Proposed by:
T. Charasaiya and J.D. Cowie, 1969
Revised by:
1. N. Chorphaka, 1987
2. A. Potichan, 2004

CHIANG RAI SERIES Field Symbol: Cr

Distribution: Moderate extent in the valleys and alluvial plains of northern Thailand.

Setting: Chiang Rai soils are formed from alluvium and occur on alluvial plains and valley flats. Relief is level to nearly level. Slope ranges from 0-2 percent. The climate is Tropical Savanna (Koppen `Aw'). The average annual precipitation does not exceed 2,000 mm.

Drainage, Permeability and Runoff: Poorly drained. These soils are normally flooded by impounded rainwater for 4 to 5 months during the rainy season to depths of about 30 cm. Permeability and surface runoff is slow.

Vegetation and Land Use: The soils are mainly used for transplanted rice cultivation. Upland crops may be grown in the early dry season.

Characteristic Profile Features: Chiang Rai series is a member of fine, kaolinitic, isohyperthermic Plinthic Paleaquults (Kandiaquults?). They are very deep soils and are characterized by a dark grayish brown or grayish brown silty clay loam A horizon over a light gray or gray clay argillic B horizon with prominent reddish (5YR or 2.5YR hues) and distinct strong brown mottles in the subsoil. Reaction is medium to slightly acid becoming very strongly or strongly acid in the deeper subsoil. Red and yellowish red plinthite is founded within 150 cm from the soil surface ranges from 5-50 percent by volume. Few to common rounded, subrounded and irregular hardened plinthite or iron nodules are normally founded in subsoil.

Typifying Pedon: Profile code no. is N-36/65 (moist colors unless otherwise stated).

Location: Ban Bun Yun, Amphoe Chiang Kham, Changwat Phayao.

Sheet Name: Amphoe Chiang Kham **Sheet No.:** 5048 II
Coordinate: 411601 **Elevation:** 395 m (MSL)
Relief: nearly level **Slope:** 1 %
Physiography: semi-recent terrace
Parent material: alluvium
Drainage: poorly drained **Permeability:** slow
Runoff: slow **Ground water depth:** >2 m
Flooding depth: - **Duration:** - **Frequency:** -
Annual rainfall: 1,354 mm **Mean temp.:** 24.0 ^{o}C **Climate type:** Tropical Savannah (Aw)
Natural vegetation or land use: paddy field
Described by: Chamrong, Mana and Scholten **Date:** 14 May, 1971
Revised by: Aniruth Potichan **Date:** 23 May, 2004

Horizon	Depth (cm)	Description
Apg	0-11	Grayish brown to light brownish gray (10YR5-6/2) silt loam to silty clay loam; few fine faint yellowish brown (10YR4/4) mottles; weak coarse and medium subangular blocky structure; friable, sticky and slightly plastic; common fine and very fine roots; strongly acid (field pH 5.5); clear and smooth boundary.
ABg	11-26	Light brownish gray (10YR6/2) silty clay loam; common fine distinct strong brown (7.5YR5/8) mottles along root channels; very weak fine and medium angular blocky structure to massive; hard, firm, sticky and plastic; few fine and very fine roots; very strongly acid (field pH 5.0); clear and smooth boundary.

Btg1	26-43	Light gray (10YR7/2) clay loam; common fine distinct brownish yellow (10YR6/6) and few fine prominent red (2.5YR4/8) mottles; weak coarse and medium subangular blocky structure; firm, sticky and plastic; patchy thin clay coatings on ped faces, broken thin clay coatings in tubular pores; few fine and very fine roots; very strongly acid (field pH 4.5); clear and wavy boundary.
Btg2	43-64	Light gray (10YR7/1) clay loam; common medium prominent dark red (10R4/8) and few medium faint brownish yellow (10YR6/6) mottles; weak coarse subangular blocky structure; firm, sticky and plastic; continuous thin clay coatings in tubular pores; very few fine roots; very strongly acid (field pH 4.5); gradual and smooth boundary.
Btgv	64-100	Light gray (10YR7/1) clay; many medium and coarse prominent red (2.5YR4/8) common fine and medium distinct brownish yellow (10YR6/6) mottles; moderate coarse subangular blocky structure; very firm, sticky and very plastic; continuous moderately thick clay coatings in tubular pores, broken thin clay coatings on ped faces; few fine and medium animal holes; some of red mottles are changing to fine soft iron nodules (plinthite); no root; very strongly acid (field pH 4.5); gradual and smooth boundary.
Btcg	100-120+	Light gray (10YR7/1) clay; many fine and medium prominent red (2.5YR5/8), many fine and medium distinct strong brown (7.5YR5/6) mottles; weak coarse breaking to weak fine subangular blocky structure; very friable, very sticky and plastic; continuous thin clay coatings in pores; few fine animal holes; many (20%) large and very large (Φ4 cm) hard irregular iron-manganese nodules; no root; very strongly acid (field pH 4.5).

