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GUIDELINES FOR THE DESCRIPTION AND CODING OF SOIL DATA

E.J. van Waveren

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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A new suction apparatus for mounting clay specimens on small-size porous plates for X-ray diffraction, 1979 (exhausted, superseded by TP 11)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, 3rd printing 1983
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, pp. 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, 1987 (provisional edition)
15. ISRIC Soil Information System - User and Technical Manuals, 1987
16. Comparative classification of some deep, well-drained red clay soils of Mozambique, 1987

Monographs

1. Podzols and podzolization in temperate regions, 1982
   with wall plate: 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, 67x97 cm, 1983 (see Monograph 1)
- Soils of the World, 85x135 cm, 1987 (Elsevier, in cooperation with ISRIC, FAO and Unesco)

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GUIDELINES FOR THE DESCRIPTION AND CODING OF SOIL DATA

E.J. van Waveren

August 1987

ISN 27090

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 (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 dBASE III, 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 flexability 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 15 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$\leq$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 20 characters. If more space is required use general description

---

CLIMATE

KÖPPEN — Enter climate classification according to Köppen:

AF tropical rain forest climate		
AM tropical monsoon climate		
AW tropical savanna climate		
BW desert climate	h	denotes a hot B climate
BS steppe climate	k	,, cool ,,
	c	,, cold ,,
	n	with frequent fog
ET tundra climate		
EF frost climate	h	high altitude
C warm temperate rainy climate		
CS summer dry	a	with hot summer
CW winter dry	b	with warm summer
CF without dry season	c	with cool summer
D cool snow forest climate		
DW dry season in winter	a	with hot summer
DF without dry season	b	with warm summer
	c	with cool summer
	d	with very cool summer

Entry of climatic data: on the description form space is available for data of at most three climatic variables recorded on one single climate station.
If data of more climatic variables is available or if the data is recorded at different stations, use backside of the form.
The database itself has no limitations in number of stations or number of variables per station.

STATION — Enter name of climate station; upto 20 characters.

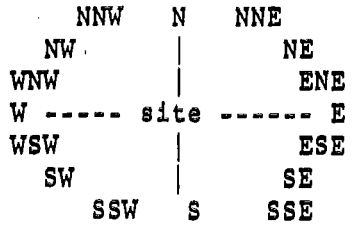
LATITUDE — Latitude of station. Enter: N or S/degrees/minutes.

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:



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

V very good : site of weather station is identical to soil site
G good : site of weather 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

DATA KIND — Enter kind of climatic variable:

T mean temperature in degrees C
Ti min temp
Ta max temp
P precipitation in cm
Pd number of raindays
E potential evapotranspiration in cm
Et thornthwaite
Ep penman
Ef frere,popov
Eb blaney-criddle
Ea papadakis
Eu turc
A actual evaporation in cm
Ao class A pan
Ac colorado pan
Ap piche
H relative humidity (%)
U windspeed in m/sec (indicate height instrument above ground in m in general descriptive part)
n hours of bright sunshine (hours/day)
nN percentage bright sunshine (%)
R total global radiation (MJ/m².day)
Re estimated total global radiation(MJ/m².day)

1MJ/m2 = 23.885cal/cm² = 23.885 langley
= 27.778mWhr/cm²
= 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.

CLIMATIC DATA — Enter mean monthly and annual figures for each climatic variable. Enter temperature in degrees Celsius and precipitation and evaporation in cm.

