APPENDIX

Appendix Table 1 Series, parent materials, taxonomic classes and distribution of Thai Alfisols

Series	Region[1]	Parent materials	Taxonomic classes*
Land condition: Lowlands			
Doem Bang (Db)	C	Old alluvium	Aeric (Plinthic) Endoaqualf; Fine, kaolinitic
Khao Yoi (Kyo)	C	Old alluvium	Aeric Endoaqualf, Fine-loamy, mixed, semiactive
Manorom (Mn)	C	Semi-recent alluvium	Aeric (Plinthic) Endoaqualf; Fine, mixed, semiactive
Nakhon Pathom (Np)	C	Semi-recent alluvium	Aeric Endoaqualf; Fine, mixed, active
Hang Dong (Hd)	N	Alluvium	Typic Endoaqualf; Fine, mixed, semiactive
Phan (Ph) (n=4)	N	Alluvium	Typic (Plinthic Endoaqualfs; Fine, kaolinitic
San Sai (Sai)	N	Alluvium	Aeric Endoaqualf; Coarse-loamy, siliceous, subactive
Mae Sai (Ms)	N	Alluvium	Aeric Endoaqualf; Fine-silty, mixed, semiactive
Lampang (Lp)	N	Old alluvium	Typic (Aeric) Endoaqualf; Fine-silty, mixed, semiactive
Tha Tum (Tt)	NE	Old alluvium	Aeric (Plinthic) Endoaqualf; Fine, mixed, semiactive
La-ngu (Lgu)	S	Relatively old alluvium	Typic Endoaqualf; Fine, kaolinitic
Land condition: Uplands			
Pran Buri (Pr)	C	Alluvium	Oxic Paleustalf; Fine-loamy, mixed
Thap Khwang (Tw)	C	Alluvium	Ultic Paleustalf; Fine, mixed
Kamphaeng Sean (Ks)	C	Semi-recent alluvium	Typic Haplustalf; Fine-silty, mixed, subactive
Phetchaburi (Pb)	C	Semi-recent alluvium	Oxyaquic Haplustalf; Fine-loamy, mixed, active
Wichain Buri (Wb)	C	Old alluvium	Aquic Haplustalf; Fine-loamy, mixed, actived
Muak Lek (Ml)	C	Residuum and colluvium derived from shales and slate	Ultic Haplustalf; Coarse-skeletal, mixed, semiactive, shallow
Kamphaeng Phet (Kp)	N	Alluvium	Oxyaquic (Ultic) Haplusalf; Fine-silty, mixed
Li (Li)	N	Residuum and colluvium derived from shale and phyllite	Ultic Haplustalf; Coarse-skeletal, mixed, semiactive, shallow

Appendix Table 1 (Continued)

Series	Region[1]	Parent materials	Taxonomic classes*
Land condition: Uplands			
Phayao (Pao)	N	Residuum and colluvium derived from sandstone	Plinthic Paleustalf; Coarse-skeletal, mixed, semiactive
Khambong (Kg)	NE	Old alluvium	Typic Haplustalf; Sandy, siliceous
Wang Hai (Wi)	NE	Old alluvium	Oxyaquic (Ultic) Paleustalf; Fine, mixed, active
Loei (Lo) (n=2)	NE	Residuum and local and colluvium derived from granite shale	Ultic Paleustalf; Fine, kaolinitic
Wang Saphung (Ws)	NE	Residuum and/or colluvium of shale (sandy shale)	Typic Haplustalf; Fine, mixed, active
Chatturat (Ct)	NE	Calcareous siltstone and fine grain sandstone	Typic Haplustalf; Fine, Mixed, active
Nam Pong (Ng)	NE	Wash deposits on sandstone	Arenic Haplustalf; Loamy, siliceous, semiactive
Sikhiu (Si)	NE	Wash deposits of calcareous sandstone	Typic Rhodustalf; Fine-loamy, mixed, semiactive
Phak Kat (Pat)	S	Relatively old alluvium	Plinthaquic Paleudalf; Fine, mixed, semiactive

n= number of sampling site

[1]C= Central, E= East, N= North, NE= Northeast, S= Southeast Coast and Peninsular Thailand

*Based on Soil Survey Staff (1999), (2003)

Appendix Table 2 Series, parent materials, taxonomic classes and distribution of Thai Ultisols

Series	Region[1]	Parent materials	Taxonomic classes*
Land condition: Lowlands			
Hin Kong (Hk)	C	Alluvium	Typic Paleaquult; Fine, silty, subactive
Pak Tho (Pth)	C	Old alluvium	(Aeric) Plinthic Paleaquult; Fine, kaolinitic
Si Thep (Sri)	C	Old alluvium	Plinthic Paleaquult; Fine-silty, mixed, subactive
Klaeng (Kl)	E	Alluvium on alluvium plain	Typic Plinthaquult; Very-fine, kaolinitic
On (On)	E	Old alluvium	Aeric (Plinthic) Epiaquult; Loamy-skeletal/fragmental, mixed, subactive
Chiang Rai (Cr) (n=2)	N	Semi-recent alluvium	Plinthic Paleaquult; Fine, kolinitic
Phen (Pn)	NE	Old local alluvium and residuum derived from clastic sedimentary rocks	Aeric Plinthic Paleaquult; Loamy-skeletal, mixed, subactive
Renu (Rn) (n=2)	NE	Old alluvium	(Aeric) Plinthic Paleaquult; Fine-loamy, mixed, semiactive
Roi Et (Re)	NE	Old local alluvium and residuum derived from sandstone	Typic Kandiaquult; Fine-loamy, mixed, active
Bang Nara (Ba)	S	Relatively old alluvium	Typic Paleaquult; Fine, kaolinitic
Khok Khain (Ko)	S	Relatively old alluvium	Typic Kandiaquult; Fine-loamy, kaolinitic
Phatthalung (Ptl)	S	Alluvium	Plinthic Paleaquult; Fine, kolinitic
Sungai Padi (Pi)	S	Old alluvium derived from igneous rocks	Aeric Paleaquult; Fine-loamy, siliceous, subactive
Visai (Vi)	S	Alluvium	Typic Plinthaquult; Fine-loamy, mixed, semiactive
Yan Ta Khao (Yk)	S	Relatively old alluvium	Typic (Aeric) Plinthaquult; Loamy-skeletal, mixed, semiactive
Land condition: Uplands			
Bang Khla (Bka)	C	Alluvium	Typic Paleudult; Loamy-skeletal, mixed
Don Rai (Dr)	C	Old alluvium	Typic Kandiustult; Fine-loamy, kaolinitic
Lat Ya (Ly)	C	Colluvium and residuum derived from sandstone and quartzite	Kanhaplic Haplustult; Fine-loamy, siliceous
Tha Yang (Ty)	C	Residuum and colluvium derived from sandstone	Kanhaplic Haplustult; Loamy-skeletal, siliceous

Appendix Table 2 (Continued)

Series	Region[1]	Parent materials	Taxonomic classes*
Land condition: Uplands			
Kabin Buri (Kb) (n=2)	E	Residuum derived from shale	Typic Paleustult; Clayey-skeletal, kaolinitic
Khlong Chak (Kc)	E	Residuum derived from fine grained clastic rocks (shale, phyllite or equivalent rocks)	Typic Kandihumult; Clayey-skeletal, kaolinitic
Mab Bon (Mb)	E	Residuum derived from granite	Oxic Paleustult; Fine-loamy, mixed
Ban Chong (Bg)	N	Residuum and local colluvium from shale	Typic (Kandic) Paleustult; Fine, kaolinitic
Ban Chong-high bases (Bg-hb)	N	Residuum and local colluvium from shale	Typic (Kandic) Paleustult; Fine, kaolinitic
Doi Pui (Dp)	N	Residuum derived from gneissic granite, gneiss or schist	Typic (Kandic) Palehumult; Fine, kaolinitic
Hang Chat (Hc)	N	Residuum derived from granite	Typic (Kandic) Paleustult; Fine-loamy, mixed
Chiang Khan (Ch) (n=2)	NE	Residuum and local colluvium derived from shale	Typic Kandiustult; Clayey-skeletal, kaolinitic
Dan Sai (Ds)	NE	Residuum and/or colluvium of mixed rocks (sandstone, shale)	Typic Kandiustult; Fine-loamy, kaolinitic
Korat (Kt) (n=3)	NE	Sandstone	(Oxyaquic) Kandiustult; Fine-loamy, siliceous
Mae Rim (Mr)	NE	Old gravelly and cobbly alluvium	Typic (Kandic) Paleustult; Loamy-skeletal, mixed
Mae Taeng (Mt)	NE	Old alluvium	Rhodic Kandiustult; Fine, kaolinitic
Nong Mot (Nm)	NE	Residuum and colluvium derived from granite	Typic Kandiustult; Fine, kaolinitic
Pak Chong (Pc)	NE	Residuum and colluvium derived from limestone and calcareous shale	Oxic Paleustult; Clayey, kaolinitic
Phu Sana (Ps)	NE	Residuum derived from granite rock	Kanhaplic Haplustult; Fine-loamy, mixed
Sakon (Sk)	NE	Old local alluvium over sheet laterite	Petroferric Haplustult; Loamy-skeletal/fragmental, mixed, subactive
Satuk (Suk) (n=4)	NE	Old local alluvium derived from clastic sedimentary rocks	Typic Paleustult; Fine-loamy, siliceous, subactive
Sung Noen (Sn) (n=2)	NE	Old local alluvium derived from calcareous shale and limestone	Typic Paleustult; Fine, silty, subactive

Appendix Table 2 (Continued)

Series	Region[1]	Parent materials	Taxonomic classes*
Land condition: Uplands			
Warin (Wn)	NE	Old alluvium	Typic Kandiustult; Fine-loamy, siliceous
Yasothon (Yt) (n=2)	NE	Old alluvium	Typic Paleustult; Fine-loamy, siliceous, semiactive
Chalong (Chl)	S	Transported materials derived from granite	Typic Kandiudult; Fine-loamy, kaolinitic
Fang Daeng (Fd)	S	Residuum derived from granite, quartzite and phyllite	Rhodic Kandiudult; Fine-loamy, kaolinitic
Hat Yai (Hy)	S	Old gravelly alluvium	Typic paleudult; Clayey-skeletal, kaolinitic
Hoi Pong (Hp)		Colluvium and alluvium from granite and quartzite	Typic Kandiudult; Fine, kaolinitic
Khao Khat (Kkt)	S	Colluvium and residuum of clastic rock (shale, phyllite and mudstone)	Typic (Kandic) Plinthudult; Clayey-skeletal, kaolinitic
Khlong Teng (Klt)	S	Residuum derived from shale and phyllite	Typic Haplohumult; Fine-loamy, mixed, semiactive
Khlong Tom (Km) (n=2)	S	Old alluvium	Typic Kandiudult; Fine-laomy, kaolinitic
Kho Hong (Kh) (n=2)	S	Alluvium	Typic Kandiudult; Coarse-loamy, kaolinitic
Klong Nok Krathung (Knk)	S	Transported materials derived from granite	Typic Kandiudult; Fine-loamy, kaolinitic
Krabi (Kbi)	S	Colluvium or residuum of fine-grained clastic rocks (shale, mudstone)	Typic Kandiudult; Fine, kaolinitic
Na Tawi (Nat)	S	Old alluvium or transported materialsmderived from sandstone	Typic Kandiudult; Coarse-loamy, kaolinitic
Na Tham (Ntm)	S	Relatively old alluvium	Typic (Aquic) Plinthudult; Fine-loamy, mixed, semiactive
Nong Khla (Nok)	S	Colluvium and residuum derived from mudstone, shale and phyllite	Typic Kandiudult; Coarse-skeletal, kaolinitic
Padang Besar (Pad)	S	Old locall alluvium derived from weathered sandstone, and quartzite	Typic Paleudult; Coarse-loamy, siliceous/kaolinitic, subactive
Pak Chan (Pac)	S	Colluvium and residuum derived from shale and phyllite	Typic Palehumult; Very-fine, kaolinitic

Appendix Table 2 (Continued)

Series	Region[1]	Parent materials	Taxonomic classes*
Land condition: Uplands			
Pathiu (Ptu)	S	Residuum and local alluvium derived from sandstone, limestone	Typic Kandiudult; Fine, kaolinitic
Phangnga (Pga)	S	Transported materials colluvium and residuum derived from granite	Typic Kandiudult; Fine, kaolinitic
Phato (Pto)	S	Residuum derived from quartzite and phyllite	Typic Hapludult; Loamy-skeletal, mixed, semiactive
Phuket (Pk)	S	Colluvium and local residuum derived from granite	Typic Paleudult; Clayey, kaolinitic
Sawi (Sw)	S	Old alluvium	Typic Peleudult; Loamy-skeletal, mixed, semiactive
Tha Sae (Te)	S	Old alluvium	Typic Kandiudult; Fine-loamy, kaolinitic
Wang Tong (Wat)	S	Residuum derived from shale, phyllite, fine-grained clastic rocks	Typic Plinthudult; Fine, kaolinitic
Yala (Ya)	S	Old gravally and cobbly alluvium	Typic Kandiudult; Clayey-skeletal, kaolinitic

n= number of sampling site

[1]C= Central, E= East, N= North, NE= Northeast, S= Southeast Coast and Peninsular Thailand

*Based on Soil Survey Staff (1999), (2003)

Appendix Table 3 Minerals in clay fraction of Thai Alfisols

Series	Clay minerals				Iron oxide minerals		Other minerals		
	Ver	Sme	Ill	Kao	Goe	Hem	Qtz	Ana	Fel
Land condition: Lowlands									
Doem Bang (Db_top[1/])	-	-	-	xxx	-	-	xxx	tr.	-
Doem Bang (Db_sub[2/])	-	-	x	xxxx	-	-	x	tr.	-
Khao Yoi (Kyo_top)		x	x	xxx	-	-	x	tr	tr
Khao Yoi (Kyo_sub)	-	x	-	xxxx	-	-	x	tr	tr
Manorom (Mn_top)	-	-	x	xxxx	-	-	x	tr	-
Manorom (Mn_sub)	-	-	x	xxxx	-	-	x	tr	-
Nakhon Pathom (Np_top)	-	tr	xx	xxx	-	-	x	tr	tr.
Nakhon Pathom (Np_sub)	-	tr	xx	xxx	-	-	x	tr	tr
Hang Dong (Hd_top)	-	x	tr	xx	x	-	tr	tr	-
Hang Dong (Hd_sub)	-	x	xxx	x	x	-	tr	tr	-
Phan (Ph1_top)	-	tr	xx	xx	-	-	xx	-	-
Phan (Ph1_sub)	-	tr	x	xxx	-	-	xx	-	-
Phan (Ph2_top)	-	tr	x	xxx	-	-	xx	tr	tr
Phan (Ph2_sub)	-	tr	xx	xxxx	-	-	-	-	-
Phan (Ph3_top)	-	tr	xx	xx	-	-	xx	-	-
Phan (Ph3_sub)	-	tr	x	xxx	-	-	xx	-	-
Phan (Ph4_top)	-	tr	x	xxx	-	-	xx	tr	tr
Phan (Ph4_sub)	-	tr	xx	xxxx	-	-	-	-	-
San Sai (Sai_top)	-	tr	xx	xxx	tr	-	x	tr	tr
San Sai (Sai_sub)	-	tr	x	xxx	tr	-	xx	tr	tr
Mae Sai (Ms_top)	-	tr	x	xx	x	-	x	tr	-
Mae Sai (Ms_sub)	-	tr	xx	xx	x	-	x	tr	-
Lampang (Lp_top)	-	-	x	xxxx	-	-	x	tr	tr
Lampang (Lp_sub)	-	-	x	xxx	-	-	xx	-	tr
Tha Tum (Tt_top)	-	x	tr	xx	tr	-	xx	tr	-
Tha Tum (Tt_sub)	-	x	tr	xx	tr	-	xx	tr	-
La-ngu (Lgu_top)	-	tr	tr	xxxx	tr	tr	x	tr	tr
La-ngu (Lgu_sub)	-	tr	tr	xxxx	x	tr	tr	tr	tr
Land condition: Uplands									
Pran Buri (Pr_top)	-	tr.	x	xxx	tr	-	x	tr	tr
Pran Buri (Pr_sub)	-	tr.	x	xx	tr	-	xx	tr	tr
Thap khwang (Tw_top)	-	tr	tr	xxxx	-	-	x	tr	-
Thap khwang (Tw_sub)	-	tr	-	xxx	-	-	xxx	tr	-
Kamphaeng Sean (Ks_top)	-	-	x	xx	tr	-	xx	tr	tr
Kamphaeng Sean (Ks_sub)	-	-	xx	xx	x	-	x	tr	tr
Phetchaburi (Pb_top)	-	-	x	x	-	-	xxx	-	-
Phetchaburi (Pb_sub)	-	-	x	x	-	-	xxx	-	-

Appendix Table 3 (Continued)

Series	Clay minerals				Iron oxide minerals		Other minerals		
	Ver	Sme	Ill	Kao	Goe	Hem	Qtz	Ana	Fel
Land condition: Uplands									
Wichain Buri (Wb_top)	-	x	tr	xxx	-	-	x	tr	tr
Wichain Buri (Wb_sub)	-	x	tr	xx	-	-	xxx	tr	tr
Muak Lek (Ml_top)	tr	-	x	xxx	tr	-	xx	tr	tr
Muak Lek (Ml_sub)	tr	-	x	xxx	tr	-	x	tr	tr
Kamphaeng Phet (Kp_top)	-	tr	x	xxx	tr	-	x	tr	tr
Kamphaeng Phet (Kp_sub)	-	tr	xx	xxx	tr	-	x	tr	tr
Li (Li_top)	tr	-	-	xxx	x	tr	tr	tr	-
Li (Li_sub)	tr	-	-	xxx	x	tr	tr	tr	-
Phayao (Pao_top)	-	x	x	xxx	tr	-	x	-	-
Phayao (Pao_sub)	-	x	x	xxx	tr	-	x	-	-
Khambong (Kg_top)	-	-	x	xxxx	tr	-	x	tr	tr
Khambong (Kg_sub_	-	-	x	xxxx	tr.	-	x	tr	tr
Wang Hai (Wi_top)	-	tr	tr	xxx	x	tr	tr	tr	tr
Wang Hai (Wi_sub)	-	tr	tr	xxx	x	tr	tr	tr	-
Loei (Lo1_top)	-	-	-	xxx	tr	x	tr	-	-
Loei (Lo1_sub)	-	-	tr	xxx	tr	x	tr	-	-
Loei (Lo2_top)	-	-	-	xxx	tr	x	tr	-	-
Loei (Lo2_sub)	-	-	tr	xxx	tr	x	tr	-	-
Wang Saphung (Ws_top)	-	-	x	xxx	x	tr	x	tr	-
Wang Saphung (Ws_sub)	-	-	x	xxx	x	tr	x	tr	-
Chatturat (Ct_top)	-	-	x	xxx	x	tr	tr	-	-
Chatturat (Ct_sub)	-	-	x	xxx	x	tr	tr	-	-
Nam Pong (Ng_top)	-	-	-	xxx	-	-	xxx	tr	-
Nam Pong (Ng_sub)	-	-	x	xxxx	-	-	x	tr	-
Sikhiu (Si_top)	-	tr	x	xx	tr	-	tr	tr	tr
Sikhiu (Si_sub)	-	tr	x	xx	tr	-	x	tr	tr
Phak Kat (Pat_top)	-	tr	x	xxxx	tr	-	x	tr	tr
Phak Kat (Pat_sub)	-	tr	x	xxxx	tr	-	x	tr	tr

[1/] Topsoil (0-50 cm)
[2/] Subsoils (50-100 cm)
Ver= vermivulite; Sme= smectite, Ill= illite; Kao= kaolinite; Goe= goethite; Hem= hematite; Qtz= quartz; Ana= anatase; Fel= felspar.
tr= trace (<5%), x= small (5-20%), xx= moderate (20-60%), xxx= large, xxxx= dominant (>60%)

Appendix Table 4 Minerals in clay fraction of Thai Ultisols

Series	Clay minerals			Iron oxide minerals		Other minerals		
	Ver	Ill	Kao	Goe	Hem	Qtz	Ana	Fel
Land condition: lowlands								
Hin Kong (Hk_top[1/])	-	x	xxx	-	-	xx	tr	tr
Hin Kong (Hk_sub[2/])	-	x	xxx	-	-	xx	tr	-
Pak Tho (Pth_top)	-	x	xxx	-	-	xx	tr	-
Pak Tho (Pth_sub)	-	x	xxx	-	-	xx	tr	-
Si Thep (Sri_top)	-	x	xxx	-	-	xx	tr	-
Si Thep (Sri_sub)	-	x	xxxx	-	-	x	tr	-
Klaeng (Kl_top)	tr	tr	xxxx	-	-	x	-	-
Klaeng (Kl_sub)	tr	tr	xxxx	-	-	x	-	-
On (On_top)	-	-	xxxx	-	-	xx	tr	tr
On (On_sub)	-	-	xxxx	-	-	xx	tr	tr
Chiang Rai (Cr1_top)	-	x	xxx	tr	-	x	tr	tr
Chiang Rai (Cr1_sub)	-	xx	xxx	tr	-	x	tr	tr
Chiang Rai (Cr2_top)	-	x	xxx	tr	-	x	tr	tr
Chiang Rai (Cr2_sub)	-	xx	xxx	tr	-	x	tr	tr
Phen (Pn_top)	-	-	xxx	-	-	xxx	-	-
Phen (Pn_sub)	-	-	xxx	-	-	xxx	-	-
Renu (Rn1_top)	-	-	xxx	x	x	xx	tr	-
Renu (Rn1_sub)	-	-	xxx	x	x	tr	tr	-
Renu (Rn2_top)	-	-	xxxx	tr	tr	xx	tr	-
Renu (Rn2_sub)	-	-	xxxx	tr	tr	tr	tr	-
Roi Et (Re_top)	-	-	xxxx	-	-	xx	tr	-
Roi Et (Re_sub)	-	-	xxxx	-	-	xx	tr	-
Bang Nara (Ba_top)	tr	x	xxxx	x	-	x	tr	-
Bang Nara (Ba_sub)	tr	tr	xxxx	x	-	tr	tr	-
Khok Khain (Ko_top)	-	x	xxxx	tr	-	x	tr	tr
Khok Khain (Ko_sub)	-	x	xxxx	tr	-	x	tr	tr
Phatthalung (Ptl_top)	-	x	xxxx	tr	tr	x	tr	-
Phatthalung (Ptl_sub)	-	x	xxx	tr	tr	x	tr	-
Sungai Padi (Pi_top)	-	tr	xxxx	-	-	tr.	-	-
Sungai Padi (Pi_sub)	-	tr	xxxx	tr	tr	tr.	-	-
Visai (Vi_top)	-	x	xxx	-	-	xx	tr	-
Visai (Vi_sub)	-	x	xxxx	-	-	x	-	-
Yan Ta Khao (Yk_top)	-	xx	xxx	tr	-	x	tr	-
Yan Ta Khao (Yk_sub)	-	xx	xx	tr	-	xx	tr	-
Land condition: Uplands								
Bang Khla (Bka_top)	-	-	xxxx	-	-	tr	-	-
Bang Khla (Bka_sub)	-	-	xxxx	-	-	tr	-	-
Don Rai (Dr_top)	tr	tr	xxxx	-	-	x	tr	tr
Don Rai (Dr_sub)	tr	tr	xxxx	-	-	x	tr	tr

