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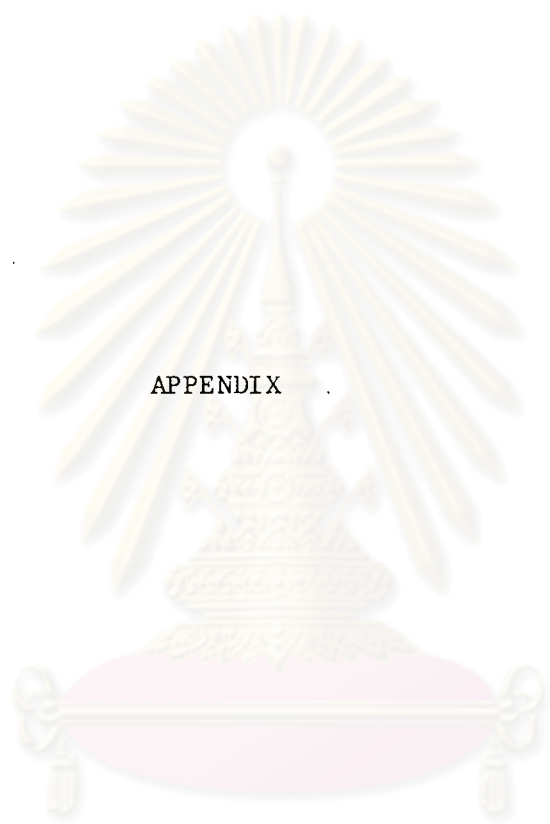
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APPENDIX

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย



APPENDIX A

DISCRIPTION OF 7 SOIL SERIES USED IN THE EXPERIMENT

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย



BAN BUNG SERIES

Distribution :

Occupies moderate extent in Southeast coast of Thailand.

Setting :

Ban Bung soils are formed from sandy alluvium derived from granite and quartzite origin and occur on the low and middle terraces. Relief is flat to nearly flat. The slope is 2 percent or less. Elevation is from 10 to 40 meters above sea level. The climate is transitional zone between Tropical savanna and Tropical Monsoon. Average annual precipitation is from 1,100 mm. to 1,800 mm. Mean annual air temperature is 27°C.

Drainage, Permeability, and surface runoff :

Moderately well drained to somewhat poorly drained soils. Permeability is rapid. Surface runoff is slow. Ground water table falls below 1.5 meters during the peak of the dry season.

Vegetation and Land Use :

Mainly used for sugar cane and cassava cultivation.

Vegetation and Land Use :

Mainly used for sugar cane and cassava cultivation.

Characteristic Profile Features :

The Ban Bung series is a member of the sandy, selicious, non-acid family of Hydromorphic Regosolic Gray Podzolic Soils

(National), Aquic Arenic Eutrochrepts (USDA). They are deep, slightly acid to moderately alkaline soils characterized by a grayish brown or brown, or dark brown sandy loam or loamy sand A or Ap horizons overlying a pinkish gray or light brown or light reddish brown sandy loam or loamy sand cambic B or C horizon. Mottles occur in the plow pan layer and in the deeper subsoils with strong brown, yellowish brown and/or dark yellowish brown colors. The sand fraction consists of medium and coarse in size.

Typifying Pedon :

Ban Bung sandy loam to loamy sand-cassava field from Amphoe Ban Bung, Chon Buri Province-code SE 15/21 (Type location). (moist colors unless otherwise stated).

Ap	-	0-20 cm.	Grayish brown (10YR5/2) sandy loam; weak coarse subangular blocky structures ; friable, non sticky, non plastic ; many fine interstitial pores, few fine and medium tubular pores ; common fine roots ; moderately alkaline (pH 8.0) ; clear smooth boundary to A21
A21	-	20-42 cm.	Very pale brown (10YR7/3) loamy sand with common coarse brown to dark brown mottles ; massive ; slightly firm, non sticky, non plastic ; many fine interstitial pores, few fine

and medium tubular pores ; more compact than above horizon ; few fine roots ; moderately alkaline (pH 8.0) ; gradual smooth boundary to A22.

- A22 - 42-95 cm. Very pale brown (10YR7/3) loamy coarse sand with many coarse and medium brown and dark brown mottles ; very weak coarse subangular blocky breaking into single grains ; friable, non sticky, non plastic ; many fine and medium interstitial pores, common fine tubular pores ; no roots ; moderately alkaline (pH 8.0) ; gradual smooth boundary to B1.
- B1 - 95-130 cm. Light brown (7.5YR6/4) loamy coarse sand with many medium and coarse strong brown mottles ; very weak coarse subangular blocky structures ; friable, non sticky, non plastic ; many fine and medium interstitial pores, few fine tubular pores ; common slightly hard, few hard iron nodules ; moderately alkaline (pH 8.0) ; gradual smooth boundary to B2.

B2 - 130-150+cm. Pinkish gray (5-7.5 YR7/2) sandy loam with common medium and coarse brownish yellow and few coarse strong brown mottles ; weak coarse subangular blocky structures ; firm ; slightly sticky, non plastic ; many fine and medium interstitial pores, few fine tubular pores ; common slightly hard iron nodules ; moderately alkaline (pH 8.0).