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 rockmass 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 eolian loess
S eolian sand
H ejecta ash
L lacustrine, incl.fluvio and glacio lacustrine
Y estuarine deposits
M marine deposits
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

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

table 1. Parent rock types

Y	**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		
W∅	**Chemically highly weathered materials** (reworked materials)	C∅	**Conglomerate (unspecified)**
	W1 lateritic material	C1	non calcareous
	W2 bauxitic material	C2	calcareous
I∅	**Igneous rocks (unspecified)**	I5	fine, unspecified
	I1 coarse , unspecified	I6	fine, basic (e.g.basalt)
	I2 coarse , basic	I7	fine, interm.(e.g.andesite)
	I3 coarse , intermediate(e.g.diorite)	I8	fine, acid (e.g.rhyolite)
	I4 coarse , acid (e.g.granite)	I9	fine, ultrabasic
M∅	**Metamorphic rocks (unspecified)**	M5	schist/phyllite,unspecified
	M1 gneiss, unspecified	M6	schist/phyllite,acidic
	M2 gneiss, acidic	M7	schist/phyllite,basic
	M3 gneiss, basic	M8	slate
	M4 serpentinite	M9	quartzite
B∅	Sedimentary rocks,interbedded (unspecified)	B4	limestone/siltstone
	B1 limestone/sandstone and shale	B5	sandstone/shale
	B2 limestone/sandstone	B6	sandstone/siltstone
	B3 limestone/shale	B7	shale/siltstone
A∅	**Sandstone (unspecified)**	A3	graywacke*
	A1 noncalcareous,unspecified	A4	calcareous, unspecified
	A2 arkosic*		
H∅	**Shale (unspecified)**	T∅	**Siltstone (unspecified)**
	H1 noncalcareous	T1	noncalcareous
	H2 calcareous	T2	calcareous
L∅	**Limestone (unspecified)**	L4	phosphatic
	L1 chalk	L5	arenaceous (sandy)
	L2 marble	L6	argillaceous
	L3 dolomitic	L7	cherty
S∅	**(other) sedimentary rocks (unspecified)**	U∅	**Claystone (unspecified)**
	S1 marl, unspecified	U1	noncalcareous
	S2 glauconite	U2	calcareous

table 1. cont'd

PØ	Pyroclasts, consolidated	EØ	Pyroclasts,unconsolidated
P1	tuff, unspecified*	E1	ash, unspecified*
P2	tuff,acidic	E2	ash,acidic
P3	tuff,basic	E3	ash,basic
P4	volcanic breccia, unspecified*	E4	lapilli, unspecified*
P5	volcanic breccia,acidic	E5	lapilli,acidic
P6	volcanic brecccia,basic	E6	lapilli,basic
P7	tuff breccia*	E7	volcanic bombs*
P8	scoria/cinders*		
P9	pumice*		
KØ	Miscellaneous organic material	K4	wood fragments <1m
K1	mossy material	K5	wood fragments >1 m
K2	herbaceous material	K6	charcoal
K3	woody material		

TEXTURE — Enter texture of parent material

SA	sandy	LO	loamy	ST	stony
SC	sandy clay	CL	clayey	NX	mixed
SI	silty	GR	gravelly	OR	organic

WEATHERING — General characterisation 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 upto 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	vulcano
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 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 galeries 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 lineair 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 upto 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.

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

Ø soils free of excess salt or alkali. 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	salt (mS/cm)	alkali (ESP)
Ø nil	0 - 4	0 - 5
S slight	4 - 8	5 - 15
M moderate	8 - 15	15 - 25
R strong	> 15	> 25

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 ∅ if not appropriate.

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.

Ø 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 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 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

DEGREE

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

∅ nil, positive statement	M moderate
S slight	R severe

SOIL AGGRADATION

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

∅ nil, positive statement
N not apparent
P present, specify in descriptive part

SLOPE STABILITY

Indicate present stability of slope:

∅ 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 mechanisation
AM arable farming: medium level
AL arable farming: low level: low inputs,low level of mechanisation
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	perrenial 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):

IØ	none	IL	levelling
IC	land cleaning	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 landuse (e.g. additional crops). Upto 40 characters

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GENERAL REMARKS ON SITE & PROFILE — Enter additional information on site and profile. Upto 254 characters

---

SAMPLES — Enter kind of sample and sample depth

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.