Appendix Table 4 (Continued)

Series	Clay minerals			Iron oxide minerals		Other minerals		
	Ver	Ill	Kao	Goe	Hem	Qtz	Ana	Fel
Land condition: Uplands								
Lat Ya (Ly_top)	tr	x	xx	tr	tr	x	tr	tr
Lat Ya (Ly_sub)	tr	x	xx	x	x	x	tr	tr
Tha Yang (Ty_top)	tr	x	xx	tr	-	x	-	tr
Tha Yang (Ty_sub)	-	x	xx	tr	-	xx	tr	tr
Kabib Buri (Kb1_top)	tr	-	xxxx	tr	x	tr	tr	-
Kabib Buri (Kb1_sub)	tr	-	xxxx	tr	xx	tr	tr	-
Kabib Buri (Kb2_top)	tr	-	xxxx	tr	x	tr	tr	-
Kabib Buri (Kb2_sub)	tr	-	xxxx	tr	xx	tr	tr	-
Khlong Chak (Kc_top)	tr	tr	xxx	tr	tr	x	-	-
Khlong Chak (Kc_sub)	tr	-	xxx	x	x	x	-	-
Mab Bon (Mb_top)	tr	-	xxxx	tr	-	x	tr	-
Mab Bon (Mb_sub)	tr	-	xxxx	tr	-	x	tr	-
Ban Chong (Bg_top)	-	x	xx	x	-	x	tr	tr
Ban Chong (Bg_sub)	-	tr	xxx	x	-	x	tr	tr
Ban Chong-high bases (Bg-hb*_top)	-	x	xx	x	-	x	tr	-
Ban Chong-high bases (Bg-hb*_sub)	-	x	xx	x	-	x	tr	tr
Doi Pui (Dp_top)	-	tr	xxxx	tr	x	tr	tr	-
Doi Pui (Dp_sub)	-	tr	xxx	tr	x	tr	tr	-
Hang Chat (Hc_top)	-	-	xxxx	tr	-	x	tr	-
Hang Chat (Hc_sub)	-	-	xxxx	tr	-	x	-	-
Chiang Khan (Ch1_top)	-	x	xxx	tr	tr	x	tr	-
Chiang Khan Ch1_sub	-	x	xxx	tr	tr	tr	tr	-
Chiang Khan (Ch2_top)	-	x	xxx	x	tr	x	tr	-
Chiang Khan(Ch2_sub)	-	x	xxx	x	x	tr	tr	-
Dan Sai (Ds_top)	-	x	xxx	tr	tr	x	-	-
Dan Sai (Ds_sub)	-	x	xxx	tr	tr	x	-	-
Korat (Kt1_top)	-	-	xx	-	-	xxxx	tr	-
Korat (Kt1_sub)	-	-	xxx	-	-	xxx	tr	-
Korat (Kt2_top)	-	-	xx	-	-	xxxx	tr	-
Korat (Kt2_sub)	-	-	xxx	-	-	xxx	tr	-
Korat (Kt3_top)	-	-	xx	-	-	xxxx	tr	-
Korat (Kt3_sub)	-	-	xxx	-	-	xxx	tr	-
Mae Rim (Mr_top)	-	tr	xx	tr	-	xx	tr	-
Mae Rim (Mr_sub)	-	tr	xx	tr	-	xx	tr	-
Mae Taeng (Mt_top)	-	-	xxxx	tr	x	tr	-	-
Mae Taeng (Mt_sub)	-	tr	xxxx	tr	xx	tr	-	-
Nong Mot (Nm_top)	-	-	xxxx	tr	tr	x	tr	-
Nong Mot (Nm_sub)	-	-	xxxx	tr	tr	tr	tr	-
Pak Chong (Pc_top)	-	-	xxx	-	xxx	tr	tr	-
Pak Chong (Pc_sub)	-	-	xxx	-	xxx	tr	tr	-

Appendix Table 4 (Continued)

Series	Clay minerals			Iron oxide minerals		Other minerals		
	Ver	Ill	Kao	Goe	Hem	Qtz	Ana	Fel
Land condition: Uplands								
Phu Sana (Ps_top)	-	tr.	xxxx	tr	x	tr	-	-
Phu Sana (Ps_sub)	-	tr.	xxxx	tr	x	tr	-	-
Sakon (Sk_top)	tr	x	xxx	-	-	xx	tr	tr
Sakon (Sk_sub)	tr	x	xxx	tr	-	x	tr	-
Satuk (Suk1_top)	-	-	xxxx	-	-	xx	tr	-
Satuk (Suk1_sub)	-	-	xxxx	tr	-	tr	-	-
Satuk (Suk2_top)	-	-	xxxx	-	-	xx	-	-
Satuk (Suk2_sub)	-	-	xxxx	tr	-	x	-	-
Satuk (Suk3_top)	-	-	xxx	-	-	xxx	-	-
Satuk (Suk3_sub)	-	-	xxxx	tr.	-	x	-	-
Satuk (Suk4_top)	-	-	xx	-	-	xxxx	-	-
Satuk (Suk4_sub)	-	-	xxxx	tr	-	xx	-	-
Sung Noen (Sn1_top)	tr	-	xxxx	-	-	x	tr	tr
Sung Noen (Sn1_sub)	tr	-	xxxx	-	-	xx	tr	tr
Sung Noen (Sn2_top)	-	xx	xx	-	-	x	tr	tr
Sung Noen (Sn2_sub)	-	xx	xx	-		x	tr	tr
Warin (Wn_top)	-	-	xxxx	tr	x	x	tr	-
Warin (Wn_sub)	-	-	xxxx	tr	x	tr.	tr	-
Yasothon (Yt1_top)	-	-	xxx	tr	x	xx	tr	-
Yasothon (Yt1_sub)	-	-	xxxx	x	x	x	-	-
Yasothon (Yt2_top)	-	-	xxx	tr	xx	x	tr	-
Yasothon (Yt2_sub)	-	-	xxx	tr	xx	tr	-	-
Chalong (Chl_top)	-	-	xxxx	tr	tr	tr	tr	tr
Chalong (Chl_sub)	-	-	xxxx	x	tr	tr	tr	tr
Fang Daeng (Fd_top)	-	tr	xxxx	tr	x	tr	tr	-
Fang Daeng (Fd_sub)	-	-	xxxx	tr	x	tr	tr	-
Hat Yai (Hy_top)	-	x	xxxx	tr	-	x	tr	-
Hat Yai (Hy_sub)	-	tr	xxx	x	x	x	tr	tr
Hoi Pong (Hp_top)	-	-	xxxx	-	-	tr	tr	-
Hoi Pong (Hp_sub)	-	-	xxxx	-	-	tr	tr	-
Khao Khat (Kkt_top)	-	tr	xxxx	tr	-	tr	tr	tr
Khao Khat (Kkt_sub)	-	x	xxx	tr	-	x	tr	tr
Khlong Teng (Klt_top)	-	x	xx	tr	-	x	tr	tr
Khlong Teng (Klt_sub)	-	x	xx	tr	-	xx	-	tr
Khlong Thom (Km_top)	-	-	xx	-	-	xxxx	tr	-
Khlong Thom (Km_sub)	-	-	xxxx	tr	-	xx	tr	-
Khlong Thom (Km_top)	-	-	xx	-	-	xxxx	tr	-
Khlong Thom (Km_sub)	-	-	xxxx	tr	-	xx	tr	-
Kho Hong (Kh1_top)	-	-	xxxx	-	-	x	-	-
Kho Hong (Kh1_sub)	-	-	xxxx	-	-	x	-	-

Appendix Table 4 (Continued)

Series	Clay minerals			Iron oxide minerals		Other minerals		
	Ver	Ill	Kao	Goe	Hem	Qtz	Ana	Fel
Land condition: Uplands								
Kho Hong (Kh2_top)	-	-	xxxx	-	-	x	-	-
Kho Hong (Kh2_sub)	-	x	xxxx	-	-	x	-	-
Klong Nok Krathung (Knk_top)	-	tr	xxx	-	-	xx	-	x
Klong Nok Krathung (Knk_sub)	-	x	xxxx	-	-	tr	-	tr
Krabi (Kbi_top)	tr	x	xx	x	tr	tr	tr	tr
Krabi (Kbi_sub)	tr	x	xx	xx	tr	tr	tr	tr
Na Tawi (Nat_top)	tr	tr	xxx	tr	-	xx	tr	-
Na Tawi (Nat_sub)	tr	tr	xxxx	tr	-	x	tr	-
Na Tham (Ntm_top)	tr	-	xxxx	tr	tr	x	tr	-
Na Tham (Ntm_sub)	tr	-	xxxx	tr	x	tr	tr	-
Nong Khla (Nok_top)	tr	x	xxx	xx	tr	tr	tr	tr
Nong Khla (Nok_sub)	-	x	xxx	xx	tr	tr	tr	tr
Padang Besar (Pad_top)	-	tr	xxxx	tr	tr	x	-	-
Padang Besar Pad_sub	-	-	xxxx	tr	x	tr	-	-
Pak Chan (Pac_top)	-	x	xx	tr	-	xxx	-	tr
Pak Chan Pac_sub	-	x	xxx	tr	-	xx	-	tr
Pathio (Ptu_top)	-	-	xxx	tr	x	x	tr	-
Pathio (Ptu_sub)	-	-	xxx	x	xx	tr	tr	-
Phangnga (Pga_top)	-	tr	xxxx	-	-	tr	-	tr
Phangnga (Pga_sub)	-	tr	xxxx	-	-	tr	-	tr
Phato (Pto_top)	tr	-	xxx	tr	tr	xx	tr	-
Phato (Pto_sub)	tr	tr	xxxx	tr	tr	x	tr	-
Phuket (Pk_top)	-	x	xx	x	x	x	tr	tr
Phuket (Pk_sub)	-	x	xx	x	x	x	tr	tr
Sawi (Sw_top)	tr	-	xxx	-	-	xxx	tr	-
Sawi (Sw_sub)	tr	-	xx	-	-	xxx	tr	-
Tha Sae (Te_top)	tr	tr	xxxx	tr	tr	x	tr	-
Tha Sae (Te_sub)	tr	-	xxxx	tr	tr	x	tr	-
Wang Tong (Wat_top)	-	-	xxxx	tr	tr	x	tr	-
Wang Tong (Wat_sub)	-	-	x	tr	tr	xxxx	-	-
Yala (Ya_top)	tr	tr	xxxx	tr	tr	x	tr	-
Yala (Ya_sub)	tr	tr	xxx	x	x	x	tr	-

1/ Topsoil (0-50 cm)
2/ Subsoils (50-100 cm)
* High bases
Ver= vermivulite; Sme= smectite, Ill= illite; Kao= kaolinite; Goe= goethite; Hem= hematite; Qtz= quartz; Ana= anatase; Fel= felspar.
tr= trace (<5%), x= small (5-20%), xx= moderate (20-60%), xxx= large, xxxx= dominant (>60%)

Appendix Table 5 Some physical properties of Thai Alfisols

Series	Bulk density	Sand	Silt	Clay	Textural class**
	(Mg m^{-3})	(----------g kg^{-1}----------)			
Land condition: Lowlands					
Doem Bang (Db_top[1/])	1.24	521	291	188	L
Doem Bang (Db_sub[2/])	2.48	349	207	444	C
Khao Yoi (Kyo_top)	1.81	564	212	224	CL
Khao Yoi (Kyo_sub)	1.83	395	317	288	SCL
Manorom (Mn_top)	1.86	395	361	244	L
Manorom (Mn_sub)	1.85	186	230	584	C
Nakhon Pathom (Np_top)	1.88	433	299	268	L
Nakhon Pathom (Np_sub)	1.86	352	272	376	CL
Hang Dong (Hd_top)	1.76	288	344	368	CL
Hang Dong (Hd_sub)	1.79	194	314	492	C
Phan (Ph1_top)	1.64	362	422	216	L
Phan (Ph1_sub)	1.87	369	395	236	L
Phan (Ph2_top)	1.72	420	333	248	L
Phan (Ph2_sub)	1.85	250	494	256	L
Phan (Ph3_top)	1.55	460	240	300	SCL
Phan (Ph3_sub)	1.71	280	330	390	CL
Phan (Ph4_top)	1.72	455	233	312	SCL
Phan (Ph4_sub)	2.15	277	323	400	CL
San Sai (Sai_top)	1.65	568	304	128	SL
San Sai (Sai_sub)	2.01	562	298	140	SL
Mae Sai (Ms_top)	1.54	140	412	448	C
Mae Sai (Ms_sub)	1.85	114	274	612	SiL
Lampang (Lp_top)	1.60	319	413	268	CL
Lampang (Lp_sub)	1.74	163	257	580	C
Tha Tum (Tt_top)	1.61	135	445	420	SiC
Tha Tum (Tt_sub)	1.90	169	391	440	SiCL
La-ngu (Lgu_top)	1.79	278	450	272	CL
La-ngu (Lgu_sub)	1.90	240	364	396	C
Land condition: Uplands					
Pran Buri (Pr_top)	1.61	326	486	188	L
Pran Buri (Pr_sub)	1.95	401	387	212	L
Thap khwang (Tw_top)	1.45	287	545	168	SiL
Thap khwang (Tw_sub)	1.50	268	472	260	L
Kamphaeng Sean (Ks_top)	1.57	231	417	352	CL
Kamphaeng Sean (Ks_sub)	1.70	214	434	352	CL
Phetchaburi (Pb_top)	1.80	650	254	96	SL
Phetchaburi (Pb_sub)	1.92	639	185	176	SL

Appendix Table 5 (Continued)

Series	Bulk density	Sand	Silt	Clay	Textural class**
	(Mg m^{-3})	(---------g kg^{-1}---------)			
Land condition: Uplands					
Wichain Buri (Wb_top)	1.79	813	127	60	LS
Wichain Buri (Wb_sub)	1.91	208	624	168	SL
Muak Lek (Ml_top)	1.40	383	349	268	CL
Muak Lek (Ml_sub)	1.44	408	284	308	CL
Kamphaeng Phet (Kp_top)	1.70	668	196	136	L
Kamphaeng Phet (Kp_sub)	1.51	298	434	268	SL
Li (Li_top)	1.49	143	357	500	C
Li (Li_sub)	1.54	110	266	624	C
Phayao (Pao_top)	1.60	528	260	212	SCL
Phayao (Pao_sub)	1.51	406	258	336	CL
Khambong (Kg_top)	1.62	762	174	64	LS
Khambong (Kg_sub_	1.80	712	172	116	SL
Wang Hai (Wi_top)	1.90	791	101	108	SL
Wang Hai (Wi_sub)	1.55	608	172	220	SCL
Loei (Lo1_top)	1.40	444	196	360	CL
Loei (Lo1_sub)	1.55	280	204	516	C
Loei (Lo2_top)	1.45	515	413	72	L
Loei (Lo2_sub)	1.65	431	153	416	C
Wang Saphung (Ws_top)	1.70	195	398	408	C
Wang Saphung (Ws_sub)	1.75	140	284	576	C
Chatturat (Ct_top)	1.54	578	202	220	SCL
Chatturat (Ct_sub)	1.63	425	235	340	CL
Nam Pong (Ng_top)	1.67	853	95	52	SL
Nam Pong (Ng_sub)	1.58	735	137	128	LS
Sikhiu (Si_top)	1.63	155	333	512	C
Sikhiu (Si_sub)	1.57	77	295	628	C
Phak Kat (Pat_top)	1.64	379	357	264	C
Phak Kat (Pat_sub)	1.52	209	383	408	CL

1/ Topsoil (0-50 cm)
2/ Subsoils (50-100 cm)
**Texture: SL = sandy loam, SiL = silt loam, SCL = sandy clay loam, CL = clay loam, L = loam, SC = sandy clay, C = clay

Appendix Table 6 Some physical properties of Thai Ultisols

Series	Bulk density	Sand	Silt	Clay	Textural class**
	(Mg m^{-3})	(----------g kg^{-1}----------)			
Land condition: Lowlands					
Hin Kong (Hk_top[1/])	1.70	278	603	120	SiL
Hin Kong (Hk_sub[2/])	1.84	208	505	288	SiL
Pak Tho (Pth_top)	1.77	426	334	240	L
Pak Tho (Pth_sub)	1.94	300	332	368	CL
Si Thep (Sri_top)	1.88	532	300	168	SL
Si Thep (Sri_sub)	1.90	400	248	352	CL
Klaeng (Kl_top)	n	528	448	24	SL
Klaeng (Kl_sub)	n	538	378	84	SL
On (On_top)	1.64	361	527	112	SiL
On (On_sub)	1.58	309	439	252	L
Chiang Rai (Cr1_top)	1.64	520	312	168	SL
Chiang Rai (Cr1_sub)	1.88	207	525	268	SiL
Chiang Rai (Cr2_top)	1.81	497	263	240	SCL
Chiang Rai (Cr2_sub)	1.86	299	133	568	C
Phen (Pn_top)	1.83	468	392	140	L
Phen (Pn_sub)	1.89	463	341	196	L
Renu (Rn1_top)	1.67	700	220	80	SL
Renu (Rn1_sub)	1.92	620	200	180	SL
Renu (Rn2_top)	1.67	587	266	148	SL
Renu (Rn2_sub)	1.84	439	286	276	L
Roi Et (Re_top)	1.75	826	82	92	LS
Roi Et (Re_sub)	1.71	822	78	100	LS
Bang Nara (Ba_top)	1.71	174	342	484	SiC
Bang Nara (Ba_sub)	1.69	47	429	524	C
Khok Khain (Ko_top)	1.75	652	204	144	SCL
Khok Khain (Ko_sub)	1.86	504	272	224	SL
Phatthalung (Ptl_top)	1.77	211	509	280	CL
Phatthalung (Ptl_sub)	1.74	196	344	460	C
Sungai Padi (Pi_top)	1.68	440	352	208	L
Sungai Padi (Pi_sub)	1.81	337	331	332	CL
Visai (Vi_top)	1.52	556	376	68	SL
Visai (Vi_sub)	1.77	430	358	212	L
Yan Ta Khao (Yk_top)	1.50	608	200	192	SL
Yan Ta Khao (Yk_sub)	1.83	461	219	320	SCL
Land condition: Uplands					
Bang Khla (Bka_top)	1.63	769	111	120	SL
Bang Khla (Bka_sub)	1.06	648	132	220	SCL
Don Rai (Dr_top)	1.68	670	202	128	SL
Don Rai (Dr_sub)	1.59	553	203	244	SCL

Appendix Table 6 (Continued)

Series	Bulk density	Sand	Silt	Clay	Textural class**
	(Mg m^{-3})	(--------g kg^{-1}---------)			
Land condition: Uplands					
Lat Ya (Ly_top)	1.66	688	193	120	SL
Lat Ya (Ly_sub)	1.57	540	252	208	SL
Tha Yang (Ty_top)	1.76	813	119	68	LS
Tha Yang (Ty_sub)	1.89	265	283	452	C
Kabib Buri (Kb1_top)	1.62	253	351	396	CL
Kabib Buri (Kb1_sub)	1.97	195	185	620	C
Kabib Buri (Kb2_top)	1.74	550	222	228	SCL
Kabib Buri (Kb2_sub)	2.12	496	200	304	SCL
Khlong Chak (Kc_top)	1.44	275	317	408	CL
Khlong Chak (Kc_sub)	1.44	184	260	556	C
Mab Bon (Mb_top)	1.56	911	69	20	S
Mab Bon (Mb_sub)	1.53	933	55	12	LS
Ban Chong (Bg_top)	1.52	90	518	392	SiCL
Ban Chong (Bg_sub)	1.48	82	182	736	C
Ban Chong-high bases (Bg-hb*_top)	1.69	207	469	324	CL
Ban Chong-high bases (Bg-hb*_sub)	1.53	158	507	336	SiCL
Doi Pui (Dp_top)	1.36	119	641	240	SiL
Doi Pui (Dp_sub)	1.72	103	457	440	SiC
Hang Chat (Hc_top)	1.52	424	408	168	L
Hang Chat (Hc_sub)	1.85	366	358	276	CL
Chiang Khan (Ch1_top)	1.62	477	223	300	SCL
Chiang Khan Ch1_sub	1.58	360	320	320	SiL
Chiang Khan (Ch2_top)	1.63	483	253	264	SCL
Chiang Khan(Ch2_sub)	2.43	388	156	456	C
Dan Sai (Ds_top)	1.5	529	459	12	SL
Dan Sai (Ds_sub)	1.67	398	378	224	L
Korat (Kt1_top)	1.83	798	82	120	SL
Korat (Kt1_sub)	1.39	788	52	160	SL
Korat (Kt2_top)	1.51	853	107	40	LS
Korat (Kt2_sub)	1.66	754	166	80	LS
Korat (Kt3_top)	1.21	896	64	40	LS
Korat (Kt3_sub)	1.63	792	168	40	LS
Mae Rim (Mr_top)	1.68	753	135	112	SL
Mae Rim (Mr_sub)	1.44	698	182	120	SL
Mae Taeng (Mt_top)	1.45	533	211	256	SCL
Mae Taeng (Mt_sub)	1.65	422	198	380	CL
Nong Mot (Nm_top)	n	695	201	104	SL
Nong Mot (Nm_sub)	n	590	179	224	SCL
Pak Chong (Pc_top)	n	144	404	452	C

Appendix Table 6 (Continued)

Series	Bulk density	Sand	Silt	Clay	Textural class**
	($Mg\ m^{-3}$)	(---------g kg^{-1}---------)			
Land condition: Uplands					
Pak Chong (Pc_sub)	n	53	247	700	C
Phu Sana (Ps_top)	1.64	719	265	16	SL
Phu Sana (Ps_sub)	1.66	686	254	60	SL
Sakon (Sk_top)	1.65	608	332	60	SL
Sakon (Sk_sub)	1.48	498	226	276	SCL
Satuk (Suk1_top)	1.44	850	94	56	LS
Satuk (Suk1_sub)	1.53	648	76	276	SCL
Satuk (Suk2_top)	1.51	765	195	40	SL
Satuk (Suk2_sub)	1.81	637	171	192	LS
Satuk (Suk3_top)	1.45	791	145	64	LS
Satuk (Suk3_sub)	1.82	722	122	156	SL
Satuk (Suk4_top)	1.58	842	102	56	LS
Satuk (Suk4_sub)	1.78	741	111	148	SL
Sung Noen (Sn1_top)	1.70	802	170	28	LS
Sung Noen (Sn1_sub)	1.62	861	107	32	LS
Sung Noen (Sn2_top)	1.57	553	203	244	SCL
Sung Noen (Sn2_sub)	1.65	427	225	348	CL
Warin (Wn_top)	1.42	840	120	40	SL
Warin (Wn_sub)	1.74	670	130	200	SCL
Yasothon (Yt1_top)	1.39	873	87	40	S
Yasothon (Yt1_sub)	1.62	668	80	252	SCL
Yasothon (Yt2_top)	1.61	763	181	56	SL
Yasothon (Yt2_sub)	1.74	652	160	188	LS
Chalong (Chl_top)	1.56	709	143	148	SL
Chalong (Chl_sub)	1.88	610	118	272	SCL
Fang Daeng (Fd_top)	n	680	200	120	SL
Fang Daeng (Fd_sub)	n	534	346	120	SL
Hat Yai (Hy_top)	1.62	565	311	124	SL
Hat Yai (Hy_sub)	1.78	538	222	240	SCL
Hoi Pong (Hp_top)	n	756	164	80	SL
Hoi Pong (Hp_sub)	n	605	316	80	SCL
Khao Khat (Kkt_top)	1.51	562	186	252	SCL
Khao Khat (Kkt_sub)	1.54	517	195	288	SCL
Khlong Teng (Klt_top)	1.95	417	319	264	L
Khlong Teng (Klt_sub)	1.63	138	282	580	C
Khlong Thom (Km_top)	1.42	746	186	68	LS
Khlong Thom (Km_sub)	1.85	670	166	164	SL
Khlong Thom (Km_top)	1.55	818	138	44	LS
Khlong Thom (Km_sub)	1.67	796	116	88	LS
Kho Hong (Kh1_top)	1.64	787	161	52	LS

