

13 Human Modified Soils of Denmark

Henry R. Mount¹

September 28, 1999 – Tuesday

The Karlslunde soil is the best that Denmark has to offer (Greve et al., 2001). On September 28, 1999, scientists from Denmark, Ghana, and the United States examined an example of this soil near the village of Karlslunde on the island of Zealand (Fig. 1).



Figure 1. ArcView map of the location for the soils described and sampled in Denmark.

The soil is cultivated and a farmer was plowing in the general area when it was described and sampled (Fig. 2). The slope is three percent with a south to southwest aspect (220°). Latitude is North 55°34'14.5" and longitude is East 12°13'14.2". The parent material is calcareous glacial till. This Karlslunde soil is moderately well drained. There is no evidence of erosion. Diagnostic features consist of a mollic epipedon from 0 to 44 cm, an agric horizon from 44 to 80 cm, and an argillic horizon from 44 to 122 cm. It classifies as a member of the fine-loamy, mixed, active, mesic Oxyaquic Argiudolls family (Soil Survey Staff 1999). A soil with similar morphology to the Karlslunde soil in the United States would be considered prime farmland and indeed, among the best of prime farmland. The soil profile description for Karlslunde is presented below. Characterization data are presented in Appendix I.

Karlslunde loam (FN-315-001)

Latitude: 55°34'14.5" North

Slope Characteristics: 3% smooth slope with an aspect of 220°

Microrelief: None

Major Landform: Glaciated Upland

Land Use: Cropland in Zealand

Hydraulic Conductivity: Moderately Low

Particle-Size Control Section: 25 to 100 cm

Ponding: None

Diagnostic Features: 0 to 44 cm – Mollic; 44 to 80 cm Agric; 44 to 122 cm – Argillic (Fig. 3)

Date Described: September 28, 1999

Longitude: 12°13'14.2" East

Runoff: Moderate

Local Landform: Ground Moraine

Stoniness: None

Drainage Class: Moderately Well

Erosion Class: Slight

Flooding: None

¹ Soil Scientist, Natural Resources Conservation Service, National Soil Survey Center, 100 Centennial Mall North, Room 152, Lincoln, NE 68506

Field Classification: Fine-loamy, mixed (active), mesic Oxyaquic Argiudolls

Described by: Berman Hudson, Mogens Greve, Lars Krogh, Henrik Bruening-Madsen, Theodore Adwadzi, and Henry Mount.

Notes: 1) The Karlslunde is the best soil in Denmark as specified in 1844 by couriers of the King of Denmark (Bruening-Madsen, 2001). 2) This soil was described from 10 a.m. to 12 noon.

Ap – 0 to 44 cm; very dark gray (10YR 3/1) loam; weak medium to coarse granular structure; friable, slightly sticky, slightly plastic; neutral (pH 6.6); common roots; 1% rock fragments; clear smooth boundary.

Bt/A – 44 to 80 cm; 70% brown (10YR 5/3) and 30% very dark gray (10YR 3/1) heavy loam; moderate coarse subangular blocky structure; friable; neutral (pH 6.6); few roots; many worm galleries; 1% rock fragments; gradual smooth boundary.

Btg – 80 to 122 cm; olive gray (5Y 5/2) loam; moderate fine yellowish brown (10YR 5/8) redox concentrations; moderate medium subangular blocky structure; friable; common brown (10YR 4/3) clay films; neutral (pH 6.6); discontinuous weak effervescence; few roots; many worm galleries; 1% rock fragments; gradual smooth boundary.

BC – 122 to 162 cm; 60% yellowish brown (10YR 5/8), 20% yellowish brown (10YR 5/4), and 20% light olive gray (5Y 6/2) loam; moderate medium subangular structure; friable; neutral (pH 6.6); discontinuous weak effervescence; common white (10YR 8/1) primary and secondary calcium carbonates; few roots; many pores; 1% rock fragments.



Figure 2. The site where the Karlslunde soil was described and sampled for lab data.



Figure 3. Karlslunde soil profile.

We are in Zealand at 2 p.m. Seagulls work the plowed fields trying to feed. We are heading for Forslev village at 2:10 p.m. Soils are all nearly level to gently sloping. We are in Teestrup village at 2:16 p.m. Kames and interkame ice lake deposits are visible. Some of these features have heavy lake deposits. We are in Skuderlose village at 2:21 p.m. Now at 2:23 p.m., we are approaching our bog stop.