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:
- A abrupt : < 2cm
- C clear : 2-5 cm
- G gradual: 5-12 cm
- D diffuse: > 12cm

Topography:
- S smooth
- W wavy: pockets wider than deep
- I irregular: pockets deeper than wide
- 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 R= 50	5 YR=150	5 Y=250	5 GY=350	10G=500
7.5R= 75	7.5YR=175	7.5Y=275	7.5GY=375	5 BG=550
10 R=100	10 YR=200	100Y=300	100GY=400	10BG=600 etc

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
- 10R 2/4 -> 100 20 40

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

Abundance:
- 0 none, positive statement
- F few: <2%
- C common: 2-20%
- M many : >20%

Size:
- F fine : < 5mm
- M medium: 5-15 mm
- C coarse: >15mm
- 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 conspicious 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 (numerical notation see COLOUR):

TEXTURE

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

Fraction < 2mm:

SA	sand	CSA	coarse sand
		MSA	medium sand
		FSA	fine sand
		VSA	very fine sand
LSA	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
SIL silt loam
SI silt
SACL sandy clay loam
CL clay loam
SICL silty clay loam
SAC sandy clay
SIC silty clay
C clay

Fraction 0.2-7.5 cm:

SG	slightly gravelly	
GR	gravelly	
VG	very gravelly	
GA	gravel	

Fraction 7.5 - 25 cm:

SS	slightly stony	2-15%
ST	stony	15-50%
VS	very stony	50-90%
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:

0 nil
S slight : > 50Z fibric or foliated material
M moderate: 10-50Z fibric/foliated material
H high : < 10Z 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:

0 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 noncoherent (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 stong

Size:

VF	very fine	ME	medium
FF	very fine to fine	MC	medium to coarse
FI	fine	CO	coarse
FM	fine to medium	CC	coarse to very coarse
		VC	very coarse

Form:

PL	platy	GR	granular
PR	prismatic	CR	crumb
CL	columnar	MA	massive
AB	angular blocky	PM	porous massive
SB	sub angular blocky	SG	single grain
AW	angular blocky (wedge shaped)	IR	irregular
		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.			
				locklike; 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	
		Without rounded caps	With rounded caps	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 to moderate pressure between thumb and forefinger

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

VI very firm: soil material crushes under strong pressure, barely crushable between 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 I:	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:

0 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):

0 nil, positive statement
F few : very fine/fine roots 1-10/dm3
medium/coarse roots 1/dm3
C common: very fine/fine roots 10-100/dm3
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:

0 non calcareous : no visible reaction
S slightly calcareous: slight reaction; scarsely 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.

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 sandgrains
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:

∅	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:

∅	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: > 25 cm

Degree of weathering:

F	fresh
W	(slightly) weathered
S	strongly weathered

Nature/composition: descriptive upto 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	vesiculair	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:

0	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)		

REFERENCES

Day (ed), 1983; The Canada Soil Information System (CanSIS). Manual for describing soils in the field,1982. Revised. Research Branch, Agriculture Canada, Ottawa.

FAO, 1977; Guidelines for Soil Profile Description. 2nd edition. FAO.- Rome.

FAO, 1986; Guidelines for the coding of soil data (first draft). Proposals for an International Soil Data Bank. Reprint 1977. FAO, Rome.

FAO/UNESCO, 1974; Soil map of the world. Volume 1: legend. Unesco, Paris

McDonald, R.C., Isbell, R.F. et al., 1984; Australian soil and land survey Field Handbook, Inkata Press, Melbourne

Parker,S.P.(ed), 1984; McGraw-Hill Dictionary of earth sciences. McGraw-Hill Book Company, New York

Spaargaren,O. 1980; Guidelines for ISM soil profile description. ISM, Wageningen.

USDA, 1951; Soil survey manual. SCS, Washington.

USDA, 1981; Soil survey manual: revised chapter 4. ,SCS, Washington.

USDA/SCS, 1975; Soil taxonomy: a basic system of soil classification for making and interpreting soil surveys. SCS, Washington

USDA/SCS, 1979; Pedon coding system for the national cooperative soil survey. SCS, Washington.