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

CHONBURI SERIES

Distribution :

Occupies moderate extent in South East and Central Plain, and small extent in Peninsular Thailand.

Setting :

Chonburi soils are formed from terrace sediments and occur on the low terrace (low marine terrace). Relief is flat to nearly flat which slope is 2 per cent or less. Elevation is from 10 meters to 40 meters above sea level. The climate is transitional zone between tropical savanna and Tropical Monsoon. Average annual precipitation is from 1,100 mm to 1,700 mm. Mean annual air temperature is 27°C.

Drainage, Permeability and Runoff :

Somewhat poorly to Poorly drained soils. Permeability is moderate and surface runoff is slow. Ground water table falls below 1.5 meters during the peak of the dry season and water stagnants at the surface during the wet season.

Vegetation and Land Use :

Are used for transplanted rice in the wet season. Parts are cultivated to vegetables during the dry season.

Characteristic Profile Features :

The Chon Buri series is a member of the fine-loamy, Kaolinitic

family of Low Humic Gley soils (National), Typic Paleaqualfs (USDA). They are deep soils which are characterized by a dark grayish brown or grayish brown sandy loam or sandy clay loam A horizon overlying a light gray or light brownish gray or pinkish gray sandy clay loam grading to sandy clay or clay argillic B horizon. The sand fraction is medium to coarse. They are mottled throughout the profile with the colors of dark brown, dark reddish brown or yellowish red at the surface and of strong brown, yellowish brown and red in the subsoil. Soils reaction is medium acid to slightly acid over strong acid to very strongly acid.

Typifying Pedon :

Chon Buri sandy clay loam : Paddy field. A profile from 6 Kms S.W. of Amphoe Phanat Nikhom, Chon Buri Province. Code is SE 15/16.

(moist colors unless otherwise stated).

Apg	-	0-18 cm.	Grayish brown (10YR5/2) sandy clay loam with medium sand fraction ; upper 2 cm. is silty clay loam ; some sand pockets just below this ; many fine yellowish brown (10YR5/8) and light olive brown (2.5Y5/4) mottles ; moderate coarse subangular blocky with crumb in spots ; friable, slightly sticky, slightly plastic ; many fine and very fine interstitial pores,
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few fine tubular pores ; many very fine and fine and few medium roots ; slightly acid (pH 6.5) ; smooth clear boundary to A3g.

A3g - 18-38 cm. Dark grayish brown (10YR4/2) sandy clay loam with medium sand fraction ; many fine distinct dark brown mottles, mainly along root channels and many coarse dark brown on ped faces ; massive ; slightly firm, slightly sticky, slightly plastic ; many very fine and fine interstitial pores, few very fine to medium tubular pores ; patchy thin clay coating on some ped faces ; many very fine roots in upper part, few roots in lower part ; medium acid (pH 6.0) gradual smooth boundary to B2ltg.

B2tg - 38-60 cm. Light gray to light brownish gray (10YR6/1-6/2) sandy clay, with medium to coarse sand fraction ; common fine yellowish brown mottles ; weak coarse subangular blocky structures ; slightly firm, slightly sticky, plastic ; patchy thin clay coatings on horizontal

and vertical ped faces and in pores ;
many very fine roots ; strongly
acid (pH 5.5) ; gradual smooth
boundary to B22tg.

B22tg - 60-85+cm.

Light brownish gray (10YR6/2) sandy
clay with medium and coarse sand
fraction ; many coarse strong brown
mottles ; weak coarse subangular
blocky structures ; friable, slightly
sticky, plastic ;, moderately thick
continuous clay coating in larger
pores, few clay bridging; many very
fine and fine interstitial pores,
few medium interstitial pores, few
very fine to medium tubular pores ;
few very fine roots; strongly acid
(pH 5.5).

ศูนย์วิทยทรัพยากร
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KAMPHAENG SAEN SERIES

Distribution :

Occupies large extent in the southwestern part of the Central Plain.

Setting :

Kamphaeng Saen soils are formed from semi-recent alluvium and occur on old levees and breach deposits of the semi-recent terrace. Relief is flat to nearly flat, with a slightly undulating micro-relief. Slopes are 1% or less. Elevation ranges from 6 to 20 m. above sea level. The climate is Tropical Savanna (Koppen 'Aw'). Mean annual precipitation ranges from 800 to 1,600 mm. Mean annual temperature is 27°C.

Drainage and Permeability :

Well drained. Permeability is moderate and runoff is slow. Groundwater level is below 1.5 m. from the soil surface throughout the year.

Vegetation and Land Use :

Mainly used for settlement sites, gardens and orchards ; or are put to upland crops such as maize, cotton and sugar cane.

Characteristic Profile Features :

Kamphaeng Saen series is a member of the fine loamy, mixed

family of Nan Calcic Brown Soils (National), Udic Haplustalfs (USDA). They are deep, friable, slightly acid over neutral to mildly alkaline soils. They are characterized by a brown or dark brown loam or clay loam A horizon, overlying a brown or strong brown clay loam, weakly developed, argillic B horizon. Fine mica flakes occur in all horizons ; but not enough for the micaceous family.

