacustrine
y estuarine sediments
m marine sediments
*c colluvium**
*v slope wash**
f fluvio-glacial deposits
i ice-pushed materials
*g glacial outwash**
*t glacial till**
*d glacial drift**
o organic sediments
x residual (in situ weathered) materials
u unconsolidated, unspecified
r solid rock
b man-made

DERIVED FROM Enter parent rock of which the parent material is derived. (based on USDA/SCS,1979).

table 1. Parent rock types

mixed lithology and composition
- *y1 noncalcareous or acid rocks*
- *y2 calcareous rocks*
- *y3 mixed lithology, unspecified*
- *y4 igneous/metamorphic/ sedimentary rocks*
- *y5 igneous/ metamorphic rocks*
- *y6 igneous/sedimentary rocks*
- *y7 metamorphic/sedimentary rocks*

wØ chemically highly weathered materials (reworked materials)
- *w1 lateritic material*
- *w2 bauxitic material*

cØ conglomerate(unspecified)
- *c1 non calcareous*
- *c2 calcareous*

iØ igneous rocks (unspecified)
- *i1 coarse , unspecified*
- *I2 coarse , basic*
- *I3 coarse , intermediate(e.g.diorite)*
- *I4 coarse , acid (e.g.granite)*
- *i5 fine, unspecified*
- *i6 fine, basic (e.g.basalt)*
- *i7 fine, intermediate (e.g.andesite)*
- *I8 fine, acid(e.g.rhyolite)*
- *I9 fine, ultrabasic*

mØ metamorphic rocks (unspecified)
- *m1 gneiss, unspecified*
- *m2 gneiss, acidic*
- *m3 gneiss, basic*
- *m4 serpentinite*
- *m5 schist/phyllite,unspecified*
- *m6 schist/phyllite,acidic*
- *m7 schist/phyllite,basic*
- *m8 slate*
- *m9 quartzite*

bØ sedimentary rocks,interbedded (unspecified)
- *b1 limestone/sandstone and shale*
- *b2 limestone/sandstone*
- *b3 limestone/shale*
- *b4 limestone/siltstone*
- *b5 sandstone/shale*
- *b6 sandstone/siltstone*
- *b7 shale/siltstone*

aØ sandstone (unspecified)
- *a1 noncalcareous,unspecified*
- *a2 arkosic**
- *a3 graywacke**
- *a4 calcareous, unspecified*

hØ shale (unspecified)
- *h1 noncalcareous*
- *h2 calcareous*

tØ siltstone (unspecified)
- *t1 noncalcareous*
- *t2 calcareous*

lØ limestone (unspecified)
- *l1 chalk*
- *l2 marble*
- *l3 dolomitic*
- *l4 phosphatic*
- *l5 arenaceous (sandy)*
- *l6 argillaceous*
- *l7 cherty*

sØ (other) sedimentary rocks (unspecified)
- *s1 marl, unspecified*
- *s2 glauconite*

uØ claystone (unspecified)
- *u1 noncalcareous*
- *u2 calcareous*

table 1. continued

Pø pyroclasts, consolidated
- *p1 tuff, unspecified**
- *p2 tuff,acidic*
- *p3 tuff,basic*
- *p4 volcanic breccia, unspecified**
- *p5 volcanic breccia,acidic*
- *p6 volcanic brecccia,basic*
- *p7 tuff breccia**
- *p8 scoria/cinders**
- *p9 pumice**

eø pyroclasts,unconsolidated
- *e1 ash, unspecified**
- *e2 ash,acidic*
- *e3 ash,basic*
- *e4 lapilli, unspecified**
- *e5 lapilli,acidic*
- *e6 lapilli,basic*
- *e7 volcanic bombs**

kø miscellaneous organic material
- *k1 mossy material*
- *k2 herbaceous material*
- *k3 woody material*
- *k4 wood fragments <1m*
- *k5 wood fragments >1 m*
- *k6 charcoal*

TEXTURE — Enter texture of parent material

sa	*sandy*	*lo*	*loamy*	*st*	*stony*
sc	*sandy clay*	*cl*	*clayey*	*mx*	*mixed*
si	*silty*	*gr*	*gravelly*	*or*	*organic*

WEATHERING — General characterization of status of weathering of solid rock:
- *s slight*
- *p partial/moderate*
- *h high*

RESISTANCE — Resistance against weathering (solid rock only):
- *v very high*
- *h high*
- *m moderate*
- *l low*

DEPTH — Enter depth of lithological boundary in cm.

REMARKS — Additional remarks parent material/rock up to 20 characters. If more space is required use general descriptive part.

EFFECTIVE SOIL DEPTH — Enter effective soil depth in cm. Effective soil depth is the depth to which roots can easily penetrate throughout the year.

Geomorphology

LANDFORM — Enter regional landform. If necessary specify in general descriptive part.

table 2. Regional landforms (based on McDonald et al.,1984)

mo	*mountain (unspecified)*
hi	*hill (unspecified)*
hl	*low hill*
in	*inselberg**
va	*valley (unspecified)*
ba	*basin (unspecified)*
ib	*intermontane basin*
bl	*badlands**
mm	*man-made*
up	*plain (unspecified)*
pu	*plateau*
pe	*peneplain**
ap	*alluvial plain (unspecified)*
af	*floodplain*
as	*stagnant alluvial plain **
at	*alluvial terrace*
ad	*delta*
pm	*piedmont features(unspecified)*
pa	*alluvial fans/bajada/sheetflood fans*
pp	*pediment**
pl	*pediplain**
cp	*coastal plain*
cb	*beach ridge*
cf	*tidal flat*
ct	*marine terrace*
lc	*(fluvio) lacustrine plain*
py	*playa**
gf	*fluvioglacial plain*
gk	*kame**
gt	*fluvioglacial terrace*
go	*outwash plain*
gp	*glacial plain (till)*
gm	*moraine*
sp	*sand plain*
du	*dune field*
vu	*volcano*
ca	*caldera*
la	*lava plain*

TOPOGRAPHY — Topography of the surrounding country (FAO, 1977):

f	*flat or almost flat:*		*slopes < 2 %*
u	*undulating*	:	*steepest slopes 2 - 8 %*
r	*rolling*	:	*steepest slopes 8 -16 %*
h	*hilly*	:	*steepest slopes 16 - 30 %, range of elevation being moderate*
s	*steeply dissected*	:	*steepest slopes > 30 %, range of elevation being moderate*
m	*mountainous*	:	*topography has great range of elevation*

PHYSIOGRAPHIC UNIT — Describe physiographic unit in the immediate surrounding of of the site. Continue in general descriptive part if more space is required.

POSITION OF SITE — Enter physiographic position of the site:

c	*crest*	*l*	*lower slope*	*v*	*open depression*
u	*upper slope*	*s*	*slope unspecified*	*d*	*depression(closed)*
m	*middle slope*	*f*	*flat*		

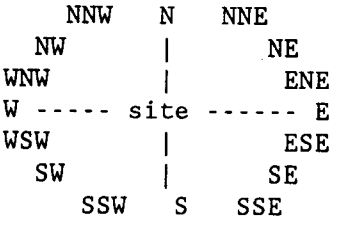
Slope characteristics

SLOPE GRADIENT — Enter slope gradient of the land immediately surrounding the site (in %).

FORM — Form of the slope surrounding the site:

v	*convex*	*s*	*straight*	*u*	*undulating*
c	*concave*	*x*	*complex*		

ASPECT — Aspect (exposure) of site: N,NNE,NE,ENE,E,...,...,NNW.



Microrelief

Small-scale differences in relief within the immediate vicinity of the site. (based upon FAO,1986)

KIND

v level
d dimples or craddle - knoll:depressions and associated mounds left by uprooted trees
w coppice mounds: wind blown material accumulated and stabilized around plants
k knobs
f frost polygons
g gilgai
m mounds (termites)
n animal tracks
l levee, artificial: due to digging and cleaning of drainage and irrigation canals
s slick spots or scabby spots
t terracettes
r ripples
h holes and galleries due to burrowing animals
a terracing, artificial

Microrelief formed by soil erosion is excluded from this item and described under denudational-aggradational processes.

PATTERN

Ø none *l linear* *r reticulate*
c closed depression *i isolated*

HEIGHT

Enter variation in height in cm.

Surface characteristics

ROCK OUTCROPS

Enter rock outcrop class (FAO,1977):

Ø nil, positive statement
lr little rocky : less than 2% rock exposed
fr fairly rocky : exposures roughly 10-35 m apart, coverage 2-10%
ro rocky : exposures roughly 10-35 m apart, coverage 10-25%
vr very rocky : exposures roughly 3.5-10 m apart, coverage 25-50%
er extremely rocky: exposures up to 3.5 m apart, coverage 50-90%
ou outcrop : coverage over 90%

STONINESS

Enter surface stoniness class (FAO,1977):

ø	*nil, positive statement*	
ws	*very few stones*	
fs	*fairly stony* :	*coverage 0.01-0.1%*
st	*stony* :	*coverage 0.1-3%*
vs	*very stony* :	*coverage 3-15 %*
es	*exceedingly stony:*	*coverage 15-90%*
ru	*rubble land*	

STONE SIZE

Enter average size of stones in cm

SHAPE

s	*(sub)rounded*	*b*	*angular blocky*
a	*angular irregular*	*p*	*platy, flat*

CRACKING

ø	*nil, positive statement*
c	*(small) cracks : width < 1 cm or depth < 50 cm*
l	*large cracks : width > 1 cm or depth > 50 cm*

SLAKING/ CRUSTING

Slaking of aggregates by tillage, rainfall or frost (USDA/SCS,1979):

ø	*nil, positive statement*
p	*partly slaked, round smooth aggregates*
s	*slaked: sorted sand/silt, some clay films*
c	*capped, crust on drying*

Enter thickness and nature of crust/seal in profile description.

