

Proposed by: C. Changprai-1966
 Revised by: 1. B. Boonsompopphan,
 P. Hemsrichart, 1988
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WARIN SERIES

Field Symbol: Wn

Distribution: Occupies moderate extent in Northeast Thailand.

Setting: Warin soils are formed from washed deposit from sandstone and occur on the upper part of peneplain. Relief is undulating. Slopes range from 2 to 8 percent. Elevation is from 180 to 250 m above sea level. The climate is Tropical Savanna (Köppen 'Aw'). Average annual precipitation is from, 1,100 to 2,200 mm. Mean annual air temperature varies from 26 to 28°C.

Drainage, Permeability and Runoff: Well drained soils. Permeability is moderate. Surface runoff is medium to rapid. Ground water table falls below 5 meters during the peak of the dry period.

Vegetation and Land Use: Originally mixed deciduous forest and dipterocarp forest. Parts are cleared for upland crops such as corn, cotton, sugar cane, kenaf, water melon and some fruit crops such as pineapple, custard apple and kapok.

Characteristic Profile Features: The Warin series are a member of fine-loamy, siliceous, isohyperthermic Typic Kandiuults. They are deep soils which are characterized by a dark brown, brown or dark grayish brown sandy loam or loamy sand A horizon overlying a yellowish red or reddish yellow sandy clay loam B horizon. Reaction is medium to strongly acid over strongly acid to very strong acid.

Typifying Pedon: Profile code no. is NE-N-29/17 (moist colors unless otherwise stated).

Location: near Ban Dong Ma-ek, Amphoe That Phanom Changwat Nakhon Phanom.

Sheet Name: Amphoe Pla Pak

Sheet No.: 5943 III

Coordinate: 680830

Elevation: 180-250 m

Relief: gently undulating to undulating

Slope: 2-8%

Physiography: upper part of peneplain

Parent material: washed deposit from sandstone

Drainage: well drained

Permeability: moderate

Runoff: medium to rapid

Ground water depth: >5 m

Flooding depth: -

Duration:-

Frequency: -

Annual rainfall: 2,163.3 mm

Mean temp: 25.9 °C

Climate type: Tropical Savannah

Natural vegetation and/or land use: mixed deciduous forest and dipterocarp forest. Parts are cleared for upland crops such as corn, cotton, sugar cane etc

Described by: C. Changprai

Date: 21 Feb. 1969

Horizon	Depth (cm)	Description
Ap	0-10/14	Dark brown (7.5YR 3/2) sandy loam with some patches of yellowish red (5YR 4/8); massive; hard, firm, nonsticky, nonplastic, few fine roots; few medium animal holes; common pieces of fine charcoal; strongly acid; (field pH 5.5) clear, wavy boundary.
BA	10/14-26	Yellowish red (5YR 5/6) sandy loam; massive; hard, firm, slightly sticky, slightly plastic; common fine tubular pores; few large termite holes; few large roots; very strongly acid; (field pH 5.5); gradual, smooth boundary.
Bt1	26-48	Yellowish red (5YR 4/8) sandy clay loam; moderate medium subangular blocky structure; hard, firm, sticky, plastic; broken thin clay coating in pores; common fine tubular pores; few large termite holes; few fine roots; very strongly acid (field pH 5.0); gradual, smooth boundary.

Bt2	48-100	Yellowish red (5YR 4/8) sandy clay loam; moderate medium subangular blocky and some strong fine granular structure; hard, firm, sticky, plastic; continuous moderately thick clay coating in pores; common fine tubular and interstitial pores; very strongly acid (field pH 5.0); gradual, smooth boundary.
Bt3	100-120	Yellowish red (5YR 4/8) sandy clay; common medium red (2.5YR 4/8) and white (5YR 8/2) mottles; sticky, plastic; very strongly acid (field pH 5.0); gradual, smooth boundary.
Bt4	120-150	Yellowish red (5YR 5/8) sandy clay; hard, firm, sticky, plastic very strongly acid (field pH 5.0); abrupt, smooth boundary.
BC	150-175	Reddish yellow (7.5YR 6/6) sandy clay; few fine yellowish red (5YR 4/8) and light gray (10YR 7/2) mottles; sticky, plastic; very strongly acid (field pH 5.0); abrupt, smooth boundary.
2Cc	175-240	Yellowish brown (10YR 5/8) and red (2.5YR 4/8) clay with about 80 percent ironstone; very strongly acid (field pH 5.0).