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 river-laid 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.
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.

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	WG	GRENADA	PA	PANAMA
AL	ALBANIA	GCA	GUATEMALA	PNG	PAPUA NEW GUINEA
GBA	ALDERNEY	GBG	GUERNSEY	PY	PARAQUAY
DZ	ALGERIA	BRG	GUYANA	PE	PERU
AND	ANDORRA	GUY	GUYANA(FRENCH)	PHI	PHILIPPINES
AN	ANGOLA	RH	HAITI	PL	POLAND
RA	ARGENTINA	HO	HONDURAS	PR	PORTO RICO
AUS	AUSTRALIA	HK	HONG KONG	P	PORTUGAL
A	AUSTRIA	H	HUNGARY	R	RUMENIA
BS	BAHAMAS	IS	ICELAND	RWA	RWANDA
BRN	BAHREIN	IND	INDIA	CNB	SABAH,LABUAN
BD	BANGLA DESH	INS	INDONESIA	RSM	SAN MARINO
BDS	BARBADOS	IR	IRAN	SK	SARAWAK
B	BELGIUM	IRQ	IRAQ	AS	SAUDI ARABIA
BH	BELIZE	IRL	IRELAND	SN	SENEGAL
RPB	BENIN	GBM	ISLE OF MAN	SY	SEYCHELLES
BM	BERMUDA	IL	ISRAEL	WAL	SIERRA LEONE
BOL	BOLIVIA	I	ITALY	SGP	SINGAPORE
RB	BOTSWANA	CI	IVORY COAST	SP	SOMALIA
BRA	BRAZIL	JA	JAMAICA	ZA	SOUTH AFRICA
BRU	BRUNEI	J	JAPAN	ROK	SOUTH KOREA
BG	BULGARIA	GBJ	JERSEY	ADN	SOUTH YEMEN
BKF	BURKINA FASO	HKJ	JORDAN	SU	SOVIET UNION
BUR	BURMA	K	KAMPUCHEA	E	SPAIN
RU	BURUNDI	EAK	KENYA	CL	SRI LANKA
CAM	CAMEROUN	KWT	KUWAIT	WV	ST VINCENT
CDN	CANADA	LAO	LAOS	WL	ST.LUCIA
RCA	CENTRAL AFRICAN REP.	LS	LESOTHO	SUD	SUDAN
RCH	CHILE	RL	LEBANON	SME	SURINAM
CHA	CHINA PEOPLES REP.	LB	LIBERIA	SD	SWAZILAND
CO	COLOMBIA	LAR	LIBYA	S	SWEDEN
RCB	CONGO	FL	LIECHTENSTEIN	CH	SWITZERLAND
CR	COSTA RICA	L	LUXEMBURG	SYR	SYRIA
C	CUBA	RM	MALAGASY	RC	TAIWAN
CY	CYPRUS	MW	MALAWI	EAT	TANZANIA
CS	CZECHOSLOVAKIA	MAL	MALAYSIA	T	THAILAND
DK	DENMARK	MLI	MALI	TG	TOGO
WD	DOMINICA	M	MALTA	IT	TRINIDAD & TOBAGO
DOM	DOMINICAN REPUBLIC	MA	MAROCCO	TN	TUNESIA
EC	ECUADOR	RIM	MAURETANIA	TR	TURKEY
ET	EGYPT	MS	MAURITIUS	EAU	UGANDA
ES	EL SALVADOR	MEX	MEXICO	GB	UNITED KINGDOM
ETH	ETHIOPIA	MOC	MOZAMBIQUE	USA	UNITED STATES
FR	FAROER	MC	MONACO	UY	URUGUAY
D	FED. REP. OF GERMANY	SWA	NAMIBIA	YV	VENEZUELA
FJI	FIJI	NL	NETHERLANDS	VN	VIETNAM
SF	FINLAND	NA	NETHERLANDS ANTILLES	WS	WEST SAMOA
F	FRANCE	NZ	NEW ZEALAND	YAR	YEMEN ARAB REPUBLIC
GBN	GABON	NIC	NIGARAGUA	YU	YUGOSLAVIA
WAG	GAMBIA	RN	NIGER	ZRE	ZAIRE
DDR	GERMAN.DEM.REP	WAN	NIGERIA	Z	ZAMBIA
GH	GHANA	KO	NORTH KOREA	EAZ	ZANZIBAR (TANZANIA)
GBZ	GIBRALTAR	N	NORWAY	ZW	ZIMBABWE
GR	GREECE	OMA	OMAN	SU-GMC	GLINKA MEMORIAL
GRO	GREENLAND (DENMARK)	PAK	PAKISTAN	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 castanozem