ALKALI/SALT

Evidence of alkali/salt (USDA,1951). The classification given below is used to describe evidence of salt as well as evidence of alkali:

ø	*soils free of excess alkali or salt. Practically no crops are inhibited by, or show evidence of injury from excess salts or alkali*
s	*soils slightly affected by salt or alkali. The growth of sensitive crops is inhibited but that of salt tolerant crops may not be.*
m	*soils moderately affected by salt or alkali. Crop growth is inhibited and no crop does well*
r	*soils strongly affected by salt or alkali. Only a few kinds of plants survive*

If conductivity measurements and/or analytical data are available the following classes can be recognized:

class		*alkali (ESP)*	*salt (mS/cm)*
ø	*nil*	*0 - 5*	*0 - 4*
s	*slight*	*5 - 15*	*4 - 8*
m	*moderate*	*15 - 25*	*8 - 15*
r	*strong*	*> 25*	*> 15*

Hydrology

KIND — Indicate kind of water table (USDA,1979):

n	*no water table observed*	*p*	*perched **
f	*flooded*	*a*	*apparent*
		w	*groundwater table*

DEPTH — Enter depth of water table in cm

FLUCTUATION — Enter (estimated values of) upper and lower limits of the water table in cm

SLOW PERMEABLE LAYER — Enter upper and lower limits of slow permeable or stagnating layer in cm. Enter N if no slow permeable layer is observed.

PERMEABILITY — Estimated permeability of least permeable part of the profile:

s slow
m moderate
h high

Quantitative data are recorded in general descriptive part

FLOODING FREQUENCY — Indicate flooding frequency, if necessary specify in general descriptive part (FAO,1986):

n	*nil, positive statement*	*y*	*yearly*
d	*daily*	*i*	*irregular*
m	*monthly*		

NATURE — Nature of flood water:

s	*saline*	*x*	*oxygenated*
b	*brackish*	*w*	*still or stagnant*
f	*fresh*		

Enter additional information (e.g. time and duration of flooding in general descriptive part)

RUN OFF — Estimated run off:

p	*ponded*	*m*	*medium*
v	*very slow*	*r*	*rapid*
s	*slow*	*a*	*very rapid*

DRAINAGE CLASS (FAO,1977), intergrades are indicated by a combination of both class codes: e.g. 34 = class 3 to 4.

0 very poorly drained; water is removed from the soil so slowly that the water table remains at or on the surface the greater part of the time. Soils of this drainage class usually occupy level or depressed sites and are frequently ponded.

1 poorly drained; water is removed so slowly that the soil remains wet for a large part of the time. The water table is commonly at or near the surface during a considerable part of the year. Poorly drained conditions are due to a high water table, to a slowly permeable layer within the profile, to seepage, or to a combination of these conditions

2 imperfectly drained; water is removed from the soil slowly enough to keep it wet for significant periods but not all of the time. Imperfectly drained soils commonly have a slowly permeable layer within the profile, a high water table, additions through seepage or a combination of these conditions

3 moderately well drained; water is removed from the soil somewhat slowly, so that the profile is wet for a small but significant part of the time. Moderately well drained soils commonly have a slowly permeable layer within or immediately below the solum, a relatively high water table, additions of water through seepage or some combination of these conditions

4 well drained; water is removed from the soil readily but not rapidly. Well drained soils commonly retain optimum amounts of moisture for plant growth after rains or additions of irrigation water

5 somewhat excessively drained; water is removed from the soil rapidly. Many of these soils have little horizon differentiation and are sandy and very porous

6 excessively drained; water is removed from the soil very rapidly. Excessively drained soils are commonly lithosols or lithosolic and may be steep, very porous or both

Moisture conditions profile:

DRY Profile dry from .. to ... (cm)

MOIST Profile moist from ... to ....(cm)

WET Profile wet from .... to..... (cm)

Denudation and aggradation (based upon FAO,1986)

Indicate nature and intensity of processes at the site and its surroundings (the physiographic unit). If there are any discrepancies between the site and the land surrounding the site, the site data should be entered here. All other information should be entered in the general descriptive part.(based upon FAO,1986)

EROSION DEGREE

Enter intensity of each type of soil erosion. Here the intensity is only described in general terms. If more accurate data are available it should be entered in the general descriptive part.

ø	*no erosion*	*m*	*moderate*
s	*slight*	*r*	*severe*

EROSION TYPE

Enter soil erosion type. There is space available for 2 types:

s *sheet*
r *rill :depth <30 cm; completely smoothed by normal cultivation*
g *gully: depth >30 cm; not smoothed by normal cultivation*
w *wind*

SOIL AGGRADATION

Indicate occurrence of recent soil aggradation (McDONALD et al.,1984):

ø *nil, positive statement*
n *not apparent*
p *present, specify in descriptive part*

SLOPE STABILITY

Indicate present stability of slope:

n	*stable*	:	*no evidence of recent mass movements*
m	*locally unstable*	:	*creep, locally shallow earth-/soil slides,flows*
h	*highly unstable*	:	*major part of slope is affected by shallow and deep slides /flows etc.*

Land use and Vegetation

Describe present land use or vegetation at the **immediate surroundings of the site.** Use REMARKS for additional information on present land use/vegetation. Use the general descriptive part to add information on past land use/vegetation, or to describe deviating land use/vegetation types close to the site in the same physiographic unit.

LAND UTILIZATION TYPE (LUT)

Indicate present land use type. Use REMARKS to specify:

a	*arable farming: unspecified*
ah	*arable farming: high level: intensive use of fertilizers and pesticides, high level of mechanization*
am	*arable farming: medium level*
al	*arable farming: low level: low inputs,low level of mechanization*
x	*mixed farming : unspecified*
xh	*mixed farming : high level*
xm	*mixed farming : medium level*
xl	*mixed farming : low level*
pa	*cultivated pasture*
gr	*(semi) natural grass land, grazed*
sh	*shrub land, grazed*
wo	*wood land, grazed*
ur	*urban land*
na	*non agricultural land: surface mines, pit spoils etc.*
af	*afforestation*
ve	*(semi) natural vegetation*
fa	*fallow*

CROPS

Indicate present or major crop. Use REMARKS to specify or enter additional crops:

cereals:	*ce*	*unspecified*	*ces*	*sorghum*
	cer	*rice*	*cet*	*millet*
	cew	*wheat*	*cex*	*other*
	cem	*maize*		
root crops:	*rt*	*unspecified*	*rty*	*yam*
	rtc	*cassava*	*rtt*	*taro*
	rtp	*potatoes*	*rtx*	*other*
sugar crops:	*suc*	*sugar cane*		
	sub	*sugar beet*		
vegetables:	*ve*	*unspecified*		
fodder crops:	*fd*	*unspecified*		
condiments:	*cn*	*unspecified*		
oil/protein crops:	*ol*	*unspecified*	*olb*	*castor bean*
	oly	*soya bean*	*olh*	*chick pea*
	olg	*ground nut*	*olu*	*sunflower*
	ola	*safflower*	*ole*	*sesame*
	olc	*coconut*	*olo*	*olive*
	oli	*oil palm*	*olx*	*other*

fibre crops:	*fb*	*unspecified*	*fbj*	*jute*
	fbc	*cotton*	*fbr*	*rosella*
	fbk	*kenaf*	*fbx*	*other*
	fbs	*sisal*		
fruit crops:	*fr*	*unspecified*	*frc*	*citrus*
	frb	*banana*	*frg*	*grapes*
	frd	*date palm*	*frx*	*other*
stimulants:	*st*	*unspecified*	*stc*	*coffee*
	stt	*tea*	*stb*	*tobacco*
	sta	*cocoa*	*stx*	*other*
miscellaneous:	*msp*	*pyrethrum*		
	msr	*rubber*		
	man	*annual crops, unspecified*		
	mpe	*perennial crops, unspecified*		
	mxx	*other*		

IRRIGATION Enter main type of irrigation (FAO,1986):

Ø no irrigation, not relevant
s seasonally irrigated, supplementary irrigation
c continuously irrigated
p paddy

ROTATION Enter rotation scheme, specify in REMARKS (FAO,1986):

Ø not relevant
ss shifting
sb shifting - long fallow bush
sg shifting - long fallow grass
cf crop rotation with current fallow
cc crop rotation
cg crop-grass rotation
mo mono culture

IMPROVEMENTS Indicate any other land improvements, specify in REMARKS (FAO,1986):

Ø	*none*	*il*	*levelling*
ic	*land clearing*	*it*	*terracing*
id	*draining*	*ix*	*other*

VEGETATION TYPE — Enter major vegetation type (FAO,1986):

closed forest:	*f*	*unspecified*
	fe	*evergreen (mainly)*
	fs	*semi-deciduous*
	fd	*deciduous*
	fx	*extremely xeromorphic*
woodland (open stands of trees)	*w*	*unspecified*
	we	*evergreen*
	ws	*semi-deciduous*
	wd	*deciduous*
	wx	*extremely xeromorphic*
shrub:	*s*	*unspecified*
	se	*evergreen*
	ss	*semi deciduous*
	sd	*deciduous*
	sx	*extremely xeromorphic(sub desert)*
dwarf shrub:	*d*	*unspecified*
	de	*evergreen*
	ds	*semi deciduous*
	dd	*deciduous*
	dx	*extremely xeromorphic(sub desert)*
	dt	*tundra*
herbaceous:	*h*	*unspecified*
	ht	*tall grassland*
	hm	*medium tall grassland*
	hs	*short grassland*
	hf	*forb*

STATUS — Enter present status of vegetation (FAO,1986):

p	*primary*
m	*modified: altered as a result of new biotic factors*
c	*cut over primary: some trees have been cut*
s	*secondary*
d	*degraded*

REMARKS — Enter additional information on present vegetation (e.g. dominant species) and land use (e.g. additional crops). Up to 40 characters

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GENERAL REMARKS ON SITE & PROFILE — Enter additional information on site and profile. The information is stored in blocks of 254 characters and blanks (dBASEIII memo-fields)

PHOTOGRAPHS/ SLIDES — Enter subject and number of slides/photographs:

la	*landscape*	*su*	*soil surface*
pr	*profile*	*pd*	*profile details*
ve	*vegetation*	*cr*	*crops*
lu	*land use*	*er*	*erosion/conservation*
xx	*other*		

(conform the codes used in the ISRIC SLIDE database.)