Typifying Pedon :

Kamphaeng Saen clay loam-- Orchard from Amphoe Muang, Nakhon Pathom province--Code SW 53/6 (Type Location) (moist colours unless otherwise stated)

Ap	--	0-30 cm.	Brown to dark brown (10YR4/3) ; clay loam ; weak coarse subangular blocky ; nonsticky and nonplastic, friable moist, hard dry ; many very fine interstitial and tubular pores ; common very fine roots ; diffuse, smooth boundary ; pH 6.5.
B2t	--	30-65 cm.	Dark yellowish brown (10YR4/4) ; clay loam to clay ; weak to moderate medium subangular blocky ; slightly sticky and slightly plastic, friable moist, hard dry ; thin, broken, brown to dark brown clay coatings in pores and on ped faces ; many fine and very fine tubular and interstitial

- pores ; few mica flakes ; many fine and medium and common very fine roots ; gradual, smooth boundary ; pH 7.5
- B3 -- 65-90 cm. Brown to dark brown (7.5YR4/4) ; clay loam; moderate medium and fine subangular blocky ; slightly sticky and slightly plastic, friable moist ; thin patchy clay coatings ; many fine and very fine interstitial and tubular pores ; many white lime pseudo-mycelia, strongly calcareous, common mica flakes ; common fine and very fine roots ; gradual, smooth boundary ; pH 8.0.
- C -- 90-130 cm. Strong brown (7.5YR5/6) ; loam ; moderate medium subangular blocky ; nonsticky and nonplastic, friable moist ; many very fine interstitial mycelia, many mica flakes ; few very fine roots ; pH 8.0.

KLAENG SERIES

Distribution :

Occupies moderate extent in Peninsular and South East Coastal Thailand.

Setting :

Klaeng soils are formed from old alluvium underlain by marine deposits. They occur on the level terrain of the lower portion of low terraces with slope less than 1%. Elevation ranges from 10 to 20 metre above sea level. The soils have formed under a Tropical Monsoon Climate (Koppen 'Am') and a Tropical Savanna Climate (Koppen 'Aw'). Average annual rainfall and air temperature is 1,800 to 3,000 mm. and 26°C to 28°C, respectively.

Drainage and Permeability :

Poorly drained with slow surface runoff. Flooded by impounded rainwater up to 30 cm. for 3 to 4 months. Groundwater level below 1 metre during the peak of dry season. Permeability is estimated to be slow.

Vegetation and Land Use :

Mainly used for transplanted rice but scattered areas of low shrubs (Malaleuca leucodendron) and wet grassland occur. In some areas rubber trees, sugar cane, and fruit trees are grown.

Characteristic Profile Features :

Klaeng series is a member of the fine-clayey, Kaolinitic family of Low Humic Gley Soils (National) ; Oxic Plinthaquults (USDA). They are deep soils and characterized by a yellowish brown, grayish brown, or gray sandy clay loam or clay loam surface horizon overlying a gray or light gray clay subsurface horizon which in turn overlies a gray or light gray clay argillic B horizon. These soils are mottles throughout with common to many, fine and medium strong brown and yellowish brown at the surface ; common, medium yellowish brown, strong brown with yellowish red and red in the subsurface ; and dominant red or dusky red in the subsoil. Reaction is medium acid to strongly acid over strongly acid to very strongly acid.

Typifying Pedon :

Klaeng clay loam - Transplanted rice, from Amphoe Sawi, Chumphon Province - Code S58/37 (moist color unless otherwise stated).

Ap	--	0-10 cm.	Dark grayish brown (10YR4/2) clay loam ; iron coating along root channels ; moderate, medium subangular blocky ; slightly hard, slightly sticky, slightly plastic ; common, medium tubular, few, medium interstitial pores ; many, fine and medium roots ; clear, wavy boundary ; pH 5.0.
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- A3 -- 10-26 cm. Light gray (10YR7/2) clay ; many, fine, prominent yellowish red mottles along root channels ; moderate, medium and coarse subangular blocky ; hard, sticky, plastic ; black, possibly humus coating on ped faces and cracks ; few, fine tubular, and common, medium interstitial pores ; many, fine roots ; gradual, smooth boundary ; pH 4.5.
- B21t -- 26-42 cm. Grayish brown (10YR5/2) clay ; common, medium, prominent yellowish red (5YR4/8) and distinct strong brown (7.5YR5/8) mottles ; strong, medium and coarse subangular blocky ; very hard, sticky, plastic ; common, patchy, thin cutans on ped faces ; few, fine tubular and common, fine and medium interstitial pores ; common, very fine roots ; clear, smooth boundary ; pH 4.5.
- B22t -- 42-65 cm. Gray (10YR5/1) clay ; common, medium, prominent red (2.5YR4/6) and yellowish red (5YR4/6) mottles ; strong, fine and medium subangular blocky ; sticky, plastic ; many, patchy, thin cutans

on ped faces ; few, fine tubular and
common, fine interstitial pores ;
few, fine roots ; clear, smooth
boundary ; pH 4.5.

