

Proposed by: J.J. Scholten, 1971  
Revised by:  
1. N. Chorphaka, 1988  
2. A. Potichan, 2004

**PHAYAO SERIES**

**Field Symbol: Pao**

**Distribution:** Occupies small extent in North Thailand, mainly in Changwat Chiang Rai and Phayao.

**Setting:** Phayao soils are formed from transported materials colluvio-alluvium(?) over residuum from siltstone, shale, sandstone and conglomerate and locally from calcareous sandstone. They occur on undulating to hilly terrains of dissected erosion surfaces and alluvial fans with slopes ranging from 3 to 35% and The climate is a Tropical Savanna (Koppen 'Aw').

**Drainage, Permeability and Runoff:** Well drained over poorly drained. Permeability in moderate over slow resulting in a 'perched' water table for small part of the year during the rainy season. Surface runoff is slow to rapid.

**Vegetation and Land Use:** Low, open Dipterocarp forest. Used locally as a source of road material.

**Characteristic Profile Features:** Phayao series is a member of the fine-loamy over clayey-skeletal, mixed, semiaactive, isohyperthermic Plinthic Paleustalfs. They are deep soils characterized by a brown sandy loam A horizon overlying a yellowish red argillic B horizon which in turn overlies a yellowish red gravelly clay 2C horizon which contains reddish clay, pinkish gray and light gray mottles. The boundary between the B and 2C horizon is typically abrupt and occurs below 30 cm and within 60 cm of the soil surface. The coarse fraction of the 2C horizon includes ironstone nodules and iron-manganese coated rock fragments (pseudo laterite). Reaction is very strongly to strongly acid throughout.

**Typifying Pedon:** Profile code no. is N-36/57 (moist colors unless otherwise stated).

**Location:** Ban Huai Bong, Amphoe Muang Changwat Phayao.

**Sheet Name:** Amphoe Mae Chai

**Sheet No.:** 4947 I

**Coordinate:** 931308

**Elevation:** 440 m (MSL)

**Relief:** gently undulating to undulating

**Slope:** 5 %

**Physiography:** dissected erosion surfaces

**Parent material:** transported materials over residuum from siltstone and fine-grained sandstone

**Drainage:** well drained-somewhat poorly drained

**Permeability:** moderate over slow

**Runoff:** slow

**Ground water depth:** >2 m

**Flooding depth:** -

**Duration:** -

**Frequency:** -

**Annual rainfall:** 1,074.2 mm

**Mean temp.:** 25.5 °C

**Climate type:** Tropical Savannah (Aw)

**Natural vegetation or land use:** mixed deciduous forest

**Described by:** Chamlong, Mana and Scholten

**Date:** 11 May, 1971

**Revised by:** Aniruth Potichan

**Date:** 26 May, 2004

Horizon	Depth (cm)	Description
A	0-6	Light brown (7.5YR6/4) dry, brown (7.5YR5/4) moist, fine sandy loam; weak medium and coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine and few medium roots; very strongly acid (field pH 5.0); clear and smooth boundary.
Bw	6-22	Reddish yellow (7.5YR7/6) dry, yellowish red (5YR4/8) moist, fine sandy clay loam; moderate coarse and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; very few, very small hard, spherical ironstone nodules; common fine, very fine, few medium and coarse roots; very strongly acid (field pH 4.5); gradual and smooth boundary.
Bt1	22-36	Reddish yellow (5YR6/6) dry, yellowish red (5YR5/8) moist, sandy clay loam; moderate coarse and medium subangular blocky structure; hard, friable, sticky and slightly plastic; very thin patchy clay coatings in tubular

pores; very few, small, hard irregular and spherical ironstone nodules; few angular sandstone fragments; few fine and medium roots; very strongly acid (field pH 4.5); abrupt and wavy boundary.

2Bt2 36-110+ Yellowish red (5YR5/6) moist; very gravelly clay (gravels about 70-80% by volume); common reddish gray mottles; gravels consisting of angular iron-manganese coated quartz and sandstone; moderate medium and fine subangular blocky structure; firms, sticky and nonplastic; many clay films on gravels and ped faces; few fine, medium and coarse roots; strongly acid (field pH 5.5).