PROFILE DESCRIPTION

ISRIC CODE — Enter ISRIC profile code.

HORIZON NUMBER — Enter serial number of horizon. Top horizon: serial number 1. Use number 1,2,3,..,9, continue with a,b,c,d etc.

DESIGNATION — Enter horizon designation according to FAO (1977)
Enter AUGER in case the data are obtained by augering.

DEPTH — Enter upper and lower limit of horizon in cm.

BOUNDARY — Indicate width and topography of boundary with horizon below (FAO,1977):

Width:	*Topography:*
a abrupt : < 2cm	*s smooth*
c clear : 2-5 cm	*w wavy: pockets wider than deep*
g gradual: 5-12 cm	*i irregular: pockets deeper than wide*
d diffuse: > 12cm	*b broken: boundary discontinuous wide*

COLOUR — Enter dry and moist matrix colour. The colour hues are entered according to a continuous numerical scale. The values and chromas are multiplied by 10.

Hue conversion table: Munsell to numerical notation:

2.5R= 25	*2.5YR=125*	*2.5Y=225*	*2.5GY=325*	*5 G=450*	*5 B=650*
5 R= 50	*5 YR=150*	*5 Y=250*	*5 GY=350*	*10 G=500*	*10 B=700*
7.5R= 75	*7.5YR=175*	*7.5Y=275*	*7.5GY=375*	*5 BG=550*	*N=800*
10 R=100	*10 YR=200*	*10 Y=300*	*10 GY=400*	*10BG=600*	

Other (intermediate) hues are allowed, e.g 6YR=160
2R= 20

Examples: 2.5R 5 /6 -> 25 50 60
7.5BG 5.5/8 -> 575 55 80
10 R 2 /4 -> 100 20 40

TEXTURE — Enter estimated (field) texture (FAO,1977).

Fraction < 2mm:

sa	*sand*	*csa*	*coarse sand*
		msa	*medium sand*
		fsa	*fine sand*
		vsa	*very fine sand*
sa	*loamy sand*	*clsa*	*coarse loamy sand*
		mlsa	*medium loamy sand*
		flsa	*fine loamy sand*
		vlsa	*very fine loamy sand*
sal	*sandy loam*	*csal*	*coarse sandy loam*
		msal	*medium sandy loam*
		fsal	*fine sandy loam*
		vsal	*very fine sandy loam*
l	*loam*	*sicl*	*silty clay loam*
sil	*silt loam*	*sac*	*sandy clay*
si	*silt*	*sic*	*silty clay*
sacl	*sandy clay loam*	*c*	*clay*
cl	*clay loam*		

Fraction 0.2-7.5 cm:		Fraction 7.5 - 25 cm:	
sg	*slightly gravelly*	*ss*	*slightly stony* *2-15%*
gr	*gravelly*	*st*	*stony* *15-50%*
vg	*very gravelly*	*vs*	*very stony* *50-90%*
ga	*gravel*	*so*	*stones* *> 90%*

Fraction > 25cm:

bo	*bouldery*	*2-50%*
vb	*very bouldery*	*50-90%*
bl	*boulders*	*> 90%*

ORGANIC MATTER (ORG.MAT)

Enter kind and rate of decomposition of organic matter. This item is normally used to describe O and H horizons. (Day(ed),1983; FAO, 1986).

Kind:

l	*leaves*	*s*	*sphagnum*	*r*	*reeds,sedges*
n	*needles*	*m*	*other moss*	*h*	*herbaceous fragments*
w	*wood fragments*	*c*	*coprogenous earth*	*u*	*unspecified*

Decomposition rate:

ø nil
s slight : > 50% fibric or foliated material
m moderate: 10-50% fibric/foliated material
h high : < 10% fibric/foliated material

STRUCTURE

When a soil contains aggregates of more than one grade, size, or form the different kinds of aggregates should be described separately. There is space for two types of soil aggregates. Enter largest type first (FAO,1977). See table 3.

Grade:

ø structureless: that condition in which there is no observable aggregation or no definite orderly arrangement of natural lines of weakness. Massive if coherent; single grain if non coherent (see form). If the soil is coherent one of the following codes should be entered:

wc structureless and weakly coherent

mc structureless and moderately coherent

sc structureless and strongly coherent.

we weak: that degree of aggradation characterized by poorly formed indistinct peds that are barely observable in place. When disturbed, soil material that has this grade of structure breaks into a mixture of few entire peds, many broken peds, and much unaggregated material. If necessary for comparison, this grade may be subdivided into:

vw very weak

wm weak to moderate.

mo *moderate: that grade of structure characterized by well formed distinct peds that are moderately durable and evident but not distinct in undisturbed soil. Soil material of this grade, when disturbed, breaks down into a mixture of many distinct entire peds, some broken peds, and little unaggregated material.*

st *strong: that grade of structure characterized by durable peds that are quite evident in undisplaced soil, that adhere weakly to one another, and that withstand displacement and become separated when the soil is disturbed. When removed from the profile, soil material of this grade of structure consists very largely of entire peds and include few broken peds and little or no unaggregated material. If necessary for comparison this grade may be subdivided into:*

ms *moderate-strong*

vs *very strong*

Size:

vf	*very fine*	*fm*	*fine to medium*	*co*	*coarse*
ff	*very fine to fine*	*me*	*medium*	*cc*	*coarse to very coarse*
fi	*fine*	*mc*	*medium to coarse*	*vc*	*very coarse*

Form:

pl	*platy*	*aw*	*angular blocky (wedge shaped)*	*ma*	*massive*
pr	*prismatic*	*gr*	*granular*	*pm*	*porous massive*
cl	*columnar*	*cr*	*crumb*	*sg*	*single grain*
ab	*angular blocky*			*ir*	*irregular*
sb	*sub angular blocky*			*ro*	*rock structure*

Relationship form 1 -> form 2 (if appropriate):

t *form 1 transitional to form 2*
a *form 1 and form 2 both occur*
f *form 1 falls apart into form 2*

Table 3. Types and classes of soil structure (FAO, 1977)

TYPES AND CLASSES OF SOIL STRUCTURE								
Type (Shape and Arrangement of Peds)								
Class	Platelike with one dimension (the vertical) limited and greatly less than the other two; arranged around a horizontal plane; faces mostly horizontal	Prismlike with two dimensions (the horizontal) limited and considerably less than the vertical; arranged around a vertical line; vertical faces well defined; vertices angular.		Blocklike; polyhedronlike, or spheroidal, with three dimensions of the same order of magnitude, arranged around a point.				
		Without rounded caps	With rounded caps	Blocklike; blocks or polyhedrons having plane or curved surfaces that are casts of the moulds formed by the faces of the		Spheroids or polyhedrons having plane or curved surfaces which have slight or no accomodation to the faces of surrounding peds		
				Faces flattened; most vertices sharply angular	Mixed rounded and flattened faces with many rounded vertices	Relatively non-porous peds	Porous peds	
	Platy	Prismatic	Columnar	(Angular) Blocky	Subangular Blocky	Granular	Crumb	
Very fine or very thin	Very thin platy; 1mm	Very fine prismatic; 10mm	Very fine columnar; 10mm	Very fine angular blocky 5mm	Very fine subangular blocky 5mm	Very fine granular; 1mm	Very fine crumb; 1mm	
Fine or thin	Thin platy; 1 to 2mm	Fine prismatic 10 to 20mm	Fine columnar; 10 to 20mm	Fine angular blocky; 5 to 10mm	Fine subangular blocky 5 to 10mm	Fine granular; 1 to 2mm	Fine crumb; 1 to 2mm	
Medium	Medium platy; 2 to 10	Medium prismatic; 20 to 50mm	Medium columnar; 20 to 50mm	Medium angular; 10 to 20mm	Medium subangular blocky; 10 to 20mm	Medium granular; 2 to 5mm	Medium crumb 2 to 5mm	
Coarse or thick	Thick platy; 5 to 10mm	coarse prismatic; 50 to 100mm	Coarse columnar;50 to 100mm	Coarse angular blocky; 20 to 50mm	Coarse subangular blocky; 20 to 50mm	Coarse granular; 5 to 10mm		
Very coarse or very thick	Very thick platy; 10mm	Very coarse prismatic; > 100mm	Very coarse columnar; >100mm	Very coarse angular blocky > 50mm	Very coarse subangular blocky;> 50mm	Very coarse granular > 10mm		

CONSISTENCE Consistence.(FAO,1977)

Consistence when dry:

lo loose : noncoherent

so soft : soil mass is very weakly coherent and friable; breaks to powder or to individual grains under very slight pressure

sh slightly hard: weakly resistant to pressure; easily broken between thumb and forefinger

ha hard : moderately resistant to pressure; can be broken in the hands without difficulty but is barely breakable between thumb and forefinger

vh very hard very resistant to pressure; can be broken in the hands only with difficulty; not breakable between thumb and forefinger

eh extremely hard: extremely resistant to pressure, can not be broken in the hands

Consistence when moist:

lo loose : noncoherent

vf very friable : soil material crushes easily under very gentle pressure, but coheres when pressed together

fr friable : soil material crushes easily under gentle to moderate pressure between thumb and forefinger

fi firm : soil material crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable

vi very firm: soil material crushes under strong pressure, barely crushable between thumb and forefinger

ef extremely firm : soil material crushes only under very strong pressure; cannot be crushed between thumb and forefinger

Consistence when wet:

a) Stickiness:

ns nonsticky: after release of pressure, practically no soil material adheres to thumb or finger

ss slightly sticky : after pressure, soil material adheres to both finger and thumb but comes off one or the other rather cleanly. It is not appreciably stretched when the digits are separated

st sticky : after pressure, soil material adheres to both thumb and finger and tends to stretch somewhat and pull apart rather than pulling free from either digit

vs very sticky : *after pressure, soil material adheres strongly to both forefinger and thumb and is decidedly stretched when they are separated*

b) Plasticity:

np non plastic : *no wire is formable*

sp slightly plastic: *wire formable but soil mass easily deformable.*

pl plastic : *wire formable and much pressure required for deformation of the soil mass*

vp very plastic : *wire formable and much pressure required for deformation of the soil mass*