We stop to enter the Holmegårds Mose at 2:51 p.m. We are digging at 3:05 p.m. This site has good black sapric material to about 3 meters. The ground water is coming from below at this site.

We then walked to a raised bog in heather (*Calluna* ssp.). Its latitude is North 55°17.545' and its longitude is East 11°48.077'. The pH of the surface organic layer is about 4.0. There is 5GY 6/1 gytje below the organic accumulations. The raised bog has a slope of about 0.5% and its aspect is to the south. Henrik and Mogens drilled to a depth of 7 meters until they encountered a sandy substratum. I took a picture of this incredible feat. The reconstructed profile in this raised acid bog was 1 meter of sphagnum material over 3 meters of sapric material over 3 meters of gytje over sand at 7 meters.

We are leaving the bog stop at 4:08 p.m. We arrive on Funen Island at 5:45 p.m. Nyborg village is seen at 5:46 p.m. It's raining hard now but the sun is shining.

Mollisol landscapes are pervasive in Zealand. I didn't view many ochric surfaces as I did in France last year. The human-made Mollisol we described today had an argillic horizon.

September 30, 1999 – Thursday

Dr. Kristian Dalsgaard is picked up at 9:30 a.m. Mogens then drove to the village of Varre at 9:52 a.m. Kristian orders Mogens to stop the aqua blue van at 10:25 a.m. Kristian explains there are some water drains here with 1 meter of colluvium over 2 to 3 cm of organic sediments. Settlement started in this area about 4000 year BC. Forestlands were protected in 1805. The current land coverage of Danish forests is 13%.

The sun is setting at 6:50 p.m. We are nearing the city of Randers at 6:53 p.m. We reach acid till country west of Randers at 6:59 p.m. Soils appear to have good umbric surfaces. Soils are most likely Dystrudepts and Hapludalfs.

October 1, 1999 – Friday

We pass Rostrus village at 5:14 p.m. There are several burial mounds viewed at 5:23 p.m. Out of about 150,000 burial mounds in Denmark, there are 40,000 remaining mounds. There are 4,000 to 5,000 years old. Some of the mounds have preserved podzols beneath them.

October 2, 1999 – Saturday

We are on the road at 9:22 a.m. and Dr. Kristian Dalsgaard is with us. The Illinois-age till in Denmark is 100,000 years old. Cultivation in Denmark started around 4000 years BC. Kristian tells us, "*Oak trees invade Calluna unless managed.*" Mogens stops by a heath field at 9:44 p.m. Its latitude is North 56°23.647' and its longitude is East 9°8.744'. We reach the Kongenshus Mindepark at 9:54 a.m. Sheep are grazing on the *Calluna*. Some grasses are invading. Kristian says that white spruce is common as a field border with some borders of red spruce. We stop along the road at 10:26 a.m. This location has a latitude of North 56°29.118' and a longitude of East 8°54.811'. Dr. Per Nørnberg joins us at 11 a.m. He gave us a publication list. We stop in the heath at 11:12 a.m. Oaks are spreading into the heath at a rate of 1 meter per year (Fig. 4). This oak species is *Quercus robur* (English Oak). Kristian Dalsgaard says they have some ground water podzols on level surfaces. Mogens said there is a correlation of Oa thickness and charcoal abundance. The Bhs horizons of the soil pit we view are strikingly mottled. Per tells us that Roy Simonson rejected his term "*Depodzolization*" for a *Catena* publication. There are 22 kg per hectare per year of nitrogen deposited in *Calluna* heath lands.



Figure 4. Disruption of the *Calluna* ecosystem due to off-road vehicles.

Mogens drives to a burned heath at 3:20 p.m. Then, two minutes later, we stop at a tiered paleopodzol profile. This location has a latitude of 56°19.933' and longitude of East 8°28.860'. The age of the Bh layers at this site range from 6,200 years BC to 800 years BC to 1620 AD. We then travel to a plaggen-like podzol in a spruce plantation. This site has a 30-cm thick plaggen horizon (Fig. 5). The C/N is 30:1. Phosphorus levels of plaggen soils range from 971 to 1418 PPM.



Figure 5. Plaggen epipedon (30-cm thick) in Denmark.

