

Proposed by P. Hemsrichart , 1969  
Revised by :  
P. Vijarnsorn and staffs, 1988  
W. Sirichuaychoo, 2004

## RA-NGAE SERIES

Field Symbol: Ra

**Distribution:** Occupies a small extent in Peninsular Thailand, almost exclusively in Changwat Narathiwat.

**Setting:** Ra-ngae soils are formed from marine clay sediment occurred on coastal plain (slightly depressed areas of back swamps marginal to the flood plain). Relief is level. Slope is less 1 percent. Elevation ranges from 1 to 5 m above mean sea level. The climate is Tropical Monsoon (Koppen 'Am'). Average annual air temperature is from 26 °C to 28°C. Average annual precipitation is from 1,800 to 3,000 mm

**Drainage, Permeability and Runoff:** Drainage is very poorly drained. Permeability is estimated to be slow and surface runoff is slow to ponded. Flooded by impounded rain water and river water during the rainy season up to 1 meter for 6 to 7 months. Ground water level falls below 1 meter from the soil surface.

**Vegetation and Land Uses:** Most of the areas are under swamp grass, reeds and low shrubs (*Malaleuca Leucadendron*). Parts are cleared for transplanted rice.

**Characteristic Profile Features:** The Ra-ngae series is a member of the very-fine, mixed, superactive, acid, isohyperthermic Sulfic Endoaquepts (soil taxonomy, 2003). They are very deep soils and are characterized by a very dark gray clay loam surface or A horizon. The cambic B horizon has 10YR hues, values 6 to 7 and chroma 1 to 2, mottles are brownish or yellowish colors overlying a gray or light gray marine clay C horizon with high sulfur content, the lithologic discontinuity between 50 to 100 cm from the soil surface. Very strongly acid to strongly acid reaction values range from 4.5 to 5.0.

**Typifying Pedon:** Ra-ngae sandy clay loam - wet paddy (marsh grass and reeds), from Moo Ban Lamphu, Amphoe Muang, Changwat Narathiwat, less than 1 percent slopes, 20 to 50 cm flooding depth, 70 cm ground water table depth.

**Profile Code Number:** S-71/12, described by F. J. Dent, 17 April 1969 (moist colors unless otherwise stated).

Horizon Depth (cm)	Description
Apg 0-10/11	Light brownish gray (10YR6/2) fine sandy clay loam; common medium distinct yellowish brown (10YR5/4) mottles; weak fine subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; few fine to very fine discontinuous, random, in ped, simple open tubular and interstitial pores; common fine and few medium roots; very strongly acid (field pH 4.5); clear smooth boundary.
Bg1 10/11-25/29	Light gray to gray (10YR6/1) silty clay; common medium distinct yellowish brown (10YR5/8) roots mottles; moderate coarse subangular blocky structure; slightly hard, firm, sticky and plastic; few fine to very fine discontinuous, random, in ped, simple open tubular and interstitial pores; many fine and common medium roots; very strongly acid (field pH 4.5); clear wavy boundary.
Bg2 25/29-62/64	Light gray (10YR7/1) silty clay; many medium prominent yellowish brown (10YR5/8) and yellowish red (5YR4/6) mottles; moderate coarse subangular blocky structure; slightly hard, firm, sticky and plastic; common fine to very fine discontinuous, random, in ped, simple open tubular and interstitial pores; many fine and few medium roots; very strongly acid (field pH 4.5); clear smooth boundary.
2Cg 62/64 <sup>+</sup>	Mixed dark grayish brown (10YR4/2) black (10YR2/1) and very dark brown (10YR2/2) mucky clay; massive, structureless; slightly sticky and slightly plastic; very strongly acid (field pH 4.5); clear smooth boundary.

Remark: Ra-ngae series normally has 35-50% clay in the control section (from field check).  
Classification of Ra-ngae series is fine, mixed, superactive, acid, isohyperthermic Sulfic Endoaquepts.

**Type Location:**

Name of district, Amphoe Ra-ngae, Changwat Narathiwat.