Other (after USDA,1985):

ws weakly smeary: *under moderate strong force between thumb and forefinger the soil changes suddenly to fluid, the fingers skid and the soil smears, little or no free water remains on fingers*

ms moderately smeary: *under moderate force between thumb and forefinger the soil changes suddenly to fluid, the fingers skid and the soil smears, some free water remains on fingers*

ss strongly smeary: *under slight force between thumb and forefinger the soil suddenly changes to fluid, the fingers skid and the soil smears, free water is easily seen on fingers.*

Sf slightly fluid: *when a specimen is squeezed in the hand some material tends to flow between the fingers, but after full pressure is applied most of the residue is left in the hand*

vf very fluid: *when a specimen is squeezed in the hand, soil material easily flows between the fingers and after full pressure is applied little or no residue is left in the hand.*

PORES

Description of individual pores. There is space for two types of pores. For size and quantity also intergrades may be entered. Intergrades are indicated with the codes of both classes. Enter the code of the class with the lowest value first:

e.g PORE type 1:		
few	enter	|f |
few to common	enter	|f c|
very fine	enter	|v |
fine to medium	enter	|f m|

If more space is required use general descriptive part

Quantity:

Ø	*none*	*c*	*common: 50-200/dm3*
f	*few :1-50 /dm3*	*m*	*many : >200/dm3*

Size:

i	*micro : < 0.1 mm*	*c*	*coarse : 5-10 mm*
v	*very fine: 0.1-1 mm*	*a*	*very coarse: >10 mm*
f	*fine : 1-2 mm*	*t*	*fine to coarse*
m	*medium : 2-5 mm*	*x*	*micro to very coarse*

Form:

v *vesicular: approx. spherical or ellipsoidal in shape, not appreciably elongated in any direction.*

i *interstitial: irregular in shape, with inward curved faces, bounded by angular or curved surfaces or adjacent mineral grains or peds or both.*

t *tubular: more or less cylindrical*

Orientation (applied to tubular pores)

v	*vertical*	*o*	*oblique*
h	*horizontal*	*r*	*random*

Continuity:		distribution:	
c	*continuous*	*I*	*inped*
d	*discontinuous*	*e*	*exped*
		b	*both inped/exped*

POROSITY

Total porosity (CANSIS,1982):

h *highly porous : > 60% by volume*

m *moderately porous: 40-60%*

s *slightly porous : < 40%*

ROOTS

There is space for two types of roots, if more space is required use descriptive part.

Quantity (CANSIS,1982):

Ø nil, positive statement
f few :very fine/fine roots 1-10/dm^3
medium/coarse roots 1/dm^3
c common :very fine/fine roots 10-100/dm^3
medium roots 1-10/dm3
coarse roots 1-5/dm3
m many :very fine/fine roots >100/dm3
medium roots > 10/dm3
coarse roots > 5/dm3

Size:

v very fine: diameter < 1mm
f fine : 1-2 mm
m medium : 2-5 mm
c coarse: > 5 mm
x all,very fine to coarse

Location (USDA,1981):

c in cracks
m in mat at top of horizon
p between peds
s matted around stones or gravel
t throughout

CaCO3

The content of calcium carbonate (tested with 10% hydrochloric acid). The reaction to acid can be expected to be more vigorous in sandy material than in fine textured material having the same carbonate content.

Agent:

h HCl 10%
u HCl (unspecified strength)

Class:

Ø non calcareous : no visible reaction
s slightly calcareous: slight reaction; scarcely visible, but detectable to ear
r calcareous: strong reaction; bubbles in simple layer
v strongly calcareous: violent reaction; foamy, bubbles in many layers

Location:

t throughout
s on ped faces
l locally
n on nodules
c in channels and holes

---

pH

Enter field determined pH and indicate the method used in the general descriptive part.

MOTTLES

There is space for 2 entries (FAO,1977):

Abundance:

Ø	*none, positive statement*	*c*	*common: 2-20%*
f	*few: <2%*	*m*	*many : >20%*

Size:

f	*fine : < 5mm*	*c*	*coarse: >15mm*
m	*medium: 5-15 mm*	*h*	*heterogeneous*

Contrast:

f	*faint:*	*indistinct mottles are evident and recognizable only with close examination. Soil colours in both matrix and mottles have closely related hues and chromas*
d	*distinct:*	*although not striking the mottles are readily seen. The hue value and chroma of the matrix are easily distinguished from those of the mottles. They may vary as much as one or two hues or several units in chroma or value*
p	*prominent:*	*the conspicuous mottles are obvious and mottling is one of the outstanding features of the horizon. Hue, chroma and value may be several units apart*

Sharpness of boundary:

d	*diffuse:*	*> 2mm*
c	*clear :*	*< 2mm*
s	*sharp*	

Enter moist colour of mottles (notation see COLOUR):

CUTANS

Cutans/surface features.

Quantity/abundance (FAO,1977):

Ø	*none*		
p	*patchy*	:	*small scattered patches of cutan*
b	*broken/common*	:	*cutans cover largest part of peds*
c	*continuous/abundant:*		*cutans cover entire peds*

Thickness(FAO,1977):

f	*thin (faint)*	:	*fine sand grains are readily apparent in the cutan, bridges between cutans are weak, thickness microscopic*
m	*moderate (distinct)*	:	*fine sand grains are enveloped in the cutan and their outlines are indistinct*
t	*thick (prominent)*	:	*surface of the cutan is smooth showing no outlines of fine sand grains, strong bridges between larger grains*

Kind:

c	*clay*	*h*	*humus*
f	*clay/sesquioxides*	*m*	*mn-hydr./ox*
u	*clay/humus*	*z*	*soluble salts*
s	*sesquioxides*	*q*	*silica*
p	*slickensides*	*x*	*unspecified*
r	*pressure*		

Location:

pe	*ped faces (unspec)*	*hp*	*horizontal ped faces*
vp	*vertical ped faces*	*zp*	*hor/vert ped faces*
co	*top columns*	*gr*	*grains*
up	*upper surfaces peds*	*no*	*nodules*
		br	*bridges between sand grains*
lp	*lower surfaces peds*	*bp*	*bottom plates*
th	*throughout*	*rc*	*root channels/pores*
ro	*rock fragments*	*cr*	*cracks*

INCLUSIONS

Inclusions of pedogenetic origin. There is space for two entries (FAO,1986).

Quantity:

Ø	*none*	*q*	*frequent : 15-40 %*
v	*very few: < 5% by volume*	*r*	*very frequent: 40-80 %*
f	*few : 5-15%*	*d*	*dominant : > 80 %*

Type:

c	*concretions*	*t*	*crystals*
n	*nodules*	*s*	*soft segregations*
p	*pedodes**	*u*	*unspecified*

Size:

p	*powdery*	*m*	*medium: 2-10 mm*
s	*small: < 2 mm*	*l*	*large : > 10 mm*

Hardness:

s	*soft*
h	*hard*

Shape:

s	*spherical*	*t*	*thread like*
i	*irregular*	*d*	*dendritic*
a	*angular*	*c*	*cylindrical*

Composition:

k	*calcareous*	*f*	*ferrigenous*
c	*argilleous*	*m*	*manganiferous*
g	*gypsiferous*	*z*	*saline*
q	*siliceous*	*u*	*unspecified*

ROCK

Rock and primary mineral fragments. There is space for two entries.

Quantity:

Ø	*none*	*q*	*frequent : 15-40 %*
v	*very few: < 5% by volume*	*r*	*very frequent: 40-80 %*
f	*few : 5-15%*	*d*	*dominant : > 80 %*

Size:

v	*very fine: < 2mm*	*c*	*coarse : 7.5-12 cm*
f	*fine : 2mm - 1 cm*	*a*	*very coarse: 12-25 cm*
m	*medium : 1 - 7.5 cm*	*e*	*extremely coarse:>25cm*

Degree of weathering:
f fresh
w (slightly) weathered
s strongly weathered

Nature/composition: descriptive up to 15 characters. If more space is required use general descriptive part.

PANS

This item includes compact and hardened uncemented as well as indurated horizons. There is space for one entry only. If more space is required use general descriptive part (FAO,1986)

Kind:

p	*plough pan*	*f*	*fragipan*
k	*petrocalcic*	*i*	*iron pan (other than indurated plinthite)*
l	*iron stone(indurated plinthite)*	*d*	*duripan*
y	*gypsum pan*	*s*	*salt pan*
x	*other, explain in descriptive part*		

Cementation:(Day(ed),1983;USDA/SCS,1981;FAO,1986)

ø	*non cemented*	
w	*weakly cemented:*	*the wet cemented soil is brittle and hard but can be broken by hands*
s	*strongly cemented:*	*the wet cemented soil is too hard to be broken by hands, but it is easily broken with a hammer*
i	*indurated:*	*the wet cemented soil is brittle and so strongly cemented that a sharp blow of a hammer is required to break it*

Continuity:
c continuous
d discontinuous
b broken

Structure:

m	*massive*	*p*	*pisolitic*
v	*vesicular*	*n*	*nodular*
l	*platy*		

BIOLOGICAL ACTIVITY (BIOL.ACT.)

Biological activity: There is space for two major types. If more space is required use general descriptive part.
Abundance:

ø	*nil*	*q*	*frequent*
f	*few*	*r*	*very frequent*

Kind:

m	*mounds*	*s*	*shells*
k	*krotovinas*	*p*	*coprogenic elements*
w	*worm channels*	*r*	*termite channels*
y	*mycelium*	*a*	*mammal channels*
c	*sclerotium*	*x*	*channels,unspecified explain in descriptive part*
t	*pedotubules (unspecified)*		

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APPENDIX A. Glossary

Parent material

Colluvium: Loose, incoherent deposits that are replaced principally by gravity and accumulated at the foot of slopes or cliffs.
Slope wash: Soil and rock material that has been transported down a slope predominantly by unchanneled running water (sheet erosion).
Glacial outwash: Sand and gravel transported away from a glacier by streams of melting water and either deposited as a floodplain along a pre-existing valley bottom or broadcast over a pre-existing plain in a form similar to an alluvial fan.
Glacial drift: All stratified deposits predominantly of glacial origin made in bodies of glacial melting water or in the sea.
Glacial till: Unsorted and unstratified drift consisting of a heterogeneous mixture of clay, sand, gravel and boulders which is deposited by and underneath a glacier. Also known as boulder clay, till, ice-laid drift.

