

Reference soil China, mainland 36: Luvisol

Description

PROFILE DESCRIPTION : Deep, moderately well drained, light brown to yellowish brown silty clay loam derived from loess-like lacustrine deposits overlying red, very gravelly sandy clay loam. The dark yellowish brown to strong brown topsoil shows weakly developed crumb and platy structures and is low in organic carbon. The subsoil dominantly shows strongly developed prismatic and angular blocky structures. Soil reaction is neutral to slightly acid. CLIMATE: climatic data regarding sunshine hours per month: J 171.2 F 185.2 M 234.2 A 271.6 M 248.7 J 271.6 J 215.9 A 277.6 S 242.2 O 215.1 N 164.2 D 154.9 Year 2574.0



Classification

WRB 2006:

Cutanic Luvisol (Siltic Chromic)
17-105 cm argic horizon

WRB 1998:

Cutani- Chromic Luvisol (Haplic)
0-17 cm ochric horizon
17-105 cm argic horizon

FAO-UNESCO-ISRIC 1988:

Silti- Chromic Luvisol
0-0 cm argic B horizon
0-0 cm ochric A horizon
0-17 cm ochric A horizon
17-105 cm argic B horizon

FAO-UNESCO 1974:

Chromic Luvisol
0-17 cm ochric A horizon
17-105 cm argillic B horizon

Site description

General information:

Names of person(s) who described the profile : Boerma JAK
General description of location of profile (e.g., town, province) : Liaoning Province, Shengyang, Dongling District, Ynda
Climate classification according to Köppen : Dwx
Date : June 1993
Latitude / Longitude : N 41.8333333° / E 123.65°

Physiography:

The altitude of the soil profile relative to mean sea level, specified in meters : 80 m asl
Regional landform : pediplain
Topography of the surrounding country : rolling
Physiographic Unit in the immediate surrounding of the site : undulating plain
The slope refers to the inclination of the land immediately surrounding the site. The measured or estimated slope angle is specified to the nearest per cent : 4 %
The physiographic position of the site where the profile is located : upper slope
Form of the slope surrounding the site : concave
Slope Aspect of the site : south

Parent material:

The main parent rock/ material over which the soil has been formed (1st entry) : sediment, unconsolidated
Mode of Accumulation or deposition of parent material (1st entry) : lacustrine sediments
Texture of parent material (1st entry) :
Depth1 of lithological boundary : 105 cm
The main parent rock/ material over which the soil has been formed (2nd entry) :
Resistance against weathering (solid rock) (2nd entry) :
Soil Depth; depth to which roots can easily penetrate throughout the year : 105 cm
Remarks on Parent Materials : loess-like

Hydrology and drainage:

Depth of groundwater table : cm
Groundwater Top : cm
Groundwater Bottom : cm
Kind of groundwater table : no groundwater table observed
Top Stagnating Layer : cm
Bottom Stagnating Layer : cm
Flooding frequency : never
Estimated permeability (class) of least permeable part of the profile :
Drainage Class : moderately well
To Drainage Class :
Moisture conditions of the profile: dry from -to : 30-140 cm
Moisture conditions of the profile: moist from -to : 0-30 cm

Land use / vegetation:

Current land use at the site : low level arable farming
Major crops : maize
Main type of irrigation : no irrigation
Rotation scheme : continuous crop rotation
Vegetation Type;The natural vegetation at the site :
Status of vegetation :

Erosion and aggradation:

Soil erosion type (1st entry)
Occurrence of soil aggradation :
Slope Stability :

Surface characteristics:

Microrelief type: small-scale differences in relief in the direct vicinity of the site :
Microrelief Height :
Rockiness : none
Stoniness : none
Average size of stones :
Shape of stones (on average) :
Cracks : no cracks observed
Slaking of aggregates by tillage, rainfall or frost : no surface slaking/crusting observed
Evidence of salt : non-saline
Evidence of alkali : non-alkaline

Nearest climate station:

Station : Dongling
Country : China, mainland
WMO Code : 9999
Distance : 15 km S (good)
Latitude / Longitude : N 41°45 / E 123°40