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	ortic 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	dos	salorthid	har	borosaprist
aq	aqualf	e	ENTISOL	hac	cryosaprist
aqw	albaqualf	eq	aquent	ham	medisaprist
aqd	duraqualf	eqc	cryaquent	hat	troposaprist
aqf	fragiaqualf	eqv	fluvaquent	i	INCEPTISOL
aqg	glossaqualf	eqa	haplaquent	in	andept
aqn	natraqualf	eqw	hydraquent	inc	cryandept
aqo	ochraqualf	eqs	psammaquent	ind	durandept
aql	plinthaqualf	eqi	sulfaquent	iny	dystrandept
aqt	tropaqualf	eqt	tropaquent	ine	eutrandept
aqm	umbraqualf	er	arent	inw	hydrandept
ab	boralf	er	arent	inp	placandept
abo	cryoboralf	ev	fluvent	inv	vitrandept
abe	eutroboralf	evc	cryofluvent	iq	aquept
abf	fragiboralf	evp	torrifluvent	iqn	andaquept
abg	glossoboralf	evt	tropofluvent	iqc	cryaquept
abn	natriboralf	evd	udifluvent	iqf	fragiaquept
abb	paleboralf	evu	ustifluvent	iqx	halaquept
ad	udalf	evx	xerofluvent	iqa	haplaquept
adc	agrudalf	eo	orthent	iqh	humaquept
adi	ferrudalf	eoc	cryorthent	iqp	placaquept
adf	fragiudalf	eop	torriorthent	iql	plinthaquept
agf	fraglossudalf	eot	troporthent	iqs	sulfaquept
adg	glossudalf	eod	udorthent	iqt	tropaquept
ada	hapludalf	eou	ustorthent	io	ochrept
adn	natrudalf	eox	xerorthent	ioc	cryochrept
adb	paleudalf	es	psamment	iod	durochrept
adt	tropudalf	esc	cryopsamment	ioy	dystrochrept
au	ustalf	esz	quartzipsamment	ioe	eutrochrept
aud	durustalf	esp	torripsamment	iof	fragiochrept
aua	haplustalf	est	tropopsamment	iou	ustochrept
aun	natrustalf	esd	udipsamment	iox	xerochrept
aub	paleustalf	esu	ustipsamment	ig	plaggept
aul	plinthustalf	esx	xeropsamment	ig	plaggept
aur	rhodustalf	h	HISTOSOL	it	tropept
ax	xeralf	hi	fibrist	ity	dystropept
axd	durixeralf	hib	borofibrist	ite	eutropept
axa	haploxeralf	hic	cryofibrist	ith	humitropept
axn	natrixeralf	hil	luvifibrist	its	sombritropept
axb	palexeralf	him	medifibrist	itu	ustropept
axl	plinthoxeralf	his	sphagnofibrist	im	umbrept
axr	rhodoxeralf	hit	tropofibrist	imc	cryumbrept
d	ARIDISOL	hl	folist	imf	fragiumbrept
dr	argid	hlb	borofolist	ima	haplumbrept
drd	durargid	hlc	cryofolist	imx	xerumbrept
dra	haplargid	hlt	tropofolist	m	MOLLISOL
drj	nadurargid	he	hemist	mw	alboll
drn	natrargid	heb	borohemist	mwr	argialboll
drb	paleargid	hec	cryohemist	mwn	natralboll
do	orthid	hel	luvihemist	mq	aquoll
dok	calciorthid	hem	medihemist	mqr	argiaquoll
dom	camborthid	hei	sulfihemist	mqk	calciaquoll
dod	durorthid	heo	sulfohemist	mqc	cryaquoll
dog	gypsiorthid	het	tropohemist	mqd	duraquoll
dob	paleorthid	ha	saprist	mqa	haplaquoll