Parent rock

Arkosic sandstone: A sandstone in which much feldspar is present, ranging from products of granular desintegration of granite to partly sorted riverlaid or even marine deposits.
Graywacke: An argillaceous sandstone characterized by an abundance of unstable minerals and rock fragments and a fine grained clay matrix binding the larger particles.
Ash: Unconsolidated pyroclasts, grainsize < 2mm.
Lapilli: Unconsolidated pyroclasts, grainsize 2 - 64 mm.
Volcanic bombs: Unconsolidated pyroclasts, grainsize > 64 mm.
Tuff: Consolidated equivalent of ash.
Volcanic breccia: Consolidated rock composed predominantly of angular volcanic particles over 2 mm.
Pumice: White or pale grey to brown highly vesicular volcanic rock, silicic to mafic glass foam which will commonly float on water.
Scoria: Usely of mafic composition, highly inflated juvenile fragments, of volcanic origin having a much higher density than pumice (they readily sink in water).

Landform

Inselberg: A large steep-sided residual hill, knob, or mountain, generally rocky and bare, rising abrubtly from an extensive, nearly lowland erosion surface in arid or semiarid regions.
Badlands: Extremely rough, high, narrowly and steeply gullied topography in arid or semiarid areas that are horizontally bedded and have dry, loose soil.
Pediment: A piedmont surface formed from a combination of processes which are mainly erosional; the surface is chiefly bare rock but may have a veneer of alluvium or gravel.
Pediplain: A rock-cut erosion surface formed by the coalescence of two or more pediments.
Peneplain: Landsurface of low elevation and slight relief produced in the late stages of denudation of a landmass.

Stagnant alluvial plain: Alluvial plain on which erosion and aggradation by chanelled and over-bank stream flow is barely active or inactive because of reduced water supply, without apparent incision or channel enlargement that would lower the level of stream action.

Playa: A low, essentially flat part of a basin or other undrained area in an arid region.

Kame: Hill composed of sorted coarse water-laid glacial drift, largely sand and gravel, built into an impounded water body within stagnant ice or against the margin of an ice sheet.

Hydrology

Perched water table: The water table of a saturated layer of soil which is separated from an underlying saturated layer by an unsaturated layer (vadose water)

Inclusions

Pedode: A spheroidal, discrete glaebule with a hollow interior, often with a drusy lining of crystals like that of a geode.

APPENDIX B 1.Country codes

AFG	AFGHANISTAN
AL	ALBANIA
GBA	ALDERNEY
DZ	ALGERIA
AND	ANDORRA
AN	ANGOLA
RA	ARGENTINA
AUS	AUSTRALIA
A	AUSTRIA
BS	BAHAMAS
BRN	BAHREIN
BD	BANGLADESH
BDS	BARBADOS
B	BELGIUM
BH	BELIZE
RPB	BENIN
BM	BERMUDA
BOL	BOLIVIA
RB	BOTSWANA
BRA	BRAZIL
BRU	BRUNEI
BG	BULGARIA
BKF	BURKINA FASO
BUR	BURMA
RU	BURUNDI
CAM	CAMEROON
CDN	CANADA
RCA	CENTRAL AFRICAN REP.
RCH	CHILE
CHA	CHINA PEOPLES REP.
CO	COLOMBIA
RCB	CONGO
CR	COSTA RICA
C	CUBA
CY	CYPRUS
CS	CZECHOSLOVAKIA
DK	DENMARK
WD	DOMINICA
DOM	DOMINICAN REPUBLIC
EC	ECUADOR
ET	EGYPT
ES	EL SALVADOR
ETH	ETHIOPIA
FR	FAROER
D	FED. REP. OF GERMANY
FJI	FIJI
SF	FINLAND
F	FRANCE
GBN	GABON
WAG	GAMBIA
DDR	GERMAN DEM.REP
GH	GHANA
GBZ	GIBRALTAR
GR	GREECE
GRO	GREENLAND (DENMARK)
WG	GRENADA
GCA	GUATEMALA
GBG	GUERNSEY
BRG	GUYANA
GUY	GUYANA(FRENCH)
RH	HAITI
HO	HONDURAS
HK	HONG KONG
H	HUNGARY
IS	ICELAND
IND	INDIA
INS	INDONESIA
IR	IRAN
IRQ	IRAQ
IRL	IRELAND
GBM	ISLE OF MAN
IL	ISRAEL
I	ITALY
CI	IVORY COAST
JA	JAMAICA
J	JAPAN
GBJ	JERSEY
HKJ	JORDAN
K	KAMPUCHEA
EAK	KENYA
KWT	KUWAIT
LAO	LAOS
LS	LESOTHO
RL	LEBANON
LB	LIBERIA
LAR	LIBYA
FL	LIECHTENSTEIN
L	LUXEMBURG
RM	MALAGASY
MW	MALAWI
MAL	MALAYSIA
MLI	MALI
M	MALTA
MA	MAROCCO
RIM	MAURETANIA
MS	MAURITIUS
MEX	MEXICO
MOC	MOZAMBIQUE
MC	MONACO
SWA	NAMIBIA
NL	NETHERLANDS
NA	NETHERLANDS ANTILLES
NZ	NEW ZEALAND
NIC	NIGARAGUA
RN	NIGER
WAN	NIGERIA
KO	NORTH KOREA
N	NORWAY
OMA	OMAN
PAK	PAKISTAN
PA	PANAMA
PNG	PAPUA NEW GUINEA
PY	PARAQUAY
PE	PERU
PHI	PHILIPPINES
PL	POLAND
PR	PORTO RICO
P	PORTUGAL
R	RUMENIA
RWA	RWANDA
CNB	SABAH,LABUAN
RSM	SAN MARINO
SK	SARAWAK
AS	SAUDI ARABIA
SN	SENEGAL
SY	SEYCHELLES
WAL	SIERRA LEONE
SGP	SINGAPORE
SP	SOMALIA
ZA	SOUTH AFRICA
ROK	SOUTH KOREA
ADN	SOUTH YEMEN
SU	SOVIET UNION
E	SPAIN
CL	SRI LANKA
WV	ST.VINCENT
WL	ST.LUCIA
SUD	SUDAN
SME	SURINAM
SD	SWAZILAND
S	SWEDEN
CH	SWITZERLAND
SYR	SYRIA
RC	TAIWAN
EAT	TANZANIA
T	THAILAND
TG	TOGO
IT	TRINIDAD & TOBAGO
TN	TUNESIA
TR	TURKEY
EAU	UGANDA
GB	UNITED KINGDOM
USA	UNITED STATES
UY	URUGUAY
YV	VENEZUELA
VN	VIETNAM
WS	WEST SAMOA
YAR	YEMEN ARAB REPUBLIC
YU	YUGOSLAVIA
ZRE	ZAIRE
Z	ZAMBIA
EAZ	ZANZIBAR (TANZANIA)
ZW	ZIMBABWE
GMC	GLINKA MEMORIAL COLLECTION (USSR)

APPENDIX B2. FAO/UNESCO classification codes

A ACRISOLS
Af ferric acrisol
Ag gleyic acrisol
Ah humic acrisol
Ao orthic acrisol
Ap plinthic acrisol

B CAMBISOLS
Bc chromic cambisol
Bd dystric cambisol
Be eutric cambisol
Bf ferralic cambisol
Bg gleyic cambisol
Bh humic cambisol
Bk calcic cambisol
Bv vertic cambisol
Bx gelic cambisol

C CHERNOZEMS
Cg glossic chernozem
Ch haplic chernozem
Ck calcic chernozem
Cl luvic chernozem

D PODZOLUVISOLS
Dd dystric podzoluvisol
De eutric podzoluvisol
Dg gleyic podzoluvisol

E RENDZINAS
E rendzina

F FERRALSOLS
Fa acric ferralsol
Fh humic ferralsol
Fo orthic ferralsol
Fp plinthic ferralsol
Fr rhodic ferralsol
Fx xanthic ferralsol

G GLEYSOLS
Gc calcaric gleysol
Gd dystric gleysol
Ge eutric gleysol
Gh humic gleysol
Gm mollic gleysol
Gp plinthic gleysol
Gx gelic gleysol

H PHAEOZEM
Hc calcaric phaeozem
Hg gleyic phaeozem
Hh haplic phaeozem
Hl luvic phaeozem

I LITHOSOL
I lithosol

J FLUVISOLS
Jc calcaric fluvisol
Jd dystric fluvisol
Je eutric fluvisol
Jt thionic fluvisol

K KASTANOZEM
Kh haplic kastanozem
Kk calcic kastanozem
Kl luvic kastanozem

L LUVISOLS
La albic luvisol
Lc chromic luvisol
Lf ferric luvisol
Lg gleyic luvisol
Lk calcic luvisol
Lo orthic luvisol
Lp plinthic luvisol
Lv vertic luvisol

M GREYZEMS
Mg gleyic greyzem
Mo orthic greyzem

N NITOSOLS
Nd dystric nitosol
Ne eutric nitosol
Nh humic nitosol

O HISTOSOLS
Od dystric histosol
Oe eutric histosol
Ox gelic histosol

P PODZOLS
Pf ferric podzol
Pg gleyic podzol
Ph humic podzol
Pl leptic podzol
Po orthic podzol
Pp placic podzol

Q ARENOSOLS
Qa albic arenosol
Qc cambic arenosol
Qf ferralic arenosol
Ql luvic arenosol

R REGOSOLS
Rc calcaric regosol
Rd dystric regosol
Re eutric regosol
Rx gelic regosol

S SOLONETZ
Sg gleyic solonetz
Sm mollic solonetz
So orthic solonetz

T ANDOSOLS
Th humic andosol
Tm mollic andosol
To ochric andosol
Tv vitric andosol

