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Istituto Sperimentale per lo Studio e la Difesa del Suolo

Università degli Studi di Napoli Federico II

FIRENZE, 13 NOVEMBRE 2002

SEMINARIO

Correlazione tra classificazione WRB e Soil Taxonomy e problematiche gestionali di suoli tropicali e sub-tropicali.

Gli interventi:

Suoli caposaldo e suoli culturali della Tailandia - Edoardo A.C. Costantini

Suoli e paesaggi del Yunan (Cina) e del Mato Grosso (Brasile) - Rosario Napoli

I giardini galleggianti del lago di Inle (Birmania) - Fabio Terribile

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SOIL PROFILE DESCRIPTION
OF
THE PEDONS TO BE OBSERVED
DURING
THE NORTHERN THAILAND TOUR

Soil Profile Description

Soil name: Bang Chong variant — Profile code No.N1
Classification (1999): Ultic Haplustalf, fine, kaolinitic, isohyperthermic
Location: Ban Buak Chan, Tambon Samoeng Tai, Amphoe Samoeng Changwat Chiang Mai
Sheet name: Changwat Chiang Mai — Map Sheet No.: 4746 I
Coordinate: 47QMA774848 — Elevation: 1115 m.
Relief: steep — Slope: 45-50 %
Physiography: mountainous
Parent material: derived from fine grained clastic rocks mainly shale
Drainage: well drained — Permeability: moderate
Runoff: rapid — Ground water depth: > 2 m.
Flooding depth: - cm — Duration: - — Frequency: -
Annual rainfall: 1,183.5 mm — Mean Temp.: 25.4 °C — Climate type: Tropical Savanna "Aw"
Natural vegetation or land use: grass and Avogado
Other: hightly erosion
Described by: P. Choldamrongkul, S. Udomsri, S. Riangthong, A. Pinjongskuldit, W. Panitkorn and W. Pholrachom — Date: April 21, 2000

Horizon	Depth (cm)	Description
A	0-6/14	Dark reddish brown (5YR 3/2) clay loam; moderate very fine and fine subangular blocky structure mixed with very fine granular structure; friable, slightly sticky and slightly plastic; many very fine roots; some charcoal fragments and termite activity; very strongly acid (field pH 5.0); clear and wavy boundary
Bt1	6/14-20/25	Mixed reddish brown and red (2.5YR 4/3 & 4/6) silty clay; moderate fine, medium and coarse subangular blocky structure; friable, sticky and plastic; moderately thick cutan on ped faces and pore walls; common very fine and fine roots; very strongly acid (field pH 5.0); clear and wavy smooth boundary
Bt2	20/25-33/45	Red (2.5YR 4/6) clay; moderate very fine, fine and medium subangular blocky structure; friable, sticky and slightly plastic; moderately thick cutan on ped faces and pore walls; few very fine and fine roots; some termite activity; very strongly acid (field pH 4.5); clear and wavy boundary
Bt3	33/45-62/78	Red (2.5YR 4/6) clay; moderate very fine, fine and medium subangular blocky structure; friable, sticky and slightly plastic; moderately thick cutan on ped faces and pore walls; common very fine and fine roots; some termite activity and krotovinas; common angular gravel of weathered shale (10 % by volume) and some quartz; very strongly acid (field pH 4.5); gradual and wavy boundary
Bt4	62/78-99	Red (2.5YR 4/6) clay; moderate very fine, fine and medium subangular blocky structure; friable, sticky and slightly plastic; moderately thick cutan on ped faces and pore walls; common very fine and fine roots; some termite activity and krotovinas; some angular weathered shale and quartz; very strongly acid (field pH 4.5); clear and smooth boundary
Bt5	99-125/132	Yellowish red (5YR 5/8) clay loam; moderate fine, medium and coarse subangular blocky structure; friable, sticky and slightly plastic; patchy thin cutan on ped faces and pore walls; few very fine and fine roots; some angular weathered shale; very strongly acid (field pH 4.5); clear and wavy boundary

Horizon	Depth (cm)	Description
Bt6	125/132-155/168	Yellowish red (5YR 5/6) clay loam; moderate very fine, fine and medium subangular blocky structure; friable, sticky and slightly plastic; patchy thin cutan on ped faces and pore walls; few very fine and fine roots; some angular weathered shale and coarse; very strongly acid (field pH 4.5); clear and wavy boundary
CB	155/168-190/195	Mixed light yellowish brown (10YR 6/4) reddish brown and yellowish red (5YR 5/4-6) and red (2.5YR 5/8) silty clay loam; moderate very fine, fine and medium subangular blocky structure; friable; few very fine and fine roots; mostly composed of shale fragments; very strongly acid (field pH 4.5); clear and wavy boundary
Cr	190/195-200	Layer of weathered shale

Micromorphology

Depth (cm)	Feature
54-93	The clayey matrix is reddish in color with no accumulation of diffuse sesquioxidic features indicating a well-drained soil. In this particular horizon, the voids are free of cutans.
25-45	The matrix is compact with fewer voids. Thin, yellowish-red argillans are present. The cutans (<1%) are grainy and birefringence is poor suggesting that they may relict formations.
78-99	There is a change in the matrix with higher amount of silt-sized quartz. Diffuse iron nodules, usually fine, are present. Ferri-argillans are few (<1%) and thin.
168-195	There is an obvious lithological discontinuity at this layer. The material is clayey and clay composition suggests high activity clay. The plasma has high birefringence. Diffuse iron forms are frequent and cutans are rare.

Interpretation

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This soil is clayey and acid. The clay content only changes slightly with depth. The plasma is reddish yellow and isotropic. Grains are subrounded fine sand to silt sized. Clay translocation is minimal in this soil. Argillans are few and thin and confined to the upper horizons (Figure Bg). Lack of argillans is not due to disruption of the matrix by bio-turbation. It appears that the soil is recently formed on pre-weathered alluvium.

The soil is classified as a Paleustult based on the field morphological and physico-chemical properties. The classification presupposes an argillic horizon, which is very poorly expressed in this soil. Clay translocation and accumulation is minimal. The clay increase in the soil is a sedimentary feature. The reddish colors are due to pre-weathering of the transported materials. Genetically, the soil is an Inceptisol with a new cycle of soil formation on recent deposits.