Climate data*:

dataType(Station)	: nrecord	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precipitation (mm)(Dongling)	: 24	5.4	7.6	13.4	40.3	54	89.2	169.5	167	68.1	45.2	16.9	8.2	684.8
Mean temperature (°C)(Dongling)	: 24	-13	-9.1	0.2	9.5	17.1	21.6	24.5	23.3	16.8	8.8	-0.1	-9.3	7.5
Minimum temperature (°C)(Dongling)	: -	-16	-14	-6	3	10	15	19	17	10	3	-6	-14	1.8
Bright sunshine (hours/day)(Dongling)	: -	171	186	234	243	272	249	216	278	242	215	164	155	218.8

*Data are considered representative for site

Profile description:

- Ap 0-17 cm : yellowish brown (10YR 5/4, dry) dark yellowish brown (10YR 3/4, moist), loam structureless, weakly coherent porous massive and weak fine and medium crumb, slightly very friable, many very fine interstitial pores and many common pores, abrupt smooth boundary to,
- EB 17-30 cm : strong brown (7.5YR 5/6, moist), loam, weakly coherent porous massive parting to weakly coherent fine and medium platy, slightly very friable, patchy thin clay on pedfaces cutans, many very fine interstitial pores and few continuous tubular vertical pores,
- Bt1 30-70 cm : strong brown (7.5YR 4/6, dry) (7.5YR 6/5, moist), clay loam, moderate to strong medium and coarse prismatic parting to very strong fine and medium angular blocky, slightly hard firm, many coarse clear mottles (7.5YR 4/4), continuous thick clay on pedfaces cutans, many very fine tubular pores, diffuse smooth boundary to,
- Bt2 70-105 cm : strong brown (7.5YR 5/6, dry) (10YR 4/7, moist), clay loam, moderate to strong medium and coarse prismatic parting to very strong fine and medium angular blocky, slightly hard firm, many coarse clear mottles (7.5YR 4/4), continuous thick clay on pedfaces cutans, many very fine tubular pores, clear wavy boundary to,
- 2C 105-140 cm : (2.5YR 7/8, dry) red (2.5YR 4/8, moist), clay very gravelly, structureless, patchy moderately thick sesquioxide on pedfaces cutans, few very fine tubular pores and few interstitial pores, very frequent fine gravel medium angular quartz fragments,

Physical

Particle size distribution:

Depth (cm)	Gravel (%)	Very Coarse Sand (%)	Coarse Sand (%)	Medium Sand (%)	Fine Sand (%)	Very Fine Sand (%)	Total Sand (%)	Coarse Silt (%)	Fine Silt (%)	Total Silt (%)	Clay (%)
0-15	-	3.4	4.1	3.5	2.7	5.6	19.3	33.1	26.1	59.2	21.6
20-30	-	0.7	0.7	0.5	0.5	4.6	7	20.1	37.1	57.2	35.8
35-60	-	0.6	0.6	0.3	0.4	4.8	6.7	27.5	31.7	59.2	34.1
75-100	-	1.3	1.2	0.6	0.5	4.0	7.6	24.8	31.9	56.7	35.6
105-120	-	27.2	14.7	6.5	4.9	2.1	55.4	5.7	9.1	14.8	29.9

Water retention characteristics

Depth (cm)	Bulk Density (kg/dm ³)	pF 0 (%) w/v)	pF 1.0 (%) w/v)	pF 1.5 (%) w/v)	pF 2.0 (%) w/v)	pF 2.3 (%) w/v)	pF 2.7 (%) w/v)	pF 3.4 (%) w/v)	pF 4.2 (%) w/v)	pF 2.5 (%)
20-25	1.445	42.2	41.3	38.7	35.9	35.6	32.8	29.0	18.9	-
55-60	1.475	39.9	37.3	34.5	32.5	32.2	29.9	30.2	20.9	-

Other physical data

Depth (cm)	Bulk Density (kg/dm ³)	Spec. Surf. Area (m2/g)	COLE (cm/cm)	Water Disp. Clay (%)	Clay (%)
0-15	-	-	-	-	21.6
20-30	-	-	-	-	35.8
35-60	-	-	-	-	34.1
75-100	-	-	-	-	35.6
105-120	-	-	-	-	29.9

Chemical characteristics:

Depth (cm)	pH H ₂ O	pH KCl	EC 1 : 2.5 (mS/cm)	CaCO ₃ (%)	Org. C (%)	Org. N (%)	C / N	Exch. Acid (cmol/kg)	Exch. Al (cmol/kg)	Ca (cmol/kg)	Mg (cmol/kg)	K (cmol/kg)	Na (cmol/kg)	Sum Cations (cmol/kg)
0-15	: 6.5	5.8	0.30	1.0	1.29	0.14	9	-	-	16.0	2.7	0.2	0.3	19.2
20-30	: 7.3	5.8	0.10	1.0	0.26	0.06	4	-	-	13.4	3.8	0.0	0.4	17.6
35-60	: 6.5	4.8	0.14	1.0	0.18	0.05	4	-	-	14.4	5.6	0.1	0.3	20.4
75-100	: 5.9	4.2	0.08	-	0.20	0.04	5	-	-	13.1	5.2	0.1	0.6	19
105-120	: 5.6	4.3	0.09	-	0.06	0.02	3	-	-	8.8	3.8	0.1	0.4	13.1

Depth (cm)	CEC Soil (cmol/kg)	CEC Clay (cmol/kg)	CEC Org (cmol/kg)	ECEC (cmol/kg)	Base sat. (%)	Al sat. (%)	ESP (%)
0-15	: 16.1	75	4.5	-	119	-	2
20-30	: 14.4	40	0.9	-	122	-	3
35-60	: 16.4	48	0.6	-	124	-	2
75-100	: 16.2	46	0.7	-	117	-	4
105-120	: 12.2	41	0.2	-	107	-	3

Depth (cm)	P Olsen (mg/kg)	P Bray (mg/kg)	pH CaCl ₂	CaSO ₄ .2H ₂ O (%)
0-15	: 18.3	-	-	-
20-30	: 3.8	-	-	-
35-60	: 8.4	-	-	-
75-100	: 29.2	-	-	-
105-120	: 12.6	-	-	-

Clay mineralogy:

Depth (cm)	Kaolinite	Mica / illite	Vermiculite	Chlorite	Smec	Halloysite	Mixed layer	Quar	Feldspar	Gibbsite	Goethite	Hematite
0-15	: weak	weak	weak	-	weak	-	weak	-	-	-	-	-
20-30	: weak	medium to strong	medium to strong	-	medium to strong	-	weak	weak	-	-	-	-
35-60	: medium to strong	medium to strong	medium to strong	-	medium to strong	-	weak	very weak	-	-	-	-
75-100	: medium to strong	medium to strong	medium to strong	-	medium to strong	-	weak	weak	-	-	-	-
105-120	: medium to strong	medium to strong	very weak	-	medium to strong	-	weak	very weak	-	-	-	-

Source of analyzing procedures:

Laboratory Attribute	Description	Proc. ref
ISRIC Base sat.	Calculation; Sum of Exchangeable Cations (Na, K, Ca, Mg) / CEC soil	labmanual 18-3
ISRIC Bulk Density	Soil density excluding mass liquid, including interparticle space	labmanual 9-4 and 9-5.3
ISRIC C / N	Calculation; Organic Carbon / Organic Nitrogen	7
ISRIC Ca	Exchangeable bases with 1 M ammonium acetate at pH 7; Ca by atomic absorption spectrometry	9-6.3
ISRIC CaCO ₃ eq.	Carbonates are dissolved with dilute HCl. Residual acid is titrated. Carbonates expressed as CaCO ₃	9-6.3
ISRIC CEC Clay	Calculation; ((CEC soil - CEC org.m.)/ clay %)*100	9-4 and 9-5.3.3
ISRIC CEC Org	CEC organic matter; expert estimate for charge per unit C	3-4.7
ISRIC CEC Soil	CEC; with index cation in buffered solution pH7	4-1.4 and 13-4
ISRIC Clay; < 0.002 mm	Fraction by Pipette analysis; after removal CaCO ₃ and organic matter, dispersion and sedimentation	9-6.3
ISRIC EC 1 : 2.5	Electro Conductivity of a soil / water (1:2.5) suspension	
ISRIC ESP	Calculation; (Exchangeable Na / CEC soil) * 100	