U RANKERS
U ranker

V VERTISOLS
Vc chromic vertisol
Vp pellic vertisol

W PLANOSOLS
Wd dystric planosol
We eutric planosol
Wh humic planosol
Wm mollic planosol
Ws solodic planosol
Wx gelic planosol

X XEROSOLS
Xh haplic xerosol
Xk calcic xerosol
Xl luvic xerosol
Xy gypsic xerosol

Y YERMOSOLS
Yh haplic yermosol
Yk calcic yermosol
Yl luvic yermosol
Yt takyric yermosol
Yy gypsic yermosol

Z SOLONCHAKS
Zg gleyic solonchak
Zm mollic solonchak
Zo orthic solonchak
Zt takyric solonchak

APPENDIX B3. Soil Taxonomy (USDA/SCS) classification codes. Orders, suborders and great groups.

a	**ALFISOL**
aq	**aqualf**
aqw	albaqualf
aqd	duraqualf
aqf	fragiaqualf
aqg	glossaqualf
aqn	natraqualf
aqo	ochraqualf
aql	plinthaqualf
aqt	tropaqualf
aqm	umbraqualf
ab	**boralf**
abo	cryoboralf
abe	eutroboralf
abf	fragiboralf
abg	glossoboralf
abn	natriboralf
abb	paleboralf
ad	**udalf**
adc	agrudalf
adi	ferrudalf
adf	fragiudalf
agf	fraglossudalf
adg	glossudalf
ada	hapludalf
adn	natrudalf
adb	paleudalf
adt	tropudalf
au	**ustalf**
aud	durustalf
aua	haplustalf
aun	natrustalf
aub	paleustalf
aul	plinthustalf
aur	rhodustalf
ax	**xeralf**
axd	durixeralf
axa	haploxeralf
axn	natrixeralf
axb	palexeralf
axl	plinthoxeralf
axr	rhodoxeralf
d	**ARIDISOL**
dr	**argid**
drd	durargid
dra	haplargid
drj	nadurargid
drn	natrargid
drb	paleargid
do	**orthid**
dok	calciorthid
dom	camborthid
dod	durorthid
dog	gypsiorthid
dob	paleorthid
dos	salorthid
e	**ENTISOL**
eq	**aquent**
eqc	cryaquent
eqv	fluvaquent
eqa	haplaquent
eqw	hydraquent
eqs	psammaquent
eqi	sulfaquent
eqt	tropaquent
er	**arent**
er	arent
ev	**fluvent**
evc	cryofluvent
evp	torrifluvent
evt	tropofluvent
evd	udifluvent
evu	ustifluvent
evx	xerofluvent
eo	**orthent**
eoc	cryorthent
eop	torriorthent
eot	troporthent
eod	udorthent
eou	ustorthent
eox	xerorthent
es	**psamment**
esc	cryopsamment
esz	quartzipsamment
esp	torripsamment
est	tropopsamment
esd	udipsamment
esu	ustipsamment
esx	xeropsamment
h	**HISTOSOL**
hi	**fibrist**
hib	borofibrist
hic	cryofibrist
hil	luvifibrist
him	medifibrist
his	sphagnofibrist
hit	tropofibrist
hl	**folist**
hlb	borofolist
hlc	cryofolist
hlt	tropofolist
he	**hemist**
heb	borohemist
hec	cryohemist
hel	luvihemist
hem	medihemist
hei	sulfihemist
heo	sulfohemist
het	tropohemist
ha	**saprist**
har	borosaprist
hac	cryosaprist
ham	medisaprist
hat	troposaprist
i	**INCEPTISOL**
in	**andept**
inc	cryandept
ind	durandept
iny	dystrandept
ine	eutrandept
inw	hydrandept
inp	placandept
inv	vitrandept
iq	**aquept**
iqn	andaquept
iqc	cryaquept
iqf	fragiaquept
iqx	halaquept
iqa	haplaquept
iqh	humaquept
iqp	placaquept
iql	plinthaquept
iqs	sulfaquept
iqt	tropaquept
io	**ochrept**
ioc	cryochrept
iod	durochrept
ioy	dystrochrept
ioe	eutrochrept
iof	fragiochrept
iou	ustochrept
iox	xerochrept
ig	**plaggept**
ig	plaggept
it	**tropept**
ity	dystropept
ite	eutropept
ith	humitropept
its	sombritropept
itu	ustropept
im	**umbrept**
imc	cryumbrept
imf	fragiumbrept
ima	haplumbrept
imx	xerumbrept
m	**MOLLISOL**
mw	**alboll**
mwr	argialboll
mwn	natralboll
mq	**aquoll**

mqr	argiaquoll
mqk	calciaquoll
mqc	cryaquoll
mqd	duraquoll
mqa	haplaquoll
mqn	natraquoll
mb	**boroll**
mbr	argiboroll
mbk	calciboroll
mbc	cryoboroll
mba	haploboroll
mbn	natriboroll
mbb	paleboroll
mbv	vermiboroll
mr	**rendoll**
mr	rendoll
md	**udoll**
mdr	argiudoll
mda	hapludoll
mdb	paleudoll
mdv	vermudoll
mu	**ustoll**
mur	argiustoll
muk	calciustoll
mud	durustoll
mua	haplustoll
mun	natrustoll
mub	paleustoll
muv	vermustoll
mx	**xeroll**
mxr	argixeroll
mxk	calcixeroll
mxd	durixeroll
mxa	haploxeroll
mxn	natrixeroll
mxb	palexeroll

o	**OXISOL**
oq	**aquox**
oqg	gibbsiaquox
oqo	ochraquox
oql	plinthaquox
oqm	umbraquox
oh	**humox**
ohk	acrohumox
ohg	gibbsihumox
oha	haplohumox
ohs	sombrihumox
oo	**orthox**
ook	acrorthox
ooe	eutrorthox
oog	gibbsiorthox
ooa	haplorthox
oos	sombriorthox
oom	umbriorthox
op	**torrox**
op	torrox
ou	**ustox**
ouk	acrustox
oue	eutrustox
oua	haplustox
ous	sombriustox

s	**SPODOSOL**
sq	**aquod**
sqc	cryaquod
sqd	duraquod
sqf	fragiaquod
sqa	haplaquod
sqp	placaquod
sqs	sideraquod
sqt	tropaquod
si	**ferrod**
si	ferrod
sh	**humod**
shc	cryohumod
shf	fragihumod
sha	haplohumod
shp	placohumod
sht	tropohumod
so	**orthod**
soc	cryorthod
sof	fragiorthod
soa	haplorthod
sop	placorthod
sot	troporthod

u	**ULTISOL**
uq	**aquult**
uqw	albaquult
uqf	fragiaquult
uqo	ochraquult
uqb	paleaquult
uql	plinthaquult
uqt	tropaquult
uqm	umbraquult
uh	**humult**
uha	haplohumult
uhb	palehumult
uhl	plinthohumult
uhs	sombrihumult
uht	tropohumult
ud	**udult**
udf	fragiudult
uda	hapludult
udb	paleudult
udl	plinthudult
udr	rhodudult
udt	tropudult
uu	**ustult**
uua	haplustult
uub	paleustult
uul	plinthustult
uur	rhodustult
ux	**xerult**
uxa	haploxerult
uxb	palexerult

v	**VERTISOL**
vp	**torrert**
vp	torrert
vd	**udert**
vdr	chromudert
vdl	pelludert
vu	**ustert**
vur	chromustert
vul	pellustert
vx	**xerert**
vxr	chromoxerert
vxl	pelloxerert

Subgroup prefixes

AB	abruptic
ABØ4	abruptic aridic
ABØ8	abruptic cryic
AB1Ø	abruptic haplic
AB14	abruptic udic
AB16	abruptic xerollic
AE	aeric
AEØ3	aeric arenic
AEØ5	aeric grossarenic
AEØ6	aeric mollic
AEØ8	aeric humic
AEØ9	aeric tropic
AE1Ø	aeric umbric
AE12	aeric xeric
AL	albaquic
ALØ2	albaquultic
ALØ4	albic
ALØ8	albic glossic
AL1Ø	alfic
AL12	alfic arenic
AL13	alfic andeptic
AL16	alfic lithic
AN	andic
ANØ1	andeptic

ANØ3	andaquic
ANØ6	andic dystric
AN11	andeptic glossoboric
AN22	andic ustic
AN24	andaqueptic
AN3Ø	anthropic
AQ	aqualfic
AQØ2	aquentic
AQØ4	aqueptic
AQØ6	aquic
AQØ8	aquic arenic
AQ14	aquic duric
AQ16	aquic durorthidic
AQ18	aquic dystric
AQ24	aquic haplic
AQ26	aquic lithic
AQ31	aquic psammentic
AQ34	aquollic
AQ36	aquultic
AR	arenic
ARØ2	arenic aridic
ARØ3	arenic orthoxic
ARØ4	arenic plinthaquic
ARØ6	arenic plinthic
ARØ8	arenic rhodic
AR1Ø	arenic ultic
AR14	arenic umbric
AR16	arenic ustalfic
AR18	arenic ustollic
AR22	argiaquic
AR24	argiaquic xeric
AR26	argic
AR28	argic lithic
AR3Ø	argic pachic
AR32	argic vertic
AR34	aridic
AR36	aridic calcic
AR42	aridic duric
AR5Ø	aridic pachic
AR52	aridic petrocalcic
BO	boralfic
BOØ2	boralfic lithic
BOØ4	boralfic udic
BOØ6	borollic
BOØ8	borollic glossic
BO1Ø	borollic lithic
BO12	borollic vertic
CA	calcic
CAØ4	calcic pachic
CAØ6	calciorthidic
CA1Ø	calcixerollic
CA2Ø	cambic
CH	chromic
CHØ6	chromudic
CR	cryic
CR1Ø	cryic lithic
CR14	cryic pachic
CU	cumulic
CUØ2	cumulic udic
CUØ4	cumulic ultic
DU	durargidic
DUØ2	duric
DUØ8	durixerollic
DU1Ø	durixerollic lithic
DU11	durochreptic
DU12	durorthidic
DU14	durorthidic xeric
DYØ2	dystric
DYØ3	dystric entic
DYØ4	dystric fluventic
DYØ6	dystric lithic
DYØ8	dystropeptic
EN	entic
ENØ2	entic lithic
ENØ6	entic ultic
EP	epiaquic
EP1Ø	epiaquic orthoxic
EU	eutric
EUØ2	eutrochreptic
EUØ4	eutropeptic
FE	ferrudalfic
FI	fibric
FIØ2	fibric terric
FLØ2	fluvaquentic
FLØ6	fluventic
FL12	fluventic umbric
FR1Ø	fragiaquic
FR18	fragic
GLØ2	glossaquic
GLØ4	glossic
GL1Ø	glossic udic
GL12	glossic ustollic
GL14	glossoboralfic
GL16	glossoboric
GR	grossarenic
GRØ1	grossarenic entic
GRØ4	grossarenic plinthic
HA	haplaquodic
HAØ1	haplaquic
HAØ2	haplic
HAØ5	haplohumic
HAØ7	haploxerollic
HAØ9	hapludic
HA12	hapludollic
HA16	haplustollic
HE	hemic
HEØ2	hemic terric
HI	histic
HIØ2	histic lithic
HIØ6	histic pergelic
HU	humic
HUØ2	humic lithic
HUØ5	humic pergelic
HUØ6	humoxic
HU1Ø	humaqueptic
HY	hydric