**Range of Profile Features:**

The surface or A horizon loam or clay loam, ranges from 10 to 20 cm in thickness and has 10YR hues, values 3 to 6 and chromas 1 or 2. Sandy loam or sandy clay loam may occurred. The structure is weak fine blocky. Very strongly acid to strongly acid, reaction values range from 4.5 to 5.0.

The cambic B horizon silty clay or clay, has 10YR hues, values 6 to 7 and chromas 1 to 2, mottles are brownish or yellowish colors. Very strongly acid to strongly acid, reaction values range from 4.5 to 5.0.

The C horizon marine clay with high sulfur content between 50 to 100 cm from the soil surface, has moist values of 6 or 7, chromas 1 or 2 in hue 10YR. The structure is massive. Very strongly acid to strongly acid, reaction values range from 4.5 to 5.0.

**Similar Soil Series:**

Munoh series (Mu): fine, mixed, semiactive, acid, isohyperthermic Sulfic Endoaquepts, jarosite mottles between 50 to 100 cm.

Thon Sai series (Ts): fine-loamy, mixed semiactive, acid, isohyperthermic Sulfic Endoaquepts.

**Principal Associated Soils:**

These included Chain Yai, Kab Daeng, Narathiwat and Tak Bai series. Kab Daeng and Narathiwat soils are organic soils and occur on the lower parts of backswamps. Chain Yai series occur on higher position. Tak Bai soils occur on former tidal flats and have formed from brackish sediments, they are poorly drained with a cambic B horizon.

Chain Yai series (Cyi): fine, mixed, superactive, acid, isohyperthermic Haplic Sulfaquents.

Kab Daeng series (Kd): loamy, mixed, superactive, dysic, isohyperthermic Terric Sulfihemists.

Narathiwat series (Nw): dysic, isohyperthermic Typic Haplofibrists.

Tak Bai series (Ta): fine-silty, mixed, semiactive, acid, isohyperthermic Typic Endoaquepts.

ANALYSIS RESULTS

Profile code No.: S-71/12

(oven dry basis)

Soil series: Ra-ngae series (Ra)

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 water	1:1 KCl			
			sand	silt	clay	vc	c	m	f	vf	result	estim <sup>n</sup>				
P-844	0-10/11	Apg	26.0	27.5	46.5					c	fsc	4.3	3.7	0.0	6.7	40
P-845	11-25/29	Bg1	25.5	26.0	48.5					c	sic	4.3	3.7	0.0	9.5	25
P-846	29-62/64	Bg2	1.2	11.3	87.5					c	sic	4.6	3.6	0.3	4.6	25
P-847	62/64+	2Cg	29.6	9.4	61.0					c	mucky c	3.2	3.1	0.0	3.8	37

Depth (cm)	Air dried to oven dried	C %	N %	Exchange capacity and cations (cmol <sub>(+)</sub> kg <sup>-1</sup> )										Base satur <sup>n</sup> (%)		ECEC cmol <sub>(+)</sub> kg <sup>-1</sup> (B+D)	AI KCl extr. cmol <sub>(+)</sub> kg <sup>-1</sup> (D)	Electrical conduct <sup>y</sup> (ECx10 <sup>6</sup> ) dS m <sup>-1</sup>
								SUM	Extr.	SUM	CEC	CEC	B/Cx100	(Bx100)/				
				Ca	Mg	K	Na	cations (B)	acidity (A)	(B+A)	NH <sub>4</sub> OAc (C)	100g Clay	(B+A)					
0-10/11	4.0	1.64		0.80	1.10	0.10	0.30	2.30	9.40	11.70	11.3	24.3	20	20			0.10	
11-25/29	3.0	1.38		0.60	1.70	0.03	0.30	2.63	8.10	10.73	12.6	26.0	21	25			0.06	
29-62/64	2.8	0.47		0.50	1.60	0.02	0.30	2.42	9.00	11.42	10.4	11.9	23	21			0.05	
62/64+	2.4	12.35		0.60	2.90	0.04	0.60	4.14	77.00	81.14	67.1	110.0	6	5			2.00	

Surveyor: F.J. Dent

Reported by: W. Sirichuaychoo

Date: April 17, 1969

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