Type Location: The Warin series was named for Amphoe Warin, Changwat Ubon Ratchathani, in which soils of this series were first described at site near school about 1.5 km east of the Ubon Ratchathani Agricultural Experiment station.

Range of Profile Feature:

The thickness of the A horizon varies from 10 to 30 cm and has 7.5YR or 10YR hues, values of 3 to 5 and chromas of 2 to 4. Structure is weak medium and/or coarse blocky. Field pH value is from 5.0 to 6.5.

The B horizon has 5YR hue, values of 4 to 6 and chromas of 6 to 8. Textures of clay loam may occur. Structure is moderate medium and/or coarse blocky. Field pH value varies from 4.5 to 5.5.

The C horizon usually occur at some depth below 150 cm from the surface and has paler color.

Similar Soil Series:

Hang Chat series (Hc): has distinct argillic B horizon and higher clay fraction in the subsoil.

Yasothon series (Yt): has redder color in the B horizon.

Principal Associated Soils: These include Khorat, Yasothon, Yang Talat and Phon Phisai series.

ANALYSIS RESULTS **Profile code no.:NE-N-29/17**
(oven dry basis) **Soil series : Warin (Wn)**

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 ₄ OAc
			USDA grading			Sand-fraction grading					Lab	Field	1:1	1:1			
			sand	silt	clay	vc	c	m	f	vf	result	estim ¹	water	KCl			
P-620	0-10/14	AP	54.6	28.6	16.8						sl	sl	4.3	3.7	0.0	6.5	64
P-621	10/14-26	BA	54.0	25.4	20.6						scl	sl	4.5	3.7	0.0	5.1	67
P-622	26-48	B11	53.4	20.2	26.4						scl	scl	4.6	3.7	0.0	5.8	75
P-623	48-100	B12	49.7	23.2	27.1						scl	scl	4.4	3.6	0.0	2.9	70
P-624	100-120	B13	43.3	26.4	30.3						cl	sc	4.5	3.7	0.0	2.2	61
P-625	120-150	B14	46.8	17.1	36.1						sc	sc	4.4	3.7	0.0	1.8	43
P-626	150-175	BC	47.0	14.1	38.9						sc	sc	4.8	3.8	0.0	2.0	49
P-627	175-240	2Cc	41.6	22.9	35.5						cl	gc	5.1	3.9	0.0	3.1	52

Depth (cm)	Air dried to oven dried	C %	N %	Exchange capacity and cations (cmol ₍₊₎ kg ⁻¹)										Base satur ⁿ (%)		ECEC cmol ₍₊₎ kg ⁻¹ (B+D)	Al KCl extr. cmol ₍₊₎ kg ⁻¹ (D)	Electrical conduct ^y (ECx10 ⁶) dS m ⁻¹
				Ca	Mg	K	Na	SUM cations (B)	Extr. acidity (A)	SUM (B+A)	CEC NH ₄ OAc (C)	CEC 100g Clay	B/Cx100	(Bx100)/(B+A)				
0-10/14	0.9	0.66		0.40	0.20	0.10	0.20	0.90	7.40	8.30	6.40	38.1	14	11			0.06	
10/14-26	0.3	0.31		0.50	0.20	0.20	0.20	1.10	4.20	5.30	3.50	17.0	31	21			0.02	
26-48	0.8	0.26		0.40	0.30	0.20	0.20	1.10	4.30	5.40	3.80	14.4	29	20			0.02	
48-100	0.8	0.19		0.40	0.30	0.20	0.20	1.10	5.60	6.70	4.80	17.7	23	16			0.02	
100-120	0.9	0.14		0.40	0.20	0.20	0.20	1.00	6.40	7.40	5.80	19.1	17	14			0.02	
120-150	0.6	0.08		0.30	0.10	0.10	0.20	0.70	5.40	6.10	5.70	15.8	12	11			0.02	
150-175	1.0	0.07		0.40	0.10	0.10	0.20	0.80	5.50	6.30	5.00	12.9	16	13			0.02	
175-240	0.9	0.08		0.40	0.10	0.10	0.20	0.80	6.30	7.10	5.80	16.3	14	11			0.01	