Appendix Table 6 (Continued)

Series	Bulk density	Sand	Silt	Clay	Textural Class**
	(Mg m^{-3})	(---------g kg^{-1}---------)			
Land condition: Uplands					
Kho Hong (Kh1_sub)	1.74	728	140	132	S
Kho Hong (Kh2_top)	1.63	163	597	240	SiL
Kho Hong (Kh2_sub)	1.91	138	494	368	SiCL
Klong Nok Krathung (Knk_top)	1.55	800	108	92	LS
Klong Nok Krathung (Knk_sub)	1.84	697	135	168	SL
Krabi (Kbi_top)	1.52	245	319	436	C
Krabi (Kbi_sub)	1.62	223	237	540	C
Na Tawi (Nat_top)	1.63	692	160	148	SL
Na Tawi (Nat_sub)	1.79	539	197	264	SCL
Na Tham (Ntm_top)	n	406	215	380	CL
Na Tham (Ntm_sub)	n	298	178	524	C
Nong Khla (Nok_top)	1.75	819	105	76	LS
Nong Khla (Nok_sub)	1.96	642	147	212	SCL
Padang Besar (Pad_top)	1.50	230	522	248	SiL
Padang Besar Pad_sub	1.69	127	457	416	SiC
Pak Chan (Pac_top)	1.57	718	198	84	SL
Pak Chan Pac_sub	1.45	500	152	348	SCL
Pathio (Ptu_top)	1.58	764	144	92	SL
Pathio (Ptu_sub)	1.87	685	151	164	SL
Phangnga (Pga_top)	1.57	728	164	108	SL
Phangnga (Pga_sub)	1.89	665	172	164	SL
Phato (Pto_top)	1.58	869	99	32	S
Phato (Pto_sub)	1.56	802	110	88	LS
Phuket (Pk_top)	1.59	657	192	152	SL
Phuket (Pk_sub)	1.72	335	185	480	C
Sawi (Sw_top)	1.69	484	484	32	SL
Sawi (Sw_sub)	1.85	240	405	356	CL
Tha Sae (Te_top)	1.42	613	255	132	SL
Tha Sae (Te_sub)	1.60	590	226	184	SL
Wang Tong (Wat_top)	1.73	384	400	216	L
Wang Tong (Wat_sub)	1.72	420	348	232	L
Yala (Ya_top)	1.57	681	183	136	SL
Yala (Ya_sub)	1.61	607	185	208	SCL

1/ Topsoil (0-50 cm)
2/ Subsoils (50-100 cm)
* High bases
**Texture: SL = sandy loam, SiL = silt loam, SCL = sandy clay loam, CL = clay loam, L = loam, SC = sandy clay, C = clay

Appendix Table 7 Chemical properties of Thai Alfisols

Series	pH (1:1)		OM	Total N	Avai. P	Avai. K	Extractable bases				CEC	EA
	H_2O	KCl					Ca	Mg	Na	K	Ag $(TU)^+$ pH4.7	
			(----g kg^{-1}------)		(-----mg kg^{-1}-----)		(----------cmol kg^{-1}----------)					
Land condition: Lowlands												
Doem Bang (Db_top[1/])	7.2	5.4	7.33	0.03	4.43	70.80	7.73	1.33	0.42	0.18	6.82	1.74
Doem Bang (Db_sub[2/])	8.0	5.5	2.87	0.03	0.36	56.19	6.07	5.20	2.65	0.17	9.05	4.22
Khao Yoi (Kyo_top)	6.1	4.6	6.67	0.01	2.64	74.30	7.41	1.79	1.64	0.08	8.59	5.99
Khao Yoi (Kyo_sub)	6.6	5.6	2.53	0.04	7.93	75.10	7.49	1.70	1.98	0.07	8.51	2.24
Manorom (Mn_top)	6.0	4.5	14.39	0.03	3.24	47.74	5.05	1.12	0.39	0.62	5.96	4.96
Manorom (Mn_sub)	5.3	3.4	4.03	0.03	1.06	12.75	1.27	0.36	0.55	0.23	7.80	14.45
Nakhon Pathom (Np_top)	7.8	6.6	16.37	0.05	49.33	123.48	14.19	2.42	0.33	0.33	8.87	2.74
Nakhon Pathom (Np_sub)	7.4	5.5	7.06	0.04	8.81	74.36	8.02	2.93	0.46	0.27	8.73	5.23
Hang Dong (Hd_top)	7.9	6.5	14.04	0.81	1.14	76.30	22.82	0.44	0.32	0.09	9.52	3.49
Hang Dong (Hd_sub)	6.8	4.4	4.39	0.40	0.35	62.57	12.48	0.39	0.51	0.11	9.57	8.37
Phan (Ph1_top)	4.8	3.5	16.01	0.10	1.77	65.24	6.50	0.44	0.25	0.24	6.46	6.48
Phan (Ph1_sub)	5.8	4.2	6.73	0.52	0.70	67.68	6.75	0.20	0.30	0.07	6.30	3.00
Phan (Ph2_top)	5.3	3.3	13.76	0.04	3.55	22.10	2.20	0.29	0.26	0.14	3.40	4.94
Phan (Ph2_sub)	5.5	3.4	2.37	0.27	1.14	8.80	0.87	0.28	0.29	0.05	2.28	2.98
Phan (Ph3_top)	4.8	4.0	9.57	0.04	3.71	37.80	3.77	1.09	0.33	0.14	5.60	5.50
Phan (Ph3_sub)	6.1	4.4	3.27	0.06	0.53	55.68	5.55	3.19	2.39	0.18	9.19	7.94
Phan (Ph4_top)	6.7	5.6	10.16	0.03	6.32	73.35	7.89	1.12	0.52	0.13	6.88	3.24
Phan (Ph4_sub)	8.5	6.3	2.67	0.03	0.53	105.50	12.10	0.88	0.38	0.14	9.10	12.90
San Sai (Sai_top)	6.5	5.3	7.17	0.04	1.60	27.94	2.78	0.46	0.30	0.09	2.64	0.50
San Sai (Sai_sub)	7.2	5.1	1.85	0.03	0.53	20.89	2.08	0.40	0.24	0.08	1.83	0.25

Appendix Table 7 (Continued)

Series	pH (1:1)		OM	Total N	Avai. P	Avai. K	Extractable bases				CEC	EA
	H_2O	KCl					Ca	Mg	Na	K	Ag $(TU)^+$ pH 4.7	
			(------g kg^{-1}------)		(-----mg kg^{-1}-----)		(----------cmol kg^{-1}----------)					
Land condition: Lowlands												
Mae Sai (Ms_top)	5.7	3.7	24.67	1.15	2.72	72.39	7.22	2.07	0.45	0.27	8.63	13.97
Mae Sai (Ms_sub)	5.8	4.0	9.41	0.27	1.49	82.87	8.26	3.00	0.45	0.13	9.50	12.81
Lampang (Lp_top)	5.4	3.6	8.56	0.04	1.49	20.54	2.04	0.56	0.43	0.14	3.49	5.74
Lampang (Lp_sub)	4.9	2.7	2.49	0.04	1.23	4.78	0.47	0.53	0.81	0.29	7.93	15.71
Tha Tum (Tt_top)	5.0	3.2	11.24	0.76	0.89	65.00	6.48	1.04	0.45	0.94	8.82	12.90
Tha Tum (Tt_sub)	5.5	3.5	3.34	0.44	0.27	90.92	9.07	1.22	0.51	0.31	9.37	8.48
La-ngu (Lgu_top)	5.6	3.9	13.93	0.04	2.47	44.86	4.47	0.62	0.40	0.10	5.41	4.99
La-ngu (Lgu_sub)	5.8	4.7	4.35	0.03	0.18	61.31	6.11	0.78	0.38	0.11	6.40	3.72
Land condition: Uplands												
Pran Buri (Pr_top)	7.2	6.1	11.81	0.02	37.00	31.56	3.14	1.57	0.42	0.28	7.19	1.49
Pran Buri (Pr_sub)	7.1	6.1	3.36	0.02	11.86	55.33	5.52	1.97	0.41	0.34	6.65	0.50
Thap khwang (Tw_top)	8.3	7.1	13.42	0.03	8.84	63.48	12.66	0.43	0.19	0.09	5.16	1.24
Thap khwang (Tw_sub)	6.9	5.5	5.84	0.02	2.20	27.51	2.74	0.41	0.14	0.04	3.36	2.99
Kamphaeng Sean (Ks_top)	7.7	5.8	19.98	0.04	14.98	108.29	12.18	2.63	0.44	0.66	8.96	4.00
Kamphaeng Sean (Ks_sub)	6.7	5.0	8.09	0.03	14.98	80.30	8.97	2.34	0.40	0.34	8.86	5.48
Phetchaburi (Pb_top)	5.9	5.0	6.84	0.03	1.68	25.87	2.58	1.07	0.36	0.11	3.20	1.24
Phetchaburi (Pb_sub)	6.1	5.2	2.88	0.03	1.05	27.81	2.77	1.22	0.18	0.18	3.79	1.99
Wichain Buri (Wb_top)	5.6	4.6	4.50	0.04	17.56	14.90	1.48	0.49	0.56	0.02	1.77	0.75
Wichain Buri (Wb_sub)	8.3	7.0	1.52	0.01	0.79	3.11	0.30	0.34	2.58	0.02	2.31	0.50

Appendix Table 7 (Continued)

Series	pH (1:1)		OM	Total N	Avai. P	Avai. K	Extractable bases				CEC	EA
	H_2O	KCl					Ca	Mg	Na	K	Ag $(TU)^+$ pH 4.7	
			(------g kg^{-1}------)		(-----mg kg^{-1}-----		(----------cmol kg^{-1}----------)					
Land condition: Uplands												
Muak Lek (Ml_top)	6.2	5.2	39.68	0.04	36.24	170.21	5.66	2.80	0.18	1.11	7.62	9.75
Muak Lek (Ml_sub)	6.3	4.6	12.66	0.04	2.63	77.93	3.88	2.47	0.31	0.84	6.54	5.74
Kamphaeng Phet (Kp_top)	5.7	4.3	19.02	0.04	8.10	89.67	8.94	2.20	0.36	0.25	8.70	9.00
Kamphaeng Phet (Kp_sub)	5.9	4.1	5.65	0.03	6.74	48.77	4.86	1.38	0.26	0.20	5.71	4.00
Li (Li_top)	4.6	3.8	43.47	2.02	2.93	64.20	7.12	0.76	0.29	0.26	7.65	19.80
Li (Li_sub)	6.4	5.6	17.97	0.91	1.15	49.91	9.95	0.29	0.27	0.09	7.45	9.95
Phayao (Pao_top)	4.9	3.1	4.72	0.27	0.89	0.60	0.05	0.62	0.30	0.08	4.41	5.96
Phayao (Pao_sub)	5.1	3.0	2.72	0.02	0.71	3.91	0.38	1.61	0.28	0.15	6.69	10.90
Khambong (Kg_top)	6.0	4.6	8.40	0.05	3.79	15.75	1.57	0.36	0.17	0.14	2.19	1.00
Khambong (Kg_sub)	4.1	3.7	3.54	0.26	1.77	16.90	1.68	0.31	0.30	0.07	2.49	0.99
Wang Hai (Wi_top)	5.5	4.4	9.89	0.04	4.23	21.87	2.18	0.39	0.21	0.13	2.92	2.49
Wang Hai (Wi_sub)	5.4	4.3	5.34	0.04	3.85	43.11	4.30	0.46	0.36	0.09	4.48	3.23
Loei (Lo1_top)	5.3	4.4	18.49	0.72	1.94	24.56	2.44	1.00	0.20	0.18	4.37	8.91
Loei (Lo1_sub)	5.0	4.2	13.68	0.03	0.44	14.42	1.43	1.10	0.26	0.06	4.39	9.41
Loei (Lo2_top)	6.9	5.5	20.71	0.79	3.06	45.42	4.88	1.21	0.24	0.69	5.62	4.99
Loei (Lo2_sub)	6.4	5.3	9.78	0.05	0.70	28.12	3.04	0.97	0.27	0.35	4.14	5.49
Wang Saphung (Ws_top)	7.0	4.7	29.05	1.41	2.74	91.20	9.10	2.92	0.33	0.55	8.8	9.45
Wang Saphung (Ws_sub)	5.4	4.0	12.35	1.20	1.23	77.39	7.72	2.56	0.39	0.2	8.83	10.95

Appendix Table 7 (Continued)

Series	pH (1:1)		OM	Total N	Avai. P	Avai. K	Extractable bases				CEC	EA
	H_2O	KCl					Ca	Mg	Na	K	Ag $(TU)^+$ pH 4.7	
			(------g kg^{-1}------)		(----mg kg^{-1}----)		(----------cmol kg^{-1}----------)					
Land condition: Uplands												
Chatturat (Ct_top)	7.8	6.3	16.31	0.04	5.48	86.88	9.63	1.17	0.18	0.56	8.00	2.48
Chatturat (Ct_sub)	7.4	5.8	10.15	0.03	1.15	95.80	11.01	1.83	0.25	0.22	8.85	5.24
Nam Pong (Ng_top)	5.6	5.0	2.71	0.12	6.67	2.47	0.24	0.07	0.01	0.08	0.57	0.50
Nam Pong (Ng_sub)	5.0	4.0	0.64	0.11	0.97	1.58	0.15	0.06	0.19	0.14	0.47	0.49
Sikhiu (Si_top)	7.3	6.1	21.65	0.05	34.02	142.34	12.68	3.04	0.32	1.42	8.37	6.21
Sikhiu (Si_sub)	6.5	6.0	7.38	0.03	0.53	185.21	9.81	1.15	0.37	1.29	8.71	8.99
Phak Kat (Pat_top)	4.6	3.4	11.58	0.04	1.32	39.93	3.98	0.21	0.54	0.08	7.03	12.94
Phak Kat (Pat_sub)	4.8	3.4	14.03	0.04	2.11	19.26	1.92	0.40	0.29	0.06	5.07	10.24

[1/] Topsoil (0-50 cm)
[2/] Subsoils (50-100 cm)

Appendix Table 8 Chemical properties of Thai Ultisols

Series	pH (1:1)		OM	Total N	Avai. P	Avai. K	Extractable bases				CEC	EA
	H_2O	KCl					Ca	Mg	Na	K	Ag $(TU)^+$ pH 4.7	
			(-----g kg^{-1}-----)		(------mg kg^{-1}-----)		(----------cmol kg^{-1}----------)					
Land condition: Uplands												
Hin Kong (Hk_top[1/])	6.0	5.0	7.79	0.02	10.19	29.07	2.89	0.32	0.38	0.09	2.58	3.98
Hin Kong (Hk_sub[2/])	7.1	5.1	6.34	0.01	0.35	35.14	3.50	0.30	2.85	0.07	5.09	1.99
Pak Tho (Pth_top)	5.9	5.2	9.80	0.04	4.46	36.91	3.96	0.62	0.26	0.11	4.23	2.49
Pak Tho (Pth_sub)	5.3	3.8	1.86	0.03	0.79	7.93	0.79	0.14	0.36	0.18	5.49	9.24
Si Thep (Sri_top)	6.2	4.9	11.28	0.02	3.78	49.31	4.92	0.81	0.35	0.02	5.07	2.74
Si Thep (Sri_sub)	6.5	5.1	4.52	0.02	1.15	82.46	8.22	1.32	0.84	0.29	8.21	4.00
Klaeng (Kl_top)	5.1	4.1	8.10	0.34	10.64	5.99	0.59	0.02	0.16	0.03	0.67	4.94
Klaeng (Kl_sub)	5.6	3.9	2.20	0.22	0.62	8.46	0.84	0.05	0.16	0.01	1.39	4.49
On (On_top)	5.5	4.6	8.02	0.04	1.94	25.13	2.50	0.21	0.30	0.05	2.26	2.25
On (On_sub)	5.6	4.3	4.68	0.03	7.02	29.87	2.97	0.75	0.26	0.07	4.16	4.24
Chiang Rai (Cr1_top)	5.3	3.7	7.06	0.02	1.23	26.10	2.60	1.00	0.43	0.09	4.36	3.50
Chiang Rai (Cr1_sub)	7.5	6.2	2.04	0.04	0.18	54.82	5.46	2.34	0.55	0.25	7.90	3.74
Chiang Rai (Cr2_top)	6.8	5.2	10.22	0.03	7.35	57.97	6.29	1.33	0.45	0.15	5.93	3.25
Chiang Rai (Cr2_sub)	5.0	3.7	3.68	0.03	1.59	47.86	5.01	0.90	0.54	0.19	8.68	12.95
Phen (Pn_top)	5.1	4.2	6.38	0.04	3.71	17.80	1.77	0.43	0.40	0.06	3.16	3.23
Phen (Pn_sub)	5.6	3.3	1.09	0.02	0.18	1.63	0.16	0.06	0.55	0.07	3.92	5.96
Renu (Rn1_top)	4.6	3.5	6.73	0.05	7.05	5.56	0.55	0.14	0.36	0.05	1.13	1.75
Renu (Rn1_sub)	6.6	5.4	1.61	0.02	0.18	8.47	0.84	0.08	0.01	0.14	3.23	1.49
Renu (Rn2_top)	5.6	3.8	4.19	0.03	0.96	8.21	0.81	0.34	0.27	0.05	1.43	2.24

Appendix Table 8 (Continued)

Series	pH (1:1)		OM	Total N	Avai. P	Avai. K	Extractable bases				CEC	EA
	H_2O	KCl					Ca	Mg	Na	K	Ag $(TU)^+$ pH 4.7	
			(-----g kg^{-1}-----)		(-----mg kg^{-1}------)		(----------cmol kg^{-1}----------)					
Land condition: lowlands												
Renu (Rn2_sub)	6.0	3.3	2.69	0.03	0.35	1.35	0.13	0.33	2.88	0.24	5.28	6.72
Roi Et (Re_top)	5.7	4.8	2.70	0.20	8.19	7.32	0.72	0.22	0.16	0.04	1.71	1.24
Roi Et (Re_sub)	5.7	5.3	1.69	0.18	0.98	10.62	1.05	0.19	0.19	0.02	1.69	0.75
Bang Nara (Ba_top)	5.5	4.8	14.71	0.04	2.66	57.78	5.76	0.71	0.46	0.11	5.46	6.98
Bang Nara (Ba_sub)	5.1	5.1	4.05	0.04	0.35	49.71	4.95	0.98	0.38	0.49	6.80	8.67
Khok Khain (Ko_top)	4.9	3.8	8.15	0.05	3.77	18.20	1.81	0.50	0.41	0.10	3.87	5.22
Khok Khain (Ko_sub)	5.1	3.9	4.39	0.04	0.97	12.90	1.28	0.21	0.20	0.04	2.32	2.00
Phatthalung (Ptl_top)	4.8	3.6	12.27	0.04	1.94	19.74	1.96	0.53	0.37	0.37	4.10	7.49
Phatthalung (Ptl_sub)	5.0	3.6	2.03	0.04	0.27	12.71	1.26	0.44	0.35	0.38	7.52	14.18
Sungai Padi (Pi_top)	5.1	3.5	7.90	0.03	1.15	12.10	1.20	0.37	0.30	0.09	2.25	2.98
Sungai Padi (Pi_sub)	4.7	4.2	2.89	0.02	0.35	5.85	0.58	0.54	0.63	0.18	4.27	6.24
Visai (Vi_top)	4.5	3.6	14.55	0.03	3.35	1.04	0.10	0.04	0.20	0.02	1.59	4.49
Visai (Vi_sub)	4.4	3.4	1.86	0.03	0.35	0.41	0.03	0.04	0.31	0.01	2.46	4.49
Yan Ta Khao (Yk_top)	5.2	4.7	14.27	0.03	1.58	25.53	2.54	0.74	0.31	0.12	5.68	8.22
Yan Ta Khao (Yk_sub)	4.8	3.6	9.26	0.03	0.53	46.26	4.61	1.57	0.39	0.20	7.82	9.96
Land condition: Uplands												
Bang Khla (Bka_top)	4.9	4.1	7.69	0.02	25.55	9.59	0.95	0.31	0.22	0.09	1.04	2.00
Bang Khla (Bka_sub)	4.8	3.5	4.19	0.03	4.70	10.31	1.02	0.20	0.23	0.03	1.32	1.25
Don Rai (Dr_top)	4.5	3.5	7.68	0.02	2.47	5.42	0.53	0.16	0.17	0.05	1.26	2.24

Appendix Table 8 (Continued)

Series	pH (1:1)		OM	Total N	Avai. P	Avai. K	Extractable bases				CEC	EA
	H_2O	KCl					Ca	Mg	Na	K	Ag $(TU)^+$ pH 4.7	
			(-----g kg^{-1}-----)		(-----mg kg^{-1}------)		(----------cmol kg^{-1}----------)					
Land condition: Uplands												
Don Rai (Dr_sub)	4.8	3.2	4.18	0.03	11.41	3.79	0.37	0.13	0.18	0.03	2.29	4.23
Lat Ya (Ly_top)	5.7	5.3	10.45	0.03	3.00	33.01	3.63	1.06	0.13	0.60	4.48	2.00
Lat Ya (Ly_sub)	7.6	7.2	9.15	0.04	3.72	78.09	8.59	2.29	0.24	0.66	6.86	0.50
Tha Yang (Ty_top)	5.2	4.0	9.75	0.02	0.88	6.87	0.68	1.20	0.21	0.15	2.34	4.73
Tha Yang (Ty_sub)	5.7	3.9	2.03	0.02	0.09	0.94	0.09	5.51	0.56	0.33	6.13	5.23
Kabib Buri (Kb1_top)	5.4	4.0	35.89	0.03	3.52	14.61	1.45	0.06	0.25	0.12	3.44	13.73
Kabib Buri (Kb1_sub)	5.2	3.9	10.38	0.03	0.97	10.70	1.06	0.41	0.27	0.06	3.58	9.22
Kabib Buri (Kb2_top)	4.7	3.8	13.63	0.03	4.54	17.52	1.74	0.43	0.19	0.07	2.58	5.74
Kabib Buri (Kb2_sub)	4.3	3.6	7.33	0.03	1.06	6.98	0.69	0.21	0.21	0.04	3.66	7.48
Khlong Chak (Kc_top)	5.5	4.1	21.88	0.03	0.53	13.12	1.30	0.49	0.34	0.06	3.99	11.49
Khlong Chak (Kc_sub)	5.2	3.7	11.02	0.03	0.98	6.79	0.67	0.32	0.59	0.05	4.63	12.50
Mab Bon (Mb_top)	6.0	5.4	5.05	0.04	114.52	9.78	0.97	0.09	0.10	0.04	1.28	0.50
Mab Bon (Mb_sub)	6.9	6.2	0.46	0.04	6.36	0.23	0.02	0.02	0.10	0.01	0.64	1.00
Ban Chong (Bg_top)	5.2	4.1	10.47	1.08	0.18	28.20	2.93	1.61	0.23	0.07	5.97	12.32
Ban Chong (Bg_sub)	5.2	4.3	7.76	0.98	0.18	29.34	3.11	1.66	0.31	0.07	6.37	15.50
Ban Chong-high bases (Bg-hb*_top)	4.9	3.8	8.43	0.86	0.53	8.27	0.82	1.16	0.23	0.14	4.51	8.91
Ban Chong-high bases (Bg-hb*_sub)	5.0	3.8	5.66	0.11	0.18	7.05	0.70	1.34	0.39	0.22	5.37	10.47
Doi Pui (Dp_top)	5.5	4.6	14.79	0.88	0.44	10.59	1.05	2.55	0.24	0.26	5.53	10.92
Doi Pui (Dp_sub)	5.5	5.3	5.06	0.43	0.09	7.28	0.72	1.55	0.24	0.53	5.97	8.93