**Remark:** A full sequence of horizons as observed in a nearby gully is:

1. nongravelly sandy loam to sandy clay loam top soil changing abruptly between 30-60 cm to,
2. gravelly and very gravelly clay with yellowish red color that changes gradually to,
3. a mottle clay with white, light gray and red colors that changes gradually and irregularly to,
4. strongly weathered fine-grained sandstone and siltstone.

**Type Location:**

Phayao series was named for Changwat Phayao where the typifying pedon was first described.

**Range of Profile Features:**

The A horizon is from 5 to 15 cm thick and has 10YR and 7.5 YR hues, values of 4 through 6 and chromas of 3 or 4. Texture may be loam. Structure is weak medium and coarse blocky and field pH values range from 4.5 to 5.5.

Matrix colours of the B horizon are 7.5YR to 5YR hues with values 4 through 6 and chromas of 6 or 8. Structure is weak to moderated, medium and coarse blocky and field pH values range from 4.5 to 5.5.

Colour of the 2C horizon is variable due to colour mottling. The fraction is more than 5% by volume and may be locally cemented by carbonate. Bedrock underlies the 2C horizon at depths of between 2 to 4 m from the soil surface.

**Similar Soil Series:**

Phon Phisai series (Pp): has similar profile but is in the clayey skeletal particle size class of Typic (Oxyaquic Plinthic) Paleustults.

**Principal Associated Soils:**

These include Lat Ya and Tha Yang series on dissected erosion surfaces and low residual hills.

**ANALYSIS RESULTS**  
(oven dry basis)

Profile code no.: N-36/57  
Soil series: Phayao (Pao)

Lab No.	Depth (cm)	Horizon	Particle size distribution analysis (% by weight)							Texture		pH		CaCO <sub>3</sub> %	P, mg kg <sup>-1</sup> Bray 2	K, mg kg <sup>-1</sup> NH <sub>4</sub> OAc
			USDA grading			Sand-fraction grading				Lab	Field	1:1	1:1			
			sand	silt	clay	vc	c	m	f	vf	result	estim <sup>n</sup>	water			
Pb-763	0-6	A	62.0	28.5	9.5						sl	fsl	5.7	4.4	3.1	73
Pb-764	6-22	Bw	58.0	20.5	21.5						scl	fscl	4.9	3.7	2.5	50
Pb-765	22-34/38	Bt1	53.0	20.0	27.0						scl	scl	4.9	3.4	3.7	53
Pb-766	34/38-110	2Bt2	34.0	20.0	46.0						c	vgc	5.2	4.0	3.3	82

Depth (cm)	Air dried to oven dried	C %	N %	Exchange capacity and cations (cmol <sub>(c)</sub> kg <sup>-1</sup> )									Base satur <sup>n</sup> (%)		ECEC cmol <sub>(c)</sub> kg <sup>-1</sup> (B+D)	Al KCl extr. cmol <sub>(c)</sub> kg <sup>-1</sup> (D)	Electrical conduct <sup>y</sup> (ECx10 <sup>6</sup> ) dS m <sup>-1</sup>						
				Ca				Mg		K		Na		SUM cations (B)				Extr. acidity (A)	SUM (B+A)	CEC NH <sub>4</sub> OAc (C)	CEC 100g Clay	B/Cx100	(Bx100)/(B+A)
0-6	0.6	0.80		2.10	0.80	0.10	0.20	3.20	3.00	6.20	5.0	52.6	64	52			0.02						
6-22	0.7	0.94		0.70	0.40	0.10	0.30	1.50	6.20	7.70	6.1	28.4	25	19			0.01						
22-34/38	1.1	0.30		1.80	0.70	0.10	0.20	2.80	8.60	11.40	10.4	38.5	27	25			0.01						
34/38-110	2.8	0.26		9.40	1.90	0.10	0.40	11.80	7.40	19.20	19.4	42.2	61	61			0.00						

Surveyor: Chamlong, Mana and Scholten

Date: 11 May, 1971