We drive to another site with a plaggen epipedon (Fig. 6). Its latitude is North 56°15.802' and its longitude is East 8°14.031'. Mogens is excavating the soil at 5:25 p.m. This site has an 82-cm thick plaggen epipedon. The C horizon is fine sand. Kristian feels that this site is one of the best examples of a plaggen soil in Denmark. The sand size is dominantly 125 micron. The structure was good subangular block and granular. This site seems to key out as a Plagganthrept. At 6:24 p.m., I have verified that our last site is a Typic Plagganthrept, assuming that the base saturation is less than 50% within 180 cm.



Figure 6. The plaggan epipedon for this Plagganthrept is 82-cm thick.

October 3, 1999 – Sunday

Mogens and Henrik take us to a Spodosol they claim to have a mollic epipedon at 12:15 p.m. This site has a latitude of North 55°47.046' and a longitude of East 9°17.254'. Here we describe and sample the Gadbjerg soil.

Gadbjerg sand (FN-315-005)

Latitude: 55°47'2.8" North

Slope Characteristics: 3% plane slope with an aspect of 360°

Microrelief: None

Major Landform: Glaciated Upland

Land Use: Wheat field that is 50 ft north of woods

Hydraulic Conductivity: High

Particle-Size Control Section: 25 to 100 cm

Ponding: None

Diagnostic Features: 0 to 31 cm – Mollic; 31 to 51 cm² - Albic; 51 to 110 cm – Spodic; 77 to 78 cm – Placic

Date Described: October 3, 1999

Longitude: 9°17'15.2" East

Runoff: None

Local Landform: Outwash Plain

Stoniness: None

Drainage Class: Somewhat Poor

Erosion Class: Slight

Flooding: None

(Fig. 6).

Field Classification: Sandy, isotic, mesic Aquic Placorthods

Described By: Berman Hudson, Lars Krogh, Mogens Greve, Henrik Breuning-Madsen, Theodore Awadzi, and Henry Mount.

Notes: 1) Site is in Jutland. 2) Water removed from pit by pump and buckets. 3) If base saturation of the Ap horizon is <50%, then pedon has an umbric epipedon. 4) Placic horizon is thicker than normal at this site but not as expressed (brittle) as in some parts of Denmark. This is one of the few placic horizons ever to be sampled for physical and chemical properties.

Ap – 0 to 31 cm; black (10YR 2/1) sand; weak medium subangular blocky parting to weak fine and medium granular structure; very friable; very strongly acid (pH 5.0); many fine and few common roots throughout; many fine interstitial pores; abrupt smooth boundary.

E – 31 to 51 cm; brown (7.5YR 5/2) sand; few fine reddish yellow (7.5YR 6/8) redox concentrations; single grain; loose; very strongly acid (pH 5.0); many fine interstitial pores; clear smooth boundary.

² Lab data later showed this soil to have an umbric epipedon. See **Appendix II** for characterization data.

Bh – 51 to 78 cm; black (7.5YR 2/1) sand; weak medium subangular blocky structure; very friable; very strongly acid (pH 5.0); many fine interstitial pores; abrupt smooth boundary.

Bhm – 77 to 78 cm; black (N2/) sand; massive; firm; strongly acid (pH 5.5); abrupt smooth boundary.

Bhs – 78 to 110 cm; dark reddish brown (5YR 3/2) sand; weak medium subangular blocky structure; very friable; strongly acid (pH 5.5); many fine interstitial pores.



Figure 6. Spodosol (Gadbjerg) with an Umbric epipedon due to farming activities.

We finished describing and sampling the Gadbjerg soil at 1:50 p.m. Lars Krogh is also with us today. Henrik tells us we are going through poor podzol country at 2:04 p.m. The new windbreaks in Denmark are broadleaf species instead of white spruce. We then stop at a young Scots pine plantation. Mogens digs a small pit. We have an 8-inch C horizon over the original A/Bh horizon due to deep plowing. This site has a latitude of North 55°47.435' and a longitude of East 9°19.038'. Most Scots pine forests are harvested for logs after 60 years. Forests for pulpwood are harvested every 40 years. We are leaving the pine site at 2:24 p.m.

October 5, 1999 – Tuesday

We stop to view a plowed burial mound at 10:37 a.m. (Fig. 7) It is part of the Bronze Age burial mound system in Denmark. I get a GPS location from the top of the mound. Its latitude is North 55°30.241' and its longitude is East 9°18.574'. A student augers the mound soil from the top. A stone bed for ancient coffins was commonly found in recent times.



Figure 7. View of burial mound in distance taken from a 'flattened' burial mound.