mqn	natraquoll	ohs	sombrihumox	uqf	fragiaquult
mb	boroll	oo	orthox	uqo	ochraquult
mbr	argiboroll	ook	acrorthox	uqb	paleaquult
mbk	calciboroll	ooe	eutrorthox	uql	plinthaquult
mbc	cryoboroll	oog	gibbsiorthox	uqt	tropaquult
mba	haploboroll	ooa	haplorthox	uqm	umbraquult
mbn	natriboroll	oos	sombriorthox	uh	humult
mbb	paleboroll	oom	umbriorthox	uha	haplohumult
mbv	vermiboroll	op	torrox	uhb	palehumult
mr	rendoll	op	torrox	uhl	plinthohumult
mr	rendoll	ou	ustox	uhs	sombrihumult
md	udoll	ouk	acrustox	uht	tropohumult
mdr	argiudoll	oue	eutrustox	ud	udult
mda	hapludoll	oua	haplustox	udf	fragiudult
mdb	paleudoll	ous	sombriustox	uda	hapludult
mdv	vermudoll	s	SPODOSOL	udb	paleudult
mu	ustoll	sq	aquod	udl	plinthudult
mur	argiustoll	sqc	cryaquod	udr	rhodudult
muk	calciustoll	sqd	duraquod	udt	tropudult
mud	durustoll	sqf	fragiaquod	uu	ustult
mua	haplustoll	sqa	haplaquod	uua	haplustult
mun	natrustoll	sqp	placaquod	uub	paleustult
mub	paleustoll	sqs	sideraquod	uul	plinthustult
muv	vermustoll	sqt	tropaquod	uur	rhodustult
mx	xeroll	si	ferrod	ux	xerult
mxr	argixeroll	si	ferrod	uxa	haploxerult
mxk	calcixeroll	sh	humod	uxb	palexerult
mxd	durixeroll	shc	cryohumod	v	VERTISOL
mxa	haploxeroll	shf	fragihumod	vp	torrert
mxn	natrixeroll	sha	haplohumod	vp	torrert
mxb	palexeroll	shp	placohumod	vd	udert
o	OXISOL	sht	tropohumod	vdr	chromudert
oq	aquox	so	orthod	vdl	pelludert
oqg	gibbsiaquox	soc	cryorthod	vu	ustert
oqo	ochraquox	sof	fragiorthod	vur	chromustert
oql	plinthaquox	soa	haplorthod	vul	pellustert
oqm	umbraquox	sop	placorthod	vx	xerert
oh	humox	sot	troporthod	vxr	chromoxerert
ohk	acrohumox	u	ULTISOL	vxl	pelloxerert
ohg	gibbsihumox	uq	aquult		
oha	haplohumox	uqw	albaquult		