HYØ2	hydric lithic
LE	leptic
LI	limnic
LIØ2	lithic
LIØ4	lithic mollic
LIØ6	lithic ruptic-alfic
LIØ7	lithic ruptic-argic
LIØ8	lithic ruptic-entic xerollic
LIØ9	lithic ruptic-entic
LI1Ø	lithic udic
LI11	lithic ruptic-xerorthentic
LI12	lithic ultic
LI13	lithic ruptic-ultic
LI14	lithic umbric
LI15	lithic ruptic-xerochreptic
LI16	lithic ustic
LI18	lithic ustollic
LI2Ø	lithic vertic
LI22	lithic xeric
LI24	lithic xerollic
MO	mollic
NAØ6	natric
OC	ochreptic
OR	orthidic
ORØ1	orthic
ORØ2	orthoxic
OX	oxic
PA	pachic
PAØ2	pachic udic
PAØ4	pachic ultic
PAØ6	paleorthidic
PAØ8	paleustollic
PA1Ø	palexerollic
PA2Ø	paralithic vertic
PE	pergelic
PEØ1	pergelic ruptic-histic
PEØ2	pergelic sideric
PEØ4	petrocalcic
PEØ6	petrocalcic ustalfic
PEØ8	petrocalcic ustollic
PE14	petrocalcic xerollic
PE16	petroferric
PE2Ø	petrogypsic
PK	placic
PK1Ø	plaggeptic
PK12	plaggic
PL	plinthaquic
PLØ4	plinthic
PLØ6	plinthudic
PS	psammaquentic
PSØ2	psammentic
QU	quartzipsammentic
RE	rendollic
RH	rhodic
RUØ2	ruptic-alfic
RUØ9	ruptic-lithic
RU11	ruptic-lithic entic
RU15	ruptic-lithic xerochreptic
RU17	ruptic-ultic
RU19	ruptic-vertic
SA	salorthidic
SAØ2	sapric
SAØ4	sapric terric
SI	sideric
SOØ4	sombrihumic
SP	sphagnic
SPØ2	sphagnic terric
SPØ4	spodic
SU	sulfic
TE	terric
THØ4	thapto-histic
THØ6	thapto-histic tropic
TO	torrertic
TOØ2	torrifluventic
TOØ4	torriorthentic
TOØ6	torripsammentic
TO1Ø	torroxic
TR	tropaquodic
TRØ2	tropeptic
TRØ4	tropic
AA	typic
UD	udertic
UDØ1	udalfic
UDØ2	udic
UDØ3	udollic
UDØ5	udorthentic
UD1Ø	udoxic
UL	ultic
UM	umbreptic
UMØ2	umbric
US	ustalfic
USØ2	ustertic
USØ4	ustic
USØ6	ustochreptic
USØ8	ustollic
US12	ustoxic
VE	vermic
VEØ2	vertic
XE	xeralfic
XEØ2	xerertic
XEØ4	xeric
XEØ8	xerollic

APPENDIX B4. Soil Taxonomy(USDA/SCS) classification codes. Texture and mineralogy.

Texture

ØØ5	ashy
ØØ7	ashy over cindery
ØØ8	ashy over loamy
Ø13	ashy over loamy-skeletal
ØØ9	ashy-skeletal
ØØ3	cindery
ØØ6	cindery over loamy
Ø17	cindery over medial
Ø15	cindery over medial-skeletal
ØØ4	cindery over sandy or sandy-skeletal
114	clayey
122	clayey over fine-silty
116	clayey over fragmental
124	clayey over loamy
12Ø	clayey over loamy-skeletal
118	clayey over sandy or sandy-skel.
Ø56	clayey-skeletal
Ø58	clayey-skeletal over sandy
Ø8Ø	coarse-loamy
Ø86	coarse-loamy over clayey
Ø82	coarse-loamy over fragmental
Ø84	coarse-loamy over sandy or sandy-skeletal
Ø88	coarse-silty
Ø94	coarse-silty over clayey
Ø92	coarse-silty over sandy or sandy-skeletal
126	fine
115	fine clayey
Ø96	fine-loamy
1Ø2	fine-loamy over clayey
Ø98	fine-loamy over fragmental
1ØØ	fine-loamy over sandy or sandy-skeletal
1Ø6	fine-silty
112	fine-silty over clayey
1Ø8	fine-silty over fragmental
11Ø	fine silty over sandy or sandy-skeletal
Ø36	fragmental
15Ø	gravelly
Ø68	loamy
Ø72	loamy over sandy or sandy-skeletal
Ø5Ø	loamy skeletal
Ø54	loamy-skeletal over clayey
Ø51	loamy-skeletal over fragmental
Ø52	loamy-skeletal over sandy
Ø7Ø	loamy sandy
Ø65	loamy to sandy
Ø1Ø	medial
Ø12	medial over cindery
Ø14	medial over clayey
Ø16	medial over fragmental
Ø18	medial over loamy
Ø2Ø	medial over loamy-skeletal
Ø22	medial over sandy or sandy-skeletal
Ø24	medial over thixotropic
Ø11	medial-skeletal
Ø62	sandy
Ø63	sandy or sandy-skeletal
Ø66	sandy over clayey
Ø64	sandy over loamy
Ø44	sandy skeletal
Ø47	sandy-skeletal over clayey
Ø46	sandy-skeletal over loamy
Ø26	thixotropic
Ø28	thixotropic over fragmental
Ø34	thixotropic over loamy
Ø32	thixotropic over loamy skeletal
Ø3Ø	thixotropic over sandy or sandy-skeletal
Ø27	thixotropic-skeletal
134	very fine

Mineralogy

Ø4	calcareous
Ø5	carbonatic
Ø9	chloritic
Ø7	clastic
Ø8	coprogenous
1Ø	diatomaceous
12	ferrihumic
14	ferritic
18	gibbsitic
2Ø	glauconitic
22	gypsic
24	halloysitic
26	illitic
27	illitic (calcareous)
28	kaolinitic
3Ø	marly
32	micaceous
34	mixed
35	mixed (calcareous)
37	montmorillonitic
38	montmorillonitic(calcareous)
4Ø	oxidic
42	sepiolitic
44	serpentinitic
46	siliceous
5Ø	vermiculitic

ISRIC SOIL DESCRIPTION FORM FOR CODED INFORMATION ISRIC CODE |_ _ _ : _ _|

DATE |_ _ : _ _| COUNTRY |_ _ _| AUTH. |_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _|

LOCATION |_ _|

|_ _|

LATITUDE |_ : _ ° _ ' _ "| LONGITUDE |_ : _ _ ° _ ' _ "| ALTITUDE |_ _ _ _|

CLASSIFICATION

FAO: SOIL UNIT |_ _| FINAL CLASS,(Y/N) |_| PHASE |_ _|

USDA/SCS: GREAT GROUP |_ _ _| SUBGROUP |_ _ _ _|

TEXTURE |_ _ _| MINERALOGY |_ _| STR |_ _| SMR |_ _|

DIAGNOSTIC HORIZONS I |_ _| II |_ _| III |_ _|

(OTHER) DIAGNOSTIC CRITERIA I |_ _| II |_ _|

LOCAL CLASS.: |_ _|

CLIMATE KöPPEN |_ _ _|

STATION |_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _| ALTITUDE |_ _ _ _|

LATITUDE |_ : _ ° _ ' _ "| LONGITUDE |_ : _ _ ° _ ' _ "| DISTANCE |_ _ _|

DIRECTION |_ _ _| RELEVANCE |_|

DATA KIND:	|_ _|	|_ _|	|_ _|	|_ _|
J	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
F	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
M	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
A	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
M	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
J	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
J	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
A	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
S	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
O	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
N	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
D	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
ANNUAL	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|	|_ _ _ _ . _|
PERIOD (YEARS)	|_ _|	|_ _|	|_ _|	|_ _|