B23t -- 65+cm.

Gray (10YR5/1) clay ; many, medium and
coarse, prominent dark red (10YR3/6)
mottles ; moderate, fine and medium
subangular blocky ; sticky, plastic ;
many, patchy, moderately thick cutans ;
few, medium tubular and common, fine
interstitial pores ; pH 4.5.



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MUAKEK SERIES

Distribution :

Occupies small to moderate extent in the Central Highlands, and North Thailand.

Setting :

The Muak Lek soils are formed from residuum and colluvium from light colored shale, slates and other equivalent rocks and occur on the undulating to hilly topography of erosion surfaces and footslopes. The range of slopes is from 4 to 20 percent. Elevation above sea level is from 180 m. upto 400 m. The climate is Tropical Savanna (Koppen 'Aw'). Average annual precipitation varies from 1,100 mm. upto 1,400 cm. Mean annual air temperature is around 27°C.

Drainage, Permeability and Surface Runoff :

The Muak Lek series consists of well drained soils. Permeability is moderate. Surface runoff is rapid. Ground water level during the dry season is very deep (several meters).

Vegetation and Land Use :

Mainly in Mixed Deciduous and Dry evergreen Forest. Parts are cleared for upland crop cultivation (Shifting cultivation).

Characteristic Profile Features :

The Muak Lek series is a member of the loamyskeletal, mixed

family of Non-calcic Brown Soils (National). Lithic Haplustalfs (USDA). They are shallow soil to parent rock and characterized by a dark brown or dark grayish brown loam or silt loam A horizon overlying a brown or dark brown or dark yellowish brown gravelly (or very gravelly) clay loam or silty clay loam argillic B horizon which in turn overlies parent rock fragments at some depth within 50 cm. of the surface. Reaction is medium acid to neutral over strongly acid to slightly acid.

Typifying Pedon :

Muak Lek loam-Dry evergreen forest. A Profile from near Ban Nam Ron, Wichianburi District, Petchabun Province. Profile Code is NC-47/92. (Colors are for moist soil unless otherwise stated).

A1	--	0-4 cm.	Dark brown (7.5YR3/2) loam ; moderate fine and medium subangular blocky structures ; slightly hard, slightly sticky, slightly plastic ; many fine interstitial and common very fine tubular pores ; common fine and medium roots ; neutral (pH 7.0) ; clear smooth boundary to B1
B1	--	4.-16 cm.	Dark yellowish brown (10YR4/4) silt loam ; moderate medium subangular blocky structures ; friable, sticky,

plastic ; many very fine interstitial and common very fine and fine tubular pores ; few fine and medium roots ; strongly acid (pH 5.2) ; clear smooth boundary to B21t

- B21t -- 16-29 cm. Brown to dark brown (7.5YR4/4) clay loam ; moderate fine and medium subangular blocky structures ; friable sticky, plastic ; many fine interstitial and tubular pores ; patchy thin cutan ; few very fine and fine roots ; strongly acid (pH 5.5), clear smooth boundary to B22t
- B22t -- 29-50 cm. Brown to dark brown (7.5YR4/4) gravelly clay loam with common fine faint reddish brown mottles, weak fine and medium subangular blocky structures, friable, sticky, slightly plastic ; patchy thin cutans ; many fine interstitial and common very fine tubular pores ; many quartz and shale fragment few very fine roots ; strongly acid (pH 5.2) ; clear smooth boundary to C

C -- 50-75 cm. This horizon consists of multicolored weathering shale and few quartz gravels (colors are dark yellowish brown, strong brown, reddish brown and dark red) ; very strongly acid (pH 4.5).



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

SATTAHIP SERIES

Distribution :

Occupies moderate extent in South East and small extent in Peninsular Thailand.

Setting :

Sattahip soils are formed from sandy alluvium (probably marine sediment) which are derived from granitic or quartzitic origin and occur on middle terrace (marine terrace) and coalescing fans. Relief is nearly flat to undulating with slope ranging from 2 to 4 percent. Elevation is from 30 to 70 meters above sea level. The climate is transitional zone between Tropical Savanna and Tropical Monsoon. Average annual precipitation is from 1,100 to 2,200 mm. Mean annual air temperature is 27 to 29°C

Drainage, Permeability and Surface Runoff :

is somewhat excessively drained. Permeability and runoff are rapid. Ground water table falls below 1.5 meters nearly throughout the years. They are dry out very deep during the peak of the dry season.

Vegetation and Land Use :

Mainly used for cassava and sugar cane cultivation.

Characteristic Profile Features :

The Sattahip series is a member of the sandy, siliceous, non-acid family of Regosols (National, Quartzipsamments? (USDA). They are very deep soils and characterized by a grayish brown, brown or light brown coarse sandy loam or loamy sandy A horizon overlying a pinkish gray, Pink or light reddish brown loamy sand or loamy coarse sand C horizon. Reaction is medium acid to neutral at the surface and medium acid to slightly acid in the subsoil.

Typifying Pedon :

Sattahip sandy loam-cassava and coconut tree field, from south east of Bang Pra Irrigation Tank, Amphoe Si Racha, Chon Buri Province. Code is SF-15/20. (moist colors unless otherwise stated).