Analysis Results

(oven dry basis)

Lab No.	Depth (cm)	Horizon	Particle Size Analysis (Percentages)								Texture Class	pH			Fe_2O_3	Al
			USDA Grading			Sand-Fraction Grading						1:1	1:1	1:2	DC	KCl
			Sand	Silt	Clay	VC	C	M	F	VF		water	KCl	$CaCl_2$	%	$cmol_c/kg$
W21	0-6/14	A	17.0	46.8	36.2	4.6	2.6	2.2	3.4	4.2	SiCL	4.9	4.4	-	5.01	1.1
W22	6/14-20/25	BA	11.6	37.9	50.5	2.6	1.6	1.6	2.6	3.2	C	5.1	4.2	-	6.41	0.47
W23	20/25-62/78	Bt11	14.3	36.6	49.1	2.1	2.3	2.2	3.4	4.2	C	5.2	3.9	-	6.48	1.68
W25	62/78-99	Bt12	14.7	45.1	40.2	1.8	2.0	2.4	4.0	4.5	SiC	5.1	4.2	-	6.94	0.49
W26	99-125/132	Bt2	15.5	56.5	28.0	1.8	2.2	2.0	4.2	5.3	SiCL	5.0	4.0	-	5.43	0.64
W27	125/132-155/168	Bt3	20.5	59.6	19.9	4.2	3.2	2.8	4.1	6.2	SiL	5.0	4.0	-	3.45	0.67
W28	155/168-190/195	BC	15.8	72.5	11.7	2.6	2.3	2.0	3.3	5.6	SiL	5.1	3.8	-	2.29	0.69

Lab No.	Total content (%)		Exchange Capacity and Cations ($cmol_c.kg^{-1}$)								Base Saturation (%)			CEC	Avail.content (mg/kg)	
	C	N	Ca	Mg	K	Na	Sum Cations (B)	Extr. Acidity (A)	SUM (B+A)	CEC NH_4OAc (C)	B/C*100	(B*100)/ (B+A)	ECEC $cmol_c.kg^{-1}$	100g. Clay	P*	K NH_4Oac
W21	2.88	0.17	8.2	2.7	1.3	0.3	12.5	15.1	27.6	21.2	57	45	12.6	58.3	10	419
W22	1.53	0.12	7.0	2.9	0.7	0.3	10.9	14.4	25.3	20.6	53	43	11.3	40.8	1	255
W23	0.80	0.06	4.8	2.8	0.4	0.2	8.2	13.3	21.5	17.8	46	38	9.7	36.2	1	134
W25	0.44	0.04	4.0	2.9	0.4	0.3	7.6	10	17.6	13.8	55	43	8.0	34.3	1	142
W26	0.33	0.03	3.8	2.9	0.5	0.3	7.4	9.6	17.0	15.8	47	44	8.2	56.4	1	134
W27	0.25	0.02	3.3	2.4	0.3	0.2	6.2	6.8	13.0	13.6	46	48	7.1	68.3	1	105
W28	0.13	0.01	2.8	2.0	0.3	0.2	5.3	5.2	10.5	10.7	50	50	6.1	91.4	1	113

P* used Olsen method when pH (1 :1 water : soil) >7.5, and Bray 2 pH (1:1 water : soil) <7.5

Depth (cm)	Bulk Density g cm^{-3}	Particle >2 mm. %by wt.	Water Content (%by wt)						Hydraulic Conductivity	
			1/20 Atm.	1/10 Atm.	1/3 Atm.	1 atm.	3 atm.	15 atm.	cm/hr	class
0-6/14	1.08	-	-	-	29.33	-	-	16.53	-	VR
6/14-20/25	1.12	-	-	-	34.30	-	-	20.67	-	VR
20/25-33/45	1.03	-	-	-	39.56	-	-	23.56	4.11	M
33/45-62/78	1.11	-	-	-	37.16	-	-	22.00	5.62	M
62/78-99	1.16	-	-	-	36.32	-	-	21.15	7.51	MR
99-125/132	1.23	-	-	-	34.26	-	-	18.41	5.89	M
125/132-155/168	1.24	-	-	-	32.75	-	-	14.06	3.50	M
155/168-190/195	1.30	-	-	-	34.91	-	-	11.25	4.57	M

Depth (cm)	Mineralogical analysis for clay fraction	Mineral and abundance code
6/14-20/25	KK2 IL1 FS1 GE1 GS2	Mineral code
20/25-33/45	KK2 IL1 FS1 GE1 GS2	KK = kaolinite IL = illite MM = montmorillonite VM = vermiculite CR = chlorite
62/78-99	KK2 IL2 FS1 GE1 GS2	Q = quartz FS = feldspar GE = goethite GS = gibbsite
99-125/132	KK2 IL2 FS1 GE1 GS2	Abandance
125/132-155/168	KK2 IL2 FS1 GE1 GS2	1 = trace 2 = small 3 = moderate 4 = large 5 = dominant

Soil Profile Description

Soil name: Hang Dong variant — Profile code No.N2
Classification (1999): Pachic Argiustoll, fine-loamy, mixed, active, isohyperthermic
Location: field plot of Mr. Tui Chanthakig, Ban Muang Kham, Tambon Pong Yaeng, Amphoe Mae Rim Changwat Chiang Mai
Sheet name: Changwat Chiang Mai — Map Sheet No.: 4746 I
Coordinate: 47QMA823857 — Elevation: 400 m.
Relief: nearly level — Slope: 3-4 %
Physiography: valley field
Parent material: alluvium over granite-gneiss
Drainage: poorly drained — Permeability: moderate
Runoff: moderate — Ground water depth: > 2 m.
Flooding depth: - cm — Duration: - — Frequency: -
Annual rainfall: 1,183.5 mm — Mean Temp.: 25.4 °C — Climate type: Tropical Savanna "Aw"
Natural vegetation or land use: vegetable
Other:
Described by: P. Choldamrongkul, S. Udomsri, S. Riangthong, A. Pinjongskuldit, W. Panitkorn and W. Pholrachom — Date: April 21, 2000

Horizon	Depth(cm)	Description
Ap	0-10	Very dark gray (10YR 3/1) clay; moderate very fine, fine and medium subangular blocky structure; sticky and plastic; common very fine and fine roots; neutral (field pH 7.0); clear and smooth boundary
BA	10-21/28	Very dark gray (10YR 3/1) clay; moderate medium and coarse angular blocky structure; sticky and plastic; few very fine and fine roots; common pressure faces; some krotovinas (earth worm); moderately alkaline (field pH 8.0); clear and wavy boundary
Bt1	21/28-48/54	Very dark grayish brown (10YR 3/2) clay loam with sand; common medium prominent yellowish red (5YR 4/6) mottles; moderate very fine, fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; patchy thin cutan on ped faces and in pores; common very fine and fine roots; few strongly weathered gneiss; moderately alkaline (field pH 8.0); clear and wavy boundary
Bt2	48/54-86/93	Very dark grayish brown (10YR 3/2) clay loam; common fine and medium prominent yellowish red (5YR 4/6) mottles; moderate fine, medium and coarse subangular blocky structure; friable, slightly sticky and plastic; moderately thick cutan on ped faces and in pores; common very fine and fine roots; few strongly weathered gneiss; moderately alkaline (field pH 8.0); clear and wavy boundary
2Bt3	86/93-108/110	Mixed dark brown to brown (10YR 4/3-4) clay loam; common fine distinct yellowish brown (10YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; moderate fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; patchy thin cutan on ped faces and in pores; some strongly weathered gneiss; moderately alkaline (field pH 8.0); clear and wavy boundary
2Bt4	108/110-130	Mixed very dark gray (10YR 3/1) and dark yellowish brown (10YR 4/4) clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; patchy thin cutan on ped faces and in pores; some strongly weathered gneiss; neutral (field pH 7.0); clear and smooth boundary