ISRIC	K	Exchangeable bases with 1 M ammonium acetate at pH 7; K by flame atomic emission spectrometry	9-6.1
ISRIC	Kaolinite	Kaolinite; relative abundance scale 0 - 7	16-1
ISRIC	Mg	Exchangeable bases with 1 M ammonium acetate at pH 7; Mg by atomic absorption spectrometry	9-4 and 9-5.3
ISRIC	Mica / Illite	Mica / illite; relative abundance scale 0 - 7	16-1
ISRIC	Mixed-layer	Mixed layer minerals; relative abundance scale 0 - 7	16-1
ISRIC	Na	Exchangeable bases with 1 M ammonium acetate at pH 7; Na by flame atomic emission spectrometry	9-4 and 9-5.3
ISRIC	Organic Carbon	Wet combustion of organic matter by potassium dichromate and sulphuric acid at about 125 degrees Celcius. Residual dichromate is back titrated against ferrous sulphate. To compensate for incomplete destruction an empirical correction factor of 1.3 is applied	5
ISRIC	Organic Nitrogen	Organic Matter is digested in sulphuric acid (and hydrogen peroxide) with selenium as catalyst. Nitrogen is converted to ammonium sulphate. The solution is made alkaline and ammonia is distilled off. The evolved ammonia is trapped in boric acid and titrated with standardized acid solution	6
ISRIC	P Olsen	Phosphate in 0.5 M NaHCO ₃ extract (Olsen); Colorimetry	14-2
ISRIC	pF 0	Moisture content of soil in a ring sample at tension of 0.1 kPa head of water	18-3
ISRIC	pF 1.0	Moisture content of soil in a ring sample at tension of 1 kPa head of water	18-3
ISRIC	pF 1.5	Moisture content of soil in a ring sample at tension of 3.2 kPa head of water	18-3
ISRIC	pF 2.0	Moisture content of soil in a ring sample at tension of 10 kPa head of water	18-3
ISRIC	pF 2.3	Moisture content of soil in a ring sample at tension of 20 kPa head of water	18-3
ISRIC	pF 2.7	Moisture content of soil in a ring sample at tension of 50 kPa head of water	18-3
ISRIC	pF 3.4	Moisture content of soil in a ring sample at tension of 250 kPa head of water	18-3
ISRIC	pF 4.2	Moisture content of soil in a ring sample at tension of 1.5 MPa head of water	18-3
ISRIC	pH H ₂ O	pH electrode; in supernatant suspension	4-1
ISRIC	pH KCl	In supernatant suspension; potentiometrically	4-1
ISRIC	Quartz	Quartz; relative abundance scale 0 - 7	16-1
ISRIC	Sand; 0.10 - 0.05 mm	Fraction by sieving; after removal CaCO ₃ and organic matter	3-4.6
ISRIC	Sand; 0.25 - 0.10 mm	Fraction by sieving; after removal CaCO ₃ and organic matter	3-4.6
ISRIC	Sand; 0.5 - 0.25 mm	Fraction by sieving; after removal CaCO ₃ and organic matter	3-4.6
ISRIC	Sand; 1.0 - 0.5 mm	Fraction by sieving; after removal CaCO ₃ and organic matter	3-4.6
ISRIC	Sand; 2.0 - 0.05 mm	Total sand fractions by sieving; after removal CaCO ₃ and organic matter	3-5
ISRIC	Sand; 2.0 - 1.0 mm	Fraction by sieving; after removal CaCO ₃ and organic matter	3-4.6
ISRIC	Silt; 0.02 - 0.002 mm	Fraction by Pipette analysis ; after removal CaCO ₃ and organic matter, dispersion and sedimentation	3-4.7
ISRIC	Silt; 0.05 - 0.002 mm	Calculation; Sum fractions Silt 0.05 - 0.02 mm	3-4.7
ISRIC	Silt; 0.05 - 0.02 mm	Fraction by Pipette analysis ; after removal CaCO ₃ and organic matter, dispersion and sedimentation	3-4.7
ISRIC	Smectite	Smectite; relative abundance scale 0 - 7	16-1
ISRIC	Sum cations	Sum of Exchangeable Cations (Ca, Mg, Na, K) with 1 M ammonium acetate at pH 7	9-
ISRIC	Vermiculite	Vermiculite; relative abundance scale 0 - 7	16-1

*ref: no labmanual available, link to presumable used analytical methode

Other classification

USDA-NRCS (1999) : Udic Haplustalf
USDA-SCS (1975) : Udic Haplustalf fine-silty mixed mesic
Classification (other) :
 Argillic brown soil; Hapli-Ustic Argosol
 Brown claypan soil