Subgroup prefixes

AA	typic	AL	albaquic
AB	abruptic	AL∅2	albaquultic
AB∅4	abruptic-aridic	AL∅4	albic
AB∅8	abruptic-cryic	AL∅8	albic-glossic
AB1∅	abruptic-haplic	AL1∅	alfic
AB14	abruptic-udic	AL12	alfic-arenic
AB16	abruptic-xerollic	AL13	alfic-andeptic
AE	aeric	AL16	alfic-lithic
AE∅3	earic-arenic	AN	andic
AE∅5	aeric-grossarenic	AN∅1	andeptic
AE∅6	aeric-mollic	AN∅3	andaquic
AE∅9	aeric-tropic	AN∅6	andic-dystric
AE1∅	aeric-umbric	AN11	andeplic glossoboric
AE12	aeric-xeric	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-ustallic
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 enthic-lithic
ENØ4 eutropeptic
ENØ6 enthic-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-ultic
LI11	lithic ruptic-xerorthentic
LI12	lithic-udic
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
UD	udertic
UDØ1	udalfic
UDØ2	udic
UDØ3	udollic
UDØ5	udorthentic
UD1Ø	udoxic
UL	ultic
UM	umbreptic
UMØ2	umbric
US	ustalfic
USØ2	usteric
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 minerology.

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 overmedial-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

APPENDIX C,1.

ISRIC SOIL DESCRIPTION FORM FOR CODED INFORMATION ISRIC CODE

DATE COUNTRY AUTHOR

LOCATION

LATITUDE LONGITUDE ALTITUDE

CLASSIFICATION FAO: SOIL UNIT PHASE

USDA/SCS: GREAT GROUP SUBGROUP

TEXTURE MINERALOGY STR SMR

DIAGNOSTIC HORIZONS I II III

(OTHER) DIAGNOSTIC CRITERIA I II

LOCAL CLASSIFICATION:

CLIMATE KOPPEN:

STATION ALTITUDE

LATITUDE LONGITUDE DISTANCE

DIRECTION RELEVANCE

DATA KIND:

J
F
M
A
M
J
J
A
S
O
N
D
ANNUAL
PERIOD (YRS)

PARENT MATERIAL/PARENT ROCK

I MODE DERIVED FROM TEXTURE WEATHERING
II

I RESISTANCE DEPTH
II

REMARKS

EFFECTIVE SOIL DEPTH (cm)

APPENDIX C,2.

ISRIC CODE |_____|

GEOMORPHOLOGY REGIONAL LANDFORM |__| TOPOGRAPHY |_|

PHYS.UNIT |_____|

POSITION OF SITE |_|

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

MICRORELIEF, SURFACE CHARACTERISTICS, SALT/ALKALI

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 |___|

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

LAND USE AND VEGETATION

LUT |__| CROP |___| IRRIGATION |_| ROTATION |__|

IMPROVEMENTS |__| VEGETATION TYPE |__| STATUS |_|

REMARKS: |_____|
|_____|

GENERAL REMARKS ON SITE AND PROFILE: |_____|
|_____|
|_____|
|_____|
|_____|
|_____|
|_____|
|_____| MAXIMUM 256 CHARACTERS + BLANKS

SAMPLES

..... |_____|_____|_____|_____|_____|_____|_____|_____|_____|_____|
..... |_____|_____|_____|_____|_____|_____|_____|_____|_____|_____|
..... |_____|_____|_____|_____|_____|_____|_____|_____|_____|_____|
..... |_____|_____|_____|_____|_____|_____|_____|_____|_____|_____|

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

APPENDIX C,3.

PROFILE CHARACTERISTICS

ISRIC CODE

DESIGNATION			
DEPTH up/low			
BOUNDARY wi/to			
COLOUR dry			
moist			
MOTTLES 1/2 ab			
si			
co			
bo			
col 1			
col 2			
TXT <2mm >2mm			
ORG MAT ki/de			
STRUCT 1/2 gr			
si			
fo			
1->2			
CONSIST.dry/mo			
st/pl (wet)			
other			
PORES 1 qu/si			
fo/or/co/di			
2 qu/si			
fo/or/co/si			
POROSITY			
RTS 1 qu/si/lo			
2 qu/si/lo			
CACO3 ag/cl/lo			
pH val/method			
CUTANS q/t/k/l			
INCL 1/2 qu			
ty			
si			
ha			
sh			
co			
ROCK 1/2 qu			
si			
we			
nature			
PANS k/ce/co/s			
BIOL ACT.ab/ki			

APPENDIX C,4.

ISRIC CODE