Ap	-	0-25 cm.	Grayish brown to brown (10YR5/2-5/3) sandy loam ; weak coarse subangular blocky structure breaking into single grains ; friable, non-sticky, non-plastic ; many fine interstitial pores, common fine and few medium tubular pores ; many fine and few medium root ; neutral (pH 7.0) ; gradual and smooth boundary to Ci
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- C1 - 25-58 cm. Light brownish gray to pale brown (10YR6/2-6/3) loamy sand ; weak coarse subangular blocky breaking into single grains ; friable, nonsticky, non plastic ; many fine interstitial pores, common fine tubular pores ; few fine, medium and coarse roots ; neutral (pH 7.0) ; diffuse smooth boundary to C2.
- C2 - 58-120+cm. Pinkish gray (7.5YR7/2) loamy sand ; massive ; friable, non sticky, non plastic ; many fine interstitial pores, common fine and few medium tubular pores ; few medium roots ; slightly acid. (pH 6.5).

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

THON BURI SERIES

Distribution :

Occupies small extent in the central part of the Central Plain.

Setting :

Thon Buri soils are formed from marine and brackish deposits and occur on former tidal flats ; but have been altered by man. Originally Bangkok series, wide beds have been constructed from material dug from separating ditches. These beds have been cultivated for a considerable number of years. Elevation ranges from 2 to 4 m. above sea level. The climate is Tropical Savanna (Koppen 'Aw'). Mean annual precipitation is about 1,500 mm. Mean annual temperature is 27°C.

Drainage and Permeability :

Artificially drained. Permeability is slow ; but run-off is rapid from the beds into the ditches. The beds are raised above the flood level of river water ; but groundwater level remains between 50 and 70 cm. from the soil surface throughout the year.

Vegetation and Land Use :

Used exclusively for horticulture, that is, vegetable gardens and fruit orchards (citrus, durian, rambutan and mangosteen).

Characteristic Profile Features :

Thon Buri series is a member of the very fine clayey, mixed, nonacid family of Hydromorphic Alluvial Soils (National), Typic Tropaquepts (USDA). They are deep, strongly to slightly acid over neutral to moderately alkaline soils. They are characterized by a thick brown to dark brown clay A horizon, overlying a greyish brown, grading to grey clay B horizon. This in turn overlies a reduced dark greenish grey clay C horizon with its upper boundary at some depth below 150 cm. from the soil surface, Yellowish brown, strong brown and yellowish red mottles occur throughout the A and B horizons. Pressure faces and slickensides may occur in the B horizon.

Typifying Pedon :

Thon Buri clay -- Fruit Orchard from Amphoe Bangkok Noi, Thon Buri province - Code C9/1 (Type Location) (moist colours unless otherwise states)

Ap1	--	0-34 cm.	Dark brown to brown (10YR4/3), patches with common, fine, distinct yellowish red and common, fine, faint yellowish brown and some coarse grey mottles ; clay ; parts with massive to weak subangular blocky and parts are moderate, medium and coarse subangular blocky ; very firm moist ; thick continuous clay coatings in pores ; many very
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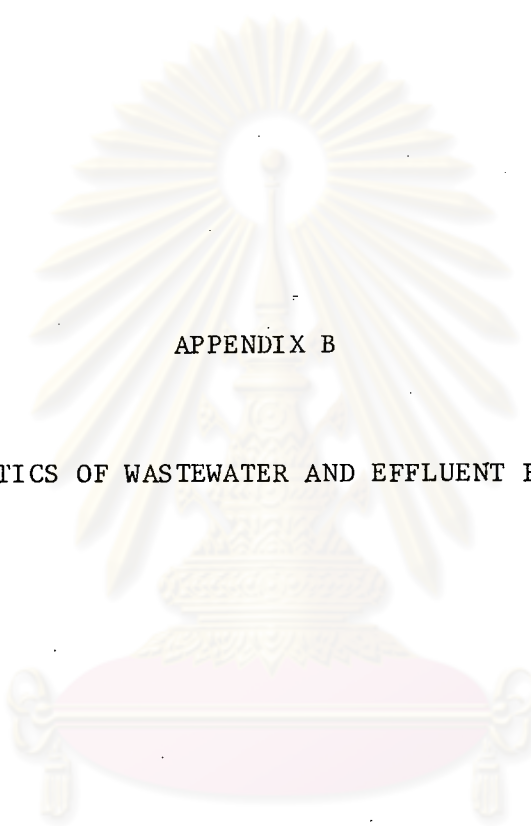
fine, common fine and few medium tubular pores, common fine and medium interstitial pores ; patchy distribution of fine black manganese nodules ; many very fine roots in upper part, few very fine and few medium roots in lower part ; clear, wavy boundary ; pH 6.8.