PARENT MATERIAL / PARENT ROCK

I MODE |_| DERIVED FROM |_ _| TEXTURE |_ _| WEATHERING |_|
II |_| |_ _| |_ _| |_|

RESISTANCE I |_|
II |_|

DEPTH |_ _ _|

REMARKS |_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _|

EFFECTIVE SOIL DEPTH (cm) |_ _ _|

GEOMORPHOLOGY ISRIC CODE |_._._:_._|

REGIONAL LANDFORM |_._| TOPOGRAPHY |_|

PHYS.UNIT |_____|

POSITION OF SITE |_|

SLOPE GRADIENT (%) |_._._| FORM |_| ASPECT |_._._|

MICRORELIEF, SURFACE CHARACTERISTICS, ALKALI/SALT

KIND |_| PATTERN |_| HEIGHT (cm) |_._._|

ROCKOUTCROPS |_._| STONINESS |_._| SIZE (cm) |_._._| SHAPE |_|

CRACKING |_| SLAKING/CRUSTING |_| ALKALI |_| SALT |_|

HYDROLOGY

WATER TABLE: KIND |_| DEPTH (cm) |_._._| FLUCTUATION (cm) FROM |_._._|
TO |_._._|

SLOW PERMEABLE LAYER: FROM |_._._| TO |_._._| (cm) PERMEABILITY |_|

FLOODING: FREQUENCY |_| NATURE |_| RUN OFF |_| DRAINAGE CLASS |_._|

MOISTURE CONDITIONS PROFILE (cm): DRY FROM |_._._| TO |_._._|
MOIST FROM |_._._| TO |_._._|
WET FROM |_._._| TO |_._._|

DENUDATION AND AGGRADATION

SOIL EROSION: DEGREE I |_| TYPE I |_|
II |_| TYPE II |_| AGGRADATION |_| SLOPE STABILITY |_|

LAND USE AND VEGETATION

LUT |_._| CROP |_._._| IRRIGATION |_| ROTATION |_._|

IMPROVEMENTS |_._| VEGETATION TYPE |_._| STATUS |_|

REMARKS: |_____
_____|

GENERAL REMARKS ON SITE AND PROFILE: |_____

_____

_____

_____

_____

_____

_____|

256 CHARACTERS + BLANKS

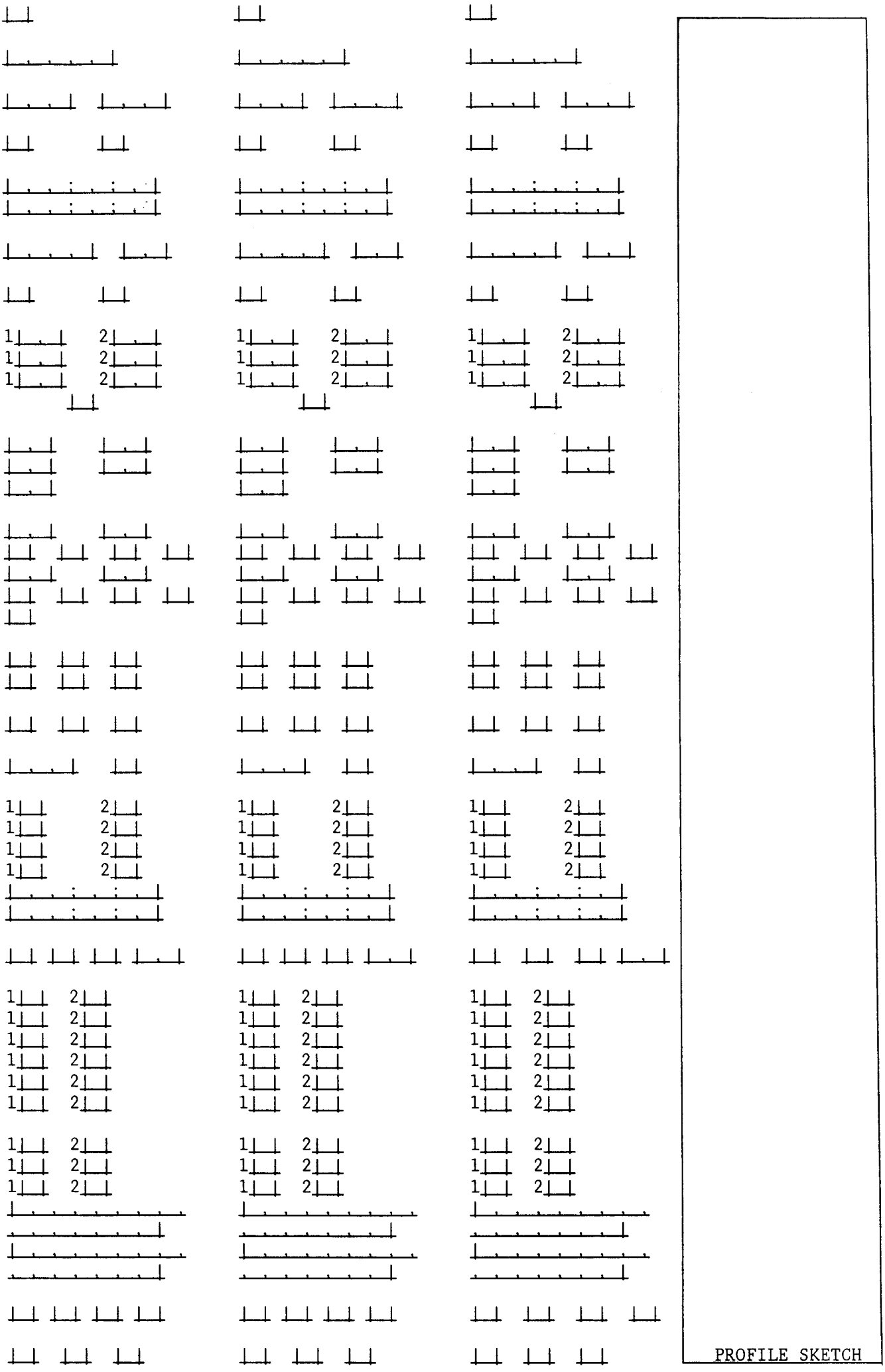
PHOTOGRAPHS / SLIDES: SUBJECT: LA SU PR PD VE CR LU ER XX

PROFILE CHARACTERISTICS

ISRIC CODE

HORIZON NUMBER			
DESIGNATION			
DEPTH up/low			
BOUNDARY wi/to			
COLOUR dry			
COLOUR moist			
TXT <2mm >2mm			
ORG. MAT. ki/de			
STRUCT 1/2 grade	1 2	1 2	1 2
STRUCT 1/2 size	1 2	1 2	1 2
STRUCT 1/2 form	1 2	1 2	1 2
STRUCT form 1->2			
CONSIST. dry/mo			
CONSIST. sti/pla (wet)			
CONSIST. other			
PORES 1 qu/si			
PORES 1 fo/or/co/di			
PORES 2 qu/si			
PORES 2 fo/or/co/di			
TOTAL POROSITY			
ROOTS 1 qu/si/lo			
ROOTS 2 qu/si/lo			
$CaCO_3$ ag/cl/lo			
pH value/method			
MOTTLES 1/2 ab	1 2	1 2	1 2
MOTTLES 1/2 si	1 2	1 2	1 2
MOTTLES 1/2 co	1 2	1 2	1 2
MOTTLES 1/2 bo	1 2	1 2	1 2
MOTTLES col 1			
MOTTLES col 2			
CUTANS q/t/k/l			
INCLUSIONS 1/2qu	1 2	1 2	1 2
INCLUSIONS 1/2ty	1 2	1 2	1 2
INCLUSIONS 1/2si	1 2	1 2	1 2
INCLUSIONS 1/2ha	1 2	1 2	1 2
INCLUSIONS 1/2sh	1 2	1 2	1 2
INCLUSIONS 1/2co	1 2	1 2	1 2
ROCK 1/2 qu	1 2	1 2	1 2
ROCK 1/2 si	1 2	1 2	1 2
ROCK 1/2 we	1 2	1 2	1 2
ROCK nature 1			
ROCK nature 2			
PANS k/ce/co/s			
BIOL.ACT. ab/ki			

ISRIC CODE



PROFILE SKETCH

International Soil Reference and Information Centre (ISRIC)
Publications - November 1988

Soil Monolith Papers

1. Thionic Fluvisol (*Sulfic Tropaquept*) Thailand, 1981
2. Orthic Ferralsol (*Typic Haplustox*) Zambia, in prep.
3. Placic Podzol (*Placaquod*) Ireland, in prep.
4. Humic Nitosol (*Oxic Paleustalf*) Kenya, in prep.
5. Humic Acrisol (*Orthoxic Palehumult*) Jamaica, 1982
6. Acri-Orthic Ferralsol (*Haplic Acrorthox*) Jamaica, 1982
7. Chernozem calcique (*Vermustoll Typique*) Romania, 1986
8. Ferric Luvisol (*Oxic Paleustalf*) Nigeria, in prep.

Technical Papers

1. Procedures for the collection and preservation of soil profiles, 1979
2. The photography of soils and associated landscapes, 1981
3. A new suction apparatus for mounting clay specimens on small-size porous plates for X-ray diffraction, 1979 (exhausted, superseded by TP 11)
4. Field extract of "Soil Taxonomy", 1980, 4th printing 1986
5. The flat wetlands of the world, 1982
6. Laboratory methods and data exchange program for soil characterization. A report on the pilot round. Part I: CEC and Texture, 1982; 3rd printing 1984
7. Field extract of "classification des sols", 1984
8. Laboratory methods and data exchange program for soil characterization. A report on the pilot round. Part II: Exchangeable bases, base saturation and pH, 1984
9. Procedures for soil analysis, 1986; 2nd edition, 1987
10. Aspects of the exhibition of soil monoliths and relevant information (provisional edition, 1985)
11. A simplified new suction apparatus for the preparation of small-size porous plate clay specimens for X-ray diffraction, 1986
12. Problem soils: their reclamation and management (copied from ILRI Publication 27, 1980, p. 43-72), 1986
13. Proceedings of an international workshop on the Laboratory Methods and Data Exchange Programme: 25-29 August 1986, Wageningen, the Netherlands, 1987
14. Guidelines for the description and coding of soil data, revised edition, 1988
15. ISRIC Soil Information System - user and technical manuals, with computer programme, 1988
16. Comparative classification of some deep, well-drained red clay soils of Mozambique, 1987
17. Soil horizon designation and classification, 1988
18. Historical highlights of soil survey and soil classification with emphasis on the United States, 1899-1970, 1988

Soil Monographs

1. Podzols and podzolization in temperate regions, 1982
   with wall chart: Podzols and related soils, 1983
2. Clay mineralogy and chemistry of Andisols and related soils from diverse climatic regions, in prep.
3. Ferralsols and similar soils; characteristics, classification and limitations for land use, in prep.

Wall charts

- Podzols and related soils, 67 x 97 cm, 1983 (see Soil Monograph 1)
- Soils of the World, 85 x 135 cm, 1987 (Elsevier Publ. Company, in cooperation with ISRIC, FAO and Unesco)

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