The German border is within view at 12:22 p.m. We are on a sandy outwash plain at 12:40 p.m. The team is in the coniferous forest of the Froslev Plantage at 12:57 p.m. The latitude here is North 54°50.099' and the longitude is East 9°18.270'. After a quick lunch, we view a buried podzol at 1:20 p.m. (Fig. 8). The old humus layer is dated at 1,200 year old. We leave the Froslev Plantage at 2:30 p.m. Henrik showed us a placic horizon from a podzol in the woods. Mogens also showed me another placic horizon.



Figure 8. Spodosol with an eolian cap.

References:

- Greve, M.H., H.R. Mount, B.D. Hudson, H. Bruening-Madsen. 2001. *History of land value assessment and establishment of benchmark soils in Denmark*. 2001. Soil Survey Horizons. Spring Vol 42(1). Pg. 19-24.
- Bruening-Madsen, H., M.H. Greve, and A. Norr. 2001. *Danish soil classification and establishment of Danish soil database*. Soil Survey Horizons. Spring. Vol 42(1). Pp. 24-34.

*** PRIMARY CHARACTERIZATION DATA ***

S99DA-315-001
 SAMPLED AS : KARLSLUNDE ; FINE-LOAMY, MIXED, ACTIVE, MESIC OXYAQUIC ARGUUDOLL
 USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON OP 139, SAMPLE OP 1104- 1107

	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-

	SAND - SILT MINERALOGY (2.0-0.002mm) ----->																			
	FRACT < - - - - X-RAY - - -> - - - THERMAL - - -> - - - OPTICAL - - - - -> INTER																			
SAMPLE	ION < - - - - 7A2i - - - -> - - - DTA - -> - - - TGA - ->TOT RE< - - - - GRAIN COUNT - - - - -> PRETA																			
	< - - - - 7A6b - - - -> - - - 7A4c - -> - - - 7B1a - - - - -> TION																			
NUMBER	< - -> - - - Peak Size - - -> - - - Percent - - -> - - - Percent - - - - -> - - -> - - ->																			
OP1105	FS									82	QZ78	FK14	CD 3	FE 1	FP 1	GL 1				
OP1105	FS										BT 1	MStr	PRtr	GNtr	HNtr	OPtr				
OP1105	FS										ZRtr									
OP1106	FS									85	QZ80	FK13	CD 3	FE 2	BT 1	AR 1				
OP1106	FS										FPtr	GLtr	HNtr	PRtr	OPtr	TMtr				
OP1106	FS										GNtr	MStr								

*** PRIMARY CHARACTERIZATION DATA ***

S99DA-315-001 (* * * DENMARK * * *)
 SAMPLED AS : KARLSLUNDE ; FINE-LOAMY, MIXED, ACTIVE, MESIC OXYAQUIC ARGUUDOLL

UNITED STATES DEPARTMENT OF AGRICULTURE
 NATURAL RESOURCES CONSERVATION SERVICE
 NATIONAL SOIL SURVEY CENTER
 SOIL SURVEY LABORATORY
 LINCOLN, NEBRASKA 68508-3866

SSL - PROJECT OP 24, (CP00DA024) DENMARK
 - PEDON OP 139, SAMPLES OP 1104- 1107
 - GENERAL METHODS 1B1a, 2A1, 2B

	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-

	ACID OXALATE EXTRACTION PHOSPHOUS KCL TOTAL (- WATER CONTENT- -)(- - - WATER DISPERSIBLE - - -) MIN AGGRT																			
	OPT FE SI AL RET ACID MN C 0.06 1- 2- 15 <- - PIPETTE - -> - HYDROMETER -> SOIL STABL																			
	DEN BAR BAR BAR BAR CLAY SILT SAND CLAY SILT SAND CONT <5mm																			
SAMPLE HZ	8J1c	6C9b	6V2b	6G12b	6S4d	6S5	6D3b	6A2f	4B1c	4B1a	4B1a	4B2b	<- - - 3A1c - - ->- - - SML - - -> 8F1	4G1						
NO. NO	<- P C T o f < 2 m m ->- P P M -> - - - - - P E R C E N T o f < 2 m m - - - - -><20mm> PCT>																			
OP1104	1	0.05	0.23	0.04	0.07	20							12.3	31.7	56.0					7
OP1105	2	0.03	0.22	0.04	0.10	23														
OP1106	3	0.04	0.14	0.04	0.08	23														
OP1107	4	0.02	0.16	0.03	0.05	64														