Horizon	Depth(cm)	Description
2Bt5	130-148/150	Mixed dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky and plastic; patchy thin cutan on ped faces and in pores; common strongly weathered gneiss (5% by volume); moderately alkaline (field pH 8.0); clear and wavy boundary
3Bt6	148/150-200	Yellowish brown (10YR 5/4-6) clay loam; many fine distinct grayish brown (10YR 5/2) mottles; moderate fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; patchy thin cutan on ped faces and in pores; common strongly weathered gneiss (15% by volume); moderately alkaline (field pH 8.0)

Micromorphology

Depth (cm)	Feature
54-93	The matrix is heavily stained with organic matter making some parts opaque. There is some structural organization of the material. Thin ferri-argillan are present and these are yellow and with good birefringence indicating current illuviation. Moisture saturation is weakly expressed in the form of few diffuse ferrans.
148-150	The compact loamy matrix is reddish in color. The plasma is heavily stained with iron and this is an insitu saturation caused by alternating oxidation and reduction processes. Ferri-argillans are present (1%) but clay translocation is not an intense process.
150-200	The influence of water saturation is best expressed in this horizon. Most of the voids are lined with ferrans, bright reddish in color. The soil matrix is yellowish in color and the cutans (<1%) are also yellowish. This combination of features suggests that iron enriched water from overlying horizons is percolating into this layer and precipitating the iron on the void walls. Hence, the main layer of water saturation is above this layer.

Interpretation

The soil is developed on alluvium over weathering products of granite-gneiss. A major discontinuity is observed at 1 m depth. The internal drainage is poor though the upper part of the soil is free-draining. The grains range from sand to silt with the former predominating. The sand grains are angular quartz. Weatherable minerals are rare. The plasma is reddish brown in color and the iron masks plasmic fabric. In the upper part of the soil, organic matter masks the plasmic features. Illuviation argillans are common and appear to increase with depth. The cutans are also stained with iron masking the birefringence (Figure Cm2-a).

Diffuse iron features increase with depth and dominated the subsoil. In the 3Bt6 horizon (Figure Cm2-b) these are seen as ferrans, neoferrans, and diffuse nodules. The ferrans coat former argillans in the larger voids. These features indicate moisture saturation during some periods of the year. In general the 3Bt6 horizon is pale and except for the iron enriched zones that are reddish.

The micromorphological analysis supports the classification as an Argiustoll. The diffuse iron features portray the aquic features and the fact that these predominate in the subsoil indicates the Endoaquic property.

Soil Profile Description

Soil name: Chiang Khong series (Cg) Profile code No.N3
Classification (1999): Kandiustalfic Eutrustox, fine, kaolinitic, isohyperthermic
Location: 150 m. west of road on km. 4.5 to Huai Hung Khrai Royal Project, Ban Huai Hung Khrai, Tambon Mae Pong, Amphoe Doi Saket Changwat Chiang Mai
Sheet name: Amphoe San Sai Map Sheet No.: 4846 IV
Coordinate: 47QNA236889 Elevation: 480-500 m.
Relief: gently undulating Slope: 2-3 %
Physiography: volcanic plain
Parent material: derived from andesite
Drainage: well drained Permeability: moderate
Runoff: moderate Ground water depth: > 2 m.
Flooding depth: - cm Duration: - Frequency: -
Annual rainfall: 1,183.5 mm Mean Temp.: 25.4 °C Climate type: Tropical Savanna "Aw"
Natural vegetation or land use: mixed deciduous
Other:
Described by: P. Choldamrongkul, S. Udomsri, S. Riangthong, A. Pinjongskuldit, W. Panitkorn and W. Pholrachom Date: April 22, 2000

Horizon	Depth(cm)	Description
A	0-8	Dark reddish brown (2.5YR 3/3) clay loam to clay; strong very fine, fine and medium subangular blocky structure mixed with very fine granular structure; slightly hard, friable, sticky and slightly plastic; common fine and medium roots; some charcoal fragments; moderately acid (field pH 6.0); clear and smooth boundary
Bo1	8-26	Dark reddish brown to dark red (2.5YR 3/4-6) clay loam to clay; strong fine, medium and coarse subangular blocky structure; slightly hard, friable, sticky and slightly plastic; patchy thin cutan on ped faces and pore walls; few fine and common medium roots; some charcoal fragments and termite activity; strongly acid (field pH 5.5); gradual and smooth boundary
Bo2	26-58/60	Dark red (2.5YR 3/6) clay loam to clay; strong fine, medium and coarse subangular blocky structure; slightly hard, friable, sticky and slightly plastic; moderately thick cutan on ped faces and pore walls; common medium roots; some charcoal fragments and termite activity; very strongly acid (field pH 5.0); diffuse and smooth boundary
Bo3	58/60-95	Dark red (2.5YR 3/6) clay loam to clay; strong fine, medium and coarse subangular blocky structure; slightly hard, friable, sticky and slightly plastic; moderately thick cutan on ped faces and pore walls; few fine and common medium roots; very strongly acid (field pH 5.0); diffuse and smooth boundary
Bo4	95-123	Dark red (2.5YR 3/6) clay loam to clay; strong fine, medium and coarse subangular blocky structure; slightly hard, friable, sticky and slightly plastic; moderately thick cutan on ped faces and pore walls; few fine roots; very strongly acid (field pH 5.0); gradual and smooth boundary
Bo5	123-162	Dark red (2.5YR 3/6) clay loam to clay; strong fine and medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; patchy cutan on ped faces and pore walls; few very fine and fine roots; very strongly acid (field pH 5.0); clear and smooth boundary
Bo6	162-200	Red (2.5YR 4/6) clay loam to clay; strong fine, medium and coarse subangular blocky structure; slightly hard, friable, sticky and slightly plastic; patchy thin cutan on ped faces and pore walls; few very fine and common fine roots; some soft Mn nodules; very strongly acid (field pH 5.0)