- Ap2 -- 34-64 cm.q Dark brown to brown (10YR4/3) with some spots of greyish brown and dark greyish brown, many, distinct, fine and medium yellowish red and common, coarse, faint dark yellowish brown mottles ; clay ; moderate medium and fine subangular blocky, sticky and plastic, firm moist ; thick continuous coatings along pores ; many very fine and few medium tubular, and common medium and coarse interstitial pores ; few fine soft black spots, many thin pieces of yellow root skins ; few very fine and medium roots ; gradual, smooth boundary ; pH 5.8.
- B1 -- 64-80 cm. Greyish brown (10YR5/2), many, fine, distinct yellowish red and many,

medium dark yellowish brown mottles ;
 clay ; weak to moderate medium and
 coarse subangular blocky ; sticky
 and plastic, firm moist ; moderately
 thick continuous coatings in medium
 pores ; many very fine and few medium
 tubular, and common fine interstitial
 pores ; some fine slightly hard
 manganese nodules ; few very fine
 roots ; clear, smooth boundary-;
 pH 6.5.

- B21 -- 80-170 cm. Grey (10YR5/1), many, medium, distinct
 yellowish brown mottles ; clay ;
 moderate medium and fine subangular
 blocky ; sticky and plastic, friable
 moist ; many pressure faces and
 moderately thick coatings in some
 very fine pores ; common very fine and
 few fine tubular pores ; few very fine
 roots ; pH 7.5.
- B22 -- 170-190 cm. Grey (10YR5/1), many, coarse strong
 brown and yellowish brown mottles ;
 clay ; groundwater at 170 cm.

- B23 -- 190-200/220 cm. Grey (10YR5/1), many, medium dark olive brown and many coarse dark greenish grey mottles ; clay ; nearly ripe ; green mottles increasing with depth and becoming slightly hard ; pH 8.0.
- C1 -- 200/220-280/300 cm. Grey (5Y5/1), mottles as above ; clay ; half ripe ; thin sand layers containing micas ; pH 8.0.
- C2 -- 280/300-400 cm. Dark greenish grey (5GY4/1) ; light clay ; nearly unripe ; some fine sandy layers with micas ; pH 8.0 to 8.5.



APPENDIX B

THE CHARACTERISTICS OF WASTEWATER AND EFFLUENT FROM SOIL COLUMNS

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

The characteristics of wastewater used in this experiment

Measurement no.	pH	COD (mg/l)	NH ₄ -N (mg N/l)	total-N (mg N/l)	NO ₃ -N (mg N/l)	Orthophosphate (mg P/l)	Total phosphate (mg P/l)	Total bacteria (x 10 ⁷ col/ml)	Fecal coliform (x 10 ⁶ col/ml)
1	7.4	504	30.0	34.0		6.5	9.2	1.8	1.9
2	7.4	348	40.0	44.0		7.1	9.8	1.5	1.2
3	7.4	398	36.5	42.3		6.9	8.5	1.8	2.5
4	7.3	461	36.5	41.1		7.2	8.5	1.3	0.1
5	7.4	332	37.0	39.7		6.2	8.8	1.6	0.1
6	7.5	457	33.5	39.0		7.4	10.5	1.4	0.9
7	7.5	356	32.0	36.7	immeasurable	6.7	9.0	1.1	0.8
8	7.4	372	34.5	38.7	low value	6.9	8.3	2.3	2.0
9	7.4	432	33.2	39.0		7.5	9.0	3.2	4.2
10	7.4	306	35.8	39.3		6.9	8.4	1.1	2.7
11	7.1	327	33.1	37.5		6.6	8.2	2.8	4.3
12	7.5	360	34.9	38.5		7.1	9.8	4.2	4.8
13	7.5	493	34.3	38.1		6.4	8.6	8.0	5.0
14	7.5	349	34.7	38.9		6.3	7.9	3.2	1.4



ศูนย์วิทยุทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

The characteristics of effluents from upper (0-50 cm depth) and lower (50-100 cm depth) soil columns of Sattahip series.

Time (Days)	ph value of effluent from		COD concentration (mg/l) in effluent from		NH ₄ -N(mgN/l) in effluent from		No ₃ -N (mgN/l) in effluent		Orthophosphate (mgP/l) in effluent from		Total bacteria (x10 ⁵ col/ml) in effluent from		Fecal coliform (x10 ³ col/ml) in effluent from	
	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil
1	5.7	4.5	46	8	23	2.8					70	1.6	50	
3	-	-	-	-	-	-					7	0.04	35	
4	-	-	44	-	-	-					-	-	-	
5	-	-	-	16	25	-					-	-	-	
6	-	-	-	-	-	-					11	0.03	10	
7	7.0	5.9	64	-	-	3.0					-	-	-	
8	-	-	-	30	22	-					-	-	-	
10	-	-	-	-	-	-					3.9	0.08	10	
11	7.5	7.3	24	-	-	-	*				-	-	-	
12	-	-	-	-	20	-					-	-	-	
13	-	-	-	34	-	-					2.8	0.004	1	
14	7.6	-	180	-	-	2.8					-	-	-	
16	-	-	-	-	17	-					-	-	-	
17	-	-	60	48	-	-	*	< 0.2	< 0.2		17	0.35	0.1	*
19	-	7.8	-	-	-	-					-	-	-	
20	-	-	-	-	9	-					-	-	-	
21	-	-	98	64	-	3.3					2.8	0.12	-	
22	8.2	-	-	-	-	-	2.0				-	-	-	
24	-	-	-	-	2.1	-	-				-	-	-	
25	-	7.7	-	-	-	-	-				0.5	-	-	
26	-	-	92	80	-	-	-				-	-	-	
27	7.9	-	-	-	-	-	3.0				-	-	-	
28	-	7.5	-	-	2.7	-	-				-	-	-	
29	-	-	-	-	5.0	-	-				-	-	-	
30	-	-	-	-	-	-	-				0.2	-	-	
31	-	-	82	92	-	-	-				-	0.19	*	
32	7.6	-	-	-	-	-	8.2				-	-	-	
33	-	8.1	-	-	2.2	-	-				0.1	-	-	
36	-	-	92	100	-	-	-				-	0.03	-	
37	8.0	8.1	-	-	-	4.0	-				0.48	-	-	
38	-	-	-	-	-	-	15				-	-	-	
39	-	-	102	-	-	-	-				-	-	-	
40	-	7.1	-	98	2.8	-	-				8	0.16	-	
41	7.4	-	-	-	-	-	-				-	-	-	