Appendix II – Laboratory Data for Gadbjerg

*** PRIMARY CHARACTERIZATION DATA ***

S99DA-315-005

(* * * DENMARK * * *)

SAMPLED AS : GABJERG

; SANDY, ISOTIC, MESIC AQUIC PLACORTHOD

UNITED STATES DEPARTMENT OF AGRICULTURE
 NATURAL RESOURCES CONSERVATION SERVICE
 NATIONAL SOIL SURVEY CENTER
 SOIL SURVEY LABORATORY
 LINCOLN, NEBRASKA 68508-3866

SSL - PROJECT 0P 24, (CP00DA024) DENMARK
 - PEDON 0P 143, SAMPLES 0P 1130- 1134
 - GENERAL METHODS 1B1A, 2A1, 2B

SAMPLE NO.	DEPTH (CM)	HORIZON	(- - -TOTAL - - -)(- -CLAY- -)(- -SILT- -)(- - - - -SAND- - - - -)(-COARSE FRACTIONS(MM)-)(>2MM)																	
			CLAY LT	SILT .002	SAND .05	FINE LT	CO3 LT	FINE .002	COARSE .02	VF .05	F .10	M .25	C .5	VC 1	2	5	20	.1- PCT OF		
			.002	-.05	-.2	.0002	-.02	-.05	-.10	-.25	-.50	-.1	-.2	-.5	-.20	-.75	.75	WHOLE		
			< - - - PCT OF <2MM (3A1) - - - - ->														< - - PCT OF <75MM(3B1)-> SOIL			
0P1130S	0- 31	Ap	1.0	3.8	95.2				1.7	2.1	2.6	31.0	53.9	7.3	0.4	TR	--	--	93	--
0P1131S	31- 51	E	0.2	0.9	98.9				0.1	0.8	1.8	35.4	54.4	7.1	0.2	--	--	--	97	--
0P1132S	51- 77	Bh	0.5	1.3	98.2				0.6	0.7	1.3	36.1	54.4	6.3	0.1	--	--	--	97	--
0P1133S	77- 78	Bhm	0.6	1.3	98.1				0.3	1.0	1.1	30.9	58.3	7.7	0.1	--	--	--	97	--
0P1134S	78-110	Bs	0.6	1.4	98.0				0.1	1.3	0.9	38.6	55.0	3.3	0.2	--	--	--	97	--

DEPTH (CM)	ORGN TOTAL		EXTR TOTAL		(- - DITH-CIT - -)(RATIO/CLAY)(ATTERBERG)				(- BULK DENSITY -)		COLE (- - -WATER CONTENT - -)		WRD							
	C	N	P	S	FE	AL	MN	CEC	BAR	LL	PI	MOIST	BAR	DRY	SOIL	MOIST	BAR	BAR	BAR	SOIL
	6A1c	6B4b	6S3e	6R3d	6C2h	6G7g	6D2g	8D1	8D1	4F1	4F	4A5	4A1d	4A1h	4D1	4B4	4B1c	4B1c	4B2a	4C1
	PCT <2MM		PPM	<- PERCENT	OF <2MM -->				PCT <0.4MM		<- - G/CC - - ->		CM/CM		<- - -PCT OF <2MM - ->				CM/CM	
0- 31			92		TR	0.1	--	5.80	5.10											5.1
31- 51			17			0.1	--													1.0
51- 77			123			0.1	--													1.5
77- 78			20			0.1	--													1.7
78-110			26			0.1	--													1.0

AVERAGES, DEPTH 25-100: PCT CLAY 0 PCT .1-75MM 97

*** PRIMARY CHARACTERIZATION DATA ***

S99DA-315-005

SAMPLED AS : GADBJERG

; SANDY, ISOTIC, MESIC AQUIC PLACORTHOD

USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON 0P 143, SAMPLE 0P 1130- 1134