Soil Profile Description

Soil name: Chiang Mai series (Cm) Profile code No.N4
Classification (1999): Typic Ustifluvent, coarse-loamy, siliceous, active isohyperthermic
Location: Ban Pa Dua, Tambon Khua Mung, Amphoe Saraphi Changwat Chiang Mai
Sheet name: Amphoe San Pa Tong Map Sheet No.: 4746 II
Coordinate: 47QMA975644 Elevation: 300 m.
Relief: nearly level Slope: 1-2 %
Physiography: flood plain (levee)
Parent material: alluvium
Drainage: well drained to moderately well drained Permeability: moderate
Runoff: moderate Ground water depth: > 2 m.
Flooding depth: - cm Duration: - Frequency: -
Annual rainfall: 1,183.5 mm Mean Temp.: 25.4 °C Climate type: Tropical Savanna "Aw"
Natural vegetation or land use: Orchards
Described by: P. Choldamrongkul, S. Udomsri, S. Riangthong, A. Pinjongskuldit, W.Panitkorn and W. Pholrachom Date: April 20, 2000

Horizon	Depth(cm)	Description
A	0-10	Dark brown to brown (10YR 4/3) silt loam; moderately strong fine, medium and coarse angular blocky structure; friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine mica flakes; strongly acid (field pH 5.5); clear and smooth boundary
C1	10-19/24	Dark brown to brown (10YR 4/3) fine sandy loam; moderately strong fine, medium and coarse angular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; many very fine mica flakes; moderately alkaline (field pH 8.0); clear and wavy boundary
C2	19/24-42/50	Dark yellowish brown (10YR 4/4) loamy sand; moderately weak very fine, fine, medium and coarse subangular blocky structure; very friable, non-sticky and non-plastic; common very fine and few fine, medium and coarse roots; many very fine mica flakes; moderately alkaline (field pH 8.0); clear and wavy boundary
C3	42/50-63/66	Dark yellowish brown (10YR 4/4) silt loam; moderate very fine, fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; few fine and medium roots; some charcoal fragments; many very fine mica flakes; neutral (field pH 7.0); clear and wavy boundary;
C4	63/66-89/94	Yellowish brown (10YR 5/4) loamy sand; weak very fine and fine subangular blocky structure; soft, very friable, non-sticky and non-plastic; few very fine roots; some termite activity; many very fine mica flakes; neutral (field pH 7.0); clear and wavy boundary;
C5	89/94-100/107	Mixed dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) loamy sand; few fine distinct strong brown (7.5YR 5/6) mottles; moderately weak very fine, fine and medium angular blocky structure; soft, very friable, non-sticky and non-plastic; common very fine and few medium roots; some termite activity; many very fine mica flakes; moderately acid (field pH 6.0); clear and wavy boundary;
C6	100/107-111/115	Mixed light yellowish brown (10YR 6/4) and reddish brown (5YR 4/4) loamy sand; moderately weak very fine, fine, medium and coarse angular blocky structure; slightly hard, very friable, non-sticky and non-plastic; few fine and medium roots; some termite activity; many very fine mica flakes; strongly acid (field pH 5.5); clear and wavy boundary;
C7	111/115-128	Mixed dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) very fine sandy loam; few fine distinct strong brown (7.5YR 4/6) mottles; moderate fine, medium and coarse angular blocky structure; slightly hard, very friable, non-sticky and non-plastic; few fine and coarse roots; some termite activity; many very fine mica flakes; strongly acid (field pH 5.5); clear and smooth boundary;

Horizon	Depth(cm)	Description
C8	128-141	Dark brown (10YR 4/3) silt loam; few fine distinct grayish brown (10YR 5/2) and common fine distinct strong brown (7.5YR 5/6-8) mottles; moderate very fine, fine and coarse angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few coarse roots; many very fine mica flakes; strongly acid (field pH 5.5); clear and smooth boundary
C9	141-155/157	Dark yellowish brown (10YR 4/4) loamy sand; moderate fine, medium and coarse angular blocky structure; slightly hard, very friable, non-sticky and non-plastic; few fine roots; many very fine mica flakes; strongly acid (field pH 5.5); clear and wavy boundary;
C10	155/157-170	Mixed dark yellowish brown (10YR 4/4) and brown (10YR 5/3) silt loam; common fine and medium distinct strong brown (7.5YR 4/6) mottles; moderate fine and medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine mica flakes; strongly acid (field pH 5.5); clear and smooth boundary;
C11	170-200	Grayish brown (10YR 5/2) silty clay loam; common fine and medium prominent dark reddish brown (2.5YR 3/4) and few fine distinct brownish yellow (10YR 6/6) mottles; strong fine, medium and coarse angular blocky structure; hard, firm, slightly sticky and plastic; strongly acid (field pH 5.5).

Micromorphology

Depth (cm)	Feature
10-24	The matrix is composed of angular fine sand-sized quartz grains with an occasional feldspar. Fragments of biotite are also present. There is no pattern to the distribution of the grains. Organic matter staining of the matrix gives the soil a dark color.
66-94	Compared to horizon at 10-24 cm, the material is much coarser and the quartz grains are more angular. The biotite flakes are larger and less weathered.
170-200	At this depth, there is an abrupt change to a more clayey material indicating a distinct lithological discontinuity. The textural change may be responsible for stagnating water. This is seen by the presence of diffuse sesquioxidic features, ferrans, and some manganese accumulations. The clayey matrix is highly birefringent suggesting high activity clay.

Interpretation

The soil is situated on a flood plain and is stratified. The stratification is both in the distribution of the particles and in the distribution of organic matter. Figure Cm1a if of the C4 horizon. The matrix is composed of angular fine sand grains randomly distributed. There are large fragments of partially weathered biotite. A few feldspar fragments are also present. Plasma is in very low amounts and occurs as aggregates between the grains.

At a depth of 170 cm (C11 horizon), the matrix is completely different (Figure Cm1-b). This is a clayey matrix, fragmented. The color is white to pale yellow showing that it has a very low free iron content. The horizon is subject to water stagnation for extended periods causing redistribution of iron. There is heavy staining of the plasma with iron and there are also many diffuse ferrans. Few fine manganese concretions are present. This layer presents aquic conditions.

The micromorphology supports the classification of an Ustifluvent. There is little evidence in major part of the soil for aquic conditions and so placement as Typic is correct.

Soil Profile Description

Soil name: Hang Chat series (Hc) Profile code No.N5
Classification (1999): Typic Kandiustult, fine-loamy, kaolinitic, isohyperthermic
Location: field plot of Hang Chat horticulture research station, Ban Thung Kwian, Tambon Wiang Tan, Amphoe Hang Chat Changwat Lampang
Sheet name: Amphoe Hang Chat Map Sheet No.: 4845 I
Coordinate: 47QNA319258 Elevation: 300 m.
Relief: nearly level Slope: 3 %
Physiography: alluvial fan (wash surface)
Parent material: derived from granite
Drainage: well drained Permeability: moderate
Runoff: moderate Ground water depth: > 2 m.
Flooding depth: - cm Duration: - Frequency: -
Annual rainfall: 1,076.8 mm Mean Temp.: 25.9 °C Climate type: Tropical Savanna "Aw"
Natural vegetation or land use: tamarind
Described by: P. Choldamrongkul, S. Udomsri, S. Riangthong, A. Pinjongskuldit, W. Panitkorn and W. Pholrachom Date: April 22, 2000

Horizon	Depth(cm)	Description
A1	0-6/8	Dark brown to brown (7.5YR 4/3) sandy loam; weak very fine and fine subangular blocky structure; very friable, non-sticky and non-plastic; many very fine roots; some charcoal fragments and termite activity; very strongly acid (field pH 5.0); clear and smooth boundary
A2	6/8-14/16	Strong brown (7.5YR 4/6) sandy loam; weak very fine, fine and medium subangular blocky structure; friable, non-sticky and non-plastic to slightly plastic; many very fine and fine roots; very strongly acid (field pH 4.5); clear and smooth boundary
BA	14/16-26/29	Mixed dark brown to brown (7.5YR 4/3-4) and yellowish red (5YR 4/6) sandy loam; moderate to strong fine and medium subangular blocky structure; slightly hard, firm, slightly sticky and non-plastic; common very fine and fine roots; very strongly acid (field pH 4.5); clear and smooth boundary
Bt1	26/29-49	Yellowish red (5YR 5/6-8) sandy clay loam; strong fine, medium and coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; patchy thin cutan on ped faces and pore walls; common very fine and fine and few medium roots; some termite activity; very strongly acid (field pH 4.5); clear and smooth boundary
Bt2	49-70	Yellowish red (5YR 5/8) sandy clay loam; strong fine, medium and coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; moderately thick cutan on ped faces and pore walls; common very fine and fine roots; some termite activity; very strongly acid (field pH 4.5); clear and smooth boundary
Bt3	70-93/96	Yellowish red (5YR 5/8) sandy clay loam to clay loam; strong medium and coarse subangular blocky structure; hard, friable, sticky and slightly plastic; moderately thick cutan on ped faces and pore walls; common very fine and few medium roots; some termite activity; very strongly acid (field pH 4.5); clear and wavy boundary
Bt4	93/96-117	Mixed yellowish red (5YR 5/8) and yellow (10YR 7/6) clay loam; common fine prominent red (2.5YR 4/6) mottles; strong medium and coarse subangular blocky structure; hard, friable, sticky and slightly plastic; patchy thin cutan on ped faces and pore walls; common very fine and medium roots; some strongly weathered of granite mainly feldspar and quartz fragment; very strongly acid (field pH 4.5); clear and smooth boundary

Horizon	Depth(cm)	Description
2Bt1	117-148	Mixed reddish yellow (5YR 6//6), light yellowish brown to brownish yellow (10YR 6/4-6) and red (2.5YR 5/6) clay loam; strong fine, medium and coarse subangular blocky structure; hard, friable, sticky and slightly plastic; patchy thin cutan on ped faces and pore walls; few very fine and fine roots; many strongly weathered of granite composed of quartz and some feldspar; very strongly acid (field pH 4.5); clear and smooth boundary
2Bt2	148-200	Mixed white (10YR 8/1), reddish yellow (7.5YR 6/8) and red (2.5YR 4/4) clay loam; strong medium and coarse subangular blocky structure; friable, sticky and slightly plastic; patchy thin cutan on ped faces and pore walls; few very fine and fine roots; many strongly weathered of granite composed of quartz and some feldspar; very strongly acid (field pH 4.5)

Micromorphology

Depth (cm)	Feature
29-49	The organic stained plasma is almost opaque. Quartz grains range from medium sand to fine silt-sized and such a range in size suggests poor sorting during short-distance transportation.
49-79	In this horizon there is a slightly better sorting of grains. The material is more clayey and the plasma is brownish with less organic staining. Illuviation argillans are common (1%) and their morphology suggests current processes.
96-117	This horizon has a different morphology from the 49-79 cm horizon. It is clayey, more compact and with fewer voids. Clay skins are rare (<1%). Diffuse nodules of iron are common indicating some moisture saturation.
148-200	This horizon is formed from different material than the overlying horizons and represents a lithological discontinuity. Qartz grains are large and there are some rock fragments. The plasma is yellow in color and there is an abundance of illuviation argillans (2%). A most striking feature is the predominance of diffuse sesquioxidic nodules. These have invaded the s-matrix. This is clear indication of periodic moisture saturation.

Interpretation

The plasma is reddish brown in all horizons. The surface horizons have a very high amount of angular sand-sized quartz grains and this decreases with depth. The size and shape of the grains do not change with depth indicating uniformity in the deposit. Illuviation argillans occupy about 1% of the surface, are thin, and bright yellow in color (Figure Hc-a). The maximum amount of argillans (about 2%) is found in the 2Bt2 horizon at a depth of 148 cm.

The plasma changes to reddish from a depth of 1m. In the deeper part of the soil, diffuse iron nodules and ferrans increase (Figure Hc-b). These indicate moisture saturation during some periods of the year.

The micromorphological analysis indicates that clay translocation and accumulation is an active process. There are layers in the soil where argillans are more predominant. The analysis confirms the classification of an Ustult. The low activity nature of the clay is shown by the isotropic nature of the plasma and supports the kandic/oxic weathering stage.

Soil Profile Description

Soil name: Muak Lek – loamy skeletal variants (Ml-lsk) Profile code No.N6
Classification (1999): Typic Haplustult, loamy-skeletal, mixed, active isohyperthermic
Location: Field plot of Ms. Suwannaporn Kapinta, Ban Pa Yup, Tambon Wang chin, Amphoe Wang chin Changwat Phrae
Sheet name: Amphoe Wang Chin Map Sheet No. 4944 IV
Coordinate: 47QNV692774 Elevation: 115 m.
Relief: undulating Slope: 5%
Physiography: erosion surface
Parent material: derived from shale and equivalent rocks
Drainage: well drained Permeability: moderate
Runoff: moderate Ground water depth: > 2 m.
Flooding depth: cm Duration: - Frequency: -
Annual rainfall: 1,095 mm Mean Temp.: 26-28 °C Climate type: Tropical Savanna "Aw"
Natural vegetation or land use: orange
Other:
Described by: P. Choldamrongkul, S. Udomsri, S. Riangthong, A. Pinjongskuldit, W. Panitkorn and W. Pholrachom Date: March 24, 2000

Horizon	Depth(cm)	Description
A	0-8/12	Dark brown to brown (10YR 4/3) loam; moderate to strong fine, medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few medium roots; few small angular to sub-rounded fragment of shale; medium acid (field pH 6.0); clear and wavy boundary
Bt1	8/12-25	Yellowish brown (10YR 5/6) slightly gravelly clay loam; moderate to strong fine, medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and plastic; patchy thin cutan on ped faces and pore walls; common fine and few medium roots; some krotovinas, common small angular to sub-rounded, diameter 1-2 cm., (approximately 10-15 % by volume) fragment of shale; very strongly acid (field pH 5.0); clear and smooth boundary
Bt2	25-27/45	Yellowish brown (10YR 5/6) very gravelly clay loam; moderate very fine, fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; moderately thick cutan on ped faces and pore walls; few fine roots; some krotovinas, many small angular to sub-rounded, diameter 1-2 cm., (approximately 40-60 % by volume) fragment of shale; very strongly acid (field pH 4.5); clear and wavy boundary
Bt3	27/45-52/58	Brownish yellow (10YR 6/8) very gravelly clay loam; moderate very fine and fine subangular blocky structure; slightly hard, friable, sticky and plastic; few fine and medium roots along crack of rocks; many small angular to sub-rounded, diameter 1-2 cm., (approximately 80-90 % by volume) fragment of shale; some weathered stone and gravel of shale; very strongly (field pH 4.5); clear and wavy boundary
Cr1	52/58-54/130	Layer of weathered stone of shale and some soil on ped faces of shale
Cr2	54/130-190	Layer of weathered stone of shale

Soil Profile Description

Soil name: Muak Lek series (Ml) Profile code No.N7
Classification (1999): Ultic Haplustalf, clayey-skeletal, mixed, active isohyperthermic
Location: Teak plot of Phrae seri-culture research station, Amphoe Den Chai Changwat Phrae
Sheet name: Amphoe Den Chai Map Sheet No. 5044 IV
Coordinate: 47QPV138857 Elevation: 180 m.
Relief: hilly Slope: 20-35%
Physiography: erosion surface
Parent material: derived from shale and equivalent rocks
Drainage: well drained Permeability: moderate
Runoff: moderate Ground water depth: > 2 m.
Flooding depth: - cm Duration: - Frequency: -
Annual rainfall: 1,095 mm Mean Temp.: 26-28 °C Climate type: Tropical Savanna "Aw"
Natural vegetation or land use: teak plantation
Other:
Described by: P. Choldamrongkul, S. Udomsri, S. Riangthong, A. Pinjongskuldit, W. Panitkorn and W. Pholrachom Date: March 24, 2000

Horizon	Depth(cm)	Description
A	0-8/13	Very dark grayish brown (10YR 3/2) loam; moderate fine, medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; some decay roots, common small angular to sub-rounded fragment of shale; neutral (field pH 7.0); clear and wavy boundary; End of paragraph must have a semi-colon(;) Make these changes in all profile descriptions.
Bt1	8/13-32	Dark brown to brown (7.5YR 4/3) very gravelly clay loam; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; patchy thin cutan on ped faces and pore walls; common fine and medium roots; some krotovinas, many small angular to sub-rounded, diameter 1-2 cm., (approximately 40-50 % by volume) fragment of shale; strongly acid (field pH 5.5); clear and smooth boundary;
Bt2	32-52/60	Mixed Dark brown to brown (7.5YR 4/4) and reddish brown (5YR 4/4) very gravelly clay; moderate fine subangular blocky structure; slightly hard, friable, sticky and very plastic; moderately thick cutan on ped faces and pore walls; few fine roots; some krotovinas, many small angular to sub-rounded, diameter 1-2 cm., (approximately 60-70 % by volume) fragment of shale; medium acid (field pH 6.0); clear and wavy boundary;
Bt3	52/60-70/88	Mixed yellowish brown (10YR 5/4) and yellowish red (5YR 5/6) very gravelly clay; moderate fine subangular blocky structure; slightly hard, friable, sticky and very plastic; few fine and medium roots along crack of rocks; many small angular to sub-rounded, diameter 1-2 cm., (approximately 80-90 % by volume) fragment of shale; some weathered stone and gravel of shale; medium acid (field pH 6.0); clear and wavy boundary
Cr1	70/88-120-135	Layer of weathered stone of shale and some soil on ped faces of shale
Cr2	120-135-190	Layer of weathered stone of shale

Soil Profile Description

Soil name: Dong Yang En variant — Profile code No.N8
Classification (1999): Oxyaquic (Ultic) Haplustept, fine-silty, mixed, active isohyperthermic
Location: Field plot of Si Samrong field crop experiment station, Ban Khlong Ta Rang, Tambon Klong Tan, Amphoe Si Samrong Changwat Sukhothai
Sheet name: Changwat Sukhothai — Map Sheet No. 4943 II
Coordinate: 47QPV922966 — Elevation: 61 m.
Relief: nearly level — Slope: 1-2 %
Physiography: Alluvial plain
Parent material: Alluvium
Drainage: moderately well drained — Permeability: moderate
Runoff: moderate — Ground water depth: 2 m.
Flooding depth: - cm — Duration: - — Frequency: -
Annual rainfall: 1,134 mm — Mean Temp.: 26-28 °C — Climate type: Tropical Savanna "Aw"
Natural vegetation or land use: corn
Other:
Described by: P. Choldamrongkul, S. Udomsri, S. Riangthong, A. Pinjongskuldit, W. Panitkorn and W. Pholrachom — Date: March 25, 2000

Horizon	Depth (cm)	Description
Ap1	0-8/10	Dark yellowish brown (10YR 4/4) silt loam; moderate to strong fine, medium and coarse subangular blocky structure; hard, friable, slightly sticky and plastic; common fine and medium roots; medium acid (field pH 6.0); clear and smooth boundary
Ap2	8/10-23/25	Dark yellowish brown (10YR 4/4) silt loam; moderate to strong fine, medium and coarse subangular blocky structure; friable, slightly sticky and plastic; common very fine and fine roots; some decay roots; medium acid (field pH 6.0); clear and smooth boundary
Bw1	23/25-60/63	Mixed brown to dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct brown (7.5YR 4/4) mottles; moderate very fine, fine and medium subangular blocky structure; friable, slightly sticky and plastic; patchy thin cutan on ped faces and pore walls; few fine roots; some soft Mn concretions; neutral (field pH 7.0); clear and smooth boundary
Bw2	60/63-82/85	Mixed brown to dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) silty clay loam; common fine and medium distinct brown (7.5YR 5/4) mottles; moderate fine and medium subangular blocky structure; friable, slightly sticky and plastic; patchy thin cutan on ped faces and pore walls; few fine and very fine roots; some soft Fe&Mn concretions; slightly acid (field pH 6.5); clear and smooth boundary
Bw3	82/85-128/131	Mixed brown to dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct dark brown and strong brown (7.5YR 4/4-6) mottles; weak fine and medium subangular blocky structure; very friable, slightly sticky and plastic; patchy thin cutan on ped faces and pore walls; few very fine roots; some soft Fe&Mn concretions; medium acid (field pH 6.0); clear and smooth boundary
Bw4	128/131-170/190	Mixed brown to dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) silty clay loam; common fine and medium distinct strong brown (7.5YR 4/6) mottles; moderately weak very fine, fine and medium subangular blocky structure; slightly sticky and plastic; patchy thin cutan on ped faces and pore walls; neutral (field pH 7.0)

Soil Profile Description

Soil name: Mae Taeng series (Mt) Profile code No.N9
Classification (1999): Rhodic Kandiustox, fine, kaolinitic isohyperthermic
Location: 1.2 km. West of Ban Dong Din Thong, Amphoe Wang Thong Changwat Phitsanulok
Sheet name: Changwat Phitsanulok Map Sheet No. 5042 I
Coordinate: 47QPU521551 Elevation: 58 m.
Relief: gently undulating Slope: 2-3%
Physiography: alluvial fan
Parent material: alluvium
Drainage: well drained Permeability: moderate
Runoff: rapid Ground water depth: > 2 m.
Flooding depth: - cm Duration: - Frequency: -
Annual rainfall: 1,351.9 mm Mean Temp.: 27.5 °C Climate type: Tropical Savanna "Aw"
Natural vegetation or land use: mango
Other:
Described by: S. Riangthong Date: April 25, 2000

Horizon	Depth(cm)	Description
A	0-10	Dark reddish brown (2.5YR 2.5-3/4) clay loam; moderate very fine, fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots; some termite activity; very strongly acid (field pH 4.5); gradual and smooth boundary
Bt1	10-40/44	Dark reddish brown (2.5YR 3/4) clay loam; moderate very fine, fine and medium subangular blocky structure; hard, friable, sticky and plastic; broken moderately thick cutan on ped faces and pore walls; many very fine and common fine roots; some termite activity and krotovinas; very strongly acid (field pH 4.5); diffuse and wavy boundary
Bt2	40/44-88/91	Dark red (2.5YR 3/6) clay loam; moderate to strong very fine, fine, medium and coarse angular blocky structure; hard, firm, sticky and plastic; broken moderately thick cutan on ped faces and pore walls; few very fine and fine roots; some krotovinas, very strongly acid (field pH 4.5); diffuse and wavy boundary;
Bt3	88/91-137/141	Dusky red to dark red (10R 3/4-6) clay loam to clay; moderate to strong very fine, fine, medium and coarse angular blocky structure; hard, firm, sticky and plastic; broken moderately thick cutan on ped faces and pore walls; few very fine and fine roots; some krotovinas; very strongly acid (field pH 4.5); diffuse and wavy boundary
Bt4	137/141-200	Dusky red to dark red (10R3/4-6) clay; moderate to strong very fine, fine, medium and coarse angular blocky structure; hard, firm, sticky and plastic; broken moderate thick cutan on ped faces and pore walls; few very fine and fine roots; some ironstones; very strongly acid (field pH 4.5)

Soil Profile Description

Soil name: Chaibadan series (Cd) Profile code No.N10
Classification (1999): Typic Haplustert, fine, Smectitic, isohyperthermic
Location: Field plot of Ms. Huang Si-hanat, 11 Moo 5, Ban km. 129, Tambon Nikhom Lamnarai, Amphoe Chaibadan Changwat Lopburi
Sheet name: Amphoe Chaibadan Map Sheet No.: 5239 III
Coordinate: 47QPS288856 Elevation: 85-100 m.
Relief: undulating Slope: 3-4 %
Physiography: basaltic terrain
Parent material: basalt
Drainage: well drained Permeability: slow
Runoff: moderate Ground water depth: > 2 m.
Flooding depth: - cm Duration: - Frequency: -
Annual rainfall: 1,211.9 mm Mean Temp.: 28.1 °C Climate type: Tropical Savanna "Aw"
Natural vegetation or land use: sesame, tobacco and corn
Other:
Described by: P. Choldamrongkul, S. Udomsri, S. Riangthong, A. Pinjongskuldit, W. Panitkorn and W. Pholrachom Date: May 27, 2000

Horizon	Depth(cm)	Description
Ap	0-10/15	Dark brown (7.5YR 3/2) clay; moderate to strong medium and coarse subangular blocky structure partly mixed with very fine and fine granular structure; sticky and plastic; few fine and common very fine roots; few charcoal fragments; moderately alkaline (field pH 8.0); clear and wavy boundary
Bss1	10/15-40	Dark brown (7.5YR 3/2-3) clay; moderate to strong medium and coarse subangular blocky structure; sticky and plastic; few very fine and common fine roots; few to common distinct slickensides and many pressure faces; moderately alkaline (field pH 8.0); gradual and smooth boundary
Bss2	40-69/80	Dark brown (7.5YR 3/3-4) clay; moderate to strong medium and coarse angular blocky structure; sticky and plastic; few very fine and fine roots; common prominent slickensides and many pressure faces; some subangular gravel of strongly weathered basalt; moderately alkaline(field pH 8.0); clear and wavy boundary
Ck1	69/80-98/100	Brown (7.5YR 4/3-4) very gravelly clay loam; many subangular gravel of strongly weathered basalt (35 % by volume); calcareous; strongly alkaline (field pH 8.5) clear and smooth boundary
Ck2	98/100-150	Brown (7.5YR 4/4) very gravelly clay loam; many subangular gravel of strongly weathered basalt (35-50 % by volume); calcareous; strongly alkaline (field pH 8.5)

Soil Profile Description

Soil name: Chaibadan series (Cd) Profile code No.N10
Classification (1999): Typic Haplustert, fine, Smectitic, isohyperthermic
Location: Field plot of Ms. Huang Si-hanat, 11 Moo 5, Ban km. 129, Tambon Nikhom Lamnarai, Amphoe Chaibadan Changwat Lopburi
Sheet name: Amphoe Chaibadan Map Sheet No.: 5239 III
Coordinate: 47QPS288856 Elevation: 85-100 m.
Relief: undulating Slope: 3-4 %
Physiography: basaltic terrain
Parent material: basalt
Drainage: well drained Permeability: slow
Runoff: moderate Ground water depth: > 2 m.
Flooding depth: - cm Duration: - Frequency: -
Annual rainfall: 1,211.9 mm Mean Temp.: 28.1 °C Climate type: Tropical Savanna "Aw"
Natural vegetation or land use: sesame, tobacco and corn
Other:
Described by: P. Choldamrongkul, S. Udomsri, S. Riangthong, A. Pinjongskuldit, W. Panitkorn and W. Pholrachom Date: May 27, 2000

Horizon	Depth(cm)	Description
Ap	0-10/15	Dark brown (7.5YR 3/2) clay; moderate to strong medium and coarse subangular blocky structure partly mixed with very fine and fine granular structure; sticky and plastic; few fine and common very fine roots; few charcoal fragments; moderately alkaline (field pH 8.0); clear and wavy boundary
Bss1	10/15-40	Dark brown (7.5YR 3/2-3) clay; moderate to strong medium and coarse subangular blocky structure; sticky and plastic; few very fine and common fine roots; few to common distinct slickensides and many pressure faces; moderately alkaline (field pH 8.0); gradual and smooth boundary
Bss2	40-69/80	Dark brown (7.5YR 3/3-4) clay; moderate to strong medium and coarse angular blocky structure; sticky and plastic; few very fine and fine roots; common prominent slickensides and many pressure faces; some subangular gravel of strongly weathered basalt; moderately alkaline(field pH 8.0); clear and wavy boundary
Ck1	69/80-98/100	Brown (7.5YR 4/3-4) very gravelly clay loam; many subangular gravel of strongly weathered basalt (35 % by volume); calcareous; strongly alkaline (field pH 8.5) clear and smooth boundary
Ck2	98/100-150	Brown (7.5YR 4/4) very gravelly clay loam; many subangular gravel of strongly weathered basalt (35-50 % by volume); calcareous; strongly alkaline (field pH 8.5)

Soil Profile Description

Soil name: Takhli series (Tk) Profile code No.N11
Classification (1999): Entic Haplustoll, loamy-skeletal, carbonatic, isohyperthermic
Location: Field plot of Mr. Daeng Ma-li, Ban Chong Sarika Moo 5, Tambon Chong Sarika, Amphoe Phattananikhom Changwat Lopburi
Sheet name: Amphoe Phattananikhom Map Sheet No.: 5138 I
Coordinate: 47PQS058388 Elevation: 100 m.
Relief: nearly level to gently undulating Slope: 3-4 %
Physiography: marl terrace
Parent material: transported material over marl
Drainage: well drained Permeability: slow
Runoff: moderate Ground water depth: > 2 m.
Flooding depth: - cm Duration: - Frequency: -
Annual rainfall: 1,211.9 mm Mean Temp.: 28.1 °C Climate type: Tropical Savanna "Aw"
Natural vegetation or land use: field crop; corn
Other:
Described by: P. Choldamrongkul, S. Udomsri, S. Riangthong, A. Pinjongskuldit, W. Panitkorn, W. Pholrachom, B. Submak and R. Tawanroan Date: May 25, 2000

Horizon	Depth(cm)	Description
Ap1	0-8/12	Black (10YR 2/1) clay loam; moderate fine granular structure mixed with fine and medium subangular blocky structure; friable, sticky and plastic; many very fine and common fine roots; some secondary lime concretions; moderately alkaline (field pH 8.0); clear and wavy boundary
Ap2	8/12-25/30	Black (10YR 2/1) clay loam; moderate fine, medium and coarse subangular blocky structure and some granular structure; sticky and plastic; common very fine roots; some secondary lime concretions; moderately alkaline (field pH 8.0); clear and wavy boundary
AC1	25/30-42/48	Dark yellowish brown (10YR 3/3) very gravelly clay loam; many medium to coarse, irregular, soft and hard, secondary lime concretions (50 % by volume); calcareous; moderately alkaline(field pH 8.0); clear and wavy boundary
2Ck1	42/48-90	Yellowish brown (10YR 3/4) very gravelly clay loam; many medium, coarse and very coarse, irregular, soft and hard, secondary lime concretions (50 % by volume); calcareous; moderately alkaline (field pH 8.0); clear and smooth boundary
2Ck2	90-120	Yellowish brown (10YR 4/4) very gravelly clay loam; many medium and coarse irregular, soft and hard, secondary lime concretions (70-80 % by volume); calcareous; moderately alkaline(field pH 8.0)

Micromorphology

Depth (cm)	Feature
25-48	The material is calcareous with large calcitic nodules. The carbonatic rock is fragmented and fragments are coated and stained with organic matter.
90-120	The carbonatic parent material is fragmented and walls of fragments are coated with organic matter. Some voids are lined with lublinite.

Soil Profile Description

Soil name: Rangsit series (Rs) Profile code No.N12
Classification (1999): Very fine, mixed, subactive, Sulfaqueptic Dystraquerts
Location: In Royal Project for improving acid sulfate soils, Ban Phrik, Moo 11, Tambon Ban Phrik, Amphoe Ban Na Changwat Nakhon Nayok
Sheet name: Amphoe Nong Sua Map Sheet No.: 5137 II
Coordinate 144750 Elevation: 3 m.
Relief: level Slope: 0-1 %
Physiography: former tidal level
Parent material: riverine alluvium overlying brackish water deposits
Drainage: poorly drained Permeability: slow
Runoff: slow Groundwater depth: 1.5 m.
Flooding depth: - Duration: - Frequency: -
Annual rainfall: 2,009.3 mm. Mean Annual Temp.: 28.4 C
Natural Vegetation or Land Use: paddy field and shrub grasses
Other: -
Described by: P. Hemsrichart and S. Udomsri Date: February 10, 1999

Horizon	Depth (cm.)	Description
Apg1	0 – 22/25	Black (10 YR2/1) many fine distinct strong brown (7.5 YR5/6-8) mottles along roots; clay; strong medium and coarse subangular blocky structure; extremely hard, very firm, sticky and very plastic; many very fine and common fine roots; strongly (field pH 6.0); clear and wavy boundary;
Apg2	22/27 – 40/50	Mixed very dark gray (10 YR 3/1) and pinkish gray (7.5YR6/2) common fine and medium prominent red (2.5 YR 4/8) and common fine distinct strong brown (7.5YR4/6) mottles; clay; moderate coarse prismatic structure breaking to medium and coarse subangular blocky structure; extremely hard, very firm, sticky and very plastic; few very fine roots; common pressure faces; extremely acid (field pH;4.0); clear and wavy boundary;
Bssg	40/45 – 68/73	Pinkish gray (7.5 YR 6/2) many medium and coarse Prominent red (2.5 YR 4/6) and many fine to medium distinct strong brown (7.5 YR 4/6) mottles and common fine and medium very dark gray (10 YR 3/1) coated on ped faces and crack surfaces; silty clay; moderate medium and coarse subangular blocky structure, firm, very sticky and very plastic; few very fine roots; common slickensides and pressure faces, some organic clay coated on ped faces; few spot of jarosite (2.5 Y 6/6); extremely acid (field pH 4.0); clear and wavy boundary;
Bssjg	68/73 – 128	Pinkish gray (7.5 YR 6/2) many medium and coarse distinct yellowish brown (10 YR 5/6) mottles and many medium distinct yellow (2.5 Y 7/6) mottles; silty cllay; moderate medium and coarse prismatic structure breaking to angular blocky structure; very sticky and very plastic; many jarosite, some spot of soft Fe&Mn concretions, common iron pipes, common slickensides and pressure faces; extremely acid (field pH 4.0); clear and smooth boundary;
Cjg	128 – 200+	Pinkish gray (7.5 YR 6/2) many fine and medium distinct yellowish brown (10 YR 5/6) mottles and common medium yellow (2.5 Y 7/6) mottles; nearly ripe clay; massive; very sticky and very plastic; common jarosite, common soft Fe&Mn concretions; extremely acid (field pH 4.0).