* Inmeasurable low value

The characteristics of effluents from upper (0-50 cm depth) and lower (50-100 cm depth) soil columns of Muak Lek series.

Time (days)	pH value of effluent from		COD concentration (mg/l) in effluent from		NH ₄ -N (mg/l) in effluent from		NO ₃ -N (mg/l) in effluent from		Orthophosphate (mgP/l) in effluent from		Total bacteria (x10 ³ col/ml) in effluent from		Fecal coliform (x10 ³ col/ml) in effluent from	
	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil
1	7.2	7.6	64	-	25.0	1.5			5.0		79	4.6	1,400	
2	-	-	-	58	-	-			-		-	-	-	
3	-	7.6	-	-	-	-			-		-	-	-	
4	-	-	-	-	-	-			-		-	4.8	-	
5	7.0	7.8	108	65	-	-			2.9		52	-	500	
6	-	-	-	-	22.0	1.9					-	-	-	
7	-	-	-	-	-	-					-	0.18	-	
9	7.9	7.6	36	28	-	-					2.3	-	1.3	
10	-	-	-	-	17.0	-					-	-	-	
11	-	-	-	-	-	-					-	0.21	-	
12	-	-	-	-	-	2.8					-	-	-	
13	7.5	7.8	-	24	-	-					3.2	-	0.11	
14	-	-	-	-	7.0	-	*	*	< 0.2	< 0.2	-	-	-	*
15	-	-	-	-	-	-					-	0.15	-	
17	7.6	7.8	30	40	-	-					4.4	-	0.2	
18	-	-	-	-	2.4	-					-	-	-	
19	-	-	-	-	-	4.1					-	0.03	-	
21	7.7	7.9	64	24	-	-					1.2	-	*	
23	-	-	-	-	2.8	-					-	-	-	
24	-	-	-	-	-	-					-	0.02	-	
25	-	-	-	-	-	3.0					-	-	-	
26	7.4	7.9	56	24	-	-					0.28	-	-	
27	-	-	-	-	-	-		4.0			-	-	-	
28	-	-	-	-	2.7	-		-			-	-	-	
29	-	-	-	-	-	-		-			-	0.01	-	
31	7.5	7.9	30	16	-	-		-			0.07	-	-	
32	-	-	-	-	-	-		5.5			-	-	-	
33	-	-	-	-	3.8	3.5		-			-	-	-	
34	-	-	-	-	-	-		-			-	0.04	-	
36	7.7	8.0	40	24	-	-		-			1.2	-	-	
37	-	-	-	-	-	-		9.0			-	-	-	
38	-	-	-	-	2.9	-		-			-	-	-	
39	-	-	-	-	-	-		-			-	0.01	-	
41	7.6	8.0	34	26	-	5.7		-			0.16	-	-	
42	-	-	-	-	-	-		15.0			-	-	-	
43	-	-	-	-	3.0	-		-			-	-	-	
44	-	-	-	-	-	-		-			-	0.01	-	
46	7.5	8.0	38	24	-	-		-			0.01	-	-	

* immeasurable low value

The characteristics of effluents from upper (0-50 cm depth) and lower (50-100 cm depth) soil columns of Ban Bung series