DEPTH (CM)	(- NH4OAC EXTRACTABLE BASES -)				ACID- EXTR		(- - -CEC - - -)		AL	-BASE SAT-		CO3 AS RES.		COND.(- - - -PH - - -)					
	CA	MG	NA	K	SUM	ITY	AL	SUM		NH4-	BASES	SAT	SUM	NH4	CACO3	OHMS			
	5B5a	5B5a	5B5a	5B5a	BASES			CATS	OAC	+ AL		OAC	<2MM	/CM					
	6N2i	6O2h	6P2f	6Q2f		6H5a	6G9c	5A3a	5A8b	5A3b	5G1	5C3	5C1	6E1h	8E1	8I	8C1d	8C1f	8C1f
	< - - - -MEQ / 100 G - - - - ->														< - - -PCT - - - ->				
0- 31	2.5	0.2	0.2	0.1	3.0	8.3		11.3	5.8			27	52			7.4	4.1	4.4	
31- 51	0.4	TR	0.2	0.2	0.8	0.4		1.2	0.4			67	100			7.6	4.6	5.4	
51- 77	1.6	0.2	0.2	0.1	2.1	3.2		5.3	2.7			40	78			8.2	4.6	5.5	
77- 78	2.1	0.2	0.2	0.2	2.7	10.2		12.9	5.2			21	52			8.8	4.4	5.1	
78-110	0.8	TR	0.2	TR	1.0	4.6		5.6	2.2			18	45			8.2	4.3	5.1	

*** PRIMARY CHARACTERIZATION DATA ***

S99DA-315-005

SAMPLED AS : GABDJERG ; SANDY, ISOTIC, MESIC AQUIC PLACORTHOD
 USDA-NRCS-NSSC-SOIL SURVEY LABORATORY ; PEDON OP 143, SAMPLE OP 1130- 1134

	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-

	< - - - - - SAND - SILT MINERALOGY (2.0-0.002mm) - - - - - >																			
	FRACT < - - - - X-RAY - - - > - - - THERMAL - - - > - - - OPTICAL - - - > - - - INTER																			
SAMPLE	ION < - - - - > - - - DTA - - - > - - - TGA - - - >TOT RE< - - - - GRAIN COUNT - - - - > - - - PRETA																			
	< - - - - 7A2i - - - - > - - - 7A6b - - - > - - - 7A4c - - - > - - - 7B1a - - - - > - - - TION																			
NUMBER	< - - > - - - Peak Size - - - > - - - Percent - - - > - - - Percent - - - - > - - - > - - - >																			
OP1134	FS									89	QZ87	FK10	CD 2	PRtr	FPtr	OPtr				
OP1134	FS										ARtr									

MINERAL INTERPRETATION: AR wthr aggrega
 QZ quartz FK potas feldsp CD chalcedony PR pyroxene FP plag-feldspa OP opaques

*** PRIMARY CHARACTERIZATION DATA ***

S99DA-315-005

SAMPLED AS : GABJERG ; SANDY, ISOTIC, MESIC AQUIC PLACORTHOD

UNITED STATES DEPARTMENT OF AGRICULTURE
 NATURAL RESOURCES CONSERVATION SERVICE
 NATIONAL SOIL SURVEY CENTER
 SOIL SURVEY LABORATORY
 LINCOLN, NEBRASKA 68508-3866

SSL - PROJECT OP 24, (CP00DA024) DENMARK
 - PEDON OP 143, SAMPLES OP 1130- 1134
 - GENERAL METHODS 1B1a, 2A1, 2B

	-1--	-2--	-3--	-4--	-5--	-6--	-7--	-8--	-9--	-10-	-11-	-12-	-13-	-14-	-15-	-16-	-17-	-18-	-19-	-20-	

	ACID OXALATE EXTRACTION PHOSPHOUS KCL TOTAL (- -WATER CONTENT- -)(- - - WATER DISPERSIBLE - - -) MIN AGGRT																				
	OPT FE SI AL CIT- MN C 0.06 1- 2- 15 <- - PIPETTE - - > - - HYDROMETER - - > SOIL STABL																				
	DEN RET ACID BAR BAR BAR BAR CLAY SILT SAND CLAY SILT SAND CONT <5mm																				
SAMPLE	HZ	8J1c	6C9b	6V2b	6G12b	6S4d	6S5	6D3b	6A2f	4B1c	4B1a	4B1a	4B2b	<- - - 3A1c - - - > - - - SML - - - > 8F1	4G1						
NO.	NO	<- P C T o f < 2 m m - - > - - P P M - - > - - - P E R C E N T o f < 2 m m - - - > <20mm>< PCT>																			
OP1130	1	0.08	0.03	0.01	0.05	64															
OP1131	2	0.03	TR	TR	TR	3															
OP1132	3	0.22	TR	TR	0.04	10															
OP1133	4	0.10	TR	TR	0.12	18															
OP1134	5	0.02	TR	TR	0.05	14															