Appendix Table 8 (Continued)

Series	pH (1:1)		OM	Total N	Avai. P	Avai. K	Extractable bases				CEC	EA
	H_2O	KCl					Ca	Mg	Na	K	Ag $(TU)^+$ pH 4.7	
			(------g kg^{-1}-----)		(-----mg kg^{-1}-----)		(----------cmol kg^{-1}----------)					
Land condition: Uplands												
Hang Chat (Hc_top)	5.9	4.2	16.37	0.76	2.20	32.75	3.26	0.58	0.26	0.14	3.94	4.49
Hang Chat (Hc_sub)	6.4	4.4	5.04	0.33	0.53	41.74	4.16	0.94	0.29	0.25	4.88	3.00
Chiang Khan (Ch1_top)	4.9	3.3	13.42	0.66	1.49	20.97	1.76	0.31	0.24	0.19	4.76	10.40
Chiang Khan Ch1_sub	4.4	3.2	6.37	0.52	0.35	27.50	1.05	0.50	0.23	0.56	5.58	12.32
Chiang Khan (Ch2_top)	5.5	4.1	8.65	0.03	3.05	5.43	2.09	1.07	0.25	0.25	4.21	6.99
Chiang Khan(Ch2_sub)	5.3	4.4	4.31	0.03	4.46	2.03	2.88	2.74	0.29	0.23	6.71	8.44
Dan Sai (Ds_top)	6.3	5.3	12.47	0.70	4.42	21.14	2.10	0.95	0.12	0.42	3.14	1.98
Dan Sai (Ds_sub)	5.2	4.5	8.02	0.06	0.88	19.50	1.94	1.17	0.18	0.51	3.87	3.48
Korat (Kt1_top)	6.0	4.5	4.39	0.05	3.00	6.96	0.69	0.12	0.20	0.03	1.21	0.25
Korat (Kt1_sub)	6.0	4.7	1.69	0.04	1.33	3.10	0.30	0.12	0.20	0.01	0.91	0.25
Korat (Kt2_top)	5.7	5.1	4.05	0.23	63.85	6.88	0.68	0.11	0.14	0.03	1.18	0.25
Korat (Kt2_sub)	6.6	5.3	1.62	0.04	13.30	5.23	0.52	0.13	0.05	0.01	1.00	0.25
Korat (Kt3_top)	6.6	5.8	4.04	0.23	0.97	10.42	1.03	0.18	0.13	0.06	1.34	0.50
Korat (Kt3_sub)	5.2	4.1	2.02	0.02	0.80	7.14	0.71	0.36	0.19	0.06	2.81	1.99
Mae Rim (Mr_top)	5.9	4.6	9.30	0.03	3.08	10.49	1.04	0.33	0.14	0.17	1.57	1.49
Mae Rim (Mr_sub)	6.2	5.4	19.26	0.03	5.64	21.41	2.13	0.84	0.16	0.42	2.56	1.75
Mae Taeng (Mt_top)	4.7	3.5	15.25	0.04	5.48	8.76	0.87	0.19	0.20	0.48	3.22	7.98
Mae Taeng (Mt_sub)	4.5	3.7	8.45	0.03	1.50	19.83	1.97	0.29	0.26	0.22	3.68	8.22
Nong Mot (Nm_top)	4.7	4.1	7.74	0.04	3.80	4.99	0.49	0.18	0.18	0.07	1.35	3.48
Nong Mot (Nm_sub)	4.5	3.8	3.01	0.03	0.79	8.34	0.83	0.14	0.22	0.14	1.79	2.98

Appendix Table 8 (Continued)

Series	pH (1:1)		OM	Total N	Avai. P	Avai. K	Extractable bases				CEC	EA
	H_2O	KCl					Ca	Mg	Na	K	Ag $(TU)^+$ pH 4.7	
			(-----g kg^{-1}-----)		(------mg kg^{-1}-----)		(----------cmol kg^{-1}----------)					
Land condition: Uplands												
Pak Chong (Pc_top)	7.8	6.4	28.98	0.05	58.53	130.75	15.73	1.67	0.26	0.47	7.97	5.24
Pak Chong (Pc_sub)	6.1	5.2	2.73	0.08	3.57	32.99	3.29	0.63	0.27	0.07	6.65	12.15
Phu Sana (Ps_top)	6.5	4.9	9.68	0.35	1.77	14.23	1.41	0.69	0.19	0.08	1.88	1.49
Phu Sana (Ps_sub)	6.2	4.5	6.04	0.20	0.61	3.59	0.35	1.19	0.22	0.15	4.74	1.50
Sakon (Sk_top)	6.9	5.4	14.07	0.53	2.66	28.37	2.82	0.36	0.25	0.28	2.54	0.50
Sakon (Sk_sub)	5.5	3.4	2.70	0.28	0.35	4.77	0.47	0.61	0.28	0.19	5.05	8.48
Satuk (Suk1_top)	5.9	4.8	3.02	0.16	2.64	2.38	0.23	0.11	0.10	0.11	1.28	1.00
Satuk (Suk1_sub)	4.7	4.3	3.05	0.15	0.89	2.06	0.20	1.16	0.21	0.20	3.18	4.25
Satuk (Suk2_top)	6.0	5.0	3.36	0.04	3.81	4.31	0.42	0.15	0.24	0.06	1.18	0.50
Satuk (Suk2_sub)	5.1	3.6	1.76	0.09	5.46	6.16	0.61	1.01	0.12	0.08	3.18	1.99
Satuk (Suk3_top)	6.4	5.2	5.74	0.24	12.08	11.11	1.10	0.21	0.14	0.05	1.57	0.50
Satuk (Suk3_sub)	5.5	4.5	1.94	0.13	14.98	10.58	1.05	0.51	0.22	0.08	2.10	1.25
Satuk (Suk4_top)	5.3	4.4	4.36	0.06	16.74	4.94	0.49	0.11	0.23	0.07	0.76	1.00
Satuk (Suk4_sub)	5.2	3.8	1.35	0.10	14.77	9.04	0.90	0.20	0.18	0.13	1.92	1.74
Sung Noen (Sn1_top)	5.8	4.2	2.71	0.03	2.20	2.32	0.23	0.10	0.31	0.04	0.64	0.75
Sung Noen (Sn1_sub)	7.0	4.8	0.51	0.05	0.53	1.37	0.13	0.01	0.15	0.01	0.43	0.25
Sung Noen (Sn2_top)	7.8	6.8	20.21	0.03	13.26	190.70	14.19	1.32	0.33	0.87	7.76	1.49
Sung Noen (Sn2_sub)	8.1	6.8	8.00	0.03	0.97	295.07	9.24	1.71	0.23	0.80	7.98	1.99
Warin (Wn_top)	5.3	4.5	4.68	0.23	7.93	3.14	0.31	0.17	0.22	0.06	0.44	0.50
Warin (Wn_sub)	5.1	4.0	2.04	0.17	1.15	8.61	0.85	0.28	0.16	0.08	1.98	1.49

Appendix Table 8 (Continued)

Series	pH (1:1)		OM	Total N	Avai. P	Avai. K	Extractable bases				CEC	EA
	H_2O	KCl					Ca	Mg	Na	K	Ag $(TU)^+$ pH 4.7	
			(-----g kg^{-1}-----)		(-----mg kg^{-1}-----)		(----------cmol kg^{-1}----------)					
Land condition: Uplands												
Yasothon (Yt1_top)	5.1	4.2	3.36	0.27	0.89	1.71	0.16	0.09	0.15	0.05	0.71	0.50
Yasothon (Yt1_sub)	5.1	3.8	1.11	0.18	0.44	0.76	0.07	0.50	0.18	0.03	2.59	2.73
Yasothon (Yt2_top)	6.0	4.8	6.02	0.05	2.48	8.57	0.85	0.20	0.12	0.03	1.44	1.00
Yasothon (Yt2_sub)	5.5	3.8	4.38	0.16	0.62	4.42	0.43	0.43	0.11	0.01	1.74	1.99
Chalong (Chl_top)	4.6	3.5	14.57	0.03	19.32	17.71	0.54	0.23	0.16	0.04	1.74	5.48
Chalong (Chl_sub)	4.3	3.2	4.75	0.05	0.61	10.57	0.20	0.11	0.20	0.01	1.47	5.24
Fang Daeng (Fd_top)	5.9	4.9	14.37	0.73	8.93	11.83	1.17	0.29	0.16	0.12	1.55	3.97
Fang Daeng (Fd_sub)	5.1	4.0	4.36	0.30	0.98	0.29	0.02	0.08	0.17	0.04	1.17	2.48
Hat Yai (Hy_top)	4.4	3.8	10.39	0.04	1.41	1.97	0.19	0.12	0.20	0.09	1.20	4.49
Hat Yai (Hy_sub)	4.8	3.7	4.70	0.05	0.18	0.70	0.06	0.28	0.21	0.15	2.36	4.99
Hoi Pong (Hp_top)	4.1	3.8	6.39	0.08	2.95	6.31	0.62	0.11	0.17	0.05	1.09	3.50
Hoi Pong (Hp_sub)	4.5	3.8	3.88	0.04	1.77	8.94	0.89	0.12	0.14	0.04	1.50	2.49
Khao Khat (Kkt_top)	4.3	3.6	19.99	0.04	1.05	73.18	7.30	1.52	0.29	0.11	6.37	6.97
Khao Khat (Kkt_sub)	4.6	4.0	15.91	0.03	0.79	29.14	2.90	0.67	0.33	0.09	3.63	7.47
Khlong Teng (Klt_top)	4.8	3.3	24.07	0.04	1.06	2.72	0.27	0.26	0.34	0.16	3.29	9.71
Khlong Teng (Klt_sub)	4.9	3.5	9.67	0.03	0.09	1.00	0.09	0.77	0.60	0.14	6.65	12.73
Khlong Thom (Km_top)	4.6	3.7	13.94	0.03	7.64	1.62	0.57	0.32	0.24	0.31	1.27	4.23
Khlong Thom (Km_sub)	4.8	3.6	2.02	0.03	0.53	1.17	0.17	0.07	0.25	0.12	2.50	5.22
Khlong Thom (Km_top)	5.4	4.4	1.69	0.06	6.74	5.82	0.15	0.06	0.23	0.01	0.55	0.25
Khlong Thom (Km_sub)	5.0	3.9	1.64	0.04	0.35	1.76	0.11	0.02	0.17	0.02	1.37	1.49

Appendix Table 8 (Continued)

Series	pH (1:1)		OM	Total N	Avai. P	Avai. K	Extractable bases				CEC	EA
	H_2O	KCl					Ca	Mg	Na	K	Ag $(TU)^+$ pH 4.7	
			(-----g kg^{-1}-----)		(-----mg kg^{-1}-----)		(----------cmol kg^{-1}----------)					
Land condition: Uplands												
Kho Hong (Kh1_top)	4.2	4.3	2.53	0.05	0.97	5.44	0.54	0.10	0.11	0.06	1.18	0.50
Kho Hong (Kh1_sub)	3.7	3.8	1.65	0.03	1.15	6.01	0.59	0.08	0.15	0.05	1.42	1.00
Kho Hong (Kh2_top)	4.2	3.8	7.24	0.03	0.80	1.87	0.18	0.10	0.17	0.14	1.36	3.23
Kho Hong (Kh2_sub)	4.6	3.6	3.21	0.04	0.88	0.94	0.09	0.06	0.20	0.17	1.43	3.47
Klong Nok Krathung (Knk_top)	4.7	4.0	11.22	0.02	2.58	0.73	0.07	0.04	0.16	0.06	1.01	3.99
Klong Nok Krathung (Knk_sub)	5.0	3.9	5.00	0.02	0.71	0.81	0.07	0.04	0.17	0.06	2.00	4.23
Krabi (Kbi_top)	4.7	3.8	23.73	0.04	0.71	15.34	1.52	0.17	0.24	0.11	4.51	12.72
Krabi (Kbi_sub)	5.0	4.0	10.72	0.01	0.35	0.23	0.02	0.22	0.32	0.05	4.73	12.45
Na Tawi (Nat_top)	4.0	3.9	13.11	0.02	9.72	0.96	0.09	0.06	0.24	0.05	1.41	5.49
Na Tawi (Nat_sub)	4.3	3.2	3.36	0.04	5.09	0.37	0.03	0.03	0.28	0.02	1.56	3.50
Na Tham (Ntm_top)	3.8	3.3	11.86	0.03	1.23	0.82	0.08	0.06	0.32	0.02	1.75	5.98
Na Tham (Ntm_sub)	4.8	3.3	5.32	0.03	0.18	0.67	0.06	0.06	0.55	0.02	3.46	6.98
Nong Khla (Nok_top)	5.4	3.4	14.74	0.05	0.27	55.11	5.49	2.33	0.55	0.12	7.97	9.49
Nong Khla (Nok_sub)	5.0	3.3	8.03	0.04	0.26	36.06	3.59	0.33	0.31	0.18	5.32	14.43
Padang Besar (Pad_top)	5.1	4.8	9.67	0.04	2.92	1.64	0.16	0.07	0.17	0.03	0.57	2.00
Padang Besar Pad_sub	5.0	3.8	3.93	0.03	0.18	1.58	0.15	0.04	0.17	0.01	1.15	3.25
Pak Chan (Pac_top)	4.8	3.5	13.57	0.04	1.33	3.78	0.37	0.34	0.34	0.11	5.13	10.24
Pak Chan Pac_sub	4.9	3.4	5.47	0.05	0.02	3.30	0.32	0.41	0.31	0.08	7.40	13.47

Appendix Table 8 (Continued)

Series	pH (1:1)		OM	Total N	Avai. P	Avai. K	Extractable bases				CEC	EA
	H_2O	KCl					Ca	Mg	Na	K	Ag $(TU)^+$ pH 4.7	
			(-----g kg^{-1}-----)		(-----mg kg^{-1}------)		(----------cmol kg^{-1}----------)					
Land condition: Uplands												
Pathio (Ptu_top)	6.8	5.6	11.73	0.58	12.29	31.16	3.30	0.24	0.17	0.08	2.89	1.49
Pathio (Ptu_sub)	5.0	3.9	1.59	0.20	0.26	13.93	1.38	0.27	0.24	0.08	3.10	7.50
Phangnga (Pga_top)	4.3	3.7	9.08	0.04	2.65	0.39	0.03	0.04	0.11	0.05	0.79	3.47
Phangnga (Pga_sub)	4.6	3.6	3.09	0.03	0.53	2.39	0.23	0.07	0.26	0.12	2.22	4.24
Phato (Pto_top)	5.4	4.3	1.80	0.05	0.80	2.59	0.25	0.08	0.15	0.03	0.73	0.25
Phato (Pto_sub)	5.1	3.9	1.36	0.03	0.79	1.67	0.16	0.02	0.18	0.04	1.38	1.75
Phuket (Pk_top)	4.5	3.4	20.58	0.03	3.01	9.80	0.97	0.37	0.35	0.14	2.72	6.97
Phuket (Pk_sub)	4.3	3.3	6.69	0.03	0.18	2.83	0.28	0.31	0.26	0.13	6.04	11.66
Sawi (Sw_top)	4.5	3.6	13.47	0.67	0.71	3.89	0.38	0.13	0.22	0.03	2.33	6.49
Sawi (Sw_sub)	4.5	3.5	4.05	0.05	0.35	3.06	0.30	0.25	0.39	0.12	5.03	9.24
Tha Sae (Te_top)	5.9	5.3	9.99	0.48	1.42	48.83	4.86	0.60	0.34	0.07	6.01	2.99
Tha Sae (Te_sub)	4.5	3.5	2.59	0.05	2.48	11.31	1.12	0.25	0.11	0.04	6.05	8.42
Wang Tong (Wat_top)	5.5	4.4	13.47	0.01	0.79	72.41	7.22	1.18	0.40	0.12	7.43	4.23
Wang Tong (Wat_sub)	6.4	5.3	3.21	0.04	0.35	65.36	6.52	1.20	0.32	0.13	6.59	1.75
Yala (Ya_top)	4.2	3.4	10.85	0.03	1.15	0.73	0.07	0.05	0.26	0.02	1.12	3.75
Yala (Ya_sub)	4.5	3.2	7.14	0.04	0.44	1.01	0.09	0.07	0.33	0.04	2.05	4.74

1/ Topsoil (0-50 cm)
2/ Subsoils (50-100 cm)
* High bases

Appendix Table 9 Major and trace elements (XRF) of Thai Alfisols

Series	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	CaO	K_2O	MgO	Na_2O	P_2O_5	SO_3	V	Cr	Ni	Zn	Y	Zr
	(----------g kg^{-1} ----------)											(----------mg kg^{-1}----------)					
Land condition: Lowlands																	
Doem Bang (Db_top[1/])	69.1	891	4.99	19.30	0.45	2.49	10.80	1.36	0.00	0.34	0.00	23.0	45.3	49.1	29.3	50.3	511
Doem Bang (Db_sub[2/])	144.0	790	6.34	40.60	1.32	2.39	11.70	3.95	0.00	0.24	0.00	49.7	56.9	48.2	46.0	41.2	358
Khao Yoi (Kyo_top)	94.9	854	5.32	30.40	0.35	5.08	4.37	1.66	3.90	0.24	0.12	68.7	20.0	36.2	49.8	21.5	193
Khao Yoi (Kyo_sub)	74.9	887	4.29	24.60	0.35	3.48	2.09	1.74	1.16	0.12	0.00	40.4	12.4	42.7	25.9	23.4	238
Manorom (Mn_top)	84.5	872	6.86	19.20	0.23	1.86	13.40	1.51	0.00	0.35	0.23	45.8	17.3	37.4	33.5	52.4	449
Manorom (Mn_sub)	211.0	707	9.04	52.20	0.12	0.50	16.00	3.72	0.00	0.37	0.00	69.2	81.9	47.7	41.4	32.8	255
Nakhon Pathom (Np_top)	120.0	788	5.81	37.20	0.74	7.04	33.20	5.56	0.86	1.36	0.12	67.8	26.3	59.3	68.0	34.4	253
Nakhon Pathom (Np_sub)	159.0	731	6.66	55.50	0.61	3.39	35.90	7.27	0.00	1.33	0.00	88.2	56.8	55.7	82.8	33.3	212
Hang Dong (Hd_top)	140.0	731	8.74	85.60	0.50	13.49	10.10	9.87	0.50	0.37	0.12	138.0	24.4	55.1	59.6	35.1	229
Hang Dong (Hd_sub)	187.0	685	8.17	82.40	0.49	9.77	14.10	12.10	0.37	0.25	0.00	155.0	6.20	44.9	59.9	31.1	213
Phan (Ph1_top)	56.3	911	6.85	18.60	0.00	2.09	3.83	0.70	0.00	0.23	0.81	40.9	22.4	21.5	21.5	41.1	372
Phan (Ph1_sub)	61.6	906	7.13	18.80	0.00	2.38	3.28	0.57	0.00	0.11	0.34	62.1	12.8	23.2	11.5	34.9	378
Phan (Ph2_top)	87.0	878	8.15	14.00	0.00	0.92	9.98	1.95	0.00	0.23	0.11	59.0	30.7	35.4	37.1	36.2	278
Phan (Ph2_sub)	84.5	859	6.14	38.30	0.00	0.45	9.38	2.34	0.00	0.33	0.00	78.7	18.9	32.5	22.2	27.5	231
Phan (Ph3_top)	90.3	848	10.20	32.70	0.12	1.63	11.90	3.14	1.75	0.35	0.00	63.4	39.9	45.8	62.5	35.4	249
Phan (Ph3_sub)	150.0	749	10.20	60.00	1.02	2.50	18.90	6.03	1.71	0.57	0.23	111.0	54.3	59.4	92.6	41.4	209
Phan (Ph4_top)	96.0	860	6.12	27.40	0.36	2.52	5.76	1.08	0.00	0.36	0.36	59.2	51.3	31.7	31.9	46.0	409
Phan (Ph4_sub)	139.0	803	7.83	34.70	0.69	4.95	6.91	2.30	0.00	0.23	0.00	65.9	54.6	3.5	35.2	52.3	412
San Sai (Sai_top)	47.0	918	4.09	16.50	0.22	0.99	11.90	0.99	0.00	0.22	0.00	20.5	11.9	38.3	17.5	37.3	261
San Sai (Sai_sub)	48.1	924	4.27	9.87	0.12	0.61	12.80	0.12	0.00	0.12	0.00	40.8	7.80	22.5	29.5	33.6	264

Appendix Table 9 (Continued)

Series	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	CaO	K_2O	MgO	Na_2O	P_2O_5	SO_3	V	Cr	Ni	Zn	Y	Zr
	(----------g kg^{-1} ----------)											(----------mg kg^{-1}----------)					
Land condition: Lowlands																	
Mae Sai (Ms_top)	175.0	687	10.50	94.70	1.14	3.17	19.20	6.98	0.51	1.40	0.25	135.0	30.0	47.3	64.7	33.0	187
Mae Sai (Ms_sub)	253.0	594	9.83	98.70	1.26	4.54	23.80	10.80	2.02	0.88	0.76	157.0	63.1	74.1	101.0	25.5	141
Lampang (Lp_top)	118.0	807	10.10	32.50	1.03	0.90	28.60	1.41	0.00	0.51	0.00	73.6	18.5	42.2	40.7	54.9	391
Lampang (Lp_sub)	232.0	686	9.45	46.50	0.23	0.35	22.60	2.68	0.00	0.35	0.00	90.5	61.3	54.7	60.5	33.8	239
Tha Tum (Tt_top)	133.0	772	9.84	65.50	0.98	2.58	9.97	6.15	0.00	0.49	0.00	79.7	51.5	42.8	66.4	40.0	247
Tha Tum (Tt_sub)	142.0	780	8.20	46.70	0.62	4.10	11.40	6.58	0.25	0.25	0.00	103.0	43.6	64.1	59.7	36.3	280
La-ngu (Lgu_top)	128.0	798	10.40	36.00	0.38	2.15	21.10	3.16	0.63	0.51	0.13	74.6	14.2	38.9	50.4	72.2	635
La-ngu (Lgu_sub)	157.0	762	11.20	45.80	0.69	2.29	17.2	3.55	0.00	0.23	0.00	106.0	17.1	55.0	50.1	59.9	576
Land condition: Uplands																	
Pran Buri (Pr_top)	85.0	841	6.42	32.70	0.70	2.33	23.10	7.12	0.47	0.93	0.12	57.5	40.4	48.8	63.3	39.8	381
Pran Buri (Pr_sub)	77.2	857	6.13	29.40	0.56	2.01	21.00	6.02	0.00	0.45	0.00	53.7	25.2	37.9	50.0	45.7	423
Thap khwang (Tw_top)	46.2	931	3.04	12.30	0.45	5.64	1.01	0.00	0.00	0.34	0.00	31.2	18.6	29.8	42.4	20.0	139
Thap khwang (Tw_sub)	63.0	912	3.29	18.80	0.11	1.36	1.02	0.34	0.00	0.23	0.00	39.0	21.6	24.2	24.3	24.1	132
Kamphaeng Sean (Ks_top)	147.0	743	7.90	50.70	1.25	6.40	34.40	7.40	1.13	1.63	0.00	74.3	48.9	53.0	89.9	42.4	277
Kamphaeng Sean (Ks_sub)	155.0	731	8.01	55.60	1.06	4.00	34.80	7.89	0.71	1.41	0.00	68.9	57.4	46.6	80.9	44.3	279
Phetchaburi (Pb_top)	39.0	922	3.98	19.70	0.66	0.77	11.90	1.77	0.00	0.22	0.00	38.6	17.9	28.8	32.9	37.4	303
Phetchaburi (Pb_sub)	52.5	898	3.80	27.70	0.43	1.09	13.50	2.50	0.65	0.22	0.00	54.9	29.1	8.6	9.1.	319.0	318
Wichain Buri (Wb_top)	14.3	975	2.40	7.30	0.00	0.60	0.30	0.00	0.00	0.10	0.00	24.0	25.1	46.0	24.4	13.6	154
Wichain Buri (Wb_sub)	13.2	976	2.92	7.24	0.00	0.20	0.30	0.10	0.30	0.00	0.00	42.5	17.3	34.6	25.1	18.5	209

Appendix Table 9 (Continued)

Series	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	CaO	K_2O	MgO	Na_2O	P_2O_5	SO_3	V	Cr	Ni	Zn	Y	Zr
	(----------g kg^{-1} ----------)											(----------mg kg^{-1}----------)					
Land condition: Uplands																	
Muak Lek (Ml_top)	139.0	726	11.90	70.70	1.63	2.76	32.90	10.40	2.64	1.63	0.25	115.0	54.3	44.6	92.1	45.9	354
Muak Lek (Ml_sub)	183.0	661	11.10	89.70	1.93	1.57	36.40	13.50	0.00	0.84	0.12	141.0	87.3	62.7	99.1	40.7	308
Kamphaeng Phet (Kp_top)	174.0	700	8.94	59.80	2.08	5.51	34.80	10.20	2.69	1.59	0.12	78.3	59.4	58.1	88.4	38.1	237
Kamphaeng Phet (Kp_sub)	127.0	780	5.31	32.40	0.68	5.31	38.00	6.44	4.97	0.79	0.00	23.6	31.6	33.0	50.6	48.4	413
Li (Li_top)	307.0	535	18.40	123.00	3.84	3.71	1.37	4.39	0.00	2.20	0.69	339.0	363.0	107.	241.0	99.7	326
Li (Li_sub)	314.0	510	17.70	144.00	3.00	4.43	1.30	4.04	0.00	1.56	0.39	395.0	507.0	90.1	258.0	95.1	300
Phayao (Pao_top)	73.5	897	6.06	17.30	0.00	0.22	3.89	2.06	0.00	0.22	0.00	57.9	35.2	46.1	31.3	45.9	499
Phayao (Pao_sub)	122.0	836	7.11	24.70	0.00	0.34	6.32	3.27	0.00	0.11	0.00	64.4	52.6	57.2	22.5	48.9	471
Khambong (Kg_top)	20.6	966	3.37	7.38	0.22	0.54	1.30	0.11	0.00	0.22	0.00	37.8	2.7	33.1	13.5	38.5	466
Khambong (Kg_sub_	37.0	947	4.06	8.93	0.00	0.70	1.97	0.00	0.00	0.12	0.00	26.6	24.3	45.5	20.4	33.6	432
Wang Hai (Wi_top)	200.0	664	14.30	105.00	1.37	7.69	2.36	3.85	0.00	1.61	0.37	224.0	319.0	79.6	105.0	59.9	321
Wang Hai (Wi_sub)	236.0	619	15.00	118.00	0.74	5.17	1.60	3.20	0.00	0.49	0.25	257.0	350.0	85.3	63.8	63.5	301
Loei (Lo1_top)	159.0	744	8.83	77.90	1.39	1.05	4.18	2.55	0.00	0.46	0.12	134.0	37.2	8.3	51.4	62.9	661
Loei (Lo1_sub)	237.0	638	10.40	106.00	0.99	0.62	4.44	2.22	0.00	0.49	0.00	191.0	40.2	57.2	63.2	52.1	485
Loei (Lo2_top)	150.0	772	7.80	56.90	1.15	1.92	7.29	2.17	0.00	0.64	0.26	106.0	12.6	20.6	36.4	46.5	471
Loei (Lo2_sub)	207.0	697	8.75	75.00	0.85	1.46	7.29	2.07	0.00	0.61	0.12	107.0	34.7	58.5	40.6	43.0	422
Wang Saphung (Ws_top)	179.0	688	11.20	89.70	1.48	4.20	20.10	4.20	0.00	1.48	0.37	142.0	22.1	39.3	52.6	34.2	207
Wang Saphung (Ws_sub)	240.0	596	10.40	116.00	0.77	3.09	26.10	5.14	0.00	1.16	0.13	151.0	48.5	61.3	40.8	36.1	158
Chatturat (Ct_top)	118.0	794	5.19	43.00	1.65	6.13	26.90	4.13	0.00	0.59	0.12	78.7	50.9	50.7	42.1	26.4	214
Chatturat (Ct_sub)	153.0	738	6.76	61.50	2.17	5.55	27.00	4.95	0.00	0.48	0.00	77.1	64.1	63.1	69.6	29.4	205

Appendix Table 9 (Continued)

Series	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	CaO	K_2O	MgO	Na_2O	P_2O_5	SO_3	V	Cr	Ni	Zn	Y	Zr
	(----------g kg^{-1} ----------)											(----------mg kg^{-1}----------)					
Land condition: Uplands																	
Nam Pong (Ng_top)	7.3	986	1.47	4.42	0.00	0.11	0.84	0.00	0.00	0.11	0.00	4.7	2.7	25.0	18.5	31.8	411
Nam Pong (Ng_sub)	11.3	975	1.73	11.00	0.00	0.10	1.12	0.00	0.00	0.10	0.00	52.8	11.3	43.2	20.3	29.9	357
Sikhiu (Si_top)	36.4	940	3.99	15.10	0.11	0.95	3.47	0.21	0.00	0.21	0.00	47.0	46.6	26.4	33.5	45.9	600
Sikhiu (Si_sub)	73.9	883	5.26	28.70	0.21	1.40	5.80	1.50	0.00	0.11	0.00	63.8	65.4	65.0	31.0	53.1	677
Phak Kat (Pat_top)	171.0	746	9.29	46.10	0.49	1.71	18.30	6.23	0.00	0.86	0.37	82.6	50.7	73.5	77.2	42.8	336
Phak Kat (Pat_sub)	132.0	801	7.38	36.80	0.48	1.07	16.20	3.93	0.00	0.60	0.48	83.9	50.8	46.9	66.3	43.6	456

1/ Topsoil (0-50 cm)
2/ Subsoils (50-100 cm)

Appendix Table 10 Major and trace elements (XRF) of Thai Ultisols

Series	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	CaO	K_2O	MgO	Na_2O	P_2O_5	SO_3	V	Cr	Ni	Zn	Y	Zr
	(----------g kg^{-1} ----------)											(----------mg kg^{-1}----------)					
Land condition: Lowlands																	
Hin Kong (Hk_top[1/])	39.4	937	3.82	10.80	0.11	1.17	6.36	0.74	0.00	0.21	0.32	26.6	2.9	18.6	26.4	34.5	371
Hin Kong (Hk_sub[2/])	87.0	876	4.52	23.60	0.12	1.34	5.49	1.22	0.12	0.00	0.12	43.0	9.4	21.2	33.5	35.2	331
Pak Tho (Pth_top)	65.5	900	6.33	14.70	0.12	1.67	10.40	1.08	0.00	0.12	0.12	39.5	14.3	58.9	24.8	48.9	375
Pak Tho (Pth_sub)	126.0	814	8.18	37.90	0.58	0.46	11.20	1.84	0.00	0.23	0.00	58.3	33.3	51.8	41.2	40.4	320
Si Thep (Sri_top)	85.1	867	6.15	18.90	0.58	1.86	17.8	2.09	0.00	0.35	0.12	52.8	32.8	41.9	38.7	36.1	406
Si Thep (Sri_sub)	151.0	786	7.21	29.70	1.49	3.21	17.7	2.86	0.00	0.23	0.00	43.7	37.2	39.2	64.3	36.8	390
Klaeng (Kl_top)	26.1	965	4.01	4.12	0.00	0.42	0.63	0.00	0.00	0.11	0.00	19.1	4.8	28.2	15.3	42.6	441
Klaeng (Kl_sub)	51.6	935	4.49	7.37	0.00	0.32	1.28	0.00	0.00	0.00	0.00	23.3	18.2	32.2	10.5	43.4	386
On (On_top)	32.9	932	4.08	26.30	0.11	1.21	3.08	0.22	0.00	0.22	0.00	103.0	0.0	0.0	12.6	36.5	460
On (On_sub)	79.1	860	5.57	46.80	0.34	1.25	4.89	1.36	0.00	0.23	0.00	120.0	12.3	42.8	18.6	33.2	389
Chiang Rai (Cr1_top)	73.4	875	5.99	26.30	0.12	3.41	11.00	0.82	3.17	0.24	0.00	47.9	17.3	51.8	35.2	33.7	296
Chiang Rai (Cr1_sub)	103.0	831	9.78	38.00	0.72	2.74	11.00	2.50	1.19	0.12	0.00	81.2	21.3	23.9	42.5	41.8	357
Chiang Rai (Cr2_top)	70.2	893	5.47	19.60	0.46	1.94	7.63	1.59	0.00	0.34	0.11	38.1	15.2	27.3	35.7	47.8	468
Chiang Rai (Cr2_sub)	207.0	722	6.73	49.50	0.87	1.74	9.35	2.99	0.00	0.37	0.00	67.1	45.6	66.6	60.8	38.4	321
Phen (Pn_top)	31.4	943	6.44	16.50	0.46	0.69	0.92	0.00	0.00	0.23	0.00	57.3	13.5	32.2	21.1	63.6	591
Phen (Pn_sub)	53.5	905	7.71	32.30	0.35	0.12	1.05	0.00	0.00	0.12	0.00	43.5	16.1	35.9	34.7	66.0	583
Renu (Rn1_top)	17.9	972	2.92	7.19	0.00	0.22	0.11	0.00	0.00	0.11	0.00	36.8	1.0	20.5	19.9	33.9	410
Renu (Rn1_sub)	70.9	908	4.28	15.00	0.00	0.36	0.48	0.59	0.71	0.00	0.00	51.0	22.9	5. 7	13.0	29.4	358
Renu (Rn2_top)	37.3	933	5.57	19.10	0.11	0.33	4.04	0.22	0.00	0.11	0.00	48.1	33.0	46.4	20.0	37.4	281
Renu (Rn2_sub)	86.4	859	6.56	36.60	0.54	0.22	8.93	1.40	0.00	0.22	0.00	73.0	39.6	45.1	32.5	34.7	262

Appendix Table 10 (Continued)

Series	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	CaO	K_2O	MgO	Na_2O	P_2O_5	SO_3	V	Cr	Ni	Zn	Y	Zr
	(----------g kg^{-1} ----------)											(----------mg kg^{-1}----------)					
Land condition: Lowlands																	
Roi Et (Re_top)	17.4	975	2.47	4.32	0.10	0.31	0.30	0.00	0.00	0.10	0.00	28.0	10.6	2.2	20.9	36.6	459
Roi Et (Re_sub)	23.3	968	2.63	5.27	0.00	0.33	0.30	0.11	0.00	0.11	0.00	18.1	0.6	23.2	12.3	34.7	457
Bang Nara (Ba_top)	211.0	683	10.80	53.1	0.61	2.67	32.50	5.46	0.12	0.73	0.24	61.2	29.8	15.9	73.0	59.0	306
Bang Nara (Ba_sub)	278.0	603	11.40	68.2	0.39	2.09	28.70	7.18	0.00	0.52	0.13	116.0	41.1	43.4	101.0	54.0	175
Khok Khain (Ko_top)	124.0	800	5.64	23.70	0.45	0.79	43.20	0.90	0.45	0.34	0.11	37.2	8.6	38.4	27.1	56.9	440
Khok Khain (Ko_sub)	90.9	847	4.08	15.40	0.34	0.68	39.80	0.68	0.45	0.23	0.00	46.9	0.0	16.1	26.1	40.1	318
Phatthalung (Ptl_top)	87.4	861	12.70	23.50	0.47	0.94	11.40	2.23	0.47	0.23	0.12	54.4	15.6	25.0	41.4	61.3	527
Phatthalung (Ptl_sub)	176.0	717	13.80	69.40	1.54	0.59	15.10	6.15	0.00	0.35	0.12	104.0	41.6	12.2	61.8	59.2	331
Sungai Padi (Pi_top)	131.0	808	5.42	11.40	0.00	0.59	42.30	0.83	0.71	0.12	0.00	32.0	0.0	30.8	31.1	56.3	412
Sungai Padi (Pi_sub)	210.0	718	5.68	26.40	0.00	0.48	37.70	1.45	0.00	0.00	0.00	40.5	7.8	36.0	32.1	54.9	331
Visai (Vi_top)	22.4	967	3.88	3.99	0.00	0.22	1.66	0.44	0.00	0.11	0.00	28.2	12.2	41.8	25.5	32.7	435
Visai (Vi_sub)	70.3	899	5.47	17.60	0.00	0.11	5.58	1.53	0.00	0.11	0.00	48.5	19.6	13.3	26.6	36.5	358
Yan Ta Khao (Yk_top)	55.5	908	4.17	23.10	0.00	0.79	4.96	3.50	0.00	0.11	0.00	53.7	41.0	31.3	15.3	29.8	360
Yan Ta Khao (Yk_sub)	97.5	845	5.25	35.80	0.00	1.63	8.63	5.71	0.00	0.23	0.00	61.6	40.0	38.1	39.1	33.7	302
Land condition: Uplands																	
Bang Khla (Bka_top)	43.3	945	3.03	7.00	0.11	0.43	0.32	0.00	0.00	0.32	0.00	22.8	20.8	20.0	88.3	47.3	624
Bang Khla (Bka_sub)	85.5	898	4.43	11.40	0.00	0.45	0.34	0.00	0.00	0.11	0.00	51.1	15.1	41.3	52.7	41.2	529
Don Rai (Dr_top)	40.2	944	4.41	9.57	0.32	0.32	0.54	0.00	0.00	0.22	0.00	18.0	66.0	45.6	24.9	38.6	472
Don Rai (Dr_sub)	87.8	893	6.50	11.70	0.00	0.32	1.07	0.00	0.00	0.11	0.00	48.3	46.7	21.2	24.9	37.2	436

Appendix Table 10 (Continued)

Series	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	CaO	K_2O	MgO	Na_2O	P_2O_5	SO_3	V	Cr	Ni	Zn	Y	Zr
	(----------g kg^{-1} ----------)											(----------mg kg^{-1}----------)					
Land condition: Uplands																	
Lat Ya (Ly_top)	103.0	812	5.87	45.50	1.84	1.38	26.50	3.11	0.00	0.46	0.00	52.3	41.4	36.0	58.40	27.0	193
Lat Ya (Ly_sub)	126.0	774	6.88	55.50	2.10	4.20	26.20	4.20	0.00	0.58	0.12	59.5	40.0	48.9	60.50	25.6	196
Tha Yang (Ty_top)	80.8	835	5.40	47.80	0.47	0.47	23.40	5.75	0.00	0.47	0.00	79.5	35.8	37.8	50.1	40.0	315
Tha Yang (Ty_sub)	184.0	663	10.10	91.70	0.24	0.12	38.70	12.3	0.00	0.35	0.00	162.0	69.0	48.2	69.0	30.2	188
Kabib Buri (Kb1_top)	201.0	683	16.60	89.90	2.79	0.89	2.79	1.77	0.00	1.01	0.38	162.0	173.0	59.2	54.4	45.8	339
Kabib Buri (Kb1_sub)	289.0	571	15.80	116.00	1.01	0.63	3.91	2.14	0.00	0.76	0.13	210.0	154.0	85.1	53.2	52.1	278
Kabib Buri (Kb2_top)	89.7	834	6.89	66.40	0.13	0.75	1.13	0.50	0.00	0.50	0.00	92.0	58.5	45.4	26.5	36.7	456
Kabib Buri (Kb2_sub)	160.0	655	7.99	173.00	0.24	0.35	2.23	1.06	0.00	0.71	0.12	220.0	161.0	41.9	42.0	40.0	442
Khlong Chak (Kc_top)	194.0	653	13.70	123.00	2.80	0.61	8.78	3.05	0.00	0.61	0.37	196.0	163.0	62.0	38.3	33.6	195
Khlong Chak (Kc_sub)	228.0	602	15.00	136.00	1.71	0.49	11.50	5.14	0.00	0.49	0.49	214.0	106.0	90.5	42.9	41.7	191
Mab Bon (Mb_top)	11.0	980	1.46	4.29	0.10	0.84	1.26	0.00	0.00	0.63	0.00	15.7	17.9	52.8	35.2	48.3	456
Mab Bon (Mb_sub)	3.87	992	1.02	2.55	0.00	0.10	0.81	0.00	0.00	0.00	0.00	15.4	0.00	28.7	13.8	35.1	359
Ban Chong (Bg_top)	242.0	590	13.70	125.0	0.83	1.07	21.40	4.53	0.00	0.72	0.00	212.0	167.0	68.3	77.6	42.8	236
Ban Chong (Bg_sub)	282.0	537	11.70	139.0	0.48	1.20	23.10	5.51	0.00	0.72	0.00	235.0	138.0	88.4	95.6	40.3	228
Ban Chong-high bases (Bg-hb*_top)	167.0	738	8.45	63.40	0.46	0.46	18.60	3.20	0.00	0.57	0.00	130.0	48.6	46.2	62.2	32.5	225
Ban Chong-high bases (Bg-hb*_sub)	213.0	668	7.54	83.20	0.24	0.35	22.00	4.83	0.00	0.47	0.00	134.0	67.2	72.0	86.8	25.3	221
Doi Pui (Dp_top)	278.0	577	8.20	106.00	0.50	0.50	24.20	4.35	0.00	0.62	0.00	84.2	67.5	73.1	120.0	24.2	186
Doi Pui (Dp_sub)	302.0	549	7.61	119.00	0.50	0.50	17.60	3.74	0.00	0.37	0.00	212.0	167.0	68.3	77.6	42.8	236
Hang Chat (Hc_top)	57.6	888	6.16	44.80	0.35	1.40	0.70	0.35	0.00	0.35	0.00	111.0	106.0	36.5	36.2	30.3	318
Hang Chat (Hc_sub)	80.8	880	6.97	28.20	0.22	1.57	0.90	0.67	0.00	0.22	0.00	71.4	61.9	40.9	21.6	33.7	375

Appendix Table 10 (Continued)

Series	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	CaO	K_2O	MgO	Na_2O	P_2O_5	SO_3	V	Cr	Ni	Zn	Y	Zr
	(----------g kg^{-1} ----------)											(----------mg kg^{-1}----------)					
Land condition: Uplands																	
Chiang Khan (Ch1_top)	124.0	823	5.28	29.60	0.00	0.70	14.70	2.11	0.00	0.35	0.00	57.1	24.1	25.6	25.4	33.8	320
Chiang Khan Ch1_sub	185.0	729	4.67	56.10	0.00	0.47	20.70	4.44	0.00	0.23	0.00	76.0	19.2	48.2	26.7	27.9	181
Chiang Khan (Ch2_top)	92.2	824	8.35	57.30	1.26	0.80	13.30	2.52	0.00	0.46	0.00	84.0	55.7	35.9	34.7	52.3	458
Chiang Khan(Ch2_sub)	194.0	605	6.64	168.00	3.38	1.00	17.90	3.76	0.00	0.75	0.00	194.0	114.0	107.0	55.4	29.9	229
Dan Sai (Ds_top)	52.1	912	4.61	19.80	0.34	1.01	8.66	1.35	0.00	0.34	0.00	43.0	19.9	35.2	81.9	32.8	345
Dan Sai (Ds_sub)	91.1	854	5.58	32.80	0.55	0.99	11.70	3.17	0.00	0.44	0.00	64.9	51.3	38.1	95.6	34.1	311
Korat (Kt1_top)	5.57	988	1.64	4.26	0.11	0.33	0.00	0.00	0.00	0.11	0.00	26.70	0.0	41.0	23.1	20.5	316
Korat (Kt1_sub)	5.50	989	1.43	4.07	0.00	0.11	0.00	0.00	0.00	0.00	0.00	6.76	18.4	29.5	20.2	21.1	269
Korat (Kt2_top)	8.27	988	1.34	1.76	0.00	0.41	0.21	0.00	0.00	0.31	0.00	30.80	3.7	28.8	14.3	28.5	354
Korat (Kt2_sub)	11.50	985	1.48	2.12	0.00	0.21	0.11	0.00	0.00	0.00	0.00	18.90	0.0	37.9	16.3	28.5	391
Korat (Kt3_top)	8.76	982	1.19	6.06	0.00	0.54	1.08	0.00	0.11	0.00	0.00	32.10	12.8	16.2	21.9	19.5	297
Korat (Kt3_sub)	26.90	959	2.11	9.32	0.00	0.33	1.77	0.22	0.00	0.00	0.00	33.20	8.7	38.7	24.4	28.1	380
Mae Rim (Mr_top)	29.2	945	3.53	18.10	0.00	0.44	2.65	0.55	0.00	0.22	0.00	39.7	27.9	20.9	9.79	40.5	410
Mae Rim (Mr_sub)	28.4	945	3.37	19.00	0.23	0.81	2.68	0.47	0.00	0.35	0.12	28.1	19.2	30.1	9.38	38.3	410
Mae Taeng (Mt_top)	113.0	825	5.21	33.00	0.34	0.79	21.50	1.13	0.00	0.34	0.11	46.4	53.8	32.8	40.60	57.0	539
Mae Taeng (Mt_sub)	161.0	766	7.02	43.90	0.23	0.94	18.90	1.05	0.00	0.35	0.23	71.1	50.0	35.4	52.00	48.2	479
Nong Mot (Nm_top)	44.9	941	3.11	10.10	0.11	0.22	0.56	0.00	0.00	0.11	0.00	33.1	18.1	29.6	33.9	29.2	356
Nong Mot (Nm_sub)	88.4	883	3.85	23.40	0.00	0.35	1.28	0.00	0.00	0.12	0.00	34.9	30.1	41.0	27.8	28.7	262
Pak Chong (Pc_top)	182.0	697	14.00	90.10	0.99	9.93	1.12	2.23	0.00	1.37	0.37	329.0	397.0	171.0	129.0	55.8	301
Pak Chong (Pc_sub)	269.0	603	12.30	111.00	0.50	1.38	0.75	1.63	0.00	0.50	0.38	398.0	479.0	183.0	127.0	68.8	271

Appendix Table 10 (Continued)

Series	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	CaO	K_2O	MgO	Na_2O	P_2O_5	SO_3	V	Cr	Ni	Zn	Y	Zr
	(----------g kg^{-1} ----------)											(----------mg kg^{-1}----------)					
Land condition: Uplands																	
Phu Sana (Ps_top)	41.5	932	5.00	17.30	0.44	0.67	3.00	0.33	0.00	0.22	0.00	43.0	0.0	10.8	25.1	59.9	798
Phu Sana (Ps_sub)	131.0	806	9.53	45.60	0.13	0.26	5.15	1.42	0.00	0.13	0.00	83.7	97.8	41.4	23.2	36.6	487
Sakon (Sk_top)	19.20	962	6.67	9.27	0.00	1.13	1.70	0.00	0.00	0.11	0.00	48.2	0.0	15.9	26.9	37.0	368
Sakon (Sk_sub)	84.30	860	4.48	38.50	0.00	0.23	8.00	4.60	0.00	0.23	0.00	66.2	29.3	59.7	31.9	34.5	364
Satuk (Suk1_top)	14.20	980	2.33	3.14	0.00	0.20	0.40	0.00	0.00	0.00	0.00	34.7	8.8	35.6	25.8	42.1	521
Satuk (Suk1_sub)	88.50	889	4.93	14.10	0.00	0.21	2.50	0.86	0.00	0.21	0.00	45.3	25.4	51.7	28.7	37.3	408
Satuk (Suk2_top)	9.67	983	1.91	3.83	0.21	0.21	0.60	0.00	0.00	0.11	0.00	10.9	0.0	44.7	12.5	44.0	534
Satuk (Suk2_sub)	56.10	925	3.01	13.10	0.11	0.21	1.70	0.21	0.00	0.11	0.00	37.8	4.4	32.3	15.9	38.3	411
Satuk (Suk3_top)	7.41	986	1.72	3.54	0.11	0.54	0.40	0.00	0.00	0.11	0.00	27.7	4.1	29.0	21.2	29.4	361
Satuk (Suk3_sub)	39.20	947	2.95	9.40	0.00	0.33	1.00	0.11	0.00	0.22	0.00	32.6	16.6	42.1	23.7	27.0	333
Satuk (Suk4_top)	5.19	989	1.62	3.92	0.00	0.23	0.20	0.00	0.00	0.12	0.00	8.8	8.0	11.8	11.6	26.8	376
Satuk (Suk4_sub)	27.20	961	2.58	8.04	0.00	0.31	0.80	0.00	0.00	0.21	0.00	30.6	14.9	29.0	28.2	29.9	299
Sung Noen (Sn1_top)	7.3	988	2.04	1.93	0.11	0.11	0.00	0.00	0.00	0.11	0.00	27.8	0.0	23.5	12.2	41.0	513
Sung Noen (Sn1_sub)	3.6	993	1.59	1.48	0.00	0.11	0.00	0.00	0.00	0.00	0.00	20.1	12.3	6.8	13.5	48.5	571
Sung Noen (Sn2_top)	75.9	866	5.09	25.80	0.33	5.87	13.80	6.42	0.00	0.44	0.33	57.3	30.0	30.5	132.0	53.6	591
Sung Noen (Sn2_sub)	110.0	819	5.78	35.40	0.33	3.06	18.20	8.19	0.00	0.22	0.00	78.2	36.4	46.6	42.1	47.3	537
Warin (Wn_top)	14.0	979	2.56	3.83	0.00	0.29	0.20	0.00	0.00	0.10	0.00	0.0	8.1	5.3	14.3	35.2	410
Warin (Wn_sub)	74.2	906	5.04	12.50	0.00	0.43	1.18	0.00	0.00	0.21	0.00	52.0	38.4	37.4	26.1	32.0	369
Yasothon (Yt1_top)	12.4	980	2.33	4.90	0.00	0.23	0.35	0.00	0.00	0.00	0.00	7.2	2.8	30.1	24.0	39.0	457
Yasothon (Yt1_sub)	83.6	882	4.26	28.20	0.00	0.22	1.46	0.34	0.00	0.22	0.00	73.0	43.5	23.7	19.6	34.2	419

Appendix Table 10 (Continued)

Series	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	CaO	K_2O	MgO	Na_2O	P_2O_5	SO_3	V	Cr	Ni	Zn	Y	Zr
	(----------g kg^{-1} ----------)											(----------mg kg^{-1}----------)					
Land condition: Uplands																	
Yasothon (Yt2_top)	15.2	975	1.88	7.06	0.00	0.44	0.11	0.00	0.00	0.00	0.00	32.2	20.6	39.5	3.1	23.5	315
Yasothon (Yt2_sub)	58.0	917	3.48	21.40	0.00	0.20	0.31	0.00	0.00	0.10	0.00	57.1	10.5	31.4	15.7	35.4	428
Chalong (Chl_top)	62.6	914	4.31.0	18.4	0.00	0.25	0.25	0.00	0.00	0.38	0.13	66.3	21.9	4.4	17.2	37.4	528
Chalong (Chl_sub)	109.0	857	5.73	27.2	0.00	0.22	0.45	0.67	0.00	0.22	0.11	45.7	25.2	25.4	21.6	39.1	513
Fang Daeng (Fd_top)	72.9	901	4.64	19.00	0.63	0.53	0.21	0.53	0.00	0.32	0.11	43.9	33.2	32.2	35.7	23.7	299
Fang Daeng (Fd_sub)	129.0	834	6.58	28.50	0.64	0.32	0.21	0.32	0.00	0.21	0.21	48.2	65.4	48.7	35.4	27.2	282
Hat Yai (Hy_top)	64.7	892	4.49	10.80	0.11	0.33	26.20	0.77	0.44	0.22	0.00	12.3	4.30	14.9	23.6	47.5	339
Hat Yai (Hy_sub)	101.0	832	4.61	31.90	0.00	0.24	28.60	1.21	0.00	0.12	0.00	30.1	15.0	15.8	41.8	43.5	230
Hoi Pong (Hp_top)	75.1	912	3.62	8.44	0.00	0.40	0.70	0.00	0.00	0.20	0.00	29.0	39.5	15.1	37.9	43.4	441
Hoi Pong (Hp_sub)	138.0	842	4.88	12.30	0.00	0.52	1.14	0.83	0.00	0.31	0.00	65.3	60.5	51.5	40.5	35.8	315
Khao Khat (Kkt_top)	98.4	848	6.73	36.30	0.25	2.92	5.33	1.78	0.00	0.51	0.13	57.8	29.9	30.8	50.3	43.8	438
Khao Khat (Kkt_sub)	94.5	855	7.14	35.10	0.00	0.94	4.80	1.75	0.00	0.58	0.12	63.8	26.0	25.2	26.4	54.3	485
Khlong Teng (Klt_top)	106.0	724	8.13	136.00	0.36	0.24	19.10	5.14	0.12	0.72	0.24	111.0	119.0	20.2	45.1	37.3	-
Khlong Teng (Klt_sub)	219.0	601	10.10	117.00	0.12	0.24	39.70	12.14	0.00	0.47	0.00	170.0	106.0	39.9	63.5	36.5	-
Khlong Thom (Km_top)	14.0	977	2.14	5.98	0.00	0.32	0.64	0.00	0.00	0.21	0.11	6.39	0.30	26.7	19.2	37.9	449
Khlong Thom (Km_sub)	40.7	939	3.12	15.10	0.00	0.11	1.56	0.11	0.00	0.00	0.00	27.3	14.0	50.1	14.2	41.4	442
Khlong Thom (Km_top)	3.8	992	1.85	2.57	0.00	0.10	0.10	0.00	0.00	0.00	0.00	17.2	19.4	23.2	13.3	29.3	398
Khlong Thom (Km_sub)	20.7	968	2.73	7.88	0.00	0.11	0.42	0.00	0.00	0.00	0.00	17.7	31.9	32.0	13.0	21.7	292
Kho Hong (Kh1_top)	20.9	969	1.34	5.05	0.10	0.31	3.40	0.00	0.00	0.10	0.00	4.3	11.3	26.1	16.9	58.0	836
Kho Hong (Kh1_sub)	33.9	954	1.87	7.07	0.00	0.31	3.33	0.00	0.00	0.00	0.00	34.0	11.2	26.2	29.1	57.5	801

Appendix Table 10 (Continued)

Series	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	CaO	K_2O	MgO	Na_2O	P_2O_5	SO_3	V	Cr	Ni	Zn	Y	Zr
	(----------g kg^{-1} ----------)											(----------mg kg^{-1}----------)					
Land condition: Uplands																	
Kho Hong (Kh2_top)	44.0	942	3.32	8.63	0.00	0.11	1.33	0.00	0.00	0.11	0.00	25.0	0.0	27.4	28.1	37.7	368
Kho Hong (Kh2_sub)	61.4	923	3.54	10.40	0.00	0.11	1.71	0.00	0.00	0.00	0.00	21.3	5.3	34.7	27.8	33.4	300
Klong Nok Krathung (Knk_top)	96.7	838	3.30	9.05	0.11	0.43	50.80	0.11	1.60	0.21	0.00	10.3	0.0	59.4	33.8	45.2	520
Klong Nok Krathung (Knk_sub)	129.0	797	4.09	16.20	0.12	0.50	49.90	1.24	2.11	0.12	0.00	42.3	0.0	28.5	41.9	42.2	433
Krabi (Kbi_top)	241.0	610	14.20	97.20	1.98	1.19	25.40	8.33	0.00	0.93	0.40	157.0	112.0	96.0	97.6	46.9	449
Krabi (Kbi_sub)	277.0	555	14.30	111.00	5.29	1.19	26.50	9.53	0.00	0.66	0.26	161.0	96.2	83.1	100.0	55.1	385
Na Tawi (Nat_top)	34.4	951	3.12	8.68	0.00	0.11	1.78	0.11	0.00	0.33	0.00	18.2	17.5	30.0	26.3	36.4	377
Na Tawi (Nat_sub)	53.7	928	3.69	11.60	0.00	0.11	2.46	0.00	0.00	0.22	0.00	31.0	10.2	25.2	34.8	39.4	397
Na Tham (Ntm_top)	42.8	940	3.98	12.40	0.00	0.11	0.66	0.00	0.00	0.11	0.00	22.8	45.2	1.5	30.4	35.5	512
Na Tham (Ntm_sub)	93.9	873	6.14	25.10	0.00	0.12	1.50	0.23	0.00	0.12	0.00	65.3	45.5	41.9	34.0	37.2	523
Nong Khla (Nok_top)	158.0	702	8.06	109.00	0.37	1.36	16.40	4.96	0.00	0.37	0.25	115.0	73.5	67.4	48.2	40.8	401
Nong Khla (Nok_sub)	195.0	652	9.09	117.00	0.25	0.61	18.30	6.02	0.00	0.49	0.86	131.0	139.0	42.4	67.6	40.6	377
Padang Besar (Pad_top)	29.4	951	1.96	16.90	0.00	0.12	0.69	0.12	0.00	0.12	0.00	25.0	0.00	38.3	10.5	36.9	340
Padang Besar Pad_sub	88.2	876	4.17	29.30	0.12	0.12	1.96	0.00	0.00	0.12	0.00	44.7	17.0	23.9	29.7	38.3	387
Pak Chan (Pac_top)	75.7	868	12.30	34.30	0.35	0.23	6.45	2.30	0.00	0.23	0.12	84.0	41.0	12.2	31.3	49.5	517
Pak Chan Pac_sub	126.0	796	14.70	48.20	0.00	0.23	10.30	5.05	0.00	0.12	0.00	98.0	33.4	25.2	39.7	53.4	459
Pathio (Ptu_top)	45.3	931	4.05	17.30	0.32	1.17	0.64	0.00	0.00	0.21	0.00	51.5	40.5	20.7	33.2	31.5	288
Pathio (Ptu_sub)	115.0	837	5.83	40.40	0.20	0.61	0.92	0.00	0.00	0.31	0.00	110.0	36.4	35.1	25.9	34.4	308
Phangnga (Pga_top)	92.9	845	3.51	5.81	0.00	0.55	50.10	0.55	1.65	0.22	0.00	26.4	0.0	29.1	19.0	46.0	603

Appendix Table 10 (Continued)

Series	Al_2O_3	SiO_2	TiO_2	Fe_2O_3	MnO	CaO	K_2O	MgO	Na_2O	P_2O_5	SO_3	V	Cr	Ni	Zn	Y	Zr
	(----------g kg^{-1} ----------)											(----------mg kg^{-1}----------)					
Land condition: Uplands																	
Phangnga (Pga_sub)	150.0	775	5.33	14.00	0.00	0.59	51.80	0.95	2.13	0.24	0.00	37.3	11.8	0.7	35.7	55.8	589
Phato (Pto_top)	13.7	980	1.72	3.91	0.00	0.11	0.46	0.00	0.00	0.11	0.00	36.7	0.0	26.9	22.2	13.4	161
Phato (Pto_sub)	29.3	959	2.32	8.45	0.00	0.11	0.95	0.00	0.00	0.11	0.00	23.2	0.9	32.0	2.8	20.1	234
Phuket (Pk_top)	58.9	902	5.30	26.00	0.13	0.52	4.78	1.55	0.00	0.39	0.13	45.0	12.0	41.2	27.0	26.8	326
Phuket (Pk_sub)	206.0	670	8.20	100.00	0.13	0.25	10.80	4.54	0.00	0.25	0.38	148.0	59.3	37.0	34.0	43.7	405
Sawi (Sw_top)	34.1	939	7.79	15.00	0.11	0.23	2.6	0.68	0.00	0.23	0.11	56.1	32.8	8.64	33.5	39.7	478
Sawi (Sw_sub)	85.6	865	12.70	27.20	0.21	0.11	6.3	2.35	0.00	0.21	0.00	79.6	35.6	5.31	21.6	49.5	470
Tha Sae (Te_top)	55.0	919	4.57	17.40	0.45	1.56	1.34	0.22	0.00	0.11	0.00	43.1	26.9	49.7	33.3	43.5	451
Tha Sae (Te_sub)	61.5	918	4.76	14.20	0.00	0.43	1.30	0.11	0.00	0.11	0.00	55.7	31.2	37.9	29.6	34.6	441
Wang Tong (Wat_top)	62.5	899	5.38	22.30	0.00	2.40	5.15	3.09	0.00	0.23	0.00	58.3	29.0	32.4	29.4	35.4	460
Wang Tong (Wat_sub)	54.7	896	4.04	26.70	0.44	1.31	13.50	2.62	0.00	0.22	0.00	48.2	32.2	30.3	22.7	29.4	317
Yala (Ya_top)	42.0	942	3.08	11.10	0.00	0.11	1.65	0.00	0.00	0.11	0.00	54.7	10.5	20.0	9. 9	28.0	340
Yala (Ya_sub)	67.5	906	3.75	19.90	0.12	0.12	2.69	0.00	0.00	0.23	0.00	47.1	14.2	35.9	26.3	20.4	258

1/ Topsoil (0-50 cm)
2/ Subsoils (50-100 cm)
* High bases

Appendix Table 11 Trace element concentrations in Thai Alfisols

Series	Li	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Mo	Cs	Pb	Bi	U
	(----------mg kg^{-1}----------)																		
Land condition: Lowlands																			
Doem Bang (Db_top[1/])	14.10	1.36	14.2	27.00	366.0	4.68	10.30	8.52	15.4	8.92	4.12	0.04	52.60	12.90	0.24	5.20	13.96	0.32	2.96
Doem Bang (Db_sub[2/])	32.40	3.32	33.5	50.80	967.0	13.20	23.80	15.80	25.9	17.90	10.10	0.01	91.90	17.60	0.24	10.76	30.23	0.52	10.92
Khao Yoi (Kyo_top)	4.44	0.52	6.64	12.00	280.0	5.96	7.08	21.50	25.3	5.36	0.12	0.01	8.80	21.00	0.08	0.64	5.92	0.01	0.84
Khao Yoi (Kyo_sub)	5.23	0.36	27.30	15.30	294.0	7.51	8.99	15.30	13.8	7.99	0.92	0.01	10.80	20.00	0.16	0.76	2.92	0.04	0.68
Manorom (Mn_top)	16.80	1.64	19.80	26.60	185.0	5.00	10.80	10.40	19.20	8.60	3.00	0.01	49.50	8.92	0.16	5.12	14.90	0.36	3.00
Manorom (Mn_sub)	53.80	3.08	38.10	59.00	89.3	6.47	26.70	19.40	33.50	23.30	5.76	0.01	124.00	9.03	0.28	15.0	23.10	0.72	5.68
Nakhon Pathom (Np_top)	17.10	2.00	22.80	25.80	587.0	9.84	17.90	16.30	49.90	12.30	10.20	0.08	51.30	26.40	0.28	4.92	26.30	0.76	1.96
Nakhon Pathom (Np_sub)	25.90	3.16	35.30	37.10	541.0	12.30	27.30	21.40	67.80	13.20	18.80	0.40	81.70	17.60	0.80	8.43	34.40	1.16	2.88
Hang Dong (Hd_top)	13.60	0.85	97.80	22.50	322.0	10.60	8.33	7.87	39.10	11.20	5.41	0.01	18.30	11.9	0.22	2.95	16.55	0.13	0.61
Hang Dong (Hd_sub)	16.70	1.25	101.00	22.20	361.0	12.60	10.40	8.66	41.8	12.70	6.81	0.22	25.00	12.6	0.22	5.50	18.68	0.18	0.68
Phan (Ph1_top)	7.20	0.33	17.30	15.60	87.7	3.86	6.28	10.70	15.70	4.80	2.01	0.26	14.00	14.40	0.45	1.49	5.68	0.12	0.47
Phan (Ph1_sub)	8.98	0.28	25.80	19.10	22.8	2.54	6.26	7.70	11.20	5.50	1.52	0.25	14.70	16.80	0.26	1.55	5.20	0.10	0.71
Phan (Ph2_top)	16.30	0.62	12.50	16.80	64.5	5.42	10.30	12.00	26.60	6.50	0.73	0.01	19.30	8.72	0.13	3.30	11.34	0.19	0.78
Phan (Ph2_sub)	15.70	0.56	38.30	22.40	75.9	5.83	9.00	11.50	20.20	6.20	3.78	0.03	17.30	6.65	0.20	2.62	11.43	0.18	0.82
Phan (Ph3_top)	12.80	0.68	24.10	19.00	139.0	5.03	11.00	15.30	41.40	6.20	4.08	0.24	21.10	11.00	0.20	2.84	12.15	0.20	0.60
Phan (Ph3_sub)	22.00	1.36	24.00	30.10	857.0	16.30	21.20	25.40	76.00	12.00	9.84	0.04	35.80	23.80	0.56	5.80	18.92	0.28	0.80
Phan (Ph4_top)	19.10	1.44	26.00	36.20	279.0	6.12	13.60	11.50	16.20	11.30	4.08	0.01	43.80	8.92	0.20	6.68	15.67	0.32	3.08
Phan (Ph4_sub)	28.50	2.60	38.80	48.40	599.0	10.00	21.80	17.80	23.80	17.70	5.56	0.01	61.80	14.60	0.12	8.76	25.39	0.44	4.40
San Sai (Sai_top)	7.39	0.60	13.00	13.70	152.0	2.76	6.99	6.95	13.70	3.72	1.96	0.04	20.50	4.40	0.08	1.28	6.15	0.16	1.04
San Sai (Sai_sub)	7.24	0.36	13.70	9.88	152.0	1.76	4.64	6.72	10.30	3.56	1.64	0.01	25.00	3.48	0.08	2.04	4.76	0.24	0.88

Appendix Table 11 (Continued)

Series	Li	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Mo	Cs	Pb	Bi	U
	(----------mg kg^{-1}----------)																		
Land condition: Lowlands																			
Mae Sai (Ms_top)	20.00	1.41	58.00	35.20	904.0	22.60	24.80	42.00	73.30	14.10	6.96	0.25	36.00	34.70	1.19	2.96	22.80	0.19	1.50
Mae Sai (Ms_sub)	31.40	1.74	57.70	34.90	891.0	24.50	35.80	50.10	79.40	18.10	5.77	0.32	34.40	72.90	0.34	1.77	18.40	0.13	1.31
Lampang (Lp_top)	17.20	1.64	21.00	24.60	727.0	8.80	8.48	9.72	22.40	9.24	1.60	0.08	46.90	6.80	0.08	3.40	20.55	0.24	5.64
Lampang (Lp_sub)	32.40	2.84	3.08	23.70	177.0	7.04	17.80	16.40	42.60	8.16	0.40	0.01	79.90	7.30	0.04	6.00	22.11	0.28	6.56
Tha Tum (Tt_top)	21.20	1.48	51.70	34.30	813.0	14.40	18.80	15.80	47.50	12.30	3.08	0.08	36.90	14.10	0.16	2.48	21.20	0.08	1.60
Tha Tum (Tt_sub)	26.10	1.28	50.50	32.90	481.0	11.00	23.60	12.90	47.40	14.40	1.60	0.20	40.20	20.80	0.36	2.96	13.70	0.16	1.00
La-ngu (Lgu_top)	13.70	2.52	5.12	17.50	327.0	8.00	11.20	10.20	37.80	8.44	1.32	0.56	37.80	7.00	0.08	3.12	34.64	0.16	5.84
La-ngu (Lgu_sub)	19.70	2.56	36.10	23.50	616.0	10.30	12.20	8.08	31.60	14.10	8.08	0.04	50.60	7.00	0.52	7.64	33.75	1.00	5.80
Land condition: Uplands																			
Pran Buri (Pr_top)	10.20	0.84	15.30	18.20	637.0	9.64	14.30	12.40	38.40	7.28	4.20	0.28	27.60	12.40	0.24	1.40	12.70	0.20	0.40
Pran Buri (Pr_sub)	9.47	0.76	15.80	18.20	625.0	10.10	13.60	11.40	31.40	7.15	4.68	0.08	28.30	10.80	0.20	1.36	13.40	0.20	0.24
Thap khwang (Tw_top)	1.28	0.12	19.40	20.60	432.0	4.72	6.76	17.60	19.20	3.72	10.90	0.12	6.20	8.88	0.28	0.88	7.80	0.12	0.28
Thap khwang (Tw_sub)	1.64	0.20	33.00	37.00	89.7	1.60	5.35	23.80	15.80	5.11	15.60	0.44	6.75	2.88	0.36	0.92	6.63	0.16	0.28
Kamphaeng Sean (Ks_top)	22.60	2.64	29.10	33.60	973.0	14.20	26.30	19.20	71.90	11.90	17.30	0.44	62.60	15.10	0.24	6.16	34.96	0.52	2.20
Kamphaeng Sean (Ks_sub)	27.40	3.16	32.50	37.50	777.0	14.20	27.80	20.80	71.50	13.40	18.60	0.08	85.40	15.10	0.68	8.47	34.85	1.16	2.36
Phetchaburi (Pb_top)	5.27	0.64	7.75	18.40	601.0	7.47	10.00	5.99	18.10	3.84	3.68	0.08	18.10	5.15	0.20	1.72	8.19	0.12	0.32
Phetchaburi (Pb_sub)	8.80	0.92	14.4	21.70	463.0	8.68	11.60	7.84	21.80	5.56	4.32	0.01	27.00	6.16	0.24	2.64	11.60	0.16	0.32
Wichain Buri (Wb_top)	0.84	0.08	15.80	13.90	54.1	1.24	2.04	3.60	4.96	1.56	0.60	0.01	2.44	4.00	0.08	0.20	1.40	0.04	0.16
Wichain Buri (Wb_sub)	1.36	0.20	15.80	12.70	90.9	4.68	7.28	3.04	2.12	1.16	0.68	0.01	2.84	2.52	0.04	0.28	1.12	0.04	0.36

Appendix Table 11 (Continued)

Series	Li	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Mo	Cs	Pb	Bi	U
	(----------mg kg^{-1}----------)																		
Land condition: Uplands																			
Muak Lek (Ml_top)	12.50	0.80	4.92	11.30	886.0	16.30	29.50	12.90	68.50	6.20	2.16	0.01	33.60	21.60	0.08	2.32	10.20	0.12	0.20
Muak Lek (Ml_sub)	17.40	1.36	7.36	40.00	1134.0	20.30	36.40	27.80	64.90	13.10	6.20	0.04	50.00	18.30	0.08	4.08	23.70	0.20	0.64
Kamphaeng Phet (Kp_top)	25.90	2.52	0.72	3.60	1629.0	15.30	33.30	16.70	77.60	5.56	2.48	0.24	72.80	18.50	0.08	4.72	22.98	0.16	2.12
Kamphaeng Phet (Kp_sub)	20.30	1.80	10.20	29.90	543.0	7.56	17.30	13.20	46.00	9.76	9.60	0.01	60.70	10.70	0.28	6.12	15.23	0.56	2.88
Li (Li_top)	43.70	2.10	315.00	454.0	2236.0	18.00	43.00	22.80	140.00	23.40	58.50	0.54	6.90	12.30	1.24	6.95	20.55	0.51	2.01
Li (Li_sub)	44.90	1.82	339.00	309.0	2062.0	18.60	41.20	23.00	139.00	23.70	61.00	0.23	6.00	11.80	1.33	6.73	21.38	0.51	2.31
Phayao (Pao_top)	6.62	0.22	42.30	42.20	48.9	3.01	9.15	6.99	11.90	7.26	3.00	0.36	26.80	2.45	0.47	3.10	5.82	0.17	0.36
Phayao (Pao_sub)	10.00	0.34	33.20	33.50	36.6	2.94	12.80	9.71	15.90	9.73	1.63	0.10	34.30	3.59	0.43	3.91	6.44	0.21	0.44
Khambong (Kg_top)	0.88	0.09	0.02	9.90	262.0	1.19	2.71	3.74	7.20	2.27	0.79	0.11	10.00	3.70	0.22	1.71	7.18	0.06	0.36
Khambong (Kg_sub_	1.53	0.08	14.10	13.00	88.0	0.85	3.27	3.79	8.90	3.46	0.59	0.01	16.50	4.40	0.12	2.58	8.71	0.06	0.45
Wang Hai (Wi_top)	4.00	0.32	15.90	22.20	139.0	3.72	5.88	2.64	7.20	3.56	1.04	0.01	14.60	2.12	0.12	0.80	3.24	0.08	0.12
Wang Hai (Wi_sub)	8.84	0.76	27.90	27.90	225.0	6.36	12.10	4.72	10.80	7.08	1.68	0.08	23.90	3.28	0.20	1.40	5.44	0.12	0.16
Loei (Lo1_top)	3.16	0.29	107.00	46.60	1067.0	21.10	8.68	14.50	27.40	11.80	1.74	0.23	10.40	11.00	0.82	0.70	9.42	0.09	0.82
Loei (Lo1_sub)	4.55	0.42	135.00	49.10	708.0	19.20	11.80	18.00	34.50	15.90	1.80	0.13	13.00	8.10	0.53	1.26	8.66	0.13	0.99
Loei (Lo2_top)	4.51	0.51	52.80	26.40	752.0	14.80	8.14	10.10	28.20	17.80	1.21	0.18	15.30	37.50	0.10	1.66	10.60	0.06	1.65
Loei (Lo2_sub)	6.70	0.62	78.50	31.60	589.0	15.80	11.30	10.20	29.20	17.60	1.57	0.19	17.90	26.40	0.25	2.40	10.90	0.09	1.63
Wang Saphung (Ws_top)	8.89	0.91	43.90	25.00	1085.0	28.40	20.20	53.30	56.00	10.30	2.78	0.49	14.20	41.40	0.80	0.59	16.9	0.05	1.67
Wang Saphung (Ws_sub)	11.5	0.88	61.50	30.20	496.0	18.00	19.10	53.70	40.70	11.90	5.10	0.29	20.50	35.30	1.69	1.58	13.10	0.15	1.51
Chatturat (Ct_top)	34.60	3.72	35.80	56.70	1349.0	15.70	36.50	31.00	43.90	15.80	45.50	0.01	90.6	14.80	0.24	13.87	28.63	0.60	1.20
Chatturat (Ct_sub)	36.60	3.76	37.70	57.20	1393.0	15.90	39.70	31.10	43.90	17.00	47.40	0.01	92.9	14.90	0.28	14.35	28.59	0.60	1.20

Appendix Table 11 (Continued)

Series	Li	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Mo	Cs	Pb	Bi	U
	(----------mg kg^{-1}----------)																		
Land condition: Uplands																			
Nam Pong (Ng_top)	0.22	0.05	10.80	6.96	51.0	0.93	1.28	2.14	2.42	0.80	0.73	0.08	3.70	1.80	4.15	0.46	2.50	0.03	0.10
Nam Pong (Ng_sub)	0.38	0.05	12.80	8.39	8.5	0.35	1.77	1.58	1.84	0.90	0.72	0.01	5.40	1.24	0.20	0.69	2.57	0.05	0.11
Sikhiu (Si_top)	28.00	2.08	175.00	282.00	1068.0	22.40	56.40	28.70	66.80	17.60	52.80	0.01	13.40	15.40	2.64	1.40	17.40	0.28	0.88
Sikhiu (Si_sub)	36.50	2.28	206.00	282.00	608.0	16.50	52.00	32.60	27.10	20.40	57.60	0.01	7.72	12.10	2.56	1.52	19.40	0.32	0.76
Phak Kat (Pat_top)	42.40	3.60	46.00	34.40	457.0	13.70	20.90	13.20	65.70	15.30	22.60	0.04	52.10	9.51	0.16	8.03	29.94	0.76	5.08
Phak Kat (Pat_sub)	37.70	2.72	32.10	25.80	363.0	8.67	13.70	9.91	43.70	11.50	36.70	0.32	42.90	6.87	0.44	9.99	24.54	0.88	4.12

1/ Topsoil (0-50 cm)
2/ Subsoils (50-100 cm)

Appendix Table 12 Trace element concentrations in Thai Ultisols

Series	Li	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Mo	Cs	Pb	Bi	U
	(----------mg kg^{-1}----------)																		
Land condition: Lowlands																			
Hin Kong (Hk_top[1/])	3.60	0.28	16.50	5.15	93.2	1.52	2.24	3.36	7.67	3.04	1.00	0.01	16.30	5.07	0.04	1.96	6.43	0.04	0.76
Hin Kong (Hk_sub[2/])	11.60	0.76	34.60	10.80	96.4	3.48	6.84	3.60	7.08	8.88	1.72	0.01	31.80	12.50	0.04	5.32	8.20	0.08	1.16
Pak Tho (Pth_top)	12.60	1.04	8.95	21.80	140.0	3.00	8.99	6.35	12.00	6.99	1.60	0.08	45.70	6.35	0.12	4.44	9.43	0.24	2.40
Pak Tho (Pth_sub)	9.04	0.72	0.02	16.00	103.0	2.16	6.32	4.76	8.36	4.92	1.32	0.01	34.40	4.40	0.12	3.36	6.76	0.16	1.80
Si Thep (Sri_top)	0.26	0.03	0.02	3.18	131.0	1.09	0.86	2.08	3.02	0.67	0.22	0.04	0.89	1.02	0.21	0.33	2.69	0.02	0.09
Si Thep (Sri_sub)	0.05	0.01	0.81	3.65	16.4	0.35	0.48	1.16	2.89	0.39	0.11	0.01	0.35	0.70	0.10	0.17	1.52	0.02	0.05
Klaeng (Kl_top)	4.86	0.17	0.02	6.11	83.8	0.76	2.33	5.63	7.55	3.75	1.70	0.01	4.09	4.00	0.29	5.19	8.56	0.26	1.37
Klaeng (Kl_sub)	7.82	0.15	1.58	10.70	43.9	0.75	3.38	5.60	7.23	6.16	2.27	0.42	6.99	4.54	0.32	5.98	9.66	0.32	1.27
On (On_top)	3.60	0.20	63.30	12.30	74.1	2.04	2.88	5.92	5.24	3.32	5.24	0.01	10.20	4.80	0.28	2.20	4.60	0.04	0.68
On (On_sub)	8.11	0.48	90.50	17.30	273.0	5.56	4.76	11.40	10.30	7.63	6.43	0.01	23.30	10.80	0.40	4.84	10.20	0.08	1.32
Chiang Rai (Cr1_top)	6.08	0.52	28.90	19.20	168.0	5.28	6.32	9.12	15.50	4.60	2.64	0.12	10.50	10.20	0.04	0.72	7.52	0.12	0.72
Chiang Rai (Cr1_sub)	12.40	0.80	42.80	32.80	577.0	11.00	11.80	17.00	26.40	8.40	5.72	0.01	21.20	15.00	0.32	1.92	14.00	0.20	1.36
Chiang Rai (Cr2_top)	10.20	0.96	32.30	43.00	294.0	5.72	10.50	10.30	19.30	8.83	15.60	0.28	29.70	1.88	0.32	5.04	29.60	0.28	0.24
Chiang Rai (Cr2_sub)	15.00	1.64	14.80	28.30	405.0	5.28	13.30	9.32	17.70	10.20	2.68	0.04	49.00	12.60	0.12	5.08	16.40	0.16	3.76
Phen (Pn_top)	3.12	0.36	27.00	24.50	429.0	9.52	6.96	5.20	7.56	4.52	0.44	0.08	5.80	3.52	0.08	0.48	2.52	0.04	0.32
Phen (Pn_sub)	3.96	0.56	25.00	28.00	285.0	9.44	7.20	5.16	7.52	7.12	0.44	0.04	8.00	1.76	0.16	0.80	3.28	0.04	0.36
Renu (Rn1_top)	3.76	0.08	1.72	8.68	55.3	1.16	2.48	2.84	4.72	2.28	0.60	0.28	1.72	1.52	0.12	0.68	3.68	0.04	0.28
Renu (Rn1_sub)	10.20	0.24	21.40	18.00	23.0	3.28	6.60	2.52	3.72	6.08	0.36	0.08	3.72	3.76	0.03	1.84	5.40	0.08	0.52
Renu (Rn2_top)	7.64	0.36	20.50	30.60	96.1	3.72	5.76	7.56	11.60	4.68	3.84	0.01	21.10	4.16	0.28	1.56	5.72	0.16	0.68
Renu (Rn2_sub)	17.30	1.12	34.80	37.90	412.0	5.52	13.40	16.90	22.60	9.92	11.50	0.01	46.50	4.24	0.68	3.32	17.20	0.24	1.60

Appendix Table 12 (Continued)

Series	Li	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Mo	Cs	Pb	Bi	U
	(----------mg kg^{-1}----------)																		
Land condition: Lowlands																			
Roi Et (Re_top)	1.43	0.06	0.68	7.92	133.0	1.18	1.98	3.30	4.82	2.04	0.56	0.01	3.75	1.83	0.22	1.10	8.21	0.05	0.38
Roi Et (Re_sub)	1.58	0.05	6.39	9.26	35.3	0.78	1.86	4.28	4.38	2.34	0.45	0.04	4.19	2.74	0.26	1.31	8.12	0.06	0.35
Bang Nara (Ba_top)	29.20	3.92	23.30	21.20	480.0	9.88	12.90	11.80	54.50	17.30	10.40	0.84	80.00	8.76	0.60	13.9	53.40	1.92	13.10
Bang Nara (Ba_sub)	45.90	5.00	39.30	31.30	350.0	12.30	19.00	15.10	69.80	25.50	13.10	0.40	97.30	8.63	0.76	19.4	64.00	2.52	17.60
Khok Khain (Ko_top)	2.84	0.32	35.00	23.70	58.0	0.40	2.68	2.48	6.00	8.87	11.40	0.48	19.80	1.76	0.36	6.67	8.91	0.80	0.64
Khok Khain (Ko_sub)	9.99	1.24	13.90	6.59	290.0	3.28	3.20	3.64	11.20	5.84	2.72	0.32	26.10	3.20	0.08	3.68	19.00	0.64	5.56
Phatthalung (Ptl_top)	12.60	1.16	26.90	21.20	375.0	5.00	7.75	8.39	23.90	8.91	3.76	0.36	34.90	5.68	0.32	3.92	23.60	0.60	3.16
Phatthalung (Ptl_sub)	25.80	2.24	48.60	37.60	1155.0	18.92	16.7	13.00	42.30	15.80	8.92	0.52	51.90	6.40	0.16	5.44	38.40	0.72	5.36
Sungai Padi (Pi_top)	3.88	0.20	38.10	45.30	694.0	5.39	9.49	17.80	29.00	8.18	7.32	0.33	16.40	7.69	0.90	18.9	15.4	0.34	0.51
Sungai Padi (Pi_sub)	2.30	0.08	15.00	26.20	23.1	1.14	4.33	3.26	5.85	6.08	2.77	0.40	15.10	3.18	0.79	11.9	5.97	0.23	0.20
Visai (Vi_top)	11.40	0.88	34.20	19.20	87.1	4.20	9.36	5.88	19.30	5.68	7.04	0.01	13.30	8.08	0.16	0.52	10.1	0.12	0.52
Visai (Vi_sub)	14.00	0.48	31.20	18.00	16.2	2.76	6.56	2.44	13.10	5.12	2.80	0.01	18.20	10.80	0.12	1.08	7.64	0.08	0.44
Yan Ta Khao (Yk_top)	16.30	0.48	20.90	18.10	67.8	3.64	7.64	5.20	14.10	5.88	4.12	0.20	22.60	9.68	0.20	4.20	9.20	0.12	0.36
Yan Ta Khao (Yk_sub)	25.30	0.92	29.70	24.90	43.0	4.80	13.00	8.39	18.70	8.51	4.52	0.16	26.60	15.50	0.08	4.52	14.20	0.08	0.60
Land condition: Upland																			
Bang Khla (Bka_top)	1.60	0.12	8.04	14.80	149.0	1.16	4.16	4.56	8.16	4.28	0.64	0.01	3.56	1.96	0.36	1.56	3.72	0.56	0.76
Bang Khla (Bka_sub)	2.72	0.16	17.20	23.60	65.0	1.04	5.96	4.40	8.04	7.00	0.36	0.01	4.08	2.60	0.08	1.88	6.12	0.56	1.16
Don Rai (Dr_top)	1.52	0.08	7.40	35.50	263.0	1.72	3.12	4.08	6.40	3.84	2.68	0.01	4.40	1.48	0.52	2.52	4.48	0.24	0.20
Don Rai (Dr_sub)	3.28	0.12	3.76	38.40	37.8	1.08	4.84	4.64	7.96	7.12	1.08	0.01	7.08	2.04	0.52	4.40	3.96	0.28	0.32

Appendix Table 12 (Continued)

Series	Li	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Mo	Cs	Pb	Bi	U
	(----------mg kg^{-1}----------)																		
Land condition: Uplands																			
Lat Ya (Ly_top)	11.70	1.28	29.70	38.60	1505.0	16.30	18.70	24.40	28.20	8.56	30.60	0.56	43.20	8.12	1.28	3.40	30.10	0.88	2.44
Lat Ya (Ly_sub)	15.20	1.68	32.30	34.80	1490.0	17.00	21.20	26.80	31.80	10.60	25.70	0.28	51.10	17.70	0.40	3.36	21.60	0.64	2.16
Tha Yang (Ty_top)	9.15	1.00	14.60	22.50	467.0	8.87	12.00	8.24	22.20	5.72	4.64	0.01	27.70	6.28	0.28	2.80	11.9	0.16	0.32
Tha Yang (Ty_sub)	20.5	0.32	19.90	18.90	26.0	1.16	4.08	3.56	8.36	7.68	8.64	0.16	26.90	3.92	0.16	11.5	11.9	0.32	0.72
Kabib Buri (Kb1_top)	3.28	0.16	169.00	124.00	1923.0	11.3	14.80	27.00	27.80	15.70	12.80	0.01	11.10	4.12	0.92	1.84	9.28	0.20	0.40
Kabib Buri (Kb1_sub)	4.52	0.16	100.00	82.80	780.0	7.40	16.50	34.00	27.50	17.00	10.70	0.01	11.50	3.76	0.36	1.48	6.64	0.04	0.44
Kabib Buri (Kb2_top)	2.72	0.12	3.88	21.60	174.0	1.68	10.80	10.70	12.50	6.24	0.48	0.01	7.68	5.40	0.12	2.00	7.28	0.04	0.32
Kabib Buri (Kb2_sub)	6.04	0.28	219.00	162.00	131.0	3.04	18.10	30.30	22.80	18.20	35.80	0.01	11.20	3.92	2.20	3.00	19.60	0.52	1.12
Khlong Chak (Kc_top)	4.32	0.20	123.00	178.00	2187.0	23.00	22.80	49.40	27.10	15.90	9.12	0.16	15.60	3.72	1.56	1.20	18.60	0.16	0.60
Khlong Chak (Kc_sub)	3.88	0.20	204.00	137.00	1617.0	10.50	19.60	51.00	23.40	19.20	12.90	0.01	22.00	2.76	1.16	2.92	22.40	0.28	0.64
Mab Bon (Mb_top)	0.64	0.05	10.90	5.16	190.0	3.07	2.02	3.31	9.03	1.53	0.33	0.01	2.41	5.46	0.16	0.50	4.59	0.04	0.51
Mab Bon (Mb_sub)	0.12	0.02	0.02	5.70	28.8	0.51	0.77	1.49	1.38	0.59	0.47	0.01	0.89	0.60	0.22	0.27	2.51	0.05	0.39
Ban Chong (Bg_top)	20.00	0.75	98.90	123.00	656.0	21.90	29.00	36.30	54.00	19.20	10.60	0.25	39.10	7.60	1.31	4.39	22.00	0.54	0.73
Ban Chong (Bg_sub)	22.10	0.72	96.80	77.40	375.0	15.30	29.00	41.20	57.10	20.70	10.50	0.27	45.30	8.02	1.32	5.53	20.10	0.52	0.73
Ban Chong-high bases (Bg-hb*_top)	24.50	0.67	44.70	34.80	409.0	11.90	21.30	25.10	50.90	10.60	6.70	0.16	27.40	8.98	0.50	3.95	14.30	0.28	0.45
Ban Chong-high bases (Bg-hb*_sub)	28.40	0.76	25.90	49.00	236.0	9.53	25.40	32.50	68.50	11.30	4.59	0.14	29.70	9.38	0.58	3.53	16.80	0.06	0.60
Doi Pui (Dp_top)	48.60	3.19	63.70	102.0	566.0	16.60	49.30	42.20	123.0	36.00	15.80	0.01	84.20	8.62	0.72	21.0	47.50	2.07	5.94
Doi Pui (Dp_sub)	36.70	3.21	71.70	99.1	436.0	10.60	48.00	45.10	129.0	36.20	13.90	0.18	57.60	6.40	0.57	16.9	62.60	2.13	7.34
Hang Chat (Hc_top)	3.62	0.17	82.70	76.80	303.0	6.17	5.81	9.41	10.80	5.44	7.61	0.19	4.87	5.74	1.24	0.75	11.10	0.05	0.68
Hang Chat (Hc_sub)	8.09	0.15	77.60	67.30	187.0	4.02	8.32	11.30	10.20	7.74	5.90	0.13	6.91	8.79	0.53	1.25	7.75	0.12	0.63

Appendix Table 12 (Continued)

Series	Li	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Mo	Cs	Pb	Bi	U
	(----------mg kg^{-1}----------)																		
Land condition: Uplands																			
Chiang Khan (Ch1_top)	3.96	0.24	19.80	12.50	38.0	1.28	2.96	7.56	14.40	6.00	13.20	0.44	20.80	3.60	0.28	1.24	13.90	0.20	1.00
Chiang Khan Ch1_sub	6.68	0.32	33.00	19.20	22.2	1.92	3.76	12.30	15.20	9.60	21.90	0.60	27.30	3.60	0.28	2.40	19.20	0.36	1.72
Chiang Khan (Ch2_top)	12.10	1.12	0.02	33.20	983.0	21.60	24.40	19.10	29.00	8.32	0.52	0.32	33.80	10.80	0.04	2.00	19.40	0.04	0.44
Chiang Khan(Ch2_sub)	26.70	2.28	40.30	68.40	2184.0	51.50	66.70	49.10	37.70	19.20	26.60	0.01	52.90	15.10	0.88	3.40	86.90	0.36	1.28
Dan Sai (Ds_top)	6.90	0.40	16.40	21.80	319.0	8.68	7.51	10.30	53.20	4.63	5.78	0.04	25.50	9.36	0.22	2.76	9.15	0.22	0.41
Dan Sai (Ds_sub)	14.40	0.63	30.50	37.80	379.0	12.60	16.20	15.60	75.20	8.44	7.63	0.01	43.10	11.00	0.16	4.70	13.10	0.24	0.57
Korat (Kt1_top)	0.41	0.03	1.27	19.08	201.0	0.59	0.95	1.92	2.75	0.83	0.87	0.01	2.29	2.30	0.26	0.54	1.82	0.04	0.07
Korat (Kt1_sub)	0.27	0.02	0.60	18.71	110.0	0.39	0.84	1.69	1.58	0.71	0.76	0.01	1.72	0.93	0.22	0.46	1.37	0.04	0.06
Korat (Kt2_top)	0.31	0.03	0.02	2.09	51.9	0.60	0.94	2.31	6.16	0.90	0.36	0.01	1.75	3.55	0.11	0.32	2.69	0.03	0.21
Korat (Kt2_sub)	0.26	0.02	0.02	2.32	25.7	0.33	0.85	1.46	1.19	0.86	0.22	0.01	1.41	0.68	0.10	0.30	1.97	0.03	0.11
Korat (Kt3_top)	0.64	0.08	18.60	5.71	52.1	0.65	1.12	1.77	2.36	1.36	3.52	0.01	5.35	0.91	1.40	0.42	11.20	0.06	0.12
Korat (Kt3_sub)	2.02	0.15	11.60	8.65	10.8	0.83	2.22	2.51	6.94	3.08	2.69	0.01	13.60	1.90	0.28	1.15	16.80	0.07	0.26
Mae Rim (Mr_top)	0.76	0.12	16.90	12.70	57.4	1.52	4.52	5.56	3.24	2.48	11.50	0.04	9.44	2.96	0.28	0.52	6.08	0.08	0.28
Mae Rim (Mr_sub)	0.48	0.12	4.40	7.91	199.0	2.84	6.87	6.47	4.76	1.96	4.28	0.08	8.31	3.36	0.20	0.44	8.19	0.08	0.28
Mae Taeng (Mt_top)	21.60	3.36	10.60	34.60	697.0	10.90	31.80	10.90	29.90	20.70	2.52	0.04	101.00	14.90	0.08	11.50	25.50	0.44	5.48
Mae Taeng (Mt_sub)	16.00	1.04	20.20	43.60	188.0	4.84	14.00	12.00	22.00	11.60	18.80	0.04	41.00	1.88	1.08	9.80	27.60	0.44	0.24
Nong Mot (Nm_top)	1.00	0.04	11.70	7.72	118.0	1.16	2.64	2.56	4.76	3.24	1.64	0.01	5.08	2.20	0.44	1.76	3.52	0.16	0.16
Nong Mot (Nm_sub)	1.80	0.12	17.30	53.70	72.9	1.28	4.84	4.92	8.16	6.96	5.16	0.44	12.40	4.04	0.92	3.48	6.96	0.28	0.52
Pak Chong (Pc_top)	13.60	0.64	219.0	244.0	689.0	11.40	51.30	15.50	43.30	9.84	17.80	0.01	4.92	8.44	1.80	0.84	17.20	0.24	0.52
Pak Chong (Pc_sub)	20.80	0.72	339.0	338.0	395.0	4.08	62.80	19.90	36.40	15.20	24.10	0.01	6.32	3.04	8.36	1.76	22.60	0.52	0.56

Appendix Table 12 (Continued)

Series	Li	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Mo	Cs	Pb	Bi	U
	(----------mg kg^{-1}----------)																		
Land condition: Uplands																			
Phu Sana (Ps_top)	0.68	0.11	20.9	12.0	318.0	3.77	1.99	3.13	5.23	3.21	0.27	0.11	6.43	7.23	0.04	0.43	3.66	0.01	0.43
Phu Sana (Ps_sub)	2.03	0.22	40.30	27.80	128.0	3.36	6.57	6.49	9.57	6.87	0.49	0.07	20.30	6.34	0.03	1.49	7.65	0.03	1.17
Sakon (Sk_top)	2.68	0.11	3.80	12.50	64.4	1.77	3.16	3.67	7.52	1.75	6.27	0.01	6.49	4.66	0.32	0.74	3.16	0.14	0.15
Sakon (Sk_sub)	20.00	0.63	34.50	29.70	46.4	6.57	20.30	10.10	19.70	8.96	3.71	0.17	41.40	8.40	0.33	8.34	7.97	0.17	0.63
Satuk (Suk1_top)	0.76	0.03	0.02	8.12	78.3	0.31	1.66	1.32	3.30	1.41	0.43	0.04	6.57	1.12	0.15	0.82	2.90	0.05	0.12
Satuk (Suk1_sub)	3.36	0.10	17.30	23.30	19.9	0.72	6.77	4.29	11.50	7.64	1.19	0.11	29.80	4.26	0.46	3.59	9.38	0.17	0.34
Satuk (Suk2_top)	0.44	0.05	3.86	9.45	258.0	1.19	1.41	1.95	4.16	1.09	0.52	0.01	3.69	1.28	0.23	0.43	4.06	0.04	0.21
Satuk (Suk2_sub)	3.04	0.20	13.90	15.60	124.0	2.31	4.55	2.89	9.90	4.92	0.93	0.12	15.50	1.87	0.27	2.35	6.96	0.09	0.35
Satuk (Suk3_top)	0.30	0.07	0.02	13.60	167.0	1.59	1.84	2.63	4.84	1.08	0.35	0.01	2.60	2.47	0.16	0.44	2.44	0.03	0.22
Satuk (Suk3_sub)	2.23	0.16	20.50	17.90	46.3	2.08	3.06	4.20	6.05	3.50	0.70	0.06	9.08	3.12	0.13	1.51	6.18	0.06	0.37
Satuk (Suk4_top)	4.96	0.20	22.8	22.6	180.0	2.96	3.44	3.60	6.44	4.00	2.56	0.01	22.10	4.36	0.24	1.36	5.72	0.12	0.32
Sung Noen (Sn1_top)	14.60	0.96	20.50	18.10	307.0	7.56	14.5	9.00	116.0	14.50	1.48	0.12	36.80	19.16	0.16	2.80	6.96	0.16	0.52
Sung Noen (Sn1_sub)	21.60	1.48	28.50	24.80	335.0	9.72	20.8	11.9	29.10	12.80	1.64	0.01	56.50	16.68	0.20	4.32	8.32	0.24	0.64
Sung Noen (Sn2_top)	6.47	1.52	1.08	5.04	63.0	1.08	3.12	2.16	14.10	6.91	2.84	0.20	35.80	3.48	0.32	4.36	38.1	1.00	6.99
Sung Noen (Sn2_sub)	9.72	2.28	10.20	8.92	44.7	1.60	3.44	2.88	21.50	12.1	4.28	0.76	47.80	3.08	0.52	7.24	55.3	1.44	14.5
Satuk (Suk4_sub)	15.3	0.48	36.5	32.5	220.0	4.04	8.67	7.96	13.2	10.2	3.60	0.01	53.10	7.68	0.36	3.68	13.7	0.24	0.56
Warin (Wn_top)	0.76	0.04	16.6	9.60	42.3	0.28	1.36	2.92	3.04	3.44	4.92	0.01	8.96	3.08	0.12	1.72	5.48	0.08	0.16
Warin (Wn_sub)	1.08	0.08	28.7	15.2	61.4	0.44	1.88	4.76	4.60	5.60	7.04	0.24	11.90	5.28	0.16	2.80	9.48	0.16	0.20
Yasothon (Yt1_top)	0.38	0.01	0.02	4.60	21.9	0.38	1.52	2.07	1.92	0.97	0.65	0.01	2.65	1.01	0.20	0.62	4.66	0.04	0.08
Yasothon (Yt1_sub)	3.08	0.10	29.10	24.20	35.0	0.51	3.04	6.83	6.32	6.69	4.68	0.33	11.90	3.75	1.30	3.38	20.40	0.22	0.36

Appendix Table 12 (Continued)

Series	Li	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Mo	Cs	Pb	Bi	U
	(----------mg kg^{-1}----------)																		
Land condition: Uplands																			
Yasothon (Yt2_top)	0.35	0.02	0.02	5.74	108.0	0.45	1.71	2.03	2.72	1.61	1.32	0.01	1.85	2.34	0.32	0.74	3.31	0.06	0.09
Yasothon (Yt2_sub)	1.18	0.04	26.90	15.20	64.0	0.54	3.62	3.66	5.51	5.00	3.52	0.01	3.04	2.36	0.64	1.61	7.42	0.16	0.21
Chalong (Chl_top)	1.64	0.04	21.10	28.30	42.9	0.40	3.68	2.68	4.20	6.20	11.90	0.16	3.84	1.24	0.72	1.56	2.64	0.40	0.32
Chalong (Chl_sub)	2.36	0.12	37.30	23.90	36.3	0.52	5.12	3.20	5.96	10.00	12.40	0.01	5.32	1.32	0.20	1.92	3.60	0.36	0.28
Fang Daeng (Fd_top)	1.34	0.04	18.30	31.40	608.0	1.31	5.75	5.76	8.19	5.70	2.82	0.22	1.97	2.56	0.61	1.17	6.87	0.27	0.23
Fang Daeng (Fd_sub)	2.48	0.06	36.10	48.00	607.0	1.90	10.0	6.07	9.24	11.10	4.60	0.08	2.43	2.02	1.19	1.88	8.46	0.43	0.29
Hat Yai (Hy_top)	5.00	0.40	9.92	5.76	69.8	1.08	1.92	1.72	8.88	3.12	4.64	0.20	23.90	1.68	0.08	2.92	7.68	0.44	2.12
Hat Yai (Hy_sub)	12.00	0.88	11.30	11.60	46.6	1.96	4.24	2.16	12.20	6.60	16.60	0.08	40.50	1.92	0.12	6.04	12.80	0.92	4.80
Hoi Pong (Hp_top)	1.43	0.09	0.02	24.94	55.5	0.46	3.37	3.01	11.40	6.44	1.65	0.17	5.89	3.43	0.49	2.93	8.43	0.57	0.62
Hoi Pong (Hp_sub)	2.20	0.15	0.02	32.11	19.6	0.52	4.78	2.83	8.05	10.90	1.64	0.05	8.05	4.44	0.51	4.74	10.80	0.70	0.76
Khao Khat (Kkt_top)	4.04	0.24	29.20	30.50	182.0	1.04	4.88	8.36	30.80	10.80	16.80	0.08	24.20	9.84	0.28	2.44	20.30	0.08	0.76
Khao Khat (Kkt_sub)	4.48	0.24	28.40	17.80	68.7	0.80	4.76	5.32	10.00	8.64	8.32	0.40	29.00	7.48	0.28	2.88	10.10	0.08	0.52
Khlong Teng (Klt_top)	5.24	1.20	0.02	3.84	294.0	8.76	12.70	17.00	28.00	3.68	0.16	0.08	23.10	4.96	0.04	0.72	25.90	0.04	0.56
Khlong Teng (Klt_sub)	14.00	1.32	53.40	51.50	106.0	5.16	11.20	24.60	28.20	15.40	12.80	0.64	52.60	8.80	1.00	3.12	28.60	0.60	0.56
Khlong Thom (Km1_top)	0.84	0.01	4.92	8.40	24.4	0.44	1.40	1.72	2.96	1.60	1.56	0.04	6.28	2.52	0.32	1.64	2.68	0.08	0.16
Khlong Thom (Km1_sub)	1.92	0.04	9.56	19.60	16.3	0.72	3.36	2.40	3.84	4.40	4.24	0.52	12.40	2.20	0.84	4.16	5.08	0.16	0.20
Khlong Thom (Km2_top)	0.05	0.01	11.80	4.23	3.9	0.05	0.36	0.95	1.86	0.60	1.15	0.01	1.38	1.17	0.22	0.41	1.08	0.03	0.04
Khlong Thom (Km2_sub)	0.43	0.04	0.89	13.00	4.0	0.17	1.23	1.72	2.73	2.14	2.12	0.22	5.91	3.24	0.37	2.01	3.96	0.09	0.11
Kho Hong (Kh1_top)	0.93	0.04	0.19	4.86	117.0	1.31	1.30	2.44	4.40	1.96	0.71	0.01	5.81	1.81	0.24	2.39	7.20	0.16	0.30
Kho Hong (Kh1_sub)	1.55	0.06	4.88	6.89	15.5	0.38	2.55	2.91	5.12	3.17	0.78	0.01	9.62	1.51	0.28	4.05	6.84	0.21	0.36

Appendix Table 12 (Continued)

Series	Li	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Mo	Cs	Pb	Bi	U
	(----------mg kg^{-1}----------)																		
Land condition: Uplands																			
Kho Hong (Kh2_top)	1.52	0.12	6.96	5.80	34.5	0.32	1.56	3.40	2.84	3.28	5.60	0.32	7.52	1.52	0.20	2.04	4.52	0.44	0.72
Kho Hong (Kh2_sub)	2.32	0.16	5.28	9.16	19.6	0.44	2.64	5.24	4.64	5.60	7.96	0.40	10.20	2.40	0.32	3.36	6.60	0.60	1.08
Klong Nok Krathung (Knk_top)	2.56	0.44	8.80	4.12	172.0	2.08	1.92	1.68	10.80	4.00	1.20	0.16	29.00	2.28	0.04	2.92	12.10	0.20	2.92
Klong Nok Krathung (Knk_sub)	5.71	0.88	4.52	7.15	195.0	3.52	4.40	2.20	23.60	9.19	2.68	0.24	61.90	3.92	0.28	6.79	20.40	0.72	5.35
Krabi (Kbi_top)	37.30	1.08	16.80	46.10	1497.0	17.90	39.10	22.30	54.00	15.60	45.20	0.44	57.20	2.88	0.44	8.27	24.30	0.24	0.96
Krabi (Kbi_sub)	40.80	1.32	37.10	82.40	3647.0	33.70	47.60	27.20	61.10	21.00	112.00	0.44	59.50	3.00	1.44	11.00	49.50	0.52	1.48
Na Tawi (Nat_top)	1.96	0.16	4.44	8.28	29.8	0.60	2.28	2.84	6.40	3.64	6.84	0.40	11.70	2.12	0.40	4.80	11.00	0.36	0.48
Na Tawi (Nat_sub)	3.08	0.24	19.40	12.10	51.6	0.88	3.60	4.28	9.12	5.56	7.44	0.16	17.00	2.84	0.12	6.88	16.10	0.48	0.68
Na Tham (Ntm_top)	3.36	0.04	8.47	13.90	18.2	0.60	3.04	2.44	4.48	4.48	2.24	0.16	5.48	3.64	0.24	2.08	3.44	0.12	0.20
Na Tham (Ntm_sub)	8.64	0.12	39.90	30.00	19.9	1.04	6.36	4.20	8.44	9.60	3.48	0.01	9.96	6.76	0.12	3.08	7.12	0.12	0.40
Nong Khla (Nok_top)	16.30	0.28	47.20	38.40	217.0	3.80	11.70	13.30	22.10	12.70	119.00	0.84	45.80	4.68	1.00	7.08	17.60	0.24	0.84
Nong Khla (Nok_sub)	20.40	0.32	31.60	51.60	218.0	4.76	16.10	15.80	27.80	13.50	102.00	0.92	53.20	4.28	0.88	10.50	23.30	0.20	1.08
Padang Besar (Pad_top)	0.92	0.12	1.08	6.44	21.4	0.16	0.84	1.12	2.12	2.64	3.72	0.04	6.12	0.68	0.16	2.08	2.56	0.24	0.24
Padang Besar Pad_sub	2.80	0.36	34.80	23.60	59.6	0.40	2.64	2.60	5.84	8.96	11.40	0.32	20.20	1.76	0.36	6.76	8.88	0.76	0.60
Pak Chan (Pac_top)	9.96	0.52	6.20	17.30	323.0	4.68	6.68	6.56	16.50	4.12	2.00	0.08	34.40	3.48	0.08	0.96	12.00	0.08	0.64
Pak Chan Pac_sub	24.30	0.64	59.80	41.40	63.6	3.56	10.80	9.64	22.30	14.40	4.88	0.01	63.40	3.92	0.28	3.28	12.40	0.28	0.76
Pathio (Ptu_top)	1.34	0.09	17.60	18.30	371.0	4.29	7.32	6.25	9.59	3.91	28.30	0.29	5.56	3.66	0.53	2.48	6.50	0.14	0.22
Pathio (Ptu_sub)	2.59	0.13	57.20	34.30	146.0	2.72	13.60	8.68	16.10	9.33	57.90	0.48	10.30	4.75	1.44	4.87	9.32	0.31	0.43
Phangnga (Pga_top)	2.20	0.32	8.40	3.80	64.2	1.08	1.76	1.44	7.52	3.64	0.68	0.01	14.70	2.56	0.04	2.40	11.20	0.36	2.84
Phangnga (Pga_sub)	6.24	0.92	10.00	8.72	63.4	2.44	5.04	2.52	22.00	9.84	0.84	0.01	37.80	3.68	0.03	6.36	25.10	0.52	7.24

Appendix Table 12 (Continued)

Series	Li	Be	V	Cr	Mn	Co	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Mo	Cs	Pb	Bi	U
	(----------mg kg^{-1}----------)																		
Land condition: Uplands																			
Phato (Pto_top)	0.50	0.02	8.14	5.23	12.7	0.44	1.40	2.61	2.53	1.18	0.89	0.01	4.57	2.55	0.15	0.94	2.29	0.05	0.11
Phato (Pto_sub)	1.11	0.03	13.10	8.76	15.0	0.50	2.42	2.50	4.02	2.42	1.48	0.17	9.26	4.54	0.30	2.03	4.18	0.09	0.16
Phuket (Pk_top)	6.48	0.24	28.30	16.20	105.0	0.84	2.52	4.36	8.04	5.20	16.00	0.20	20.60	3.32	0.20	3.44	8.28	0.16	0.48
Phuket (Pk_sub)	24.60	0.80	100.00	47.30	107.0	2.40	10.60	15.20	25.60	21.40	80.10	1.08	62.20	5.80	1.68	15.60	23.00	0.80	1.68
Sawi (Sw_top)	10.70	1.32	15.3	16.60	518.0	5.15	9.55	9.15	23.30	7.19	2.64	0.01	36.70	7.87	0.08	2.40	12.40	0.08	2.12
Sawi (Sw_sub)	31.00	2.84	19.4	28.40	1330.0	8.16	26.20	13.70	46.80	17.20	3.08	0.01	87.10	12.2	0.16	6.92	15.30	0.44	2.24
Tha Sae (Te_top)	9.60	1.00	22.6	21.70	502.0	12.90	16.70	12.80	36.80	5.20	8.64	0.01	16.30	2.64	0.40	0.88	16.60	0.16	0.28
Tha Sae (Te_sub)	34.30	1.56	24.5	37.70	191.0	19.90	23.20	24.80	47.70	10.9	10.6	0.01	39.60	7.44	0.64	3.04	19.10	0.40	0.36
Wang Tong (Wat_top)	0.24	0.02	0.02	10.20	56.6	0.33	1.27	1.82	3.92	1.57	0.52	0.15	3.31	2.21	0.18	0.95	3.04	0.07	0.14
Wang Tong (Wat_sub)	1.44	0.05	7.61	20.40	29.3	0.41	3.94	3.42	6.69	6.55	1.46	0.01	10.30	4.11	0.45	3.67	9.34	0.18	0.30
Yala (Ya_top)	4.96	0.20	22.8	22.60	180.0	2.96	3.44	3.60	6.44	4.00	2.56	0.01	22.10	4.36	0.24	1.36	5.72	0.12	0.32
Yala (Ya_sub)	15.30	0.48	36.5	32.50	220.0	4.04	8.67	7.96	13.20	10.20	3.60	0.01	53.10	7.68	0.36	3.68	13.70	0.24	0.56

1/ Topsoil (0-50 cm)
2/ Subsoils (50-100 cm)
* High bases

Appendix Table 13 Soil property interpretation of Thailand (Land Classification Division and FAO Project Staff, 1773)

1. Soil reaction (soil reaction), pH (soil : water = 1:1)

Rating	Range
Ultra acid	< 3.5
Extremely acid	3.5-4.5
Very strongly acid	4.5-5.0
Strongly acid	5.1-5.5
Moderately acid	5.6-6.0
Slightly acid	6.1-6.5
Neutral	6.6-7.3
Slightly alkaline	7.4-7.8
Moderately alkaline	7.9-8.4
Strongly alkaline	8.5-9.0
Very strongly alkaline	> 9.0

2. Organic matter content (% organic carbon x 1.724) (Nelson and Sommers, 1996)

Rating	Range ($g\ kg^{-1}$)
Very low	< 5
Low	5-10
Moderately low	10-15
Medium	15-25
Moderately high	25-35
High	35-45
Very high	> 45

3. Total nitrogen (Jackson, 1965)

Rating	Range ($g\ kg^{-1}$)
Very low	< 0.25
Low	0.50-0.75
Medium	0.75-1.25
High	1.25-1.75
Very high	> 2.25

4. Available phosphorus (Bray II) (Bray and Kurtz, 1945)

Rating	Range (mg kg^{-1})
Very low	< 3
Low	3-6
Moderately low	6-10
Medium	10-15
Moderately high	15-25
High	25-45
Very high	> 45

5. Available potassium (Rayment and Higginson, 1992)

Rating	Range (mg kg^{-1})
Very low	< 30
Low	30-60
Medium	60-90
High	90-120
Very high	> 120

6. Cation exchange capacity (CEC) (Rayment and Higginson, 1992)

Rating	Range (cmol kg^{-1})
Very low	< 3
Low	3-5
Moderately low	5-10
Medium	10-15
Moderately high	15-20
High	20-30
Very high	> 30

7. Extractable bases (Rayment and Higginson, 1992)

Rating	Range (cmol kg^{-1})				
	extr. Ca	extr.Mg	extr.K	Extr.Na	extr. bases
Very low	< 2.0	< 0.3	< 0.2	< 0.1	< 2.6
Low	2-5	0.3-1.0	0.2-0.3	0.1-0.3	2.6-6.6
Medium	5-10	1.0-3.0	0.3-0.6	0.3-0.7	6.6-14.3
High	10-20	3.0-8.0	0.6-1.2	0.7-2.0	14.3-31.2
Very high	> 20	> 8.0	> 1.2	> 2.0	> 31.2

8. Extractable acidity (EA) (Thomas, 1982)

Rating	EA (cmol kg^{-1})
Very low	< 1.0
Low	1.0-2.0
Medium	2.0-5.0
Moderately high	5.0 10.0
High	10.0-20.0
Very high	> 20.0

9. Bulk density (BD) (Blake and Hartge, 1986)

Rating	BD (Mg m^{-3})
Low	< 1.2
Moderately low	1.2-1.4
Medium	1.4-1.6
Moderately high	1.6-1.8
High	1.8-2.0
Very high	> 2.0

Appendix Table 14 X-ray diffraction spacings for the (001) reflections of layer-silicate species as related to sample treatment

Diffraction spacing (nm)	Mineral (or minerals) Indicated
	Mg-saturated, air-dried
1.4 - 1.5	Smectite, vermiculite, chlorite
0.99 - 1.01	Mica (illite), halloysite
0.72 - 0.75	Metahalloysite
0.715	Kaolinite, chlorite (2nd-order maximum)
	Mg-saturated, glyceral-solvated
1.77 - 1.80	Smectite
1.4 - 1.5	Vermiculite, chlorite
1.08	Halloysite
0.99 - 1.01	Mica (illite)
0.72 -0. 75	Metahalloysite
0.75	Kaolinite, chlorite (2nd-order maximum)
	K-saturated, air-dried
1.4 - 1.5	Chlorite, vermiculite (with interlayer aluminium)
1.24 - 1.28	Smectite
0.99 - 1.01	Mica (illite), halloysite, vermiculite (contracted)
0.72 - 0.75	Metahalloysite
0.715	Kaolinite, chlorite (2nd-order maximum)
	K-saturated, heated (550°C)
1.4	Chlorite
0.99 - 1.01	Mica, vermiculite (contracted), smectite (contracted)
0.715	Chlorite (2nd-order maximum)

Source: Whittig (1965)