Type Location:

Chiang Rai series was named for Changwat Chiang Rai. The site is on almost flat surfaces, between Ban San Ko Kuk and Ban Mae Ha, Amphoe Mae Chan, Changwat Chiang Rai (Sheet no. 4971 I, Coord. 010302).

Range of Profile Features:

The A horizon is from 15 to 20 cm thick and has 10YR hues, values of 4 through 5 and chromas of 1 through 2 with sandy clay loam, silty clay loam or clay loam texture. The E horizon is usually present if not deep ploughed and has 10YR hues, values of 6 and chromas of 2 or less. The structure of the A horizon is weak medium to coarse subangular blocky to massive. Reaction is medium acid to moderately acid (field pH 5.5 to 6.5).

The B horizon has 10YR hues, values of 5 to 7 and chromas of 2 or less with clay texture. Structure is weak to moderate medium prismatic breaking to strong medium subangular blocky. The B horizon is argillic (kandic?) showing evidence of clay translocation in the form of cutans Red and yellowish red plinthite is founded within 150 cm from the soil surface ranges from 5-50 percent by volume. Few to common rounded, subrounded and irregular hardened plinthite or iron nodules are normally founded in subsoil. Soil reaction is very strongly acid to strongly acid (field pH 4.5 to 5.5).

Similar Soil Series:

Chumsaeng series (Cs): has no argillic B horizon.

Manorom series (Mn): has browner matrix colour (10YR 4/3) throughout the profile.

Nakhon Phanom series (Nn): has better drained (somewhat poorly drained).

Phan series (Ph): has similar profile except the pH values is higher and is in Typic (Plinthic) Endoaqualfs.

Principal Associated Soil:

These include Phan, Nakhon Phanom, and That Phanom series. These occupy the same topographical site except That Phanom soils which are found on slightly higher positions.

ANALYSIS RESULTS — Profile code no.: N-36/65

(oven dry basis) — Soil series: Chiang Rai (Cr)

Lab No.	Depth (cm)	Horizon	Particle size distribution analysis (% by weight)								Texture		pH		$CaCO_3$ %	P, mg kg^{-1} Bray 2	K, mg kg^{-1} NH_4OAc
			USDA grading			Sand-fraction grading					Lab	Field	1:1	1:1			
			sand	silt	clay	vc	c	m	f	vf	result	estim[n]	water	KCl			
Pb-802	0-11	Apg	27.0	56.0	17.0						sil	sil-sicl	4.6	3.8		9.9	41
Pb-803	11-26	ABg	21.5	57.0	21.5						sil	sicl	5.1	4.0		7.2	21
Pb-804	26-43	Btg1	20.0	49.0	31.0						sicl	cl	4.9	3.6		8.1	32
Pb-805	43-64	Btg2	16.0	44.5	39.5						sicl	cl	4.9	3.7		5.6	38
Pb-806	64-100	Btgv	14.2	43.8	42.0						sic	c	5.0	3.7		5.5	55
Pb-807	100-120+	Btcg	19	41	40						sicorsicl	c	5	3.8		4.5	29

Depth (cm)	Air dried to oven dried	C %	N %	y and cations (cmol(+) kg-1)							Base saturn (%)			ECEC	Al KCl extr.	Electrical conduty
				Ca	Mg	K	Na	SUM cations	Extr. acidity	SUM (B+A)	CEC NH_4OAc	CEC 100g	B/Cx100	(Bx100)/ (B+A)	cmol(+) kg-1	$cmol_{(+)}$ kg^{-1}	(ECx10^6)
								(B)	(A)		(C)	Clay			(B+D)	(D)	dS m-1
0-11	0.9	1.88		1.80	0.30	0.10	0.20	2.40	7.00	9.40	6.1	35.9	39	26			0.10
11-26	0.8	0.64		1.00	0.20	0.03	0.20	1.43	4.60	6.03	4.2	19.5	34	24			0.01
26-43	0.7	0.34		0.30	0.10	0.04	0.20	0.64	5.50	6.14	5.0	16.1	13	10			0.01
43-64	0.8	0.77		0.30	0.20	0.05	0.20	0.75	6.90	7.65	6.3	15.9	12	10			0.01
64-100	1.0	0.24		0.30	0.10	0.03	0.30	0.73	7.50	8.23	6.8	16.2	11	9			0.01
100-120+	0.9	0.22		0.20	0.10	0.10	0.20	0.60	7.10	7.70	6.9	17.3	9	8			0.00

Surveyor: Chamrong, Mana and Scholten — Date: 14 May, 1971