Time (days)	pH value of effluent from		COD concentration (mg/l) in effluent from		NH ₄ -N (mgN/l) in effluent from		NO ₃ -N (mgN/l) in effluent		Orthophosphate (mgP/l) in effluent from		Total bacteria (x10 ³ col/ml) in effluent from		Fecal coliform (x10 ³ col/ml) in effluent from	
	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil
1	6.6	6.4	84	40	21	3.0			3.6		327	15	40	
4	-	7.0	-	18	-	-					80	5.6	60	
5	7.4	-	-	-	26	-					-	-	-	
6	-	7.1	98	-	-	-					-	-	-	
7	-	-	-	30	-	4.3					-	-	2.0	
8	-	-	-	-	-	-	*				40	-	-	
9	7.3	7.8	-	-	10	-					-	-	-	
10	-	-	-	90	-	-					-	42	-	
12	-	7.7	-	-	-	-					-	-	-	
13	-	-	124	10	2.3	-					3	1.5	0.02	
14	8.2	-	-	-	-	-					-	-	-	
15	-	-	-	-	-	4.0					-	-	-	
16	-	7.5	-	-	-	-	3.0	*	< 0.2	< 0.2	-	-	-	*
17	-	-	-	62	-	-	-				-	0.7	-	
19	-	-	-	-	2.3	-	-				-	-	-	
20	-	-	176	-	-	-	-				-	-	-	
21	-	-	-	50	-	-	6.8				8	6.2	0.01	
22	-	7.0	-	-	-	-	-				-	-	-	
23	-	-	-	-	-	5.7	-				-	-	-	
25	7.6	-	-	-	1.0	-	-				-	4.1	-	
26	-	-	170	70	-	-	-				5.4	-	-	
27	-	-	-	-	-	-	9.0				-	-	-	
28	-	7.2	-	-	-	-	-				-	-	-	
29	-	-	-	-	-	-	-				-	4.7	-	
30	-	-	-	-	2.0	-	-				-	-	-	
31	-	-	160	64	-	5.8	-				1.3	-	*	
32	7.5	7.0	-	-	-	-	-				-	-	-	
33	-	-	-	-	-	-	-				-	0.7	-	
34	-	-	-	-	-	-	11.2				-	-	-	
35	-	7.5	-	-	-	-	-				-	-	-	
36	-	-	-	84	1.5	-	-				0.29	-	-	
37	-	-	-	-	-	-	-				-	3.6	-	
39	-	7.3	120	-	-	6.0	-				-	-	-	
40	6.2	-	-	-	-	-	13.5				3.8	1.6	-	
43	-	-	-	92	-	-	-				-	-	-	

* immeasurable low value

The characteristics of effluents from upper (0-50 cm. depth) and lower (50-100 cm depth) soil columns of Chon Buri series

Time (days)	pH value of effluent from		CO ₂ concentration (mg/l) in effluent from		NH ₄ -N (mgN/l) in effluent from		NO ₃ -N (mgN/l) in effluent		Orthophosphate (mgP/l) in effluent from		Total bacteria (x10 ³ col/ml) in effluent from		Fecal coliform (x10 ³ col/ml) in effluent from	
	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil	upper soil	lower soil
1	5.2	5.2	24	-	2.0	2.0					17	-		
2	-	-	-	30	-	-					-	1.2		
4	-	-	24	-	-	-					-	-		
6	-	-	-	-	-	-					4.5	-		
7	5.0	-	-	-	2.2	-					-	-		
8	-	4.8	-	-	-	3.5					-	-		
9	-	-	16	48	-	-					0.01	0.05		
13	4.9	4.9	-	-	-	-					-	-		
14	-	-	24	32	5.0	-					1.1	0.86		
17	-	-	-	-	-	-	*	*	< 0.2	*	-	-	*	*
18	-	-	16	-	-	3.5					1.3	-		
21	-	-	-	-	4.0	-					-	-		
22	-	-	44	-	-	-					-	-		
23	-	-	-	-	-	-					7.6	0.11		
26	5.0	5.5	-	-	-	4.5					-	-		
27	-	-	-	20	-	-					-	-		
28	-	-	22	-	-	-					0.1	36		
30	-	-	-	-	5.0	-					-	-		
33	-	-	48	-	-	-					-	-		
35	-	-	-	-	-	-					-	2.0		
37	5.5	5.8	-	-	-	5.0					-	-		
38	-	-	-	24	-	-					-	-		
40	-	-	52	-	6.0	-					0.7	-		
43	-	-	-	-	-	-					-	1.3		
45	6.0	6.1	-	-	-	-					5.6	-		
46	-	-	-	48	-	-					-	-		
47	-	-	60	-	-	-					-	-		

* immeasurable low value

The characteristics of effluent from upper soil column (0-50 cm depth) of Klaeng series

Time (days)	pH	COD (mg/l)	NH ₄ -N (mgN/l)	NO ₃ -N (mgN/l)	Orthophosphate (mgP/l)	Total bacteria (x10 ⁵ col/ml)	Fecal coliform (x10 col/ml)
1	5.6	-	4.0			2.5	
2	-	108	-			-	
8	5.9	-	-			1.2	
10	-	100	-			-	
11	-	-	4.7			-	
15	6.0	-	-	immeasurable		4.2	
16	-	80	-	low value	< 0.2	-	immeasurable
21	-	-	5.1			-	low value
24	6.0	-	-			5.0	
25	-	84	-			-	
28	-	-	5.0			-	
31	-	-	-			3.8	
34	-	98	-			-	
38	-	-	6.3			-	
42	6.2	-	-			-	
44	-	108	-			-	
45	-	-	-			2.8	

BIOGRAPHY

Mr. Nimit Bamrungchitta was born in Bangkok, Thailand, on April 13, 1954. He was graduated with a B.Ed. from Srinakharinwirot University in 1975.



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย