

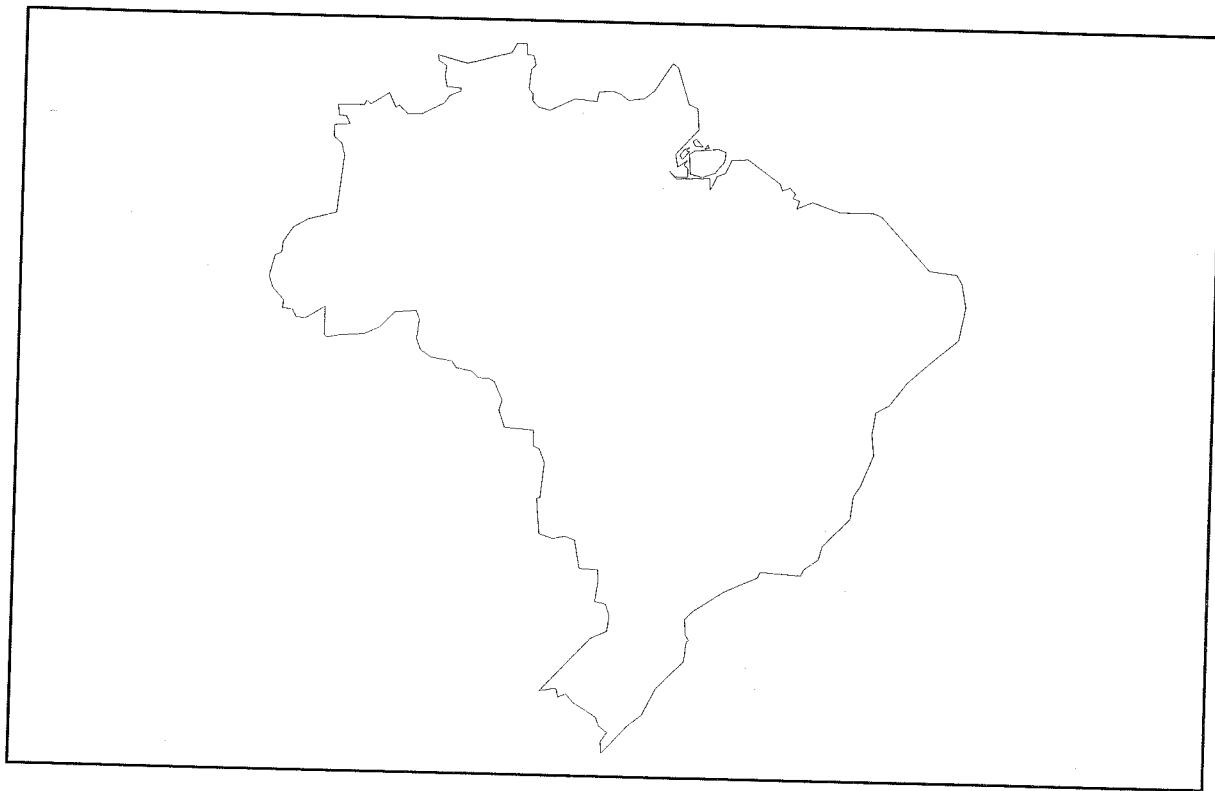
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Country Report 9

DRAFT

Soil Reference Profiles of Brazil

Field and Analytical Data



**Centro Nacional de Pesquisa de Solos
International Soil Reference and Information Centre**



ISRIC

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COUNTRY REPORT 9

DRAFT

Soil Reference Profiles of Brazil

Field and Analytical Data

Published by

**Centro Nacional de Pesquisa de Solos
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FOREWORD

National Soil Reference Collection and Database of Brazil

The objective of this Country Report is to provide comprehensive field and analytical data of a number of reference soils representative for the major soils of Brazil. The sites were carefully selected, described and sampled by CNPS and ISRIC, and analyzed in their respective soil laboratories. Additional information on the reference soils is provided in a series of Soil Briefs, comprising information about the environment and soils, such as characterization, classification and an assessment of soil/land qualities. For Brazil such Soil Briefs have to be prepared.

The sites are located in the major ecological regions throughout the country. The sites were selected on a number of criteria, such as major soil type, extension, advanced stage of weathering, textural differentiation between top and subsoil, presence of plinthite, a high water table, a high salt content and production potential.

At present the collection comprises 28 soil reference profiles. From each reference soil two or three undisturbed profiles were taken, specially preserved and prepared into monoliths, ready for exposition. The monolith expositions of Brazil is housed in Centro Nacional de Pesquisa de Solos in Rio de Janeiro and Recife, and in the Centro de Pesquisa Agropecuária dos Cerrados in Planaltina. Duplicate monoliths are included in ISRIC's world soil collection in The Netherlands.

The plan for a national soil reference collection existed already for a long time and it could be realized in two joint cooperative field missions of the former SNCLS (now CNPS) and ISRIC in the period 1984 and 1986. Additional training in the Netherlands of SNLCS staffmember Osorio was realized in 1989, within the framework of ISRIC's National Soil Reference Collection Programme (NASREC).

The establishment of the soil reference collection, comprising exposition and accompanying documentation has been made possible with the support of many persons, some are specially mentioned here: Dr. W.G. Sombroek (former director of ISRIC), Ir. J.H. Kauffman (coordinator NASREC programme), Dr. Idare Azvedo Gomes and Dr. Francesco Palmieri (Chefes dos SNLCS), and Dr. M.N. Camargo, Dr. Paulo Klinger T. Jacomine and the late Prof. J. Bennema (site selection).

Dr. Antonio Ramalho Filho, chief CNPS Brazil

International Soil Reference Collection and Database

The International Soil Reference and Information Centre (ISRIC), founded in 1966 as an initiative of the International Society of Soil Science (ISSS), has a mandate to collect and disseminate scientific knowledge about soils for the purpose of a better understanding of their formation, characterization, classification, distribution and capability for sustained land use at local, national, and global scales. One of ISRIC's main objectives is to assemble soil profiles, soil samples and associated information to illustrate the units of the FAO-Unesco Soil Map of the World. To date, the world soil collection consists of about 800 reference soils from 60 countries, accompanied by soil and environmental data. The collection is supported by a soil map collection, soil reports library, a thin section collection and a slide collection.

The National Soil Reference Collection Programme (NASREC), supported by the Directorate General of International Cooperation of the Netherlands within the Action Plan of National Soil Policies of UNEP, and through ISRIC's own budget has been instrumental to achieve this objective. ISRIC greatly appreciates the cooperation of CNPS in its efforts to bring together a National Soil Reference Collection of Brazil.

The collected information of the reference soil profiles is stored in ISRIC's Soil Information System (ISIS), a database management system for storing and retrieving data on geology, geomorphology, hydrology, soil morphology, soil chemical and physical characteristics, and climate.

To disseminate its data, ISRIC has combined the different types of information into several publication series. Each series aims to address the needs of those working in one of the many fields of research using soil data and soil related data. One of these series is the Country Report.

The Country Reports, containing all ISRIC held data on soils and associated information of a specific country are generated by ISIS. Additional information on literature references, small scale maps, and a list of slides available in the ISRIC Slide Database is included. The country reports are jointly published by the national institution involved in the collection and ISRIC. A list of country reports (in press) is given on the back cover of this report. We are very pleased to release the draft Brazil Country Report at the occasion of the XVth World Soil Congress.

Any comments on the Country report in general or on the presentation of the data in particular is highly appreciated and may be communicated to the directors of either CNPS or ISRIC

Dr. L.R. Oldeman, Director ISRIC

Country Reports can be purchased through ISRIC or the national institution of the country concerned. Publications based on the Country Reports should explicitly indicate the information source. To order Country Reports please contact:

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22460 Rio de Janeiro RJ
Brazil

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Fax (55 21) 264 5291

or

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P.O.Box 353
6700 AJ Wageningen
The Netherlands

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Fax (31) (0)8370 24460
E-mail ISRIC@RCL.WAU.NL

SUMMARIZED INFORMATION OF REFERENCE SOILS BR001 TO BR028

ISIS-ID ¹⁾	FAO-88 ²⁾	ST-92 ³⁾	PARENT MATERIAL	CLIM ⁴⁾	LANDFORM	LAND USE	VEGETATION	DRAINAGE CLASS	ALT ⁵⁾
BR001	Haplic Lixisol	Kanhaplustalf	residual material	Aw	plain	semi natural grassland,grazed	grassland	moderately well to well	45
BR002	Haplic Lixisol	Kanhaplustalf		Aw	hill	semi natural grassland,grazed		well	80
BR003	Geric Ferralsol	Acrustox	slope wash	Aw	hill	semi natural grassland,grazed		well	210
BR004	Rhodic Ferralsol	Eutrustox	slope wash	Cw	pediplain	high level arable farming		well	650
BR005	Geric Ferralsol	Acrustox	slope wash	Cwa	pediplain	medium level arable farming		well	760
BR006	Rhodic Ferralsol	Haplustox	colluvium	Cwa	pediplain	semi natural grassland,grazed		well	562
BR007	Rhodic Nitisol	Paleustalf	residual material		pediplain	high level arable farming		well	480
BR008	Humic Ferralsol	Hapludox	ice-pushed materials	Cfa	pediplain	mixed farming	evergreen forest	well	760
BR009	Humic Ferralsol	Haplustox	residual material	Cfb	pediplain	medium level arable farming		well	1100
BR010	Humic Ferralsol	Hapludox	unconsolidated	Ccf	pediplain	medium level mixed farming		well	910
BR011	Xanthic Ferralsol	Kandiperox	lacustrine sediments	Am	lacustrine plain	semi natural grassland,grazed	evergreen forest	well	70
BR012	Fimic Anthrosol	Plaggept		Aw	plain			well	60
BR013	Geric Ferralsol	Haploperox	lacustrine sediments	Am	lacustrine plain	(semi)natural vegetation	evergreen forest	well	75
BR014	Rhodic Ferralsol	Haplustox	slope wash	Aw	plateau	(semi)natural vegetation	deciduous woodland	well	1010
BR015	Geric Ferralsol	Acrustox	colluvium	Aw	plateau	high level arable farming	deciduous woodland	well	1170
BR016	Luvic Pheozem	Argiustoll	solid rock	As	hill	medium level arable farming		well	85
BR017	Haplic solonetz	Natrustalf	residual material	As	plain	semi natural grassland,grazed	extraxeromorphic dwarf shrub	imperfectly	240
BR018	Haplic Acrisol	Kandustult	marine sediments	As	marine terrace	low level arable farming	deciduous woodland	moderately well	170
BR019	Haplic Podzol	Haplorthod	marine sediments	As	marine terrace	low level arable farming	deciduous woodland	moderately well	50
BR020	Haplic Arenosol	Quartzipsamment	marine sediments	As	marine terrace	(semi)natural vegetation	deciduous woodland	somewhat excessive	150
BR021	Haplic Lixisol	Haplustalf	residual material	BSh	plain	shrubland,grazed	extremely xeromorphic shrub	moderately well	510
BR022	Eutric Planosol	Paleustalf	residual material	BSh	plain	shrubland,grazed	extremely xeromorphic shrub	imperfectly	500
BR023	Ferric Alisol	Hapludult	colluvium	Ams	hill	medium level arable farming		moderately well	80
BR024	Ferrals Arenosol	Ustropelt	colluvium	Aw	plain	semi natural grassland,grazed		well-somewhat excess.	800
BR025	Geric Ferralsol	Acrustox	residual material	Aw	plain	high level arable farming		well	480
BR026	Geric Ferralsol	Acrustox	colluvium	Aw	plateau	(semi)natural vegetation	semi deciduous woodland	well	1150
BR027	Humic Plinthosol	Plinthaquept	alluvium	Aw	floodplain	high level arable farming		poor	200
BR028	Eutric Gleysol	Tropaquept	alluvium	Aw	floodplain	(semi)natural vegetation	deciduous forest	imperfectly	200

1) ISIS-ID ISIS identification number
 2) FAO-88 FAO-Unesco Legend (1988)
 3) ST-92 USDA Soil Taxonomy 1982
 4) CLIM Climate (Köppen)

5) ALT Altitude (m)



SOIL INFORMATION SHEETS

Generated by the ISRIC Soil Information System (ISIS, version 4.0)

FAO/UNESCO (1988)	:	Haplic Lixisol	(1974 : Ferric Luvisol)
USDA/SCS SOIL TAXONOMY (1992)	:	Typic Kanhaplustalf, fine loamy, kaolinitic, isohyperthermic	(1975 : oxic paleustalf)
LOCAL CLASSIFICATION	:	Podzolico vermelho	
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	: Diagnostic horizons : ochric A, argic B : Diagnostic horizons : ochric epipedon, argillic horizon : Soil moisture regime : ustic	
LOCATION	Latitude :	Rio de Janeiro, Itaguaí 22°45' 0'' S	Longitude : 43°41' 0'' W
AUTHOR(S)		: Kauffman, J.H.	Altitude : 45 (m.a.s.l.) Date (mm.yy) : 10.84
GENERAL LANDFORM	:	plain	Topography : rolling
PHYSIOGRAPHIC UNIT	:	low hill with flat valley	
SLOPE	Gradient :	20%	Aspect :
POSITION OF SITE	:	lower slope	Form : straight
MICRO RELIEF	Kind :		
SURFACE CHAR.	Rock outcrop :	nil	Stoniness : nil
	Cracking :		Slaking/crusting :
SLOPE PROCESSES	Soil erosion :	slight sheet	
PARENT MATERIAL	1 :	residual material	derived from : gneiss
Remarks	Texture :		: Weathered rock
EFFECTIVE SOIL DEPTH(cm)	:	180	
WATER TABLE	Depth(cm) :		Kind : no watertable observed
DRAINAGE	:	moderately well to well	
PERMEABILITY	:	moderate	Slow permeable layer from : 38 to 100 cm
FLOODING	Frequency :	nil	
MOISTURE CONDITIONS PROFILE	:	0 - 180 cm dry	
LAND USE	:	semi natural grassland, grazed	
VEGETATION	Type :	grassland	Status : secondary
Landuse/vegetation remarks	:	occ. subsistence farming	
ADDITIONAL REMARKS :			
Brief field description:			
Deep, moderately well drained, red clay soil derived from gneiss; having a yellowish brown, porous massive, sandy (clay) loam topsoil.			
Brazilian classification: Podzolico vermelho amarelo Tb alico.			
The B horizons show a multicolouring aspect due to grey and brown coatings of illuvial clay from upper horizons, in the C horizons this is caused by weathering minerals.			
The B horizons have probably a limited permeability causing saturation with water of (A and) E horizon, leading to lateral transport of the excess moisture due to the high inclination (20%).			
Limitations in land use: 1. slope too steep for mechanization. 2. rootability and possibilities for tillage suboptimal. 3. risk of erosion.			
Drainage pattern: dendritic; often presence of flat depressions without clear streamlines.			
Vegetation: 5% shrubs; 20% herbs; 50% grasses; 25% bare soil; original vegetation is tropical forest.			

CLIMATE :	Köppen: Aw	Station: SANTA CRUZ 22 56 S/ 43 55 W	16 m a.s.l	10 km SE of site	Relevance: good								
No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EP Penman mm	186	149	149	119	95	89	95	107	107	122	138	149	1504
relative humidity %	71	78	77	75	78	65	65	73	86	88	86	87	77
precipitation mm	158	159	186	119	79	40	43	47	75	113	124	173	1317
tot.glob.rad. MJ/m ²	24.8	22.0	20.0	17.2	13.9	13.9	14.7	16.2	16.6	18.0	20.3	20.5	18.2
T mean °C	25.7	25.9	25.5	24.0	22.0	20.9	20.0	20.8	21.0	21.7	23.1	24.6	22.9
bright sunshine %	59	52	53	55	52	65	65	57	42	37	41	39	51

PROFILE DESCRIPTION :

Ap 0 - 14 cm. dark grayish brown (10 YR 3.5/1.5, moist)light brownish gray (10 YR 6.0/2.0, dry) sandy clay loam ; weak fine to very fine subangular blocky and weak fine to very fine granular structure; slightly sticky, slightly plastic, very friable, slightly hard; no cutans; many very fine to fine pores and many micro pores; many very fine roots and many fine roots; abrupt smooth boundary to

E1	14 - 30 cm.	yellowish brown (10 YR 5.0/4.0, moist)pale brown (10 YR 6.0/3.0, dry) sandy clay loam; strongly coherent porous massive structure; slightly sticky, slightly plastic, very friable, very hard; no cutans; common very fine to fine pores; common very fine roots and common fine roots; clear wavy boundary to
E2	30 - 38 cm.	yellowish brown (10 YR 5.0/4.0, moist)pale brown (10 YR 6.0/3.0, dry) gravelly sandy clay loam; strongly coherent porous massive structure; slightly sticky, slightly plastic, friable, very hard; no cutans; common very fine to fine pores; few very fine roots and few fine roots; few fine strongly weathered quartz fragments; clear wavy boundary to
Bt1	38 - 50 cm.	red (2.5 YR 4.0/6.0, moist)reddish yellow (5 YR 6.0/6.0, dry) clay; moderate fine to medium subangular blocky and moderate fine to medium angular blocky structure; very sticky, very plastic, friable, very hard; broken thick clay cutans; common pores; few very fine roots and few fine roots ; gradual wavy boundary to
Bt2	50 - 80 cm.	red (2.5 YR 4.0/6.0, moist)light red (2.5 YR 6.0/6.0, dry) clay; moderate fine to medium subangular blocky and moderate fine to medium angular blocky structure; very sticky, very plastic, friable, very hard; broken thick clay cutans; few very fine roots and few fine roots; gradual wavy boundary to
Bt3	80 - 100 cm.	4 YR 4.0/6.0, moistreddish yellow (5 YR 6.0/6.0, dry) clay loam; moderate fine to medium subangular blocky structure; very sticky, very plastic, friable, very hard; broken moderately thick clay cutans;; very few very fine strongly weathered not identified fragments; gradual irregular boundary to
CB	100 - 150 cm.	yellowish red (5 YR 4.0/6.0, moist)reddish yellow (7.5 YR 6.0/6.0, dry) sandy clay loam; weak medium subangular blocky to moderately coherent porous massive structure; sticky, plastic, very friable, hard;; few very fine strongly weathered not identified fragments; gradual wavy boundary to
C	150 - 180 cm.	reddish yellow (7.5 YR 6.0/6.0, moist)yellow (10 YR 7.0/6.0, dry) moderately coherent porous massive structure; slightly sticky, slightly plastic, very friable, slightly hard;; frequent very fine strongly weathered not identified fragments;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2	2000	1000	500	250	100	TOT	50	20	TOT	<2	DISP	BULK	PF-	---	---	---	---	---		
		mm	1000	500	250	100	50	SAND	20	2	SILT	μm	DENS	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2	
1	0 - 14	-	9	19	21	16	5	69	8	8	16	15	7.1	-	-	-	-	-	-	-	-	
2	14 - 30	-	7	17	21	15	4	65	6	8	15	21	14.3	1.57	36	35	29	23	21	18	15	14
3	30 - 38	-	7	16	20	15	4	61	6	7	13	26	16.5	-	-	-	-	-	-	-	-	-
4	38 - 50	-	2	4	7	11	5	28	3	8	12	61	0.0	-	-	-	-	-	-	-	-	-
5	50 - 80	-	6	12	9	6	2	35	5	11	16	49	2.9	1.43	43	41	38	35	33	32	30	27
6	80 - 100	-	9	13	8	6	3	39	6	14	20	42	0.5	-	-	-	-	-	-	-	-	-
7	100 - 157	-	10	13	9	9	5	45	7	19	26	29	0.5	1.54	41	40	38	34	32	30	24	21
8	157 - 180	-	16	14	9	11	5	55	7	19	26	19	1.5	-	-	-	-	-	-	-	-	-
Hor. no.	pH- H2O	-- CaCO ₃ KCl	ORG- C	MAT- N	EXCH Ca	CAT. Mg	-----	EXCH K	AC. Na sum	H+Al	CEC soil clay cmol(+)/kg	CEC OrgC	--- ECEC	BASE SAT	AL SAT	EC mS/cm	2.5					
1	4.5	4.1	-	0.95	0.09	1.0	0.5	0.2	0.1	1.8	-	-	3.7	25	3.3	1.8	49	-	0.20			
2	4.7	3.9	-	0.42	-	1.0	0.3	0.0	0.1	1.4	-	-	2.1	10	1.5	1.4	67	-	0.05			
3	4.9	3.9	-	0.38	-	0.8	0.4	0.0	0.1	1.3	-	-	2.6	10	1.3	1.3	50	-	0.04			
4	6.5	5.4	-	0.27	-	0.8	2.3	0.1	0.1	3.3	-	-	3.9	6	0.9	3.3	85	-	0.02			
5	5.8	4.4	-	0.34	-	1.4	0.9	0.1	0.1	2.5	-	-	3.5	7	1.2	2.5	71	-	0.02			
6	5.8	4.2	-	0.18	-	1.2	1.0	0.0	0.2	2.4	-	-	4.4	11	0.6	2.4	55	-	0.02			
7	5.6	3.9	-	0.13	-	0.6	1.5	0.0	0.2	2.3	-	-	5.0	17	0.5	2.3	46	-	0.02			
8	5.5	3.4	-	-	-	0.8	2.0	0.1	0.0	2.9	-	-	7.7	40	-	2.9	38	-	0.02			
remarks (hor. 1)	:	Spec.Surf.=26	remarks (hor. 5)	:	Spec.Surf.=73																	
remarks (hor. 2)	:	Spec.Surf.=29	remarks (hor. 6)	:	Spec.Surf.=65																	
remarks (hor. 3)	:	Spec.Surf.=35	remarks (hor. 7)	:	Spec.Surf.=56																	
remarks (hor. 4)	:	Spec.Surf.=79	remarks (hor. 8)	:	Spec.Surf.=48																	

CLAY MINERALOGY (1 very weak,,, 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	-	-	-	-	-	0.10	0.00	0.00	0.50	0.10	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	0.10	0.00	0.00	0.60	0.10	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	0.10	0.00	0.00	0.70	0.10	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	0.10	0.10	0.00	3.40	0.30	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	0.10	0.10	0.00	1.80	0.20	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	0.10	0.10	0.00	1.40	0.10	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-	0.00	0.10	0.00	1.40	0.10	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	0.00	0.00	0.00	0.80	0.10	-	-	-	-	-	-	-	-

FAO/UNESCO (1988)	:	Haplic Lixisol	(1974 : Ferric Luvisol)
USDA/SCS SOIL TAXONOMY (1992)	:	Typic Kanhaplustalf, clayey, hyperthermic	(1975 : oxic paleustalf)
LOCAL CLASSIFICATION	:	Podzolico Vermelho*)	
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	: Diagnostic horizons : ochric A, argic B : Diagnostic horizons : ochric epipedon, argillic horizon : Soil moisture regime : ustic	
LOCATION	: Brasil, Rio de Janeiro, Aparibe(5PRJ-IRCC)		
AUTHOR(S)	Latitude : 21°38' 0'' S Longitude : 42° 7' 0'' W : Kauffman, J.H.		Altitude : 80 (m.a.s.l.) Date (mm.yy) : 10.84
GENERAL LANDFORM	: hill	Topography : hilly	
PHYSIOGRAPHIC UNIT	: low hill		
SLOPE	Gradient : 30%	Aspect : S	Form : convex
POSITION OF SITE	: lower slope		
MICRO RELIEF	Kind : termite mounds	Pattern : isolated	Height (cm) : 125
SURFACE CHAR.	Rock outcrop : little rocky Cracking : nil Salt : nil	Stoniness : very few stones Slaking/crusting : partly slaked Alkali : nil	
SLOPE PROCESSES	Soil erosion : slight sheet and moderate rill Slope stability : locally unstable		
PARENT MATERIAL	1 : Texture : clayey Remarks : PreCambrian *)	derived from : acidic gneiss	
EFFECTIVE SOIL DEPTH(cm)	: 150		
WATER TABLE	Depth(cm) :	Kind : no watertable observed	
DRAINAGE	: well		
PERMEABILITY	:	No slow permeable layer(s) cm	
FLOODING	Frequency : nil	Run off : rapid	
MOISTURE CONDITIONS PROFILE	: 0 - 175 cm dry		
LAND USE	: semi natural grassland, grazed		
Landuse/vegetation remarks	: Grass: Grama Batatais		
ADDITIONAL REMARKS :			
Brief field description:			
Deep, well drained, dark red clay derived from gneiss.			
AB horizon has about 30% of darker coloured(7.5YR4/3) spots due to incomplete homogenization. Structure of AB horizon has also porous massive character. CB horizon consists mainly out of multicoloured weathered rock.			
*)Brazilian classification Podzolico Vermelho-Amarelo Eutrofico, argila de atividade baixa, A moderado, textura media/argilosa, fase floresta tropical subcaducifolia, relevo ondulado.			
Middle to superior pre-cambrium,'Paraiba do Sul'group.			
Density of termitaria about 4/hectare. Erosion is accelerated in cultivated spots, locally rill and shallow gullies are present.			
Area is partly cultivated for subsistence crops.			

CLIMATE :	Köppen: Aw	Station: 21 32 S/ 42 12 W	91 m a.s.l	10 km NW of site	Relevance: good
SAN ANTONIO PADUA					
No. years of record	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Annual				
EP Penman mm	185 152 153 119 98 83 88 109 113 127 134 146 1507				
relative humidity %	71 76 74 76 75 73 73 71 84 88 89 89 78				
precipitation mm	182 148 110 57 38 24 19 28 48 132 187 260 1234				
tot.glob.rad. MJ/m ²	24.7 22.4 20.6 17.2 14.7 13.5 14.2 16.9 17.3 18.2 19.3 19.8 18.3				
T mean °C	25.7 25.7 25.4 23.7 21.1 19.3 18.5 20.1 21.8 23.0 23.9 25.0 22.8				
bright sunshine %	59 54 56 54 55 57 57 60 44 38 37 37 51				

PROFILE DESCRIPTION :

A(p) 0 - 14 cm. brown (7.5 YR 4.0/2.0, moist) sandy clay loam; weak fine to medium subangular blocky structure; slightly sticky, slightly plastic, very friable, hard; many very fine to fine pores; many very fine roots between pedes and fine roots; gradual smooth boundary to
AB 14 - 27 cm. 3.5 YR 4.0/8.0, moist sandy clay; weak fine to medium subangular blocky structure; sticky, plastic , friable, very hard; many very fine to fine pores; common very fine roots and fine roots; gradual smooth boundary to
Bt1 27 - 41 cm. 4 YR 4.0/6.0, moist clay; moderate to strong fine to medium angular blocky structure; sticky , plastic, very friable, extremely hard; broken thick clay cutans; common very fine to fine pores; common very fine roots between pedes; gradual smooth boundary to
Bt2 41 - 110 cm. red (2.5 YR 4.0/6.0, moist) clay; moderate to strong fine to medium angular blocky structure; sticky, plastic, very friable, very hard; broken thick clay cutans; common very fine to fine pores ; common very fine roots and fine roots; diffuse wavy boundary to
BC 110 - 150 cm. red (2.5 YR 4.0/6.0, moist) clay; strong fine to medium angular blocky structure; sticky, plastic, very friable, very hard; continuous thick clay cutans; common very fine to fine pores; few very fine roots and fine roots; few fragments; diffuse wavy boundary to
CB 150 - 175 cm. red (2.5 YR 4.0/6.0, moist) silty clay loam; weak fine to medium subangular blocky structure; slightly sticky, slightly plastic, very friable, hard; patchy moderately thick clay cutans; few pores; few very fine roots; no fragments;

ANALYTICAL DATA :

Hor.	Top - Bot	>2 mm	2000	1000	500	250	100	TOT 50	SAND 20	TOT 20	<2 µm	DISP	BULK DENS	pF- 0.0	- - -	- - -	- - -	- - -	- - -	- - -	- - -	
no.		mm	1000	500	250	100	50	SAND	20	2 SILT	µm			0.1	1.0	1.5	2.0	2.3	2.7	3.4	4.2	
1	0 - 14	-	3	8	16	25	10	62	7	6	13	26	12.8	-	-	-	-	-	-	-	-	
2	14 - 27	-	2	4	10	16	23	54	8	6	14	32	19.4	1.48	40	40	38	30	25	21	19	17
3	27 - 41	-	2	5	10	16	7	39	7	4	11	49	23.1	-	-	-	-	-	-	-	-	-
4	41 - 72	-	6	11	10	7	2	36	4	9	13	51	26.9	1.41	45	44	39	35	33	31	31	28
5	72 - 110	-	1	3	5	10	6	26	8	16	23	51	0.5	1.38	47	47	43	39	37	35	31	28
6	110 - 155	-	1	4	8	14	7	34	7	18	24	42	0.5	-	-	-	-	-	-	-	-	-
7	155 - 175	-	3	7	11	15	6	42	7	20	26	31	1.5	-	-	-	-	-	-	-	-	-

Hor.	pH-H ₂ O	-- CaCO ₃ -KCl	ORG-C%	MAT-N%	EXCH Ca%	CAT-Mg%	EXCH K%	CEC sum H+Al	AC. Al	CEC soil	BASE clay	Al OrgC	ECEC	EC SAT	EC SAT	EC 2.5				
no.			%	%				cmol(+) / kg								mS/cm				
1	5.7	4.5	-	0.99	0.09	1.2	1.2	0.1	0.4	2.9	-	-	4.4	17	3.5	2.9	66	-	0.05	
2	5.8	4.5	-	0.65	0.06	1.2	1.3	0.1	0.3	2.9	-	-	3.5	11	2.3	2.9	83	-	0.03	
3	6.1	4.9	-	0.46	0.06	1.2	1.5	0.0	0.1	2.8	-	-	3.9	8	1.6	2.8	72	-	0.03	
4	5.4	4.2	-	0.47	0.05	1.4	0.9	0.0	0.1	2.4	-	-	4.8	9	1.6	2.4	50	-	0.03	
5	5.7	4.8	-	0.19	-	0.2	3.2	0.2	0.3	3.9	-	-	5.3	10	0.7	3.9	74	-	0.01	
6	5.8	4.3	-	0.15	-	0.4	4.7	0.2	0.2	5.5	-	-	9.4	22	0.5	5.5	59	-	0.01	
7	6.0	3.9	-	0.13	-	0.0	7.8	0.1	0.1	8.0	-	-	10.9	35	0.5	8.0	73	-	0.01	

remarks (hor. 1) : Spec.Surf.=38

remarks (hor. 2) : Spec.Surf.=45

remarks (hor. 3) : Spec.Surf.=64

remarks (hor. 4) : Spec.Surf.=74

remarks (hor. 5) : Spec.Surf.=79

remarks (hor. 6) : Spec.Surf.=83

remarks (hor. 7) : Spec.Surf.=88

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	-	-	-	-	0.10	0.00	0.00	1.20	0.10	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	0.10	0.00	0.00	1.50	0.10	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	0.10	0.00	0.00	2.50	0.30	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	0.10	0.10	0.00	2.00	0.20	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	0.10	0.10	0.00	3.80	0.30	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	0.10	0.10	0.00	2.70	0.20	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	0.10	0.10	0.00	1.80	0.10	-	-	-	-	-	-	-	-

FAO/UNESCO (1988)	: Geric Ferralsol	(1974 : Acris Ferralsol)
USDA/SCS SOIL TAXONOMY (1992)	: Rhodic Acrustox, clayey, kaolinitic, hyperthermic	(1975 : typic acrustox)
LOCAL CLASSIFICATION	: Latossolo	
DIAGNOSTIC CRITERIA	FAO (1988)	: Diagnostic horizons : ochric A, ferralic B : Diagnostic properties : geric properties USDA/SCS (1992)
		: Diagnostic horizons : ochric epipedon, oxic horizon : Soil moisture regime : ustic
LOCATION	: Rio de Jan., Itaperuna-Raposo road at km 164.8, 200 mtrs to the right	
AUTHOR(S)	Latitude : 21° 8' 0'' S Longitude : 42° 5' 0'' W Author : Kauffman, J.H.	Altitude : 210 (m.a.s.l.) Date (mm.yy) : 11.84
GENERAL LANDFORM	: hill	Topography : hilly
PHYSIOGRAPHIC UNIT	: steep low hill & flat valley	
SLOPE	Gradient : 32%	Aspect :
POSITION OF SITE	: lower slope	Form :
MICRO RELIEF	Kind :	
SURFACE CHAR.	Rock outcrop : nil Cracking : nil Salt : nil	Stoniness : nil Slaking/crusting : partly slaked Alkali : nil
SLOPE PROCESSES	Soil erosion : slight sheet	Aggradation : nil
PARENT MATERIAL	1 : slope wash Texture : clayey	derived from : basic gneiss
Remarks	:	
EFFECTIVE SOIL DEPTH(cm)	: 175	
WATER TABLE	Depth(cm) :	Kind : no watertable observed
DRAINAGE	: well	
PERMEABILITY	:	No slow permeable layer(s) cm
MOISTURE CONDITIONS PROFILE	: 000 - 170 cm dry	
LAND USE	: semi natural grassland, grazed	
ADDITIONAL REMARKS :		
Brief field description:		
Very deep, well drained, dark red, clay derived from gneiss.		
Charcoal particles present in the top 36 cm.		
Brazilian classification: Latossolo Vermelho Escuro argiloso.		

CLIMATE :	Köppen: Aw	Station: 21 32 S/ 42 12 W	91 m a.s.l	40 km SSW of site	Relevance: good								
SAN ANTONIO PADUA													
No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EP Penman mm	185	152	153	119	98	83	88	109	113	127	134	146	1507
relative humidity %	71	76	74	76	75	73	73	71	84	88	89	89	78
precipitation mm	182	148	110	57	38	24	19	28	48	132	187	260	1234
tot.glob.rad. MJ/m ²	24.7	22.4	20.6	17.2	14.7	13.5	14.2	16.9	17.3	18.2	19.3	19.8	18.3
T mean °C	25.7	25.7	25.4	23.7	21.1	19.3	18.5	20.1	21.8	23.0	23.9	25.0	22.8
bright sunshine %	59	54	56	54	55	57	57	60	44	38	37	37	51

PROFILE DESCRIPTION :

Ap	0 - 9 cm.	dark reddish brown (5 YR 3.0/3.0, moist) reddish brown (5 YR 3.5/3.0, dry) sandy clay; weak to moderate granular to weak to moderate subangular blocky structure; sticky, plastic, friable , slightly hard; common very fine pores and many fine pores; many fine roots; clear smooth boundary to
AB	9 - 36 cm.	dark reddish brown (5 YR 3.0/4.0, moist) reddish brown (5 YR 4.5/4.0, dry) sandy clay; weak to moderate fine to medium subangular blocky structure; sticky, plastic, friable, slightly hard; common to many, very fine to fine pores; many fine roots; gradual smooth boundary to
Bw1	36 - 72 cm.	4.5 YR 3.0/4.0, moist clay; weak fine to medium subangular blocky structure; sticky, plastic , friable, slightly hard; many very fine to fine continuous impeded tubular pores; many fine roots; diffuse smooth boundary to
Bw2	72 - 102 cm.	3.5 YR 3.0/4.0, moist 4 YR 3.0/5.0, dry clay; weak fine to medium subangular blocky structure; sticky, plastic, very friable, soft; many very fine continuous impeded tubular pores; common fine roots; diffuse smooth boundary to
Bw3	102 - 147 cm.	6 YR 4.0/6.0, moist 6.5 YR 4.0/6.0, dry clay; weakly coherent porous massive structure; sticky , plastic, very friable, soft; many very fine to fine continuous impeded tubular pores; common fine roots; diffuse smooth boundary to
Bw4	147 - 175 cm.	6 YR 4.0/6.0, moist 6.5 YR 4.0/6.0, dry clay; weakly coherent porous massive structure; sticky , plastic, very friable, soft; many very fine to fine continuous impeded tubular pores; few fine roots:

ANALYTICAL DATA -

Hor. no.	Top - Bot	>2	2000	1000	500	250	100	TOT	50	20	TOT	<2	DISP	BULK	pF-	---	---	---	---	---		
		mm	1000	500	250	100	50	SAND	20	2	SILT	μm	DENS	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2	
1	0 - 8	-	2	8	10	15	7	42	4	3	7	50	30.6	-	-	-	-	-	-	-	-	
2	9 - 36	-	2	7	8	14	6	37	4	4	9	53	27.9	1.26	53	52	43	34	31	29	25	23
3	36 - 72	-	2	6	7	12	6	33	5	6	11	55	1.0	1.12	56	56	43	32	29	27	24	22
4	72 - 102	-	2	5	8	11	6	32	5	5	9	59	0.5	1.02	57	56	43	30	27	25	23	21
5	102 - 147	-	2	6	8	11	6	32	5	4	9	58	0.5	-	-	-	-	-	-	-	-	-
6	147 - 170	-	2	5	8	12	6	33	4	6	10	58	0.5	-	-	-	-	-	-	-	-	-

Hor. no.	pH-	--	CaCO ₃	ORG-	MAT.	EXCH	CAT.	-----	-----	EXCH	AC.	CEC	-----	BASE	AL	EC	2.5		
	H ₂ O	KCl	C	N	Ca	Mg	K	Na	sum	H+Al	Al	soil	clay	OrgC	ECEC	SAT	SAT	%	
			%	%	%					cmol(+)/kg					%	%	mS/cm		
1	5.1	4.2	-	1.74	0.13	0.6	0.4	0.1	0.2	1.3	0.8	0.5	4.1	8	6.1	2.1	32	12	0.04
2	4.9	4.2	-	1.18	0.10	0.2	0.0	0.0	0.2	0.4	0.7	0.5	3.5	7	4.1	1.1	11	14	0.02
3	4.8	4.3	-	0.74	0.07	0.0	0.0	0.0	0.1	0.1	0.5	0.7	1.8	3	2.6	0.6	6	39	0.02
4	5.0	4.5	-	0.52	0.05	0.1	0.0	0.0	0.0	0.1	0.2	0.1	1.8	3	1.8	0.3	6	6	0.01
5	5.7	5.0	-	0.32	-	0.0	0.0	0.0	0.4	0.4	0.1	0.0	1.8	3	1.1	0.5	22	0	0.01
6	5.7	5.2	-	0.25	-	0.0	0.0	0.0	0.2	0.2	0.0	0.0	1.1	2	0.9	0.2	18	0	0.01

remarks (hor. 1 - 2): Spec.Surf.=69

remarks (hor. 3) : Spec.Surf.=70

remarks (hor. 4) : Spec.Surf.=74

remarks (hor. 5) : Spec.Surf.=69

remarks (hor. 6) : Spec.Surf.=68

CLAY MINERALOGY (1 very weak, ..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p)

Hor.

no.	MI	VE	CH	SM	KA	HA	ML	QU	FE	GI	GO	HE	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Fe(p)	Al(p)	Pret	pHNaF
1	-	-	-	-	-	-	-	-	-	-	-	-	0.12	0.13	0.01	4.52	0.75	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	0.11	0.14	0.02	4.73	0.80	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	0.11	0.13	0.01	5.11	0.99	-	-	-	-
4	-	-	-	-	8	-	-	-	4	5	2	-	0.13	0.15	0.02	5.38	1.01	-	-	-	-
5	-	-	-	-	8	-	-	-	5	5	2	-	0.07	0.13	0.03	5.78	1.10	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	0.05	0.14	0.02	5.46	1.02	-	-	-	-

SAND MINERALOGY

Hor. no.	HEAV	LIGH	light fraction				heavy fraction															
	QU	FE	PL	RE	OP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O		

5 11.2 88.8 100 0 0 0 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
key : QU=quartz;FE=feldspar;PL=plagioclase;RE=rest group light min.:OP=opaque

remarks (hor. 5) : a few grains of zircon, rutile and sillimanite

FAO/UNESCO (1988)	:	Rhodic Ferralsol	(1974 : Rhodic Ferralsol)
USDA/SCS SOIL TAXONOMY (1992)	:	Typic Eutrustox, clayey, kaolinitic, isothermic	(1975 : typic eutroorthox)
LOCAL CLASSIFICATION	:	LR eutrofico	
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	: Diagnostic horizons : ferralic B : Diagnostic horizons : oxic horizon : Soil moisture regime : ustic	
LOCATION	:	Sao Paulo, Bonfim Paulista, nearby quarry of INDERP	
AUTHOR(S)	Latitude : 21°21' 0'' S :	Longitude : 47°47' 0'' W Kauffman, J.H.	Altitude : 650 (m.a.s.l.) Date (mm.yy) : 10.84
GENERAL LANDFORM	:	pediplain	Topography : undulating
PHYSIOGRAPHIC UNIT	:	low, very broad hill	
SLOPE	Gradient : 7%	Aspect :	Form :
POSITION OF SITE	:	middle slope	
MICRO RELIEF	Kind :		
SURFACE CHAR.	Rock outcrop : nil Cracking : small cracks Salt : nil	Stoniness : nil Slaking/crusting : nil Alkali : nil	Aggradation : nil
SLOPE PROCESSES	Soil erosion : slight sheet		
PARENT MATERIAL	1 : slope wash Texture : clayey		derived from : fine-basic igneous rock
Remarks	:		
EFFECTIVE SOIL DEPTH(cm)	:	250	
WATER TABLE	Depth(cm) :		Kind : no watertable observed
DRAINAGE	:	well	
PERMEABILITY	:	high	No slow permeable layer(s) cm
FLOODING	Frequency :	nil	
MOISTURE CONDITIONS PROFILE	:	000 - 200 cm dry	
LAND USE	:	high level arable farming; Crops : sugar cane	

ADDITIONAL REMARKS :

Brief field description:

A very deep, well drained, dusky red clay soil derived from basic rock; weakly structured.

High bio-activity: many antholes throughout the profile.

Charcoal particles of 1-3 cm diameter throughout the profile.

Silt fraction is considered to be pseudo-silt and the high silt/clay ratio is waived for classification (otherwise no Ferralic B-horizon).

Brazilian classification: Latossolos Roxos eutroficos.

CLIMATE :	Köppen: Cw	20 33 S/ 47 26 W	1036 m a.s.l	80 km NE of site	Relevance: moderate									
	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EP Penman mm		155	124	132	117	102	92	102	121	123	132	132	125	1457
relative humidity %		78	84	79	68	64	52	48	55	75	83	85	90	72
precipitation mm		250	220	187	81	40	22	16	11	65	131	206	270	1499
tot.glob.rad. MJ/m ²		23.0	20.4	19.7	18.8	16.4	16.0	17.0	19.1	19.4	19.9	20.6	18.9	19.1
T mean °C		21.6	21.4	21.2	20.0	18.5	17.3	17.3	19.2	20.5	21.0	21.1	21.0	20.0
bright sunshine %		52	45	50	62	66	76	79	74	55	45	42	34	57

PROFILE DESCRIPTION :

Ap 0 - 18 cm. 1 YR 3.0/2.0, moist clay; weak fine subangular blocky to granular structure; sticky, plastic, friable, hard; many very fine continuous impeded tubular pores; many very fine roots and fine roots; few large soft argilleous nodules; very frequent channels; gradual smooth boundary to

AB 18 - 34 cm. 1 YR 3.0/3.0, moist 1 YR 3.0/4.0, dry clay; weak fine to medium subangular blocky structure; sticky, plastic, friable; patchy thin clay cutans; many very fine continuous impeded tubular pores; common very fine roots and fine roots; few large soft argilleous nodules; very frequent channels; diffuse smooth boundary to

BA	34 - 56 cm.	1 YR 3.0/3.0, moist 1 YR 3.0/4.0, dry clay; weakly coherent porous massive structure; sticky, plastic, very friable, slightly hard; patchy thin clay cutans; many very fine continuous impeded tubular pores; common very fine roots and fine roots; few large soft argillaceous nodules; very frequent channels; diffuse smooth boundary to
Bws1	56 - 90 cm.	1 YR 3.0/3.0, moist 1 YR 3.0/4.0, dry clay; weakly coherent porous massive structure; sticky, slightly plastic, very friable, slightly hard; many very fine continuous impeded tubular pores; common very fine roots and fine roots; few large soft argillaceous nodules; very frequent channels; diffuse smooth boundary to
Bws2	90 - 150 cm.	1 YR 3.0/3.0, moist 1 YR 3.0/4.0, dry clay; weakly coherent porous massive structure; sticky, slightly plastic, very friable, slightly hard; many very fine continuous impeded tubular pores; common very fine roots and fine roots; frequent large soft argillaceous nodules; very frequent channels; diffuse smooth boundary to
Bws3	150 - 250 cm.	1 YR 3.0/3.0, moist 1 YR 3.0/4.0, dry clay; weakly coherent porous massive structure; sticky, slightly plastic, very friable, slightly hard; many very fine continuous impeded tubular pores; common very fine roots and fine roots; frequent large soft argillaceous nodules; very frequent channels;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000	1000	500	250	100	TOT 50	20	TOT 2 SILT	<2 µm	DISP	BULK DENS	pE-0.0	---	---	---	---	---	---		
1	0 - 18	-	0	1	2	4	2	8	20	32	52	40	28.0	1.34	53	52	45	40	37	35	31	30
2	18 - 34	-	0	1	2	3	2	8	14	14	28	64	35.7	-	-	-	-	-	-	-	-	-
3	34 - 56	-	0	0	2	4	2	8	13	16	29	63	12.9	1.20	56	51	46	37	34	33	30	28
4	56 - 90	-	0	0	2	4	2	8	15	17	32	60	6.2	-	-	-	-	-	-	-	-	-
5	90 - 150	-	0	0	2	4	2	8	17	19	36	56	0.4	1.14	58	57	47	39	34	32	28	27
6	150 - 200	-	0	0	2	3	2	7	19	18	37	56	0.0	-	-	-	-	-	-	-	-	-

Hor. no.	pH-H ₂ O	-- CaCO ₃ HCl	ORG-C %	MAT-N %	EXCH Ca %	CAT-Mg %	---	Ca Na sum	EXCH H+Al cmol(+)/kg	AC. Al	CEC soil	---	BASE ECEC	AL SAT %	EC SAT %	2.5 mS/cm			
1	6.4	5.4	-	1.98	0.17	6.4	1.4	0.6	0.0	8.4	0.1	0.0	12.0	30	6.9	8.5	70	0	0.08
2	6.6	5.5	-	1.14	0.10	4.9	0.7	0.1	0.0	5.7	0.1	0.0	8.1	13	4.0	5.8	70	0	0.04
3	6.9	5.7	-	0.89	0.07	5.1	0.7	0.0	0.1	5.9	0.0	0.0	7.0	11	3.1	5.9	84	0	0.03
4	7.0	5.9	-	0.75	0.05	4.7	0.6	0.0	0.1	5.4	0.0	0.0	6.1	10	2.6	5.4	89	0	0.03
5	7.0	6.0	-	0.52	0.03	3.1	1.1	0.0	0.0	4.2	0.0	0.0	4.5	8	1.8	4.2	93	0	0.03
6	7.0	6.1	-	0.34	-	2.4	0.5	0.0	0.1	3.0	0.0	0.0	3.5	6	1.2	3.0	86	0	0.04

remarks (hor. 1) : Spec.Surf.=74
 remarks (hor. 2) : Spec.Surf.=73
 remarks (hor. 3) : Spec.Surf.=74
 remarks (hor. 4) : Spec.Surf.=73
 remarks (hor. 5) : Spec.Surf.=70
 remarks (hor. 6) : Spec.Surf.=68

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor. no.	MI	VE	CH	SM	KA	HA	ML	QU	FE	GI	GO	HE	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Fe(p)	Al(p)	Pret	pHNaF
1	-	-	-	-	-	-	-	-	-	-	-	-	0.40	0.35	0.02	8.11	0.68	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	0.53	0.36	0.02	8.02	0.62	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	0.59	0.40	0.02	8.37	0.68	-	-	-	-
4	-	-	-	-	5	-	-	4	2	4	0.69	0.37	0.04	8.17	0.67	-	-	-	-	-	-
5	-	-	-	-	5	-	-	4	2	4	0.75	0.29	0.03	8.18	0.66	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	0.75	0.24	0.04	8.05	0.64	-	-	-	-	-	-

SAND MINERALOGY

Hor. no.	HEAV QU	LIGH FE	light fraction PL	heavy fraction RE	OP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	7.6	92.4	100	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	

key : QU=quartz; FE=feldspar; PL=plagioclase; RE=rest group light min.; OP=opaque

remarks (hor. 5) : a few grains of zircon

FAO/UNESCO (1988)	: Geric Ferralsol	(1974 : Acris Ferralsol)
USDA/SCS SOIL TAXONOMY (1992)	: Rhodic Acrustox, clayey, oxidic, isothermic	(1975 : typic acorthox)
LOCAL CLASSIFICATION	: LR acrico	
DIAGNOSTIC CRITERIA		
	FAO (1988)	: Diagnostic horizons : ferralic B
		: Diagnostic properties : geric properties
	USDA/SCS (1992)	: Diagnostic horizons : oxic horizon
		: Soil moisture regime : ustic
LOCATION	: Sao Paulo, Bomfim Paulista, municipio de Cravinhos	
AUTHOR(S)	Latitude : 21°21' 0'' S Longitude : 47°44' 0'' W Author : Kauffman, J.H.	Altitude : 760 (m.a.s.l.) Date (mm.yy) : 5.84
GENERAL LANDFORM	: pediplain	Topography : undulating
PHYSIOGRAPHIC UNIT	: low, very broad hill	
SLOPE	Gradient : 2%	Aspect :
POSITION OF SITE	: upper slope	Form : convex
MICRO RELIEF	Kind :	
SURFACE CHAR.	Rock outcrop : nil Cracking : Salt : nil	Stoniness : nil Slaking/crusting : Alkali : nil
SLOPE PROCESSES	Soil erosion : slight sheet	
PARENT MATERIAL	1 : slope wash Texture : clayey	derived from : fine-basic igneous rock
Remarks	:	
EFFECTIVE SOIL DEPTH(cm)	: 250	
WATER TABLE	Depth(cm) :	Kind : no watertable observed
DRAINAGE	: well	
PERMEABILITY	: high	No slow permeable layer(s) cm
FLOODING	Frequency : nil	
MOISTURE CONDITIONS PROFILE	: 000 - 250 cm dry	
LAND USE	: medium level arable farming; Crops : sugar cane	
ADDITIONAL REMARKS :		
Brief field description:		
Very deep, well drained, dark red clay soil derived from basic rock; weakly structured.		
Rather large charcoal particles present at varying depths.		
Silt fraction is considered to be pseudo-silt (high silt/clay ratio waived for soil classification).		
Brazilian classification: Latossolo Roxo acrico.		
CLIMATE :	Köppen: Cwa	
Station: FRANCA	20 33 S/ 47 26 W	1036 m a.s.l
		90 km NE of site
		Relevance: moderate
	No. years of record	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Annual
EP Penman mm	155	124 132 117 102 92 102 121 123 132 132 125 1457
relative humidity %	78	84 79 68 64 52 48 55 75 83 85 90 72
precipitation mm	250	220 187 81 40 22 16 11 65 131 206 270 1499
tot.glob.rad. MJ/m ²	23.0	20.4 19.7 18.8 16.4 16.0 17.0 19.1 19.4 19.9 20.6 18.9 19.1
T mean °C	21.6	21.4 21.2 20.0 18.5 17.3 17.3 19.2 20.5 21.0 21.1 21.0 20.0
bright sunshine %	52	45 50 62 66 76 79 74 55 45 42 34 57

PROFILE DESCRIPTION :

Ap 0 - 26 cm. 1.5 YR 3.0/3.0, moistdark red (2.5 YR 3.0/6.0, dry) clay; moderate fine to medium subangular blocky, crumb structure; sticky, slightly plastic, very friable, hard; many medium continuous vesiculair pores and interstitial pores; many fine roots; gradual smooth boundary to
 AB 26 - 50 cm. 1.5 YR 3.0/3.5, moistdark red (2.5 YR 3.0/6.0, dry) clay; weak very fine subangular blocky to weak medium subangular blocky structure; sticky, slightly plastic, very friable, slightly hard; many medium continuous vesiculair pores and interstitial pores; many fine roots; diffuse smooth boundary to
 BA 50 - 70 cm. 1.5 YR 3.0/4.0, moistdark red (2.5 YR 3.0/6.0, dry) clay; weak very fine subangular blocky to weak medium subangular blocky structure; sticky, slightly plastic, very friable, slightly hard; many medium continuous vesiculair pores and interstitial pores; common fine roots; diffuse smooth boundary to
 Bw1 75 - 215 cm. 1.5 YR 3.0/4.0, moistdark red (2.5 YR 3.0/6.0, dry) clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, slightly hard; many very fine continuous vesiculair pores and fine interstitial pores; few fine roots; very few medium soft argilleous nodules; few termite channels; diffuse smooth boundary to
 Bw2 215 - 250 cm. 1.5 YR 3.0/4.0, moistdark red (2.5 YR 3.0/6.0, dry) clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, slightly hard; many very fine continuous vesiculair pores and fine interstitial pores; few fine roots; few medium cylindrical soft argilleous nodules;

ANALYTICAL DATA :

Hor.	Top - Bot	>2 mm	2000	1000	500	250	100	TOT 50	20	TOT 2 SILT	<2 μm	DISP	BULK DENS	pF 0.0	---	---	---	---	---	---	---	
no.		mm	1000	500	250	100	50	SAND	20	2	μm			1.0	1.5	2.0	2.3	2.7	3.4	4.2		
1	0 - 26	-	1	1	2	6	1	12	8	20	28	61	27.3	-	-	-	-	-	-	-	-	
2	26 - 50	-	1	1	2	5	1	10	8	18	26	64	0.0	1.27	55	54	46	39	36	34	31	30
3	50 - 75	-	1	1	2	5	1	10	7	21	28	62	2.4	1.17	58	58	51	40	36	33	28	28
4	75 - 215	-	1	1	2	5	0	9	19	24	43	49	24.0	1.00	60	60	52	36	32	29	25	24
5	215 - 250	-	1	1	2	4	2	10	13	21	34	56	0.5	-	-	-	-	-	-	-	-	

Hor.	pH-H ₂ O	-- CaCO ₃ -KCl	ORG-C%	MAT-N%	EXCH-Ca	CAT-Mg	---	---	---	EXCH-H+Al	AC.-Na	CEC-Al	---	BASE-ECEC	Al-SAT	EC-SAT	2.5		
no.			%	%													mS/cm		
1	4.7	4.2	-	2.47	0.18	0.2	0.1	0.1	0.0	0.4	0.8	0.7	7.7	13	8.6	1.2	5	9	0.09
2	4.9	4.8	-	1.15	0.09	0.0	0.0	0.0	0.1	0.1	0.0	0.0	3.6	6	4.0	0.2	3	0	0.02
3	5.4	5.1	-	0.88	0.05	0.2	0.0	0.0	0.1	0.3	0.0	0.0	1.4	2	3.1	0.3	21	0	0.01
4	5.6	5.5	-	0.80	0.04	0.0	0.0	0.0	0.1	0.1	0.0	0.0	1.6	3	2.8	0.1	6	0	0.01
5	5.9	5.8	-	0.53	0.04	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.7	1	1.9	0.1	14	0	0.01

remarks (hor. 1) : Spec.Surf.=66

remarks (hor. 2 - 3) : Spec.Surf.=63

remarks (hor. 4) : Spec.Surf.=60

remarks (hor. 5) : Spec.Surf.=57

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	-	-	-	-	-	0.46	0.34	0.02	9.06	0.76	-	-	-	-
2	-	-	-	-	-	-	-	-	0.49	0.37	0.02	10.30	0.82	-	-	-	-
3	-	-	-	4	-	-	4	2	0.47	0.35	0.03	10.70	0.83	-	-	-	-
4	-	-	-	4	-	-	4	2	0.46	0.34	0.02	9.94	0.82	-	-	-	-
5	-	-	-	-	-	-	-	-	0.44	0.28	0.02	10.30	0.77	-	-	-	-

SAND MINERALOGY

Hor.	HEAV QU	LIGH FE	light fraction	heavy fraction	OP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
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4	2.1	97.9	100	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0
---	-----	------	-----	---	---	-----	---	---	---	---	---	---	---	---	---	---	---	---	---

key : QU=quartz;FE=feldspar;PL=plagioclase;RE=rest group light min.;OP=opaque

remarks (hor. 4) : a few grains of zircon and tourmaline

FAO/UNESCO (1988)	:	Rhodic Ferralsol	(1974 : Rhodic Ferralsol)
USDA/SCS SOIL TAXONOMY (1992)	:	Rhodic Haplustox, loamy, kaolinitic, hyperthermic	(1975 : typic haplustox)
LOCAL CLASSIFICATION	:	LV textura media	
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	: Diagnostic horizons : umbric A, ferralic B : Diagnostic horizons : umbric epipedon, oxic horizon : Soil moisture regime : udic	
LOCATION	Latitude	: Sao Paulo, road Marilia-Assis, 11 km north of Assis : 22°33' 0'' S	Longitude : 50°19' 0'' W
AUTHOR(S)		: Kauffman, J.H.	Altitude : 562 (m.a.s.l.) Date (mm.yy) : 2.84
GENERAL LANDFORM		: pediplain	Topography : undulating
PHYSIOGRAPHIC UNIT		: slope	
SLOPE	Gradient	: 4%	Aspect :
POSITION OF SITE		: upper slope	Form : convex
MICRO RELIEF	Kind :		
SURFACE CHAR.	Rock outcrop	: nil	Stoniness : nil
	Cracking	: nil	Slaking/crusting : nil
	Salt	: nil	Alkali : nil
SLOPE PROCESSES	Soil erosion	: slight sheet	
PARENT MATERIAL	1	: colluvium	derived from : sandstone
	Texture	: loamy	
Remarks		: Upper cretaceous	
EFFECTIVE SOIL DEPTH(cm)		: 250	
WATER TABLE	Depth(cm)		Kind : no watertable observed
DRAINAGE		: well	
PERMEABILITY		:	No slow permeable layer(s) cm
FLOODING	Frequency	: nil	
MOISTURE CONDITIONS PROFILE		: 000 - 250 cm dry	
LAND USE		: semi natural grassland, grazed	

ADDITIONAL REMARKS :

Brief field description:

Very deep, well drained, dusky red, sandy loam soil, derived from reworked material, originating from clay-kit sandstone from the Bauru group, upper cretaceous.

CLIMATE :	Köppen: Cwa	Station: LONDRINA	23 22 S/ 51 10 W	585 m a.s.l	115 km SW of site	Relevance: moderate								
	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
precipitation	mm	226	176	127	116	93	86	57	56	101	171	105	171	1485
T mean	°C	23.9	23.9	22.9	21.1	18.1	16.8	16.9	18.7	20.2	21.4	22.7	23.2	20.8

PROFILE DESCRIPTION :

Ah 0 - 28 cm. 2.5 YR 3.0/3.0, moist 2.5 YR 4.0/3.0, dry sandy loam; weak crumb structure; slightly sticky, non plastic, friable, slightly hard; many very fine continuous tubular pores and coarse pores; many fine roots and few medium roots; smooth boundary to

BA 28 - 85 cm. 1.5 YR 3.0/4.0, moist 1.5 YR 4.0/4.0, dry sandy loam; porous massive structure; slightly sticky, slightly plastic, very friable, slightly hard; many very fine continuous tubular pores and medium pores; many fine roots and few medium roots; diffuse smooth boundary to

BW 85 - 250 cm. 1.5 YR 3.0/5.0, moist 1.5 YR 4.0/5.0, dry sandy clay loam; porous massive structure; sticky, plastic, very friable, slightly hard; many very fine continuous tubular pores and medium pores; common fine roots;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000	1000	500	250	100	TOT	50	20	TOT	<2 µm	DISP	BULK DENS	pF	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
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remarks (hor. 1 - 4): Spec.Surf.=14

remarks (hor. 5) : Spec.Surf.=16

CLAY MINERALOGY (1 very weak,..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p)

Ног.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	-	-	-	-	-	-	0.07	0.07	0.00	1.18	0.09	-	-	-	
2	-	-	-	-	-	-	-	-	-	0.06	0.08	0.00	1.39	0.10	-	-	-	
3	-	-	2	-	8	-	-	-	2	3	2	0.05	0.07	0.00	1.48	0.09	-	-
4	-	-	2	-	8	-	-	-	2	3	2	0.04	0.07	0.00	1.62	0.11	-	-
5	-	-	-	-	-	-	-	-	-	0.04	0.07	0.01	1.80	0.11	-	-	-	

SAND MINERALOGY

Hor. HEAV LIGH	light fraction	heavy fraction																		
no.	QU	FE	PL	RE	OP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O

4 0.3 99.7 100 0 0 0 84 23 65 11 0 1 0 0 0 0 0 0 0 0 0 0 0

key : QU=quartz; FE=feldspar; PL=plagioclase; RE=rest group light min.; OP=opaque

key (hor. 4): A=tourmaline;B=zircon;C=rutile;D=anatase;E=staurolite;F=disthene;G=sillimanite - grains;H=sillimanite - fibrous structure

remarks (hor. 4) : In the light fraction some opaque concretions

FAO/UNESCO (1988)	: Rhodic Nitisol	(1974 : Eutric Nitosol)
USDA/SCS SOIL TAXONOMY (1992)	: Kandic Paleustalf, clayey, kaolinitic, hyperthermic	(1975 : rhodic paleudalf)
LOCAL CLASSIFICATION	: Tr Estruturada eutr.	
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	: Diagnostic horizons : argic B : Diagnostic properties : nitic properties : Diagnostic horizons : kandic horizon, argillic horizon : Soil moisture regime : ustic
LOCATION	Latitude : 23°40' 0'' S	Parana, 34 km from Londrina on highway to Ponta Grossa, 20 mtrs left Longitude : 51°10' 0'' W Altitude : 480 (m.a.s.l.)
AUTHOR(S)	Author : Kauffman, J.H.	Date (mm.yy) : 3.77
GENERAL LANDFORM	: pediplain	Topography : rolling
PHYSIOGRAPHIC UNIT	: low, broad hill	
SLOPE	Gradient : 15%	Aspect :
POSITION OF SITE	: middle slope	Form : convex
MICRO RELIEF	Kind :	
SURFACE CHAR.	Rock outcrop : little rocky Cracking : small cracks Salt : nil	Stoniness : nil Slaking/crusting : nil Alkali : nil
SLOPE PROCESSES	Soil erosion : moderate sheet gully	
PARENT MATERIAL	1 : residual material Texture : clayey	derived from : fine-ultrabasic igneous rock
Remarks	Remarks : Diabase, upper trias	
EFFECTIVE SOIL DEPTH(cm)	: 275	
WATER TABLE	Depth(cm) :	Kind : no watertable observed
DRAINAGE	: well	
PERMEABILITY	: moderate	No slow permeable layer(s) cm
MOISTURE CONDITIONS PROFILE	Moisture profile : 000 - 050 cm dry	050 - 275 cm moist
LAND USE	Land use : high level arable farming; Crops : annual crops	
ADDITIONAL REMARKS :		
Brief field description:		
Very deep, well drained, dark reddish brown clay soil, derived from ultra basic rock; well structured throughout. The soil is bordering to a Phaeozem (FAO) or Mollisol (ST) although soil consistency is too hard when dry. According to ST (1992) the soil may classify as Oxisol, however, a high content of weatherable minerals is assumed.		
Brazilian classification: Terra Roxa Estruturada eutrofica.		
Land use: 1. cattle breeding; 2. agriculture: soja, maize, wheat, cotton, beans, ramin(malvaceae,fibre), peanuts, sunflower, rice, tea; 3. horticulture: fruits: grapes, apples.		
CLIMATE :	Köppen:	
Station: LONDRINA	23 22 S/ 51 10 W	585 m a.s.l
	34 km NNW of site	Relevance: good
	No. years of record	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Annual
precipitation	mm	226 176 127 116 93 86 57 56 101 171 105 171 1485
T mean	°C	23.9 23.9 22.9 21.1 18.1 16.8 16.9 18.7 20.2 21.4 22.7 23.2 20.8

PROFILE DESCRIPTION :

Ah 0 - 15 cm. dusky red (2.5 YR 3.0/2.0, moist) 2.5 YR 3.0/3.0, dry clay; moderate to strong fine to medium subangular blocky to crumb structure; sticky, plastic, firm, hard; many micro pores and medium pores; many very fine roots and medium roots; clear smooth boundary to

AB 15 - 32 cm. 2.5 YR 3.0/3.0, moist clay; strong fine subangular blocky to strong coarse angular blocky structure; sticky, plastic, firm, hard; broken moderately thick clay cutans; common micro pores and coarse pores; many very fine roots and fine roots; gradual smooth boundary to

Bt1 32 - 75 cm. dark reddish brown (2.5 YR 3.0/4.0, moist) clay; strong fine subangular blocky to strong coarse angular blocky structure; sticky, plastic, firm, hard; continuous moderately thick clay cutans; common micro pores and coarse pores; common very fine roots and fine roots; diffuse smooth boundary to

Bt2 75 - 150 cm. 1.5 YR 3.0/4.0, moist clay; strong fine subangular blocky to strong coarse angular blocky structure; sticky, plastic, firm, hard; continuous thick clay cutans; common very fine pores and fine pores; common very fine roots and fine roots; diffuse smooth boundary to

Bt3 150 - 275 cm. 1.5 YR 3.0/4.0, moist clay; weak to moderate fine subangular blocky to coarse structure; sticky, plastic, friable, slightly hard; broken thick clay cutans; many very fine pores and fine pores; few very fine roots and fine roots;

ANALYTICAL DATA :

Hor. no.	Top - Bot mm	>2 1000 500 250 100 50	TOT 2000 500 250 100 50	50 TOT 20	20 TOT 2 SILT μm	DISP	BULK DENS	pf- --- - - - - - - - -													
								2000 1000 500 250 100 50	20 TOT 2 SILT μm	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2				
1	0 - 15	-	1	1	1	3	1	7	9 28	38	55	24.6	1.30	55	53	49	46	44	42	34	32
2	15 - 30	-	1	1	1	3	1	7	10 27	37	57	37.4	-	-	-	-	-	-	-	-	-
3	30 - 75	-	1	0	1	1	1	3	5 14	18	79	29.8	1.18	59	56	49	45	43	42	40	38
4	75 - 112	-	1	0	0	1	0	3	6 10	16	82	3.9	1.17	58	57	50	47	46	45	42	39
5	125 - 175	-	0	0	0	1	1	3	3 12	15	82	0.0	-	-	-	-	-	-	-	-	-
6	200 - 275	-	0	1	0	1	0	3	7 14	20	77	0.0	-	-	-	-	-	-	-	-	-
Hor. no.	pH- H2O	-- CaCO ₃ KCl	ORG-C %	MAT-N %	EXCH Ca %	CAT-Mg %	----- EXCH K Na sum ----- EXCH H+Al cmol(+)/kg	AC. sum ----- CEC Al soil clay ----- BASE ECEC ----- AL SAT ----- EC SAT mS/cm	CEC ----- OrgC ----- ECEC ----- % ----- % ----- mS/cm												
1	6.2	5.2	-	2.84	0.28	10.4	2.2	1.1	0.0	13.7	0.0	0.0	17.7	32	9.9	13.7	77	0	0.21		
2	6.4	5.3	-	1.62	0.18	8.0	1.5	0.5	0.0	10.0	0.0	0.1	12.2	21	5.7	10.0	82	1	0.13		
3	6.8	5.4	-	0.92	0.10	6.9	1.7	0.7	0.0	9.3	0.0	0.0	11.9	15	3.2	9.3	78	0	0.06		
4	6.9	5.6	-	0.60	0.05	5.8	2.1	0.9	0.1	8.9	0.0	0.0	10.7	13	2.1	8.9	83	0	0.05		
5	6.8	5.5	-	0.43	-	4.6	2.1	0.6	0.0	7.3	0.0	0.0	9.0	11	1.5	7.3	81	0	0.05		
6	6.1	4.8	-	0.19	-	3.1	1.2	0.1	0.0	4.4	0.0	0.0	7.7	10	0.7	4.4	57	0	0.01		

remarks (hor. 1) : Spec.Surf.=83
 remarks (hor. 2) : Spec.Surf.=81
 remarks (hor. 3) : Spec.Surf.=109
 remarks (hor. 4) : Spec.Surf.=113
 remarks (hor. 5) : Spec.Surf.=114
 remarks (hor. 6) : Spec.Surf.=110

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor. no.	MI	VE	CH	SM	KA	HA	ML	QU	FE	GI	GO	HE	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Fe(p)	Al(p)	Pret	pHNaF
1	-	-	-	-	-	-	-	-	-	-	-	-	0.64	0.20	0.04	8.09	0.54	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	0.67	0.18	0.04	8.19	0.53	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	0.84	0.26	0.05	8.08	0.64	-	-	-	-
4	-	-	-	-	7	-	-	-	3	3	3	-	0.88	0.31	0.04	7.84	0.62	-	-	-	-
5	-	-	-	-	7	-	-	-	3	3	3	-	0.87	0.36	0.05	7.81	0.61	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	0.88	0.23	0.05	7.74	0.61	-	-	-	-

FAO/UNESCO (1988)	:	Humic Ferralsol	(1974 : Humic Ferralsol)
USDA/SCS SOIL TAXONOMY (1992)	:	Humic Hapludox, clayey, kaolinitic, thermic	(1975 : typic haplorthox)
LOCAL CLASSIFICATION	:	Solo c/b latossolico	
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	: Diagnostic horizons : umbric A, ferralic B : Diagnostic horizons : umbric epipedon, oxic horizon : Soil moisture regime : udic	
LOCATION		: Parana, road BR466 Ivaipora-Pitanga, 6km from junction to Ivaipora.	
AUTHOR(S)	Latitude : 24°18' 0'' S :	Longitude : 51°43' 0'' W :	Altitude : 760 (m.a.s.l.) Date (mm.yy) : 11.83
GENERAL LANDFORM	:	piedplain	Topography : undulating
PHYSIOGRAPHIC UNIT	:	broad low hill	
SLOPE	Gradient : 3%	Aspect :	Form :
POSITION OF SITE	:		
MICRO RELIEF	Kind :		
	Salt : nil	Alkali : nil	
SLOPE PROCESSES	Soil erosion : slight sheet		
PARENT MATERIAL	1 : ice-pushed materials Texture : clayey	derived from : fine-basic igneous rock	
Remarks	:	Jurassic/cretaceous	
EFFECTIVE SOIL DEPTH(cm)	:	265	
WATER TABLE	Depth(cm) :		Kind : no watertable observed
DRAINAGE	:	well	
PERMEABILITY	:	high	No slow permeable layer(s) cm
FLOODING	Frequency : nil	Run off : slow	
MOISTURE CONDITIONS PROFILE	:	000 - 040 cm dry 040 - 250 cm moist	
LAND USE	:	mixed farming; Crops : maize	
VEGETATION	Type : evergreen forest	Status : cut over	
Landuse/vegetation remarks	:	Soja and green beans	
ADDITIONAL REMARKS :			
Brief field description:			
Very deep, well drained, dark reddish brown clay soil derived from basic rock; slightly cracking when dry. Sorptivity for water is high throughout the profile (although relatively less high in the first 65 cm). Soil is formed in weathered products of basalt of the Serra Geral formation, Jurassic/Cretaceous.			

CLIMATE :	Köppen: Cfa													
Station: GUARAPUAVA	25 24 S/ 51 28 W	1116 m a.s.l				130 km SSE of site				Relevance: poor				
	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EP Penman mm	146	125	122	93	73	59	69	88	94	119	141	151	1278	
relative humidity %	81	80	78	76	76	79	69	69	82	82	76	78	77	
precipitation mm	188	141	134	113	119	136	102	112	157	163	157	153	1675	
tot.glob.rad. MJ/m ²	22.4	21.4	19.3	16.5	13.4	11.6	13.4	16.1	17.2	20.1	23.6	23.7	18.2	
T mean °C	20.8	20.0	19.1	16.3	14.3	12.9	12.6	14.3	15.3	16.9	18.3	19.6	16.6	
bright sunshine %	47	49	51	54	54	51	61	61	47	47	54	51	52	

PROFILE DESCRIPTION :

Ap	0 - 22 cm.	2.5 YR 3.0/3.0, moistdark reddish brown (2.5 YR 3.0/4.0, dry) clay; weak to moderate fine to very fine subangular blocky to granular structure; sticky, plastic, very friable, slightly hard; many very fine pores and fine pores; many very fine roots and fine roots; gradual smooth boundary to
AB	22 - 44 cm.	1.5 YR 3.0/4.0, moist 2.5 YR 3.0/5.0, dry clay; strong fine to very fine granular structure; sticky, plastic, very friable, slightly hard; many very fine pores and fine pores; many very fine roots and common fine roots; gradual smooth boundary to
BA	44 - 65 cm.	1.5 YR 3.0/4.0, moist clay; weak to strong fine to very fine subangular blocky to granular structure; sticky, plastic, very friable, slightly hard; many very fine pores and fine pores; common very fine roots and many fine roots; gradual smooth boundary to
Bw1	65 - 145 cm.	1 YR 3.0/5.0, moist clay; strong very fine subangular blocky to porous massive structure; sticky, plastic, very friable, slightly hard; many very fine pores; common very fine roots and fine roots; diffuse smooth boundary to
Bw2	145 - 265 cm.	1 YR 3.0/5.0, moist clay; strong very fine subangular blocky to porous massive structure; sticky, plastic, very friable, slightly hard; many very fine pores; few very fine roots and fine roots;

ANALYTICAL DATA :

Hor. no.	Top - Bot mm	>2 mm	2000 1000					500 500 250 100					100 50 SAND					<2 μm	DISP	BULK DENS	pf- 0.0 1.0 1.5 2.0 2.3 2.7 3.4 4.2							
			2000	1000	500	250	100	50	SAND	20	2	SILT	μm	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2							
1	0 - 22	-	0	0	0	1	1	2	6	10	16	82	25.2	0.93	62	59	50	40	37	33	27	27						
2	22 - 44	-	0	0	0	1	1	3	3	11	14	83	40.9	0.98	63	58	49	43	40	38	31	31						
3	44 - 65	-	0	0	0	2	1	3	5	11	16	81	1.0	-	-	-	-	-	-	-	-	-						
4	65 - 120	-	0	0	0	1	1	3	5	8	13	84	0.0	0.93	63	60	51	43	40	38	31	30						
5	120 - 200	-	0	0	0	1	1	3	5	8	12	85	0.5	0.93	60	60	53	47	43	41	31	30						
6	200 - 350	-	0	0	0	1	1	3	6	9	15	82	0.5	-	-	-	-	-	-	-	-	-						
7	350 - 450	-	0	0	0	1	1	3	6	11	17	80	0.5	-	-	-	-	-	-	-	-	-						
8	450 - 550	-	0	0	0	1	1	3	5	12	16	81	0.9	-	-	-	-	-	-	-	-	-						
9	550 - 650	-	0	0	0	1	2	3	7	11	18	79	0.5	-	-	-	-	-	-	-	-	-						

Hor. no.	pH-	-- CaCO ₃	ORG-	MAT.	EXCH	CAT.	---	EXCH	AC.	CEC	---	---	---	BASE	Al	EC	2.5		
	H ₂ O	KCl	C	N	Ca	Mg	K	Na	sum	H+Al	Al	soil	clay	OrgC	ECEC	SAT	SAT	mS/cm	
1	4.2	3.8	-	2.58	0.23	0.8	0.5	0.2	0.0	1.5	3.6	3.8	12.2	15	9.0	5.1	12	31	0.18
2	4.4	3.8	-	1.76	0.17	0.8	0.2	0.1	0.2	1.3	3.6	3.7	10.2	12	6.2	4.9	13	36	0.06
3	4.7	3.9	-	1.34	0.10	1.0	0.2	0.0	0.3	1.5	2.7	2.7	9.0	11	4.7	4.2	17	30	0.04
4	5.1	4.2	-	0.75	0.04	0.6	0.1	0.0	0.1	0.8	1.4	1.3	7.3	9	2.6	2.2	11	18	0.01
5	4.8	4.3	-	0.50	0.02	0.4	0.1	0.0	0.0	0.5	0.7	0.6	5.8	7	1.8	1.2	9	10	0.03
6	5.4	4.4	-	0.14	-	0.2	0.1	0.0	0.1	0.4	0.4	0.3	6.1	7	0.5	0.8	7	5	0.01
7	5.4	4.4	-	0.09	-	0.2	0.1	0.0	0.0	0.3	0.4	0.3	4.8	6	0.3	0.7	6	6	0.01
8	5.5	4.3	0.0	0.06	-	0.2	0.1	0.0	0.1	0.4	0.7	0.7	7.5	9	0.2	1.1	5	9	0.01
9	5.3	4.2	0.0	0.03	-	0.4	0.1	0.0	0.2	0.7	0.0	0.0	5.1	6	0.1	0.7	14	0	0.01

remarks (hor. 1) : Spec.Surf.=91
 remarks (hor. 2) : Spec.Surf.=89
 remarks (hor. 3) : Spec.Surf.=88
 remarks (hor. 4) : Spec.Surf.=93
 remarks (hor. 5) : Spec.Surf.=94
 remarks (hor. 6) : Spec.Surf.=92
 remarks (hor. 7) : Spec.Surf.=91
 remarks (hor. 8) : Spec.Surf.=93
 remarks (hor. 9) : Spec.Surf.=94

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	-	-	-	-	-	-	0.45	0.36	0.03	8.56	0.67	-	-	-	-	
2	-	-	-	-	-	-	-	-	-	0.48	0.32	0.02	8.48	0.71	-	-	-	-	
3	-	-	-	-	-	-	-	-	-	0.49	0.35	0.02	8.97	0.71	-	-	-	-	
4	-	-	2	-	6	-	-	-	3	4	0.56	0.39	0.03	8.85	0.72	-	-	-	-
5	-	-	3	-	6	-	-	-	3	4	0.57	0.39	0.04	8.75	0.82	-	-	-	-
6	-	-	-	-	-	-	-	-	-	0.52	0.29	0.05	8.48	0.57	-	-	-	-	
7	-	-	-	-	-	-	-	-	-	0.54	0.29	0.05	8.50	0.56	-	-	-	-	
8	-	-	-	-	-	-	-	-	-	0.48	0.28	0.04	8.42	0.54	-	-	-	-	
9	-	-	-	-	-	-	-	-	-	0.47	0.28	0.04	8.36	0.51	-	-	-	-	

FAO/UNESCO (1988)	:	Humic Ferralsol	(1974 : Humic Ferralsol)											
USDA/SCS SOIL TAXONOMY (1992)	:	Humic Haplustox, clayey, kaolinitic, thermic	(1975 : typic acrohumox)											
LOCAL CLASSIFICATION	:	Latossolo bruno												
DIAGNOSTIC CRITERIA	FAO (1988)	: Diagnostic horizons	: umbric A, ferralic B											
	USDA/SCS (1992)	: Diagnostic horizons	: umbric epipedon, oxic horizon											
		: Soil moisture regime	: udic											
LOCATION	:	Parana, road Pitanga-Guarapuava, 50 km of Pitanga, 3km of Rio Turvo												
Latitude	:	25° 6' 0'' S	Longitude : 51°32' 0'' W											
AUTHOR(S)	:	Kauffman, J.H.	Altitude : 1100 (m.a.s.l.) Date (mm.yy) : 12.83											
GENERAL LANDFORM	:	pediplain	Topography : undulating											
PHYSIOGRAPHIC UNIT	:	low broad hill												
SLOPE	Gradient :	9%	Aspect :											
POSITION OF SITE	:	upper slope	Form : convex											
MICRO RELIEF	Kind :													
SURFACE CHAR.	Rock outcrop :	nil	Stoniness : nil											
	Cracking :	small cracks	Slaking/crusting : nil											
	Salt :	nil	Alkali : nil											
SLOPE PROCESSES	Soil erosion :	slight sheet												
PARENT MATERIAL	1 :	residual material	derived from : fine-basic igneous rock											
	Texture :	clayey												
Remarks	:	Saprolite												
EFFECTIVE SOIL DEPTH(cm)	:	250												
WATER TABLE	Depth(cm) :		Kind : no watertable observed											
DRAINAGE	:	well												
PERMEABILITY	:	high	No slow permeable layer(s) cm											
MOISTURE CONDITIONS PROFILE	:	000 - 030 cm dry	030 - 200 cm moist											
LAND USE	:	medium level arable farming; Crops :	annual crops											
ADDITIONAL REMARKS :														
Brief field description:														
Very deep, well drained, dark brown clay soil derived from basalt; soil has high organic matter content. Soil cracks considerably when drying out. From 50-100 cm depth onwards clay nodules (0.5-2 cm) of irregular shape, and white chalcedon in irregular concentric form.														
Soil formed in saprolite of basalt of the Serra Geral formation, jurassic/cretaceous.														
CLIMATE :	Köppen: Cfb													
Station: GUARAPUAVA	25 24 S/ 51 28 W	1116 m a.s.l	36 km SE of site											
			Relevance: poor											
	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EP Penman	mm	146	125	122	93	73	59	69	88	94	119	141	151	1278
relative humidity	%	81	80	78	76	76	79	69	69	82	82	76	78	77
precipitation	mm	188	141	134	113	119	136	102	112	157	163	157	153	1675
tot.glob.rad.	MJ/m ²	22.4	21.4	19.3	16.5	13.4	11.6	13.4	16.1	17.2	20.1	23.6	23.7	18.2
T mean	°C	20.8	20.0	19.1	16.3	14.3	12.9	12.6	14.3	15.3	16.9	18.3	19.6	16.6
bright sunshine	%	47	49	51	54	54	51	61	61	47	47	54	51	52

PROFILE DESCRIPTION :

A 0 - 16 cm. 9 YR 3.0/2.0, moist clay; weak to moderate fine to very fine crumb structure; slightly sticky, slightly plastic, friable, very hard; many very fine pores and medium pores; many very fine roots and fine roots; gradual smooth boundary to
 AB 16 - 41 cm. 8 YR 3.0/2.0, moist clay; weak to moderate fine to medium subangular blocky to porous massive structure; slightly sticky, slightly plastic, friable, hard; many very fine pores and medium pores; common very fine roots and fine roots; gradual smooth boundary to
 BA 41 - 80 cm. 8 YR 3.0/3.0, moist clay; weak to moderate fine to medium subangular blocky to porous massive structure; sticky, plastic, friable, slightly hard; many very fine pores and medium pores; common very fine roots and fine roots; diffuse smooth boundary to
 Bw1 80 - 150 cm. brown (7.5 YR 3.5/4.0, moist) clay; weak to moderate fine to medium subangular blocky to porous massive structure; sticky, plastic, friable, slightly hard; many very fine pores and medium pores; few very fine roots and fine roots; diffuse smooth boundary to
 Bw2 150 - 250 cm. 5 YR 3.5/5.0, moist clay; weak to moderate fine to medium subangular blocky to porous massive structure; sticky, plastic, friable, hard; many very fine pores and medium pores; few very fine roots and fine roots;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2	2000	1000	500	250	100	TOT	50	20	TOT	<2	DISP	BULK	PF-	---	---	---	---	---	---	
		mm	1000	500	250	100	50	SAND	20	2	SILT	μm	DENS	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2	
1	0 - 16	-	0	1	1	1	0	3	7	14	21	76	23.0	-	-	-	-	-	-	-	-	
2	16 - 41	-	1	1	1	1	1	4	10	13	23	74	30.3	0.86	64	61	54	48	44	42	26	25
3	41 - 80	-	1	1	0	1	1	3	9	13	22	75	32.2	0.93	62	59	53	48	45	44	28	27
4	80 - 120	-	1	1	1	1	2	5	10	11	21	74	3.4	1.07	58	58	46	52	50	48	33	31
5	150 - 200	-	1	1	0	1	2	4	7	15	22	74	0.0	-	-	-	-	-	-	-	-	

Hor. no.	pH-	-- CaCO ₃	ORG-	MAT.	EXCH	CAT.	-----	EXCH	AC.	CEC	-----	-----	BASE	Al	EC 2.5				
	H ₂ O	KCl	C	N	Ca	Mg	K	Na	sum	H+Al	Al	soil clay	OrgC	ECEC	SAT	SAT	mS/cm		
1	4.4	3.9	-	3.69	0.22	0.2	0.2	0.1	0.3	0.8	4.6	4.5	17.9	24	13.0	5.4	4	25	0.06
2	4.7	4.0	-	2.26	0.13	0.0	0.1	0.0	0.2	0.3	3.6	3.8	13.5	18	7.9	3.9	2	28	0.02
3	4.8	4.1	-	1.85	0.10	0.0	0.1	0.1	0.7	0.9	3.3	3.3	11.5	15	6.5	4.2	8	29	0.01
4	5.0	4.2	-	1.09	0.08	0.2	0.1	0.0	0.1	0.4	1.9	1.9	9.0	12	3.8	2.3	4	21	0.01
5	5.0	4.4	-	0.53	0.04	0.2	0.0	0.0	0.1	0.3	0.6	0.5	6.7	9	1.9	0.9	4	7	0.01

remarks (hor. 1) : Spec.Surf.=113

remarks (hor. 2) : Spec.Surf.=107

remarks (hor. 3) : Spec.Surf.=105

remarks (hor. 4) : Spec.Surf.=106

remarks (hor. 5) : Spec.Surf.=105

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	-	-	-	-	-	0.40	0.50	0.03	8.55	1.91	-	-	-	-	
2	-	-	-	-	-	-	-	-	0.27	0.43	0.03	8.94	1.92	-	-	-	-	
3	-	-	-	-	-	-	-	-	0.24	0.39	0.03	9.08	2.04	-	-	-	-	
4	-	4	-	6	-	-	4	4	-	0.31	0.30	0.04	8.68	1.84	-	-	-	-
5	-	4	-	6	-	-	4	4	-	0.27	0.26	0.05	8.93	1.59	-	-	-	-

SAND MINERALOGY

Hor. no.	HEAV	LIGH	light fraction				heavy fraction				OP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	QU	FE	PL	RE	OP	A	B	C	D	E																

4 12.4 87.6 100 0 0 0 53 19 30 10 0 33 3 4 1 0 0 0 0 0 0 0 0 0 0 0 0

key : QU=quartz;FE=feldspar;PL=plagioclase;RE=rest group light min.;OP=opaque

key (hor. 4): A=tourmaline;B=zircon;C=rutile;D=anatase;E=staurolite;F=disthene;G=sillimanite - grains;H=sillimanite - fibrous structure

FAO/UNESCO (1988)	:	Humic Ferralsol	(1974 : Humic Ferralsol)											
USDA/SCS SOIL TAXONOMY (1992)	:	Humic Hapludox, clayey, kaolinitic, thermic	(1975 : typic acrohumox)											
LOCAL CLASSIFICATION	:	Latossolo Humico v-a												
DIAGNOSTIC CRITERIA	FAO (1988)	Diagnostic horizons	: umbric A, ferralic B											
	USDA/SCS (1992)	Diagnostic horizons	: umbric epipedon, oxic horizon											
		Soil moisture regime	: udic											
LOCATION	:	Parana, road BR376 Curitiba-Joinville, km 24, San Jose dos Pinhais												
AUTHOR(S)	Latitude :	25°40' 0'' S	Longitude : 49°11' 0'' W											
			Altitude : 910 (m.a.s.l.)											
			Date (mm.yy) : 21.77											
GENERAL LANDFORM	:	pediplain	Topography : undulating											
PHYSIOGRAPHIC UNIT	:	low broad hill												
SLOPE	Gradient :	2%	Aspect :											
POSITION OF SITE	:	upper slope	Form :											
MICRO RELIEF	Kind :													
SURFACE CHAR.	Rock outcrop :	nil	Stoniness : nil											
	Cracking :	small cracks	Slaking/crusting : nil											
	Salt :	nil	Alkali : nil											
SLOPE PROCESSES	Soil erosion :	slight sheet												
PARENT MATERIAL	1 :	unconsolidated	derived from : igneous and metamorphic											
Remarks	Texture :	clayey												
		: Acidic												
EFFECTIVE SOIL DEPTH(cm)	:	200												
WATER TABLE	Depth(cm) :		Kind : no watertable observed											
DRAINAGE	:	well												
PERMEABILITY	:		No slow permeable layer(s) cm											
MOISTURE CONDITIONS PROFILE	:													
LAND USE	:	medium level mixed farming												
ADDITIONAL REMARKS :														
Brief field description:														
Very deep, well drained, red clay soil with a well developed, thick, dark A horizon. The bio-activity is high, shown by bio-channels filled with strongly contrasting coloured soil from upper or lower soil layers.														
Brazilian classification: Latossolo Humico Vermelho amarelo distrofico.														
CLIMATE :	Köppen: Ccf													
Station: CURITIBA	25 26 S/ 49 16 W	947 m a.s.l	24 km NNW of site											
			Relevance: good											
	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EP Penman mm		139	119	119	92	74	60	68	83	87	109	129	142	1223
relative humidity %		84	84	80	77	76	77	70	73	86	86	81	82	80
precipitation mm		199	173	124	78	85	88	81	83	119	130	105	147	1412
tot.glob.rad. MJ/m ²		21.4	20.4	18.9	16.1	13.5	11.8	13.3	15.4	16.2	18.9	22.2	22.6	17.6
T mean °C		20.1	20.1	19.2	16.8	14.5	13.2	12.5	14.0	14.8	16.2	17.4	18.9	16.5
bright sunshine %		43	45	49	52	54	53	60	57	42	41	48	47	49

PROFILE DESCRIPTION :

- Ah1 0 - 16 cm. very dark gray (10 YR 3.0/1.0, moist) clay; weak fine to medium subangular blocky to granular structure; sticky, plastic, very friable, slightly hard; many very fine pores and coarse pores; many very fine roots and fine roots; gradual smooth boundary to
- Ah2 16 - 42 cm. very dark gray (10 YR 2.5/1.0, moist) clay; weak fine to medium subangular blocky to granular structure; sticky, plastic, very friable, slightly hard; many very fine pores and coarse pores; many very fine roots and fine roots; diffuse smooth boundary to
- Ah3 42 - 64 cm. very dark grayish brown (10 YR 3.0/1.5, moist) clay; weak fine to medium subangular blocky to granular structure; sticky, plastic, very friable, slightly hard; many very fine pores and coarse pores; many very fine roots and fine roots; gradual smooth boundary to

AB 64 - 81 cm. dark brown (10 YR 4.0/3.0, moist) clay; weak fine subangular blocky structure; sticky, plastic, friable, slightly hard; patchy thin clay cutans; many very fine pores and coarse pores; common very fine roots and fine roots; gradual smooth boundary to
 BA 81 - 101 cm. yellowish red (5 YR 4.5/6.0, moist) clay; weak fine subangular blocky to porous massive structure; sticky, plastic, friable, slightly hard; patchy thin clay cutans; common very fine pores and medium pores; common very fine roots and fine roots; diffuse smooth boundary to
 bws1 101 - 140 cm. 3.5 YR 4.0/6.0, moist clay; weak to moderate fine subangular blocky to porous massive structure; sticky, plastic, friable, hard; patchy thin clay cutans; common very fine pores and medium pores; few very fine roots and fine roots; diffuse smooth boundary to
 Bws2 140 - 200 cm. 1.5 YR 4.0/6.0, moist clay; weak medium to coarse subangular blocky to porous massive structure; sticky, plastic, firm, hard; patchy thin clay cutans; common very fine pores and fine pores; few very fine roots and fine roots;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2	2000	1000	500	250	100	TOT	50	20	TOT	<2	DISP	BULK	PF-	-	-	-	-	-		
		mm	1000	500	250	100	50	SAND	20	2	SILT	μm	DENS	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2	
1	0 - 16	-	1	3	7	12	6	29	6	9	15	55	6.0	0.84	63	59	53	48	44	42	21	21
2	16 - 42	-	1	3	7	12	7	29	5	10	15	56	8.2	0.87	61	57	50	44	40	38	22	21
3	42 - 64	-	1	3	6	11	6	27	6	10	16	57	17.5	-	-	-	-	-	-	-	-	-
4	64 - 81	-	1	3	5	10	6	24	5	9	13	62	21.9	1.03	51	47	44	41	39	38	25	24
5	81 - 101	-	1	2	5	10	6	25	8	11	20	55	21.9	-	-	-	-	-	-	-	-	-
6	101 - 140	-	1	3	5	10	6	25	4	9	13	62	5.0	1.12	53	51	50	48	47	46	29	28
7	140 - 200	-	2	3	5	10	7	26	7	19	26	48	0.7	-	-	-	-	-	-	-	-	-

Hor. no.	pH-	--	CaCO ₃	ORG-	MAT.	EXCH	CAT.	---	---	---	---	EXCH	AC.	CEC	---	---	---	BASE	Al	EC	2.5
	H ₂ O	KCl	%	C	N	Ca	Mg	K	Na	sum	H+Al	Al	soil	clay	OrgC	ECEC	SAT	SAT	%	%	mS/cm
1	4.3	3.9	-	5.52	0.31	0.8	0.5	0.2	0.3	1.8	5.3	5.5	20.3	37	19.0	7.1	9	27	0.23		
2	4.5	4.0	-	4.19	0.22	0.4	0.3	0.1	0.4	1.2	5.0	5.2	19.4	35	15.0	6.2	6	27	0.09		
3	4.8	4.0	-	2.81	0.11	0.4	0.5	0.1	0.1	1.1	3.8	4.0	14.7	26	9.8	4.9	7	27	0.05		
4	4.9	4.1	-	2.03	0.08	0.2	0.3	0.1	0.1	0.7	3.5	3.7	11.9	19	7.1	4.2	6	31	0.02		
5	5.1	4.1	-	1.37	0.08	0.2	0.2	0.0	0.1	0.5	2.4	2.4	8.3	15	4.8	2.9	6	29	0.01		
6	5.4	4.9	-	0.60	0.05	0.0	0.2	0.0	0.3	0.5	0.0	0.1	3.3	5	2.1	0.5	15	3	0.01		
7	5.0	4.1	-	0.09	-	0.0	0.1	0.0	0.2	0.3	1.8	1.8	5.9	12	0.3	2.1	5	31	0.01		

remarks (hor. 1 - 2): Spec.Surf.=112

remarks (hor. 3) : Spec.Surf.=102

remarks (hor. 4) : Spec.Surf.=110

remarks (hor. 5) : Spec.Surf.=96

remarks (hor. 6) : Spec.Surf.=95

remarks (hor. 7) : Spec.Surf.=58

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor. no.	MI	VE	CH	SM	KA	HA	ML	QU	FE	GI	GO	HE	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Fe(p)	Al(p)	Pret	pHNaF
1	-	-	-	-	-	-	-	-	-	-	-	-	0.57	0.52	0.03	4.17	1.58	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	0.61	0.60	0.03	4.25	1.66	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	0.44	0.49	0.03	4.58	1.52	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	0.41	0.52	0.04	4.64	1.59	-	-	-	-
5	-	-	-	-	4	-	3	-	4	3	1	-	0.33	0.39	0.04	4.89	1.25	-	-	-	-
6	-	-	-	-	6	-	-	-	5	3	1	-	0.35	0.32	0.05	4.78	1.04	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-	0.18	0.15	0.04	3.99	0.41	-	-	-	-

SAND MINERALOGY

Hor. no.	HEAV	LIGH	light fraction				heavy fraction				OP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	QU	FE	PL	RE	OP	A	B	C	D	E																

5 0.7 99.3 - 0 0 0 83 0 91 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

key : QU=quartz;FE=feldspar;PL=plagioclase;RE=rest group light min.;OP=opaque

key (hor. 5): A=tourmaline;B=zircon;C=rutile;D=anatase;E=staurolite;F=disthene;G=sillimanite - grains;H=sillimanite - fibrous structure

remarks (hor. 5) : In light fraction many Fe-concretions (by colouring Al was determined)

FAO/UNESCO (1988)	:	Xanthic Ferralsol	(1974 : Orthic Acrisol)
USDA/SCS SOIL TAXONOMY (1992)	:	Xanthic Kandiperox, loamy, kaolinitic, isohyperthermic	(1975 : haplic acrustox)
LOCAL CLASSIFICATION	:	Latossolo Amarelo	
DIAGNOSTIC CRITERIA	FAO (1988)	Diagnostic horizons : ochric A, ferralic B	
	USDA/SCS (1992)	Diagnostic horizons : ochric epipedon, oxic horizon	
		Soil moisture regime : perudic	
LOCATION	:	Para, 8.5 km E of Castanhal along road BR 316	
AUTHOR(S)	Latitude :	1°22' 0'' S	Longitude : 47°11' 0'' W
			Altitude : 70 (m.a.s.l.)
		: Kauffman/Martins	Date (mm.yy) : 11.83
GENERAL LANDFORM	:	lacustrine plain	Topography : flat or almost flat
PHYSIOGRAPHIC UNIT	:	nearly level plain	
SLOPE	Gradient :	1%	Aspect :
POSITION OF SITE	:	flat	Form :
MICRO RELIEF	Kind :	level	
SURFACE CHAR.	Rock outcrop :	nil	Stoniness : nil
	Cracking :	nil	Slaking/crusting : nil
	Salt :	nil	Alkali : nil
SLOPE PROCESSES	Soil erosion :	slight sheet	
PARENT MATERIAL	1 :	lacustrine sediments	derived from :
Remarks	Texture :	sandy clay	
		: Barreiras	
EFFECTIVE SOIL DEPTH(cm)	:	310	
WATER TABLE	Depth(cm) :		Kind : no watertable observed
DRAINAGE	:	well	
PERMEABILITY	:		No slow permeable layer(s) cm
FLOODING	Frequency :	nil	Run off : very slow
MOISTURE CONDITIONS PROFILE	:	0 - 18 cm dry	18 - 310 cm moist
LAND USE	:	semi natural grassland, grazed	
VEGETATION	Type :	evergreen forest	Status : secondary
Landuse/Vegetation remarks	:	Kicuio do Amazonas grass (Brachiaria sp)	

ADDITIONAL REMARKS :

Brief field description:

Deep, well drained, yellowish brown sandy clay loam derived from lacustrine sediments; with loamy sand topsoil. Intense biological activity in the first 45 cm; principally ants. Crotovinas present in AB and BA.

Brazilian classification: Latossolo Amarelo alico.

The soil has a clear clay increase, however the soil has all the properties of a ferralic B-horizon, it therefore does not qualify for an Argic horizon (FAO, 1988).

CLIMATE :	Köppen: Am		24 m a.s.l.												65 km W of site			
Station: BELEM	1	28 S/ 48 27 W																
	No. years of record		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual			
EP Penman mm		136	112	119	126	137	139	153	169	170	175	160	158	1753				
relative humidity %		85	91	92	87	81	73	67	62	64	66	71	74	76				
precipitation mm		318	407	436	382	265	165	161	116	120	105	90	197	2762				
tot.glob.rad. MJ/m ²		18.3	16.6	16.1	17.4	18.2	19.1	20.3	22.4	23.3	23.1	21.7	20.8	19.8				
T mean °C		25.6	25.5	25.4	25.7	26.0	26.0	25.9	26.0	26.0	26.2	26.5	26.3	25.9				
bright sunshine %		42	33	31	39	48	57	63	68	66	64	59	56	52				

PROFILE DESCRIPTION :

Ah 0 - 8 cm. dark grayish brown (10 YR 4.0/2.0, moist) grayish brown (10 YR 5.0/2.0, dry) loamy sand; strong fine to medium granular structure; slightly sticky, slightly plastic, friable, slightly hard; many very fine pores and coarse pores; many very fine roots and medium roots; abrupt smooth boundary to

AB 8 - 18 cm. brown (10 YR 4.5/3.0, moist)pale brown (10 YR 5.5/3.0, dry) sandy loam; strong fine to medium subangular blocky to granular structure; slightly sticky, slightly plastic, friable, hard; many very fine pores and coarse pores; common very fine roots and medium roots; clear smooth boundary to

BA 18 - 45 cm. light yellowish brown (10 YR 5.5/4.0, moist) sandy clay loam; weak fine to medium subangular blocky structure; sticky, plastic, friable, very hard; many very fine pores and coarse pores; few very fine roots and medium roots; clear smooth boundary to
 Bs1 45 - 80 cm. 10 YR 5.0/5.0, moist sandy clay; weak fine to medium subangular blocky structure; sticky, plastic, friable, hard; many coarse pores and medium pores; few very fine roots and medium roots; clear smooth boundary to
 Bs2 80 - 160 cm. 10 YR 6.0/7.0, moist clay; weak fine to medium subangular blocky structure; sticky, plastic, friable, hard; many very fine pores and fine pores; few very fine roots and fine roots; clear smooth boundary to
 Bs3 160 - 310 cm. brownish yellow (10 YR 6.0/8.0, moist) clay; fine to very fine subangular blocky to crumb structure; sticky, plastic, friable, hard; many very fine pores; few very fine roots and fine roots;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2	2000	1000	500	250	100	TOT	50	20	TOT	<2	DISP	BULK	PF-	-	-	-	-	-	-
		mm	1000	500	250	100	50	SAND	20	2	SILT	μm	DENS	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2

1	0 - 8	-	0	3	41	40	5	89	1	0	2	9	1.9	-	-	-	-	-	-	-	-	
2	8 - 18	-	0	3	32	38	7	80	2	1	3	17	4.5	-	-	-	-	-	-	-	-	
3	18 - 45	-	0	3	28	35	7	73	4	1	4	23	8.4	1.55	34	33	28	22	19	18	11	10
4	45 - 80	-	0	3	25	33	7	68	3	1	3	29	13.8	1.51	36	34	29	24	22	21	13	13
5	80 - 120	-	0	3	25	33	7	68	2	2	4	28	0.0	1.40	37	34	28	21	19	17	14	13
6	120 - 160	-	0	3	25	32	7	67	3	0	3	31	0.0	-	-	-	-	-	-	-	-	-
7	160 - 220	-	0	3	25	31	6	66	4	1	5	30	0.0	-	-	-	-	-	-	-	-	-
8	220 - 260	-	0	3	27	30	5	65	3	2	5	30	0.0	-	-	-	-	-	-	-	-	-
9	260 - 300	-	1	3	26	31	7	67	2	2	4	29	0.0	-	-	-	-	-	-	-	-	-

Hor. no.	pH-	CaCO ₃	ORG-	MAT.	EXCH	CAT.	-----	-----	-----	EXCH	AC.	CEC	-----	-----	-----	BASE	Al	EC	2.5
	H ₂ O	KCl	%	%	C	N	Ca	Mg	K	Na sum	H+Al	Al	soil clay	OrgC	ECEC	SAT	SAT	%	mS/cm
1	6.1	5.3	-	1.42	0.09	3.4	0.6	0.1	0.1	4.2	0.0	0.1	6.7	74	5.0	4.2	63	1	0.13
2	5.1	4.3	-	1.03	0.07	1.2	0.3	0.0	0.1	1.6	0.4	0.4	4.4	27	3.6	2.0	36	9	0.11
3	4.8	4.2	-	0.64	0.04	0.4	0.1	0.0	0.0	0.5	0.8	0.9	3.0	13	2.2	1.3	17	30	0.04
4	4.8	4.3	-	0.36	-	0.4	0.1	0.0	0.1	0.6	0.7	0.9	2.3	8	1.3	1.3	26	39	0.03
5	4.9	4.3	-	0.20	-	0.3	0.0	0.0	0.0	0.3	0.6	0.8	1.4	5	0.7	0.9	21	57	0.03
6	4.8	4.2	-	0.11	-	0.4	0.0	0.0	0.0	0.4	0.6	0.8	1.4	5	0.4	1.0	29	57	0.02
7	4.8	4.2	-	0.09	-	0.4	0.0	0.0	0.0	0.4	0.5	0.7	1.2	4	0.3	0.9	33	58	0.02
8	5.0	4.4	-	0.10	-	0.4	0.1	0.0	0.0	0.5	0.2	0.3	1.0	3	0.4	0.7	50	30	0.02
9	4.9	4.3	-	0.10	-	0.3	0.1	0.0	0.0	0.4	0.0	0.0	1.0	3	0.4	0.4	40	0	0.02

remarks (hor. 1) : Spec.Surf.=16
 remarks (hor. 2) : Spec.Surf.=19
 remarks (hor. 3) : Spec.Surf.=22
 remarks (hor. 4) : Spec.Surf.=23
 remarks (hor. 5 - 8) : Spec.Surf.=21
 remarks (hor. 9) : Spec.Surf.=20

CLAY MINERALOGY (1 very weak,..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	-	-	-	-	-	0.04	0.04	0.01	0.28	0.07	-	-	-	-	-	-	
2	-	-	-	-	-	-	-	-	0.07	0.05	0.00	0.50	0.10	-	-	-	-	-	-	
3	-	-	-	-	-	-	-	-	0.09	0.08	0.00	0.65	0.15	-	-	-	-	-	-	
4	-	-	-	-	-	-	-	-	0.08	0.11	0.01	0.77	0.19	-	-	-	-	-	-	
5	-	-	-	8	-	-	2	-	3	1	0.05	0.08	0.01	0.77	0.17	-	-	-	-	-
6	-	-	-	8	-	-	2	-	3	1	0.02	0.07	0.01	0.81	0.17	-	-	-	-	-
7	-	-	-	-	-	-	-	-	0.01	0.07	0.01	0.81	0.16	-	-	-	-	-	-	
8	-	-	-	-	-	-	-	-	0.01	0.05	0.01	0.79	0.17	-	-	-	-	-	-	
9	-	-	-	-	-	-	-	-	0.01	0.05	0.01	0.69	0.13	-	-	-	-	-	-	

SAND MINERALOGY

Hor. no.	HEAV	LIGH	light fraction	heavy fraction	OP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	QU	FE	PL	RE	OP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O

5	1.4	98.6	100	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0
---	-----	------	-----	---	---	---	-----	---	---	---	---	---	---	---	---	---	---	---	---

key : QU=quartz;FE=feldspar;PL=plagioclase;RE=rest group light min.;OP=opaque

FAO/UNESCO (1988)	: Fimic Anthrosol	(1974 : Eutric Cambisol)
USDA/SCS SOIL TAXONOMY (1992)	: Plaggept, fine clayey, kaolinitic, isohyperthermic	(1975 : plaggept)
LOCAL CLASSIFICATION	: T.P.dos Indios	
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	Diagnostic horizons : feric A, ferralic B Diagnostic horizons : placic horizon, oxic horizon Soil moisture regime : perudic
LOCATION	: Para province, Belterra (Santarem)	
AUTHOR(S)	Latitude : 2°36' 0'' S Longitude : 54°57' 0'' W Kauffman, J.H./Sombroek, W.G.	Altitude : 60 (m.a.s.l.) Date (mm.yy) : 0.00
GENERAL LANDFORM	: plain	Topography : flat or almost flat
PHYSIOGRAPHIC UNIT	: margin of flat plain	
SLOPE	Gradient : 1%	Aspect :
POSITION OF SITE	: middle slope	Form : straight
MICRO RELIEF	Kind :	
SLOPE PROCESSES	Soil erosion : nil	
PARENT MATERIAL	1 : Texture : clayey	derived from :
Remarks	: Belterra clay	
EFFECTIVE SOIL DEPTH(cm)	: 360	
WATER TABLE	Depth(cm) :	Kind : no watertable observed
DRAINAGE	: well	
PERMEABILITY	:	No slow permeable layer(s) cm
FLOODING	Frequency : nil	Run off : very slow
MOISTURE CONDITIONS PROFILE	: 0 - 360 cm moist	
Landuse/vegetation remarks	: See general remarks	
ADDITIONAL REMARKS :		
-Brief field description:		
Black, very deep, well drained (man made) clay soil; the soil is strongly determined by past human influences shown by accumulation of organic matter and the many pot sherds in the A1 horizon. The soil has been occupied by Indians during centuries, who practiced soil fertilization with household waste.		
The first 5 cm from the surface are slightly compacted.		
The BA horizon (89-124 cm) is characterized by many pockets (5-10 cm diameter) and channels (1-2 cm diameter) filled with darker coloured soil from the above lying horizons.		
Many channels (1-10 cm diameter), made by different animals and filled with darker topsoil, occur from 170 cm depth. The walls of the bigger channels are covered with a compact, smooth, clay layer of 0.5 to 1 cm thickness.		
Land use: old rubber estate; extensively used for rubber, mango's and vegetables.		
Soil classification in FAO (1975) is difficult because there is no provision for the Anthropogenic A-horizon.		
USDA classification: Plaggept with oxic horizon is difficult to classify correctly.		
Local classification: Terra Preta dos Indios.		

CLIMATE :	Köppen: Aw	Relevance: very good													
Station: BELTERRA	2 40 S/ 54 53 W	31 m a.s.l				2 km S of site									
		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EP Penman mm		143	112	141	123	141	139	154	180	186	185	161	157	1821	
relative humidity %		85	92	87	90	80	75	70	59	59	68	78	80	77	
precipitation mm		235	395	325	368	210	182	107	38	30	53	132	190	2265	
tot.glob.rad. MJ/m ²		18.4	16.1	18.3	16.3	18.1	18.4	19.7	22.7	23.9	23.0	20.6	19.7	19.6	
T mean °C		27.3	27.0	27.0	27.2	27.4	27.4	27.6	28.3	28.7	28.9	29.1	28.3	27.8	
bright sunshine %		42	31	40	35	49	55	61	71	70	62	51	49	51	

PROFILE DESCRIPTION :

A1.1 0 - 5 cm. 7.5 YR 2.0/1.0, moist clay; moderate very coarse crumb and moderate very coarse subangular blocky structure; slightly sticky, slightly plastic, friable, slightly hard; many very fine to fine pores ; many very fine roots and many medium roots; clear smooth boundary to

A1.2 5 - 38 cm. 7.5 YR 3.0/1.0, moist clay; moderate fine to very fine crumb and moderate fine to very fine subangular blocky structure; sticky, plastic, very friable, slightly hard; many very fine to fine pores; many very fine roots and many medium roots; clear wavy boundary to

AB 38 - 89 cm. dark brown (7.5 YR 3.0/4.0, moist) clay; weak fine to medium subangular blocky structure; sticky, plastic, friable; many very fine to fine pores; common very fine roots and common medium roots; gradual smooth boundary to

BA 89 - 124 cm. strong brown (7.5 YR 5.0/6.0, moist) clay; weak fine to medium subangular blocky structure; sticky , plastic, very friable; many very fine to fine pores; common very fine roots and common fine roots; gradual smooth boundary to

B1 124 - 170 cm. strong brown (7.5 YR 5.0/6.0, moist) clay; weak fine to medium subangular blocky structure; sticky , plastic, very friable; many very fine to fine pores; common very fine roots and common fine roots; diffuse smooth boundary to

B2.1 170 - 210 cm. strong brown (7.5 YR 5.0/8.0, moist) clay; moderately coherent porous massive structure;; diffuse smooth boundary to

B2.2 210 - 270 cm. strong brown (7.5 YR 5.0/8.0, moist) clay; moderately coherent porous massive structure;; diffuse smooth boundary to

B2.3 270 - 360 cm. 6 YR 5.0/8.0, moist clay; moderately coherent porous massive structure;; diffuse smooth boundary to

B2.4 360 - 400 cm. 6 YR 5.0/8.0, moist clay; moderately coherent porous massive structure;;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2	2000	1000	500	250	100	TOT	50	20	TOT	<2	DISP	BULK	pF-	---	---	---	---	---	---	
		mm	1000	500	250	100	50	SAND	20	2	SILT	μm	DENS	DENS	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 5	-	1	2	6	6	2	17	11	17	27	56	26.7	-	-	-	-	-	-	-	-	-
2	5 - 38	-	0	1	2	1	1	5	10	13	23	73	26.3	-	-	-	-	-	-	-	-	-
3	38 - 89	-	0	1	2	2	1	5	15	8	23	72	44.2	0.72	59	55	45	35	32	29	25	23
4	89 - 124	-	0	1	1	2	1	4	11	10	20	76	47.4	-	-	-	-	-	-	-	-	-
5	124 - 170	-	0	0	1	1	0	3	8	12	21	76	50.8	-	57	53	44	35	32	29	27	26
6	170 - 210	-	0	0	1	1	0	3	12	9	22	76	0.0	-	-	-	-	-	-	-	-	-
7	210 - 270	-	0	0	1	1	0	2	11	9	21	77	0.0	-	-	-	-	-	-	-	-	-
8	270 - 360	-	0	0	1	1	0	2	18	10	29	69	0.0	-	-	-	-	-	-	-	-	-
9	360 - 400	-	0	0	1	1	1	2	15	14	29	69	0.0	-	-	-	-	-	-	-	-	-
Hor. no.	pH- H ₂ O	-- CaCO ₃ KCl	ORG- C	MAT- N	EXCH Ca	CAT. Mg	---	---	---	---	---	EXCH Na	AC. sum	CEC H+Al	CEC Al	soil clay	OrgC ECEC	BASE SAT	Al SAT	EC %	2.5 mS/cm	
0	6.6	5.4	-	6.37	0.37	28.4	6.4	0.0	0.2	35.0	-	-	39.8	55	22.0	35.0	88	-	0.08			
0	6.5	5.3	-	2.93	0.14	13.0	3.4	0.0	0.1	16.5	-	-	18.6	26	10.0	16.5	89	-	0.05			
0	6.1	4.9	-	1.74	0.08	6.7	1.2	0.0	0.1	8.0	-	-	10.5	14	6.1	8.0	76	-	0.03			
0	6.2	4.9	-	0.82	-	2.2	1.0	0.0	0.0	3.2	-	-	6.3	8	2.9	3.2	51	-	0.02			
0	6.2	5.2	-	0.45	-	1.2	0.3	0.0	0.0	1.5	-	-	4.0	5	1.6	1.5	38	-	0.02			
0	6.2	5.7	-	0.30	-	0.8	0.7	0.0	0.0	1.5	-	-	2.8	4	1.1	1.5	54	-	0.01			
0	6.4	5.7	-	0.15	-	0.6	0.7	0.0	0.0	1.3	-	-	1.9	3	0.5	1.3	68	-	0.01			
0	6.3	5.7	-	0.12	-	0.4	0.7	0.0	0.0	1.1	-	-	3.0	4	0.4	1.1	37	-	0.01			
1	6.2	5.2	-	7.89	0.49	28.1	5.0	0.2	0.1	33.4	-	-	41.5	75	28.0	33.4	80	-	0.13			
remarks (hor. 0) : Spec.Surf.=108																						
remarks (hor. 0) : Spec.Surf.=91																						
remarks (hor. 0) : Spec.Surf.=76																						
remarks (hor. 0) : Spec.Surf.=67																						
remarks (hor. 0) : Spec.Surf.=62																						
remarks (hor. 1) : Spec.Surf.=112																						

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

0	-	-	-	-	7	-	-	-	-	4	-	0.30	1.20	0.40	2.00	0.70	-	-	-	-	-
0	-	-	-	-	7	-	-	-	-	4	-	0.20	0.50	0.10	2.10	0.50	-	-	-	-	-
0	-	-	-	-	7	-	-	-	-	4	-	0.20	0.40	0.00	2.00	0.50	-	-	-	-	-
0	-	-	-	-	7	-	-	-	-	4	-	0.00	0.20	0.00	1.90	0.40	-	-	-	-	-
0	-	-	-	-	7	-	-	-	-	4	-	0.00	0.10	0.00	1.70	0.40	-	-	-	-	-
0	-	-	-	-	7	-	-	-	-	4	-	0.00	0.10	0.00	1.70	0.40	-	-	-	-	-
0	-	-	-	-	7	-	-	-	-	2	-	0.00	0.10	0.00	1.80	0.40	-	-	-	-	-
0	-	-	-	-	-	-	-	-	-	-	-	0.00	0.10	0.00	1.70	0.30	-	-	-	-	-
1	-	-	-	-	6	-	-	-	-	4	-	0.20	1.10	0.20	2.10	0.70	-	-	-	-	-

FAO/UNESCO (1988)	: Geric Ferralsol	(1974 : Acric Ferralsol)
USDA/SCS SOIL TAXONOMY (1992)	: Xanthic Haplodox, clayey, kaolinitic, isohyperthermic	(1975 : typic haplustox)
LOCAL CLASSIFICATION	: Latossolo Amarelo	
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	: Diagnostic horizons : ferralic B : Diagnostic properties : geric properties : Diagnostic horizons : oxic horizon : Soil moisture regime : perudic
LOCATION	: Parana, road BR163 Santarem-Cuiaba at km 52.2, near Belterra	
AUTHOR(S)	Latitude : 2°54' 0'' S : Kauffman, J.H.	Longitude : 54°56' 0'' W Altitude : 75 (m.a.s.l.) Date (mm.yy) : 11.84
GENERAL LANDFORM	: lacustrine plain	Topography : flat or almost flat
PHYSIOGRAPHIC UNIT	: flat plain	
SLOPE	Gradient : 1%	Aspect :
POSITION OF SITE	: flat	Form :
MICRO RELIEF	Kind :	
SURFACE CHAR.	Rock outcrop : nil Cracking : nil Salt : nil	Stoniness : nil Slaking/crusting : nil Alkali : nil
SLOPE PROCESSES	Soil erosion : slight sheet	
PARENT MATERIAL	1 : lacustrine sediments Texture : clayey	derived from :
Remarks	: Belterra clay	
EFFECTIVE SOIL DEPTH(cm)	: 250	
WATER TABLE	Depth(cm) :	Kind : no watertable observed
	Estimated highest level : 500	Estimated lowest level : 0
DRAINAGE	: well	
PERMEABILITY	: high	No slow permeable layer(s) cm
FLOODING	Frequency : nil	
MOISTURE CONDITIONS PROFILE	: 000 - 250 cm moist	
LAND USE	: (semi)natural vegetation	
VEGETATION	Type : evergreen forest	
Landuse/vegetation remarks	: Forestry research station	

ADDITIONAL REMARKS :

Brief field description:

Very deep, well drained brownish yellow, clay soil with a massive porous structure.

Biological activity: few small termite mounds are present; black and red ant activity in litter layer.

The soil layer from 10 to 50 cm has a vague dark greyish mottled appearance. This mottling is caused by dark humus which

is

not well homogenized through the yellow soil.

Brazilian classification: Latossolo Amarelo alico.

According to FAO (1988) the soil has geric properties because the ECCEC is less than 1.5 cmol(+)/kg clay. According to ST (1992) the soil does not have acric properties, because the soil should have also a pH (1N KCl) of more than 5.0.

Land use: in the environment of the site limited wood extraction.

There is no surface drainage network present. All surplus precipitation infiltrates to the deeper subsoil and flows laterally through the subsoil to the Rio Tapajoz.

The genesis of the Belterra clay is not very well understood.

CLIMATE :	Köppen: Am	Relevance: good												
Station: BELTERRA	2 40 S/ 54 53 W	31 m a.s.l				15 km N of site								
	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EP Penman mm		143	112	141	123	141	139	154	180	186	185	161	157	1821
relative humidity %		85	92	87	90	80	75	70	59	59	68	78	80	77
precipitation mm		235	395	325	368	210	182	107	38	30	53	132	190	2265
tot.glob.rad. MJ/m ²		18.4	16.1	18.3	16.3	18.1	18.4	19.7	22.7	23.9	23.0	20.6	19.7	19.6
T mean °C		27.3	27.0	27.0	27.2	27.4	27.4	27.6	28.3	28.7	28.9	29.1	28.3	27.8
bright sunshine %		42	31	40	35	49	55	61	71	70	62	51	49	51

PROFILE DESCRIPTION :

Ah 0 - 7 cm. brown (10 YR 5.0/3.0, moist) clay; weak to moderate fine to very fine subangular blocky to crumb structure; sticky, plastic, friable; many very fine pores and fine pores; common very fine roots and medium roots; clear smooth boundary to

AB 7 - 25 cm. yellowish brown (10 YR 5.0/4.0, moist) clay; weak subangular blocky to porous massive structure; sticky, plastic, friable; many very fine pores and fine pores; few fine roots and medium roots; gradual smooth boundary to

BA 25 - 48 cm. brownish yellow (10 YR 6.0/6.0, moist) clay; weak fine to medium subangular blocky to porous massive structure; sticky, plastic, firm; many very fine pores and fine pores; few fine roots and medium roots; diffuse smooth boundary to

Bu1 48 - 85 cm. brownish yellow (10 YR 6.0/8.0, moist) clay; weak fine to medium subangular blocky structure; sticky, plastic, firm; broken thin clay cutans; many very fine pores and fine pores; few fine roots and few medium roots; diffuse smooth boundary to

Bu2 85 - 170 cm. brownish yellow (10 YR 6.0/8.0, moist) clay; moderately coherent porous massive structure; sticky, plastic, firm; broken thin clay cutans; many very fine pores and fine pores; few fine roots and few medium roots; diffuse smooth boundary to

Auger 170 - 250 cm. 7.5 Y 0.0/0.0, moist clay; moderately coherent porous massive structure; few fine roots;

ANALYTICAL DATA :

Hor. no.	Top - Bot mm	>2 1000	2000 500	1000 250	500 100	250 50	100 SAND	TOT 20	50 2	20 SILT	<2 μm	DISP	BULK DENS	pf- 0.0	- - - 1.0	- - - 1.5	- - - 2.0	- - - 2.3	- - - 2.7	- - - 3.4	- - - 4.2
1	0 - 7	-	0	1	5	4	1	11	4	1	4	84	43.9	-	-	-	-	-	-	-	
2	7 - 25	-	0	1	3	2	1	7	5	0	5	88	49.4	1.11	51	47	42	39	39	37	35
3	25 - 48	-	0	1	2	1	0	4	4	0	4	92	0.0	1.13	51	47	42	40	39	38	36
4	48 - 85	-	0	1	1	1	0	4	2	1	4	93	0.0	1.11	48	47	43	40	39	38	35
5	85 - 132	-	0	1	1	1	0	4	4	1	5	92	0.0	1.19	50	50	48	45	43	42	38
6	132 - 150	-	0	1	2	1	0	4	1	6	6	90	0.0	-	-	-	-	-	-	-	
7	170 - 250	-	0	1	2	1	0	4	3	3	6	90	0.0	-	-	-	-	-	-	-	
8	- - -	0	0	1	2	1	0	4	4	6	9	87	0.0	-	0	0	0	0	0	0	
Hor. no.	pH- H2O	-- CaCO3 KCl	ORG- C %	MAT- N %	EXCH Ca %	CAT- Mg %	--- K %	EXCH Na %	AC- sum %	H+Al cmol(+)/kg	CEC soil	--- clay %	BASE ECEC	AI SAT %	EC SAT %	2.5 mS/cm					
1	3.9	3.7	-	2.64	0.21	1.0	0.3	0.1	0.1	1.5	2.0	2.0	6.9	8	9.2	3.5	22	29	0.26		
2	4.5	3.9	-	1.37	0.10	0.4	0.1	0.0	0.1	0.6	1.5	1.6	5.5	6	4.8	2.1	11	29	0.06		
3	4.6	4.0	-	0.77	0.08	0.2	0.1	0.0	0.1	0.4	1.1	1.3	3.0	3	2.7	1.5	13	43	0.02		
4	4.8	4.0	-	0.50	0.08	0.0	0.1	0.0	0.0	0.1	1.0	1.1	2.6	3	1.8	1.1	4	42	0.02		
5	5.1	4.1	-	0.35	-	0.2	0.1	0.0	0.1	0.4	0.9	1.0	2.6	3	1.2	1.3	15	38	0.01		
6	5.4	4.2	-	0.27	-	0.0	0.0	0.0	0.1	0.1	0.8	0.9	1.9	2	0.9	0.9	5	47	0.01		
7	5.2	4.1	-	0.30	-	0.0	0.1	0.0	0.0	0.1	0.8	0.8	2.1	2	1.1	0.9	5	38	0.01		
8	5.2	4.2	-	0.24	-	0.0	0.1	0.0	0.1	0.2	-	-	1.9	2	0.8	0.2	11	-	0.01		
remarks (hor. 1) : Spec.Surf.=70										remarks (hor. 6) : Spec.Surf.=59											
remarks (hor. 2) : Spec.Surf.=65										remarks (hor. 7) : Spec.Surf.=60											
remarks (hor. 3) : Spec.Surf.=62										remarks (hor. 8) : Spec.Surf.=59											
remarks (hor. 4 - 5) : Spec.Surf.=61																					

CLAY MINERALOGY (1 very weak,.., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	-	-	-	-	-	0.19	0.11	0.03	1.57	0.30	-	-	-	-	
2	-	-	-	-	-	-	-	-	0.12	0.12	0.04	1.70	0.33	-	-	-	-	
3	-	-	-	-	-	-	-	-	0.05	0.11	0.05	1.79	0.35	-	-	-	-	
4	-	-	-	-	-	-	-	-	0.03	0.10	0.04	1.76	0.33	-	-	-	-	
5	-	-	-	6	-	2	-	4	4	0.02	0.11	0.05	1.80	0.34	-	-	-	-
6	-	-	-	6	-	2	-	4	4	0.02	0.12	0.05	1.80	0.36	-	-	-	-
7	-	-	-	-	-	-	-	-	0.02	0.10	0.05	1.55	0.30	-	-	-	-	
8	-	-	-	-	-	-	-	-	0.02	0.11	0.05	1.64	0.29	-	-	-	-	

SAND MINERALOGY

Hor.	HEAV	LIGH	light fraction	heavy fraction																
no.	QU	FE	PL	RE	OP	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O

5	69.7	30.3	100	0	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0
---	------	------	-----	---	---	---	-----	---	---	---	---	---	---	---	---	---	---	---	---

key : QU=quartz;FE=feldspar;PL=plagioclase;RE=rest group light min.;OP=opaque

FAO/UNESCO (1988) : Rhodic Ferralsol
 (1974) : Rhodic Ferralsol, cerrado phase
 USDA/SCS SOIL TAXONOMY (1992) : Humic Haplustox, clayey, isohyperthermic
 LOCAL CLASSIFICATION : Latossolo LVe (1975 : typic haplustox)

DIAGNOSTIC CRITERIA FAO (1988) : Diagnostic horizons : ferralic B
 USDA/SCS (1992) : Diagnostic horizons : oxic horizon
 : Soil moisture regime : ustic

LOCATION : Distrito Federal, Planaltina, CPAC research station, experimental plot
 Latitude : 15°36'38'' S Longitude : 47°42'32'' W Altitude : 1010 (m.a.s.l.)
 AUTHOR(S) : Kauffman, J.H. Date (mm.yy) : 4.86

GENERAL LANDFORM : plateau Topography : undulating
 PHYSIOGRAPHIC UNIT : dissected plateau,*
 SLOPE Gradient : 4% Aspect :
 POSITION OF SITE : middle slope Form : concave
 MICRO RELIEF Kind :
 SURFACE CHAR. Rock outcrop : nil Stoniness : nil
 Cracking : nil Slaking/crusting : nil
 Salt : nil Alkali : nil
 SLOPE PROCESSES Soil erosion : slight sheet Aggradation : present
 Slope stability : stable

PARENT MATERIAL 1 : slope wash derived from : highly weathered material
 Texture : clayey
 Weathering degree : high Resistance :
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 500

WATER TABLE Depth(cm) : Kind : no watertable observed
 DRAINAGE : well
 PERMEABILITY : high No slow permeable layer(s) cm
 FLOODING Frequency : nil Run off : rapid
 MOISTURE CONDITIONS PROFILE : 0 - 500 cm moist

LAND USE : (semi)natural vegetation
 VEGETATION Type : deciduous woodland Status : primary
 Landuse/vegetation remarks : Detailed info ISRIC-libr:LA-36 + file

ADDITIONAL REMARKS :

Brief field description:

Very deep, well drained, dusky red clay; weakly coherent porous massive subsoil.

Infillings from deeper substrata are common in the Bw1 horizon, caused by biological activity. Colour of the infillings 1.25 YR 4/6 to 8. Consistency Ah1, Ah2 and AB horizons is soft to slightly hard. The horizon AB from 20-38 cm shows a much lower porosity than over- and underlying horizons.

Physiography: *) very broad open V-valley.

Soil aggradation: in nearby soil pit presence of thin layers of coarser fragments (sometimes ironstone gravel) shows the colluvial processes.

Photographs/slides no 9795-9798

CLIMATE : Köppen: Aw
 Station: 15 35 S / 47 42 W 1007 m a.s.l 1 km of site Relevance: very good
 CPAC, MAIN STATION

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EA class A pan mm	13	144	152	157	144	143	150	173	209	200	177	147	145	1942
relative humidity %	13	75	73	73	72	70	66	61	58	60	67	72	74	68
precipitation mm	13	321	196	267	102	28	5	5	15	42	171	181	234	1566
T max °C	13	26.5	27.2	27.5	26.9	26.4	26.1	26.0	27.9	29.0	28.1	27.0	26.7	27.1
T min °C	13	17.6	17.6	17.8	17.1	15.6	13.8	13.4	15.1	16.8	17.5	17.7	17.6	16.4
windspeed(at 2m) m/s	13	1.3	1.2	1.0	1.2	1.2	1.3	1.5	1.5	1.5	1.3	1.2	1.2	1.3
bright sunshine h/d	13	3.9	6.8	5.8	7.1	7.8	8.7	8.9	8.7	7.2	6.4	5.2	4.1	6.7

PROFILE DESCRIPTION :

Ah1	0 - 9 cm.	dark reddish brown (5 YR 2.5/4.0, moist) clay; weak fine to medium subangular blocky structure; slightly sticky, slightly plastic, friable, soft; many very fine to fine pores; many fine roots throughout and common medium roots; very few medium spherical hard ferrigenous concretions; clear smooth boundary to
Ah2	9 - 20 cm.	dark reddish brown (2.5 YR 2.5/4.0, moist) clay; weak fine to medium subangular blocky structure; slightly sticky, slightly plastic, friable, soft; many very fine to fine pores; many fine roots throughout and common medium roots; clear smooth boundary to
AB	20 - 38 cm.	red (2.5 YR 5.0/6.0, moist) clay; weak fine subangular blocky and weak very fine granular structure; slightly sticky, slightly plastic, friable, soft; many very fine tubular pores; many fine roots throughout; gradual smooth boundary to
BA	38 - 80 cm.	red (2.5 YR 3.5/6.0, moist) clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, friable, soft; many very fine tubular pores; common fine roots throughout; very few medium spherical hard ferrigenous concretions; diffuse smooth boundary to
Bw1	80 - 147 cm.	1 YR 3.5/6.0, moist clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, friable, soft; many very fine tubular pores; common fine roots throughout; gradual smooth boundary to
Bw2	147 - 170 cm.	red (10 R 3.5/6.0, moist) clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, friable, soft; many very fine tubular pores; few fine roots throughout; diffuse smooth boundary to
Auger	170 - 250 cm.	1 YR 4.0/6.0, moist clay;; diffuse boundary to
Auger	250 - 350 cm.	red (2.5 YR 4.0/8.0, moist) clay;; diffuse boundary to
Auger	350 - 470 cm.	red (10 R 4.0/8.0, moist) clay::

ANALYTICAL DATA -

Hor. no.	pH-	H2O	CaCO3	ORG- C	MAT. %	EXCH Ca	CAT. Mg	----- K	Na sum	EXCH H+Al	AC. Al	CEC soil	----- clay	BASE ECEC	Al SAT	EC 2.5 SAT			
	KCl	%	%	%										%	%	mS/cm			
1	4.0	4.0	-	2.58	-	0.2	0.1	0.1	0.0	0.4	0.9	1.0	7.3	17	9.0	1.3	5	14	0.30
2	4.3	4.1	-	1.90	-	0.0	0.0	0.1	0.0	0.1	1.4	1.5	6.7	15	6.6	1.5	1	22	0.11
3	4.5	4.0	-	1.47	-	0.2	0.0	0.0	0.0	0.2	1.4	1.5	6.2	14	5.1	1.6	3	24	0.05
4	4.6	4.1	-	1.36	-	0.2	0.0	0.0	0.1	0.3	1.3	1.4	6.0	13	4.8	1.6	5	23	0.03
5	4.7	4.1	-	1.21	-	0.0	0.0	0.0	0.0	0.0	1.0	1.0	6.2	14	4.2	1.0	0	16	0.03
6	4.8	4.2	-	0.79	-	0.0	0.0	0.0	0.0	0.0	0.4	0.5	3.3	7	2.8	0.4	0	15	0.03
7	5.1	4.5	-	0.45	-	0.0	0.0	0.0	0.0	0.0	-	-	1.9	4	1.6	0.0	0	-	0.01
8	5.2	5.0	-	0.30	-	0.0	0.0	0.0	0.0	0.0	-	-	1.8	4	1.1	0.0	0	-	0.02
9	4.9	4.7	-	0.25	-	0.0	0.0	0.0	0.1	0.1	-	-	2.0	4	0.9	0.1	5	-	0.01

CLAY MINERALOGY (1 very weak,.., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p)

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHnAE

1	-	2	-	-	8	-	4	-	2	4	4	-	0.20	0.30	0.00	4.10	0.80	-	-	-	-
2	-	2	-	-	8	-	4	-	2	4	4	-	0.20	0.30	0.00	3.80	0.80	-	-	-	-
3	-	2	-	-	8	-	4	-	2	4	4	-	0.20	0.30	0.00	4.10	0.80	-	-	-	-
4	-	1	-	-	8	-	4	-	2	4	4	-	0.20	0.30	0.10	4.20	0.70	-	-	-	-
5	-	-	-	-	8	-	4	-	2	4	4	-	0.20	0.30	0.10	4.30	0.70	-	-	-	-
6	-	-	-	-	8	-	4	-	2	4	4	-	0.10	0.20	0.00	4.60	0.70	-	-	-	-
7	-	-	-	-	8	-	4	-	2	4	4	-	0.10	0.20	0.10	4.30	0.80	-	-	-	-
8	-	-	-	-	8	-	4	-	2	4	4	-	0.10	0.10	0.10	4.60	0.70	-	-	-	-
9	-	-	-	-	8	-	4	-	2	4	4	-	0.10	0.10	0.10	5.00	0.50	-	-	-	-

FAO/UNESCO (1988) (1974)	: Geric Ferralsol
USDA/SCS SOIL TAXONOMY (1992)	: Humic Acrustox, fine clayey, isohyperthermic
LOCAL CLASSIFICATION	: Latossolo LVA
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)
	: Diagnostic horizons : ferralic B : Diagnostic properties : geric properties : Diagnostic horizons : oxic horizon : Soil moisture regime : ustic
LOCATION	: Distrito Federal, Planaltina, CPAC research station, top plateau
AUTHOR(S)	Latitude : 15°36'30'' S Longitude : 47°45' 5'' W Altitude : 1170 (m.a.s.l.) Kauffman, J.H. Date (mm.yy) : 4.86
GENERAL LANDFORM	: plateau
PHYSIOGRAPHIC UNIT	: "chapada"=nearly flat plateau
SLOPE	Gradient : 1%
POSITION OF SITE	: flat
MICRO RELIEF	Kind :
SURFACE CHAR.	Rock outcrop : nil Cracking : nil Salt : nil
SLOPE PROCESSES	Soil erosion : slight sheet Slope stability : stable
PARENT MATERIAL	1 : colluvium Texture : clayey Weathering degree : high
Remarks	:
EFFECTIVE SOIL DEPTH(cm)	: 300
WATER TABLE	Depth(cm) : 320
DRAINAGE	: well
PERMEABILITY	: high
FLOODING	Frequency : nil
MOISTURE CONDITIONS PROFILE	: 0 - 120 cm dry 120 - 300 cm moist 300 - 470 cm wet
LAND USE	: high level arable farming; Crops : soya bean; seasonal irrigated; Rotation : crop rotation continuous
VEGETATION	Type : deciduous woodland
Landuse/vegetation remarks	: Cerrado = brazilian wooded savanna

ADDITIONAL REMARKS :

Brief field description:

Very deep, well drained, yellowish brown clay derived from extremely weathered parent material.

Soil has very high porosity in upper two horizons, more than 5/cm².

The soil does not show any oxidation/reduction colours above and below the water table.

Additional information: Boletim tecnico no.53 SNLCS-EMBRAPA. (ISRIC-libr. LA-36). Detailed information on vegetation in field archive. U=windspeed is measured at 2m high.

Slides no 9781-9793.

CLIMATE :	Köppen: Aw											Relevance: very good
Station: CPAC,MAIN STATION	15 35 S/ 47 42 W		1007 m a.s.l		5 km of site							

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EA class A pan mm	13	144	152	157	144	143	150	173	209	200	177	147	145	1942
relative humidity %	13	75	73	73	72	70	66	61	58	60	67	72	74	68
precipitation mm	13	321	196	267	102	28	5	5	15	42	171	181	234	1566
T max °C	13	26.5	27.2	27.5	26.9	26.4	26.1	26.0	27.9	29.0	28.1	27.0	26.7	27.1
T min °C	13	17.6	17.6	17.8	17.1	15.6	13.8	13.4	15.1	16.8	17.5	17.7	17.6	16.4
windspeed(at 2m) m/s	13	1.3	1.2	1.0	1.2	1.2	1.3	1.5	1.5	1.5	1.3	1.2	1.2	1.3
bright sunshine h/d	13	3.9	6.8	5.8	7.1	7.8	8.7	8.9	8.7	7.2	6.4	5.2	4.1	6.7

PROFILE DESCRIPTION :

Ah1 0 - 9 cm. dark brown (10 YR 4.0/3.0, moist) clay; weak fine to very fine granular and weak fine to very fine crumb structure; slightly sticky, slightly plastic, friable, soft; many very fine to fine pores; many very fine roots throughout and common medium roots; clear smooth boundary to
 Ah2 9 - 21 cm. dark yellowish brown (10 YR 4.0/4.0, moist) clay; weak fine to very fine granular and weak fine to very fine crumb structure; slightly sticky, slightly plastic, friable, slightly hard; many very fine to fine pores; many very fine roots throughout and common medium roots; clear smooth boundary to
 AB 21 - 42 cm. dark yellowish brown (10 YR 4.0/6.0, moist) clay; weak fine to very fine subangular blocky structure; slightly sticky, slightly plastic, friable, slightly hard; many very fine to fine tubular pores; common very fine roots throughout and fine roots; gradual smooth boundary to
 BA 42 - 70 cm. 10 YR 5.0/6.5, moist clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, friable, soft; many very fine tubular pores; common very fine roots throughout and fine roots; gradual smooth boundary to
 BW1 70 - 105 cm. 7.5 YR 5.0/7.0, moist clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, soft; many very fine to fine tubular pores; common very fine roots throughout and fine roots; diffuse smooth boundary to
 BW1 105 - 150 cm. strong brown (7.5 YR 5.0/8.0, moist) clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, soft; many very fine to fine pores; few very fine roots throughout and fine roots; clear smooth boundary to
 BW3 150 - 160 cm. strong brown (7.5 YR 5.0/6.0, moist) clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, soft; many very fine tubular pores;;
 Auger 160 - 250 cm. yellowish red (5 YR 5.0/8.0, moist) clay;; diffuse boundary to
 Auger 250 - 350 cm. yellowish red (5 YR 5.0/6.0, moist) clay; common medium faint mottles;; diffuse boundary to

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 TOT	<2 2 SILT	DISP μm	BULK DENS	pF- 0.0	- - - 1.0	- - - 1.5	- - - 2.0	- - - 2.3	- - - 2.7	- - - 3.4	- - - 4.2	
1	0 - 9	0	0	1	4	8	2	16	8	19	27	58	13.8	-	-	-	-	-	-	-	-	
2	9 - 21	0	0	1	3	9	2	15	6	21	28	57	16.9	0.87	60	57	35	29	27	25	22	21
3	21 - 42	0	0	1	3	8	2	14	7	14	21	66	25.9	1.04	55	51	38	34	32	30	26	25
4	42 - 70	0	0	1	2	7	2	12	6	11	18	70	20.5	-	-	-	-	-	-	-	-	-
5	70 - 105	0	0	1	2	7	2	12	10	12	22	67	5.8	0.89	59	57	45	34	30	28	23	23
6	105 - 150	0	0	1	2	7	2	12	14	15	29	59	15.5	0.83	61	59	47	32	28	25	22	22
7	170 - 270	0	0	0	1	6	2	10	13	15	28	62	33.3	-	-	-	-	-	-	-	-	-
8	270 - 370	0	0	0	1	6	2	10	10	15	25	65	36.5	-	-	-	-	-	-	-	-	-
9	370 - 470	0	2	2	3	9	4	21	11	13	24	55	8.3	-	-	-	-	-	-	-	-	-
Hor. no.	pH- H2O	-- CaCO3 KCl	ORG- C %	MAT- N %	EXCH Ca	CAT. Mg	---	---	---	---	---	---	---	---	---	---	---	BASE ECEC	Al SAT	EC SAT	2.5 mS/cm	
1	4.5	4.2	-	3.33	0.20	0.6	0.4	0.3	0.1	1.4	0.7	0.7	6.7	12	12.0	2.1	21	10	0.22			
2	4.7	4.4	-	2.51	0.14	0.0	0.1	0.1	0.1	0.3	0.2	0.2	3.5	6	8.8	0.5	9	6	0.07			
3	5.5	4.7	-	1.87	0.01	0.0	0.1	0.1	0.0	0.2	0.0	0.1	3.4	5	6.5	0.2	6	3	0.02			
4	5.2	5.0	-	1.43	0.01	0.0	0.0	0.1	0.0	0.1	0.0	0.1	1.4	2	5.0	0.1	7	7	0.01			
5	5.2	5.6	-	1.03	0.07	0.2	0.0	0.1	0.0	0.3	0.0	0.1	0.7	1	3.6	0.3	43	14	0.02			
6	5.3	6.0	-	0.46	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0	1.6	0.0	0	50	0.01			
7	5.8	6.5	-	0.45	-	0.0	0.0	0.0	0.0	0.0	-	-	0.2	0	1.6	0.0	0	-	0.01			
8	5.9	6.5	-	0.30	-	0.0	0.0	0.0	0.1	0.1	-	-	0.4	1	1.1	0.1	25	-	0.00			
9	5.8	6.1	-	0.11	-	0.0	0.0	0.0	0.0	0.0	-	-	0.4	1	0.4	0.0	0	-	0.00			

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.
no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	5	-	-	4	6	4	-	0.10	0.40	0.00	2.90	1.00	-	-	-	-	-
2	-	-	-	5	-	-	4	6	4	-	0.10	0.40	0.00	2.90	1.10	-	-	-	-	-
3	-	-	-	6	-	-	4	6	4	-	0.10	0.40	0.00	3.20	1.10	-	-	-	-	-
4	-	-	-	5	-	-	4	6	4	-	0.10	0.40	0.00	3.10	1.00	-	-	-	-	-
5	-	-	-	5	-	-	4	6	4	-	0.10	0.40	0.00	3.10	1.00	-	-	-	-	-
6	-	-	-	5	-	-	4	6	4	-	0.10	0.30	0.10	3.10	0.80	-	-	-	-	-
7	-	-	-	5	-	-	4	6	4	-	0.10	0.30	0.00	3.20	0.60	-	-	-	-	-
8	-	-	-	6	-	-	4	6	4	-	0.10	0.20	0.10	3.60	0.50	-	-	-	-	-
9	-	-	-	7	-	-	4	6	4	-	0.00	0.10	0.00	4.60	0.30	-	-	-	-	-

FAO/UNESCO (1988)	:	Luvic Phaeozem	(1974 : Luvic Phaeozem)
USDA/SCS SOIL TAXONOMY (1992)	:	Pachic Argiustoll, clayey, isohyperthermic	(1975 : udic argiustoll)
LOCAL CLASSIFICATION	:	Brunizem Avermelhado	
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	: Diagnostic horizons : mollic A, argic B : Diagnostic horizons : mollic epipedon, argillic horizon : Soil moisture regime : ustic	
LOCATION	Latitude :	Pernambuco, Nazare do Mata, see topo map in file 7°44' 0'' S	Longitude : 35°15' 0'' W
AUTHOR(S)		: Kauffman, J.H.	Altitude : 85 (m.a.s.l.) Date (mm.yy) : 3.86
GENERAL LANDFORM	:	hill	Topography : rolling
PHYSIOGRAPHIC UNIT	:	hill of demi-orange relief *	
SLOPE	Gradient :	10%	Aspect : W
POSITION OF SITE	:		Form : convex
MICRO RELIEF	Kind :		
SURFACE CHAR.	Rock outcrop :	little rocky	Stoniness : nil
	Cracking :	nil	Slaking/crusting : nil
	Salt :	nil	Alkali : nil
SLOPE PROCESSES	Soil erosion :	slight sheet	Aggradation : nil
	Slope stability :	stable	
PARENT MATERIAL	1 :	solid rock	derived from : basic gneiss
	Texture :		
	Weathering degree :	high	Resistance :
Depth lithological boundary (cm):	150		
Remarks	:	Pre-Cambrian	
EFFECTIVE SOIL DEPTH(cm)	:	125	
WATER TABLE	Depth(cm) :		Kind : no watertable observed
DRAINAGE	:	well	
PERMEABILITY	:	high	No slow permeable layer(s) cm
FLOODING	Frequency :	nil	Run off : rapid
MOISTURE CONDITIONS PROFILE	:	0 - 150 cm moist	
LAND USE	:	medium level arable farming; Crops : sugar cane; no irrigation; Rotation : monoculture	
Landuse/vegetation remarks	:	Improvements : none See file for production info	
ADDITIONAL REMARKS :			
Brief field description:			
Deep, well drained, dark brown sandy clay loam derived from basic gneiss with a well developed thick A-horizon.			
A few pieces of bricks/potshells are found in the A-horizons. The colour in BC and C-horizon is an approximation because			
multi-coloured minerals. A banded gneiss structure is present in the C1 and C2 horizon. Over-all pore size is very fine to fine.			
The original vegetation is a deciduous forest.			
*Physiography: the demi-orange relief is known as "meia-laranja".			
Slides: no 9911-9805			
CLIMATE :	Köppen: As		
Station:	7 44 S/ 35 15 W	87 m a.s.l	5 km of site
NAZARE DO MATA			Relevance: very good
	No. years of record	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Annual	
relative humidity %	30	60 63 67 69 75 80 75 72 64 57 54 51 66	
precipitation mm	30	38 64 109 151 197 197 129 77 40 21 27 33 1083	
T mean °C	30	26.4 26.5 26.2 25.6 24.7 23.5 22.9 22.9 23.7 24.8 25.6 26.0 24.9	
windspeed(at 2m) m/s	30	1.8 1.7 1.6 1.2 1.7 1.7 1.9 1.9 1.9 1.8 1.5 1.2 1.7	
bright sunshine h/d	30	593.0 581.0 547.0 503.0 434.0 390.0 419.0 472.0 545.0 598.0 613.0 621.0 526.0	

PROFILE DESCRIPTION :

Ap 0 - 14 cm. 7.5 YR 2.0/1.0, moist sandy clay loam; weak fine to very fine crumb and weak fine to very fine granular structure; sticky, plastic, very friable; many very fine pores; many very fine roots and few medium roots; gradual smooth boundary to
 Ah1 14 - 45 cm. 7.5 YR 2.0/1.0, moist sandy clay loam; weak to moderate fine to medium granular and subangular blocky structure; slightly sticky, slightly plastic, friable; many very fine pores; many very fine roots and few medium roots; gradual smooth boundary to
 Ah2 45 - 58 cm. 7.5 YR 3.0/1.0, moist clay loam; weak to moderate fine to medium subangular blocky structure; slightly sticky, slightly plastic, friable; many very fine pores; many very fine roots and few medium roots; clear wavy boundary to
 Bt 58 - 82 cm. brown (7.5 YR 4.0/4.0, moist) clay loam; moderate fine to medium subangular blocky structure; slightly sticky, friable; broken thin cutans; many very fine pores; common fine roots; gneiss fragments; gradual wavy boundary to
 BC 82 - 105 cm. 7.5 YR 4.0/3.0, moist clay loam; strong fine to medium subangular blocky structure; slightly sticky, friable; many very fine pores; few fine roots; very few fine strongly weathered gneiss fragments; gradual wavy boundary to
 C1 105 - 125 cm. dark brown (10 YR 3.0/3.0, moist) loamy sand; non sticky, non plastic; common very fine pores;; frequent fine strongly weathered gneiss fragments; clear wavy boundary to
 C2 125 - 150 cm. loamy sand; non sticky, non plastic; few very fine pores;; very frequent fine weathered fragments ;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2	2000	1000	500	250	100	TOT	50	20	TOT	<2	DISP	BULK	pF-	---	---	---	---	---	---	---	---
	mm	1000	500	250	100	50	SAND	20	2	SILT	μm	DENS		DENS	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2	
1	0 - 14	0	4	9	11	19	12	56	13	10	24	21	9.7	1.21	47	40	31	26	24	21	16	16	
2	14 - 45	0	4	8	11	20	12	54	11	11	22	25	13.6	1.48	40	38	34	31	30	29	20	19	
3	45 - 58	0	3	7	11	19	11	51	10	11	21	28	15.2	-	-	-	-	-	-	-	-	-	
4	58 - 82	0	2	5	8	17	9	41	8	17	25	35	14.7	1.37	47	46	42	40	38	37	28	27	
5	82 - 105	0	5	9	14	24	10	61	8	13	21	19	10.5	-	-	-	-	-	-	-	-	-	
6	105 - 125	0	4	14	20	30	11	79	6	7	13	9	6.4	1.65	36	33	27	22	19	16	12	12	
7	125 - 150	45	8	16	18	30	12	83	8	5	13	4	2.5	-	-	-	-	-	-	-	-	-	
Hor. no.	pH-H ₂ O	-- CaCO ₃ KCl	ORG-C	MAT-N	EXCH-Ca	CAT-Mg	-----	EXCH-K	AC-Na	sum	H+Al	Al	CEC soil	---	ECEC	BASE	Al	EC	2.5				
		%	%	%	---	----	-----	cmol(+)/kg	sum	-----	-----	-----	clay	OrgC	---	SAT	SAT	mS/cm					
1	5.6	4.8	-	2.46	0.17	12.2	2.8	0.4	0.1	15.5	0.0	0.0	19.2	92	8.6	15.5	81	0	0.21				
2	6.1	4.8	-	1.80	0.13	13.2	2.9	0.1	0.1	16.3	0.0	0.0	17.0	69	6.3	16.3	96	0	0.06				
3	6.5	4.9	-	1.67	0.12	14.5	3.4	0.1	0.0	18.0	0.0	0.0	19.2	69	5.8	18.0	94	0	0.03				
4	6.7	4.6	1.8	0.64	0.07	12.5	5.0	0.1	0.1	17.7	0.0	0.0	14.9	43	2.2	17.7	119	0	0.50				
5	7.0	4.5	0.6	0.31	-	8.8	4.4	0.0	0.0	13.2	0.0	0.0	7.3	39	1.1	13.2	181	0	0.29				
6	6.9	4.7	1.2	0.12	-	5.0	2.4	0.1	0.1	7.6	0.0	0.0	5.8	67	0.4	7.6	131	0	0.03				
7	6.9	4.6	1.2	0.05	-	3.6	1.4	0.1	0.2	5.3	0.0	0.0	3.5	95	0.2	5.3	151	0	0.02				

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p)

Hor. no.	MI	VE	CH	SM	KA	HA	ML	QU	FE	GI	GO	HE	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Fe(p)	Al(p)	Pret	pHNaF
1	5	-	4	8	-	-	-	-	3	-	0.20	0.10	0.00	1.20	0.10	-	-	-	-	-	-
2	5	-	4	8	-	-	-	-	3	-	0.20	0.10	0.00	1.50	0.20	-	-	-	-	-	-
3	4	-	4	8	-	-	-	-	3	-	0.20	0.10	0.10	1.70	0.20	-	-	-	-	-	-
4	4	-	4	8	-	-	-	-	3	-	0.20	0.20	0.10	3.10	0.30	-	-	-	-	-	-
5	4	-	3	8	-	-	-	-	3	-	0.20	0.10	0.00	2.00	0.20	-	-	-	-	-	-
6	4	-	4	7	-	-	-	-	3	-	0.10	0.00	0.00	1.40	0.10	-	-	-	-	-	-
7	4	-	5	7	-	-	-	-	3	-	0.00	0.00	0.00	1.10	0.10	-	-	-	-	-	-

FAO/UNESCO (1988)	:	Haplic solonetz	(1974 : Orthic Solonetz)
USDA/SCS SOIL TAXONOMY (1992)	:	Typic Natrustalf, coarse loamy o.clayey, isohyperthermic	(1975 : typic natrustalf)
LOCAL CLASSIFICATION	:	Planossolo solódico	
DIAGNOSTIC CRITERIA	FAO (1988)	: Diagnostic horizons : natic B	
	USDA/SCS (1992)	: Diagnostic horizons : natic horizon	
		: Soil moisture regime : ustic	
LOCATION	:	Alagoas, Cacimbinhas, 4 km west of Traipu river, topomap in file	
Latitude	:	9°23' 0'' S	Longitude : 36°51' 0'' W
AUTHOR(S)	:	Kauffman, J.H.	Altitude : 240 (m.a.s.l.) Date (mm.yy) : 3.86
GENERAL LANDFORM	:	plain	Topography : undulating
PHYSIOGRAPHIC UNIT	:	weakly diss.planation surface	
SLOPE	Gradient :	4%	Aspect :
POSITION OF SITE	:	middle slope	Form :
MICRO RELIEF	Kind :		
SURFACE CHAR.	Rock outcrop :	little rocky	Stoniness : very few stones
	Form :	(sub)rounded	Av.Size (cm) : 8
	Cracking :		Slaking/crusting : slaked
SLOPE PROCESSES	Soil erosion :	slight sheet	Aggradation : nil
	Slope stability :	stable	
PARENT MATERIAL	1 :	residual material	derived from : basic gneiss
	Texture :		
	Weathering degree :	partial or moderate	Resistance :
Remarks	:	biotite gneiss *	
EFFECTIVE SOIL DEPTH(cm)	:	75	
WATER TABLE	Depth(cm) :		Kind : no watertable observed
DRAINAGE	:	imperfectly	
PERMEABILITY	:	slow	Slow permeable layer from : 30 to 67 cm
FLOODING	Frequency :	nil	Run off : rapid
MOISTURE CONDITIONS PROFILE	:	0 - 30 cm dry 30 - 90 cm moist	
LAND USE	:	semi natural grassland, grazed; Crops :	fodder crops
VEGETATION	Type :	extr.xeromorphic dwarf shrub	Status : degraded
Landuse/vegetation remarks	:	Foddercrop:palma forrageira(Opuntia spp)	

ADDITIONAL REMARKS :
 Brief description:
 Moderately deep, imperfectly drained, sandy clay derived from gneiss; abruptly overlain by a sandy loam topsoil (duplex profile). In C-horizon banded gneiss structure well visible. E2-horizon is not always present, thickness varies between 0-15 cm.
 Parent material: Pre-cambrium biotite(?) gneiss. Climate on limit between As and BSh(ustic to aridic). Natural vegetation:"Caatinga hipoxerofila", for spp. listing see field archives.
 See boletim tecnico no 35 (ISRIC-library).
 Slides no 9806-9816.

CLIMATE :	Köppen: As		321 m a.s.l	25 km E of site	Relevance: moderate								
Station:	9 25 S/ 36 40 W												
PALMEIRA DOS INDIOS													
No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
relative humidity %	14	66	66	68	66	75	79	74	75	69	65	58	58
precipitation mm	14	27	47	74	71	146	166	137	87	39	35	19	21
T mean °C	14	26.3	26.2	26.0	25.3	23.8	22.4	21.5	21.6	23.0	24.4	25.8	26.0
windspeed(at 2m) m/s	14	2.2	2.0	1.7	1.5	1.0	0.9	1.0	1.3	2.0	2.4	2.5	2.4
													1.7

PROFILE DESCRIPTION :

A 0 - 6 cm. brown (10 YR 5.0/3.0, moist) light yellowish brown (10 YR 6.0/4.0, dry) sandy loam; very weak fine subangular blocky structure; non sticky, non plastic, friable; common very fine to fine pores; few fine roots throughout; clear smooth boundary to
 E1 6 - 20 cm. yellowish brown (10 YR 4.5/4.0, moist) very pale brown (10 YR 7.0/3.0, dry) sandy loam; very weak fine subangular blocky structure; non sticky, non plastic, friable, slightly hard; common very fine to fine pores; few fine roots throughout; clear wavy boundary to
 E2 20 - 30 cm. light yellowish brown (10 YR 6.0/4.0, moist) very pale brown (10 YR 7.0/3.0, dry) very gravelly sandy loam; structureless structure; non sticky, non plastic, loose;; abrupt wavy boundary to
 Bt 30 - 67 cm. yellowish brown (10 YR 4.5/4.0, moist) clay; moderate medium prismatic, strong medium angular blocky structure;, very firm, very hard; broken pressure cutans on pedfaces; few very fine to fine pores;; clear wavy boundary to
 C 67 - 90 cm. structureless structure;, firm;; very frequent fine weathered gneiss fragments;

ANALYTICAL DATA :

Hor.	Top - Bot	>2 mm	2000	1000	500	250	100	TOT 50	20	TOT 2	<2 SILT	DISP μm	BULK DENS	pF- 0.0	- 1.0	- 1.5	- 2.0	- 2.3	- 2.7	- 3.4	- 4.2
no.		mm	1000	500	250	100	50	SAND	20	2	μm										

1	0 - 6	4	4	11	17	30	12	75	7	8	16	10	4.5	-	-	-	-	-	-	-	-	
2	6 - 20	7	5	12	17	30	12	76	8	6	15	9	5.8	1.49	43	39	33	21	16	13	8	8
3	20 - 30	64	8	13	17	24	11	73	8	8	16	11	6.6	-	-	-	-	-	-	-	-	
4	30 - 67	8	6	10	10	14	6	45	6	8	14	41	37.5	1.64	65	64	62	57	53	48	30	27
5	67 - 90	34	6	14	25	31	11	87	3	4	7	6	6.4	-	-	-	-	-	-	-	-	

Hor.	pH-H ₂ O	-- CaCO ₃ -KCl	ORG-C%	MAT-N%	EXCH-Ca	CAT-Mg	---	EXCH-K	CAT-Na	---	EXCH-H+Al	AC-Al	CEC-soil	---	BASE-ECEC	Al-SAT%	EC-SAT%	2.5 mS/cm	
no.			%	%															
1	5.0	4.4	-	1.49	-	3.6	1.5	0.8	0.1	6.0	0.1	0.0	6.9	70	5.2	6.1	87	0	0.30
2	5.7	4.6	-	0.74	-	2.8	1.0	0.3	0.0	4.1	0.0	0.0	4.4	47	2.6	4.1	93	0	0.09
3	6.0	4.4	-	0.42	-	2.2	1.8	0.2	0.4	4.6	0.0	0.0	4.6	41	1.5	4.7	100	0	0.11
4	7.9	5.3	3.2	0.23	-	2.7	11.4	0.2	9.2	23.5	-	-	13.6	34	0.8	23.5	173	-	0.43
5	9.4	7.3	2.9	0.05	-	0.8	2.5	0.1	4.1	7.5	-	-	5.8	91	0.2	7.5	129	-	0.34

CLAY MINERALOGY (1 very weak,.., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	6	-	-	5	-	-	-	2	-	0.10	0.00	0.10	0.40	0.00	-	-	-	-	-
2	8	-	-	5	-	-	-	2	-	0.10	0.00	0.00	0.40	0.00	-	-	-	-	-
3	8	-	-	2	5	-	-	2	-	0.10	0.00	0.00	0.50	0.10	-	-	-	-	-
4	7	-	-	4	7	-	-	3	-	0.10	0.10	0.10	1.10	0.10	-	-	-	-	-
5	4	-	-	6	5	-	-	3	-	0.00	0.00	0.00	0.40	0.00	-	-	-	-	-

FAO/UNESCO (1988) (1974)	: Haplic Acrisol : Orthic Acrisol, fragipan phase
USDA/SCS SOIL TAXONOMY (1992)	: Typic Kandiustult, loamy, isohyperthermic
LOCAL CLASSIFICATION	: Podzolico Acinzentado
DIAGNOSTIC CRITERIA	FAO (1988) : Diagnostic horizons : argic B USDA/SCS (1992) : Diagnostic properties : abrupt textural change : Diagnostic horizons : argillic horizon : Diagnostic properties : abrupt textural change : Soil moisture regime : ustic
LOCATION	: Alagoas, S.Sebastiao, see topomap in file
AUTHOR(S)	Latitude : 9°56' 0'' S Longitude : 36°32' 0'' W Altitude : 170 (m.a.s.l.) : Kauffman, J.H. Date (mm.yy) : 3.86
GENERAL LANDFORM	: marine terrace
PHYSIOGRAPHIC UNIT	: tabuleiro plain occ.deep.diss.
SLOPE	Gradient : 1%
POSITION OF SITE	: flat
MICRO RELIEF	Kind :
SURFACE CHAR.	Rock outcrop : nil Stoniness : nil Cracking : nil Slaking/crusting : nil Salt : nil Alkali : slight
SLOPE PROCESSES	Soil erosion : slight sheet Aggradation : nil Slope stability : stable
PARENT MATERIAL	1 : marine sediments derived from : Texture : loamy
Remarks	: Tertiary sediments
EFFECTIVE SOIL DEPTH(cm)	: 200
WATER TABLE	Depth(cm) : 800 Kind : groundwater table
DRAINAGE	: moderately well
PERMEABILITY	: moderate
FLOODING	Frequency : nil Slow permeable layer from : 50 to 150 cm Run off : rapid
MOISTURE CONDITIONS PROFILE	: 57 - 177 cm dry 0 - 57 cm moist
LAND USE	: low level arable farming; Crops : rice; no irrigation; Rotation : crop with current fallow; Improvements : none
Landuse/vegetation remarks	: Cassava,maize,beans,tobacco,fruittrees*
ADDITIONAL REMARKS :	
Brief field description:	Deep, moderately well drained grey sandy clay loam derived from old sediments.
	Characteristic for these soils is the slight exchangeable Sodium (E.S.P.) level. The permeability of the slow permeable layer is an estimation. The fragipan is only weakly cemented, upon moistening it becomes friable.
not yet understood.	Parent material of the soil is Tertiary sediments of the "Barreiras" group. The genesis of the "Barreiras" sediments is
At the site fruittrees observed (Mango, Cashew and Jackfruit).	
Slides no 9817-9820.	

CLIMATE :	Köppen: As	Station: ANADIA	9 38 S/ 36 16 W	130 m a.s.l	25 km NE of site	Relevance: moderate									
	No. years of record		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
relative humidity %			62	67	76	66	78	79	75	76	70	62	55	55	68
precipitation mm			33	51	86	141	195	218	192	122	70	48	17	26	1199
T mean °C			25.6	25.7	25.5	24.7	23.7	22.6	21.7	21.6	22.6	23.8	25.0	25.4	24.0
bright sunshine %			68	63	60	64	52	51	55	54	60	68	73	74	62

PROFILE DESCRIPTION :

Ap 0 - 17 cm. dark gray (10 YR 4.0/1.0, moist)gray (10 YR 5.0/1.0, dry) sand; structureless structure; non sticky, non plastic, loose, soft; many very fine to fine pores; many very fine roots throughout and medium roots; clear smooth boundary to
 E 17 - 57 cm. light brownish gray (10 YR 6.0/2.0, moist) loamy sand; weakly coherent porous massive structure; non sticky, non plastic, very friable; many very fine to fine pores; many very fine roots throughout and common medium roots; abrupt smooth boundary to
 Btx1 57 - 115 cm. very pale brown (10 YR 7.0/3.0, moist)light gray (10 YR 7.0/2.0, dry) sandy clay loam; strongly coherent porous massive structure; slightly sticky, slightly plastic, very friable, very hard; common very fine to fine pores; few very fine roots and fine roots; weakly cemented continuous massive fragipan; diffuse smooth boundary to
 Btx2 115 - 147 cm. pale brown (10 YR 6.0/3.0, moist)very pale brown (10 YR 7.5/4.0, dry) sandy clay loam; strongly coherent porous massive structure; slightly sticky, slightly plastic, very friable, very hard; few coarse prominent mottles; many very fine to fine pores; few very fine roots; weakly cemented continuous massive fragipan; diffuse smooth boundary to
 Bt 147 - 177 cm. very pale brown (10 YR 6.5/4.0, moist)very pale brown (10 YR 7.0/4.0, dry) sandy loam; strongly coherent porous massive structure; slightly sticky, slightly plastic, very friable, very hard; few coarse prominent sharp mottles; many very fine to fine pores;
 Auger 177 - 375 cm. very pale brown (10 YR 6.5/4.0, moist) strongly coherent porous massive structure;;

ANALYTICAL DATA :

Hor.	Top - Bot	>2 mm	2000	1000	500	250	100	TOT 50	20	TOT 2	<2 µm	DISP	BULK DENS	PF- 0.0	PF- 1.0	PF- 1.5	PF- 2.0	PF- 2.3	PF- 2.7	PF- 3.4	PF- 4.2
no.		mm	1000	500	250	100	50	SAND	20	2 SILT											
1	0 - 17	0	4	21	31	29	6	90	3	1	4	6	3.1	1.43	42	38	21	10	9	8	5
2	17 - 57	0	4	20	28	28	6	87	2	1	3	10	9.1	1.47	38	34	19	11	10	9	5
3	57 - 115	0	8	17	17	22	7	70	3	1	5	25	0.5	1.67	30	28	23	19	17	16	13
4	115 - 147	0	4	15	20	19	6	65	4	2	5	31	0.9	-	-	-	-	-	-	-	-
5	147 - 177	0	4	13	20	21	6	64	4	1	4	31	0.5	-	-	-	-	-	-	-	-
6	200 - 275	0	5	12	17	17	6	58	5	2	6	36	0.0	-	-	-	-	-	-	-	-
7	300 - 375	0	4	11	13	13	5	47	5	5	9	44	0.0	-	-	-	-	-	-	-	-

Hor.	pH-H2O	-- CaCO3-KCl	ORG-C %	MAT-N %	EXCH-Ca %	CAT-Ca %	--- EXCH-Mg %	CAT-Mg %	--- EXCH-K %	CAT-K %	Na sum %	H+Al %	Al soil %	CEC clay %	--- OrgC %	ECEC %	BASE SAT %	Al SAT %	EC 2.5 mS/cm	
			%	%	%	%	---	---	---	---	cmol(+) / kg	---	---	---	---	---	%	%		
1	6.9	6.4	0.1	1.97	0.07	4.4	1.2	0.3	0.0	5.9	-	-	-	-	-	6.9	5.9	-	-	0.18
2	6.0	5.0	-	0.71	0.03	0.8	0.3	0.1	0.0	1.2	0.0	0.0	-	-	-	2.5	1.2	-	-	0.05
3	5.4	4.4	-	0.29	-	0.2	0.3	0.1	0.2	0.8	0.1	0.0	-	-	-	1.0	0.9	-	-	0.02
4	5.4	4.4	-	0.21	-	0.6	0.4	0.0	0.1	1.1	0.1	0.0	-	-	-	0.7	1.2	-	-	0.02
5	5.3	4.6	-	0.07	-	0.2	0.4	0.0	0.1	0.7	0.1	0.0	-	-	-	0.2	0.8	-	-	0.02
6	5.3	4.6	-	0.05	-	0.4	0.3	0.0	0.1	0.8	0.1	0.0	-	-	-	0.2	0.9	-	-	0.02
7	5.2	4.3	-	0.06	-	0.2	0.3	0.0	0.0	0.5	0.5	0.2	-	-	-	0.2	1.0	-	-	0.02

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	-	8	-	-	2	-	3	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-
2	-	-	-	-	8	-	-	2	-	3	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-
3	-	-	-	-	8	-	-	2	-	3	-	0.00	0.00	0.00	0.10	0.00	-	-	-	-
4	-	-	-	-	8	-	-	2	-	3	-	0.00	0.00	0.00	0.10	0.00	-	-	-	-
5	-	-	-	-	8	-	-	2	-	3	-	0.00	0.00	0.00	0.10	0.00	-	-	-	-
6	-	-	-	-	8	-	-	2	-	3	-	0.00	0.00	0.00	0.10	0.00	-	-	-	-
7	-	-	-	-	8	-	-	2	-	3	-	0.00	0.10	0.00	0.10	0.00	-	-	-	-

FAO/UNESCO (1988) (1974)	: Haplic Podzol : Placic Podzol, duripan phase	
USDA/SCS SOIL TAXONOMY (1992)	: Typic Haplorthod, sandy, siliceous, isohyperthermic	(1975 : spodosol)
LOCAL CLASSIFICATION	: Podzol com duripan*	
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	: Diagnostic horizons : spodic B : Diagnostic horizons : spodic horizon : Soil moisture regime : ustic
LOCATION	Latitude : 7°17' 0'' S	Longitude : 34°20' 0'' W
AUTHOR(S)	: Kauffman, J.H.	Altitude : 50 (m.a.s.l.) Date (mm.yy) : 4.86
GENERAL LANDFORM	: marine terrace	Topography : rolling
PHYSIOGRAPHIC UNIT	: broad low hill	
SLOPE	Gradient : 6%	Aspect : NE
POSITION OF SITE	: middle slope	Form : convex
MICRO RELIEF	Kind :	
SURFACE CHAR.	Rock outcrop : nil Cracking : nil Salt : nil	Stoniness : nil Slaking/crusting : nil Alkali : nil
SLOPE PROCESSES	Soil erosion : slight sheet Slope stability : stable	Aggradation : not apparent
PARENT MATERIAL	1 : marine sediments Texture : sandy	derived from :
Remarks	: Tertiary sediments *	
EFFECTIVE SOIL DEPTH(cm)	: 116	
WATER TABLE	Depth(cm) :	Kind : no watertable observed
DRAINAGE	: moderately well	
PERMEABILITY	: slow	Slow permeable layer from : 116 to 150 cm
FLOODING	Frequency :	Run off : rapid
MOISTURE CONDITIONS PROFILE	: 0 - 150 cm moist	
LAND USE	: low level arable farming; no irrigation; Rotation : shifting - fallow grass;	
Improvements	: none	
VEGETATION	Type : deciduous shrub	Status : degraded
Landuse/vegetation remarks	: Inhame, cassava,*	

ADDITIONAL REMARKS :

Brief field description:

Deep, moderately well drained, brownish grey sandy soil derived from Tertiary sediments; having a strongly cemented impermeable iron layer in the deeper subsoil.

Brazilian classification: Podzol com duripan or Podzol hidromorfo.

*Geomorphology: dissected plain ("Tabuleira") developed in Tertiary sediments of the "Barreiras" group. The genesis of these sediments is not yet understood.

Groundwater flows lateral over impermeable iron pan. Seepage zones on lower slope. Imperfectly to moderately well drained.

Major crops: roots like 'inhame' (Dioscoreaceae), cassava, sweet potato. See Boletim Tecnico no 35 ISRIC-libr no....slides 9821-9826.

Classification: the iron & duripan is situated at a depth more than 100cm, it therefore does not classify as Placorthods Durorthods.

CLIMATE : Köppen: As
 Station: 7 6 S/ 34 52 W 28 m a.s.l 20 km NNW of site Relevance: very good
 JOAO PESSOA

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
relative humidity %	30	57	60	67	71	75	76	75	69	61	52	52	49	64
precipitation mm	30	62	80	173	227	301	348	190	132	61	23	31	41	1669
T mean °C	30	26.6	26.8	26.8	26.3	25.3	24.3	23.7	23.7	24.7	25.6	26.1	26.4	25.5
bright sunshine %		72	70	63	59	55	54	55	61	68	76	76	79	66

PROFILE DESCRIPTION :

- A 0 - 20 cm. very dark gray (10 YR 3.0/1.0, moist)gray (10 YR 5.0/1.0, dry) sand; structureless single grain structure; non sticky, non plastic, loose; many very fine interstitial pores; common fine roots; clear smooth boundary to
- E1 20 - 70 cm. very dark gray (10 YR 3.0/1.0, moist)gray (10 YR 6.0/1.0, dry) sand; structureless single grain structure; non sticky, non plastic, loose; many very fine to micro pores; few fine roots; gradual smooth boundary to
- E2 70 - 110 cm. light brownish gray (10 YR 5.5/2.0, moist)light gray (10 YR 7.0/1.0, dry) sand; structureless single grain structure; non sticky, non plastic, loose; many very fine to micro pores; few fine roots; abrupt wavy boundary to
- Bh 110 - 116 cm. dark grayish brown (10 YR 4.0/2.0, moist) sand; structureless single grain structure; non sticky, non plastic, loose; many very fine interstitial pores;; abrupt wavy boundary to
- Bhir 116 - 126 cm. pale brown (10 YR 6.0/3.0, moist) sand; strongly coherent massive structure;, extremely firm, very hard; common fine prominent clear mottles (7.5 YR 5.0/8.0); nil roots; strongly cemented
- Bir 126 - 150 cm. brownish yellow (10 YR 6.0/6.0, moist) sand; strongly coherent massive structure;, extremely firm, extremely hard; common fine prominent clear mottles (7.5 YR 5.0/8.0); nil roots; indurated continuous massive;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2	2000	1000	500	250	100	TOT	50	20	TOT	<2	DISP	BULK	pF-	---	---	---	---	---	---	
		mm	1000	500	250	100	50	SAND	20	2	SILT	μm	DENS	DENS	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 20	-	3	21	40	26	5	94	2	1	3	3	0.9	1.39	44	42	22	8	7	6	3	3
2	20 - 70	-	2	16	36	33	7	94	2	1	4	2	0.4	-	-	-	-	-	-	-	-	-
3	70 - 110	-	6	18	31	33	7	95	3	1	3	2	0.4	1.62	34	32	23	5	3	3	1	1
4	110 - 116	4	7	17	28	32	7	91	3	1	4	5	1.3	-	-	-	-	-	-	-	-	-
5	116 - 126	13	3	16	26	24	8	76	9	5	14	10	2.5	-	-	-	-	-	-	-	-	-
6	126 - 150	60	3	17	30	24	9	82	7	8	15	3	0.9	-	-	-	-	-	-	-	-	-

Hor. no.	pH-	--	CaCO ₃	ORG-	MAT.	EXCH	CAT.	---	---	---	---	---	---	EXCH	AC.	CEC	---	---	---	BASE	AL	EC	2.5
	H ₂ O	KCl	%	C	N	Ca	Mg	K	Na	sum	H+Al	Al	soil clay	OrgC	ECEC	SAT	SAT	---	%	%	mS/cm		
1	5.2	4.3	-	0.65	-	0.2	0.1	0.0	0.1	0.4	0.4	0.2	1.6	64	2.3	0.8	25	12	0.04				
2	5.6	4.2	-	0.42	-	0.2	0.0	0.0	0.1	0.3	0.5	0.5	2.3	115	1.5	0.8	13	22	0.01				
3	5.6	4.4	-	0.16	-	0.2	0.0	0.0	0.1	0.3	0.2	0.0	0.5	29	0.6	0.5	60	0	0.01				
4	5.2	4.4	-	0.48	-	0.0	0.0	0.0	0.0	0.0	0.5	0.5	2.1	42	1.7	0.5	0	24	0.02				
5	5.1	4.4	-	1.11	-	0.2	0.0	0.1	0.1	0.4	1.0	0.9	4.8	48	3.9	1.4	8	19	0.02				
6	4.9	5.0	-	0.85	-	0.2	0.0	0.0	0.1	0.3	0.2	0.0	1.1	32	3.0	0.5	27	0	0.02				

CLAY MINERALOGY (1 very weak,,, 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.
no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	4	-	-	3	2	-	3	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
2	-	-	-	4	-	-	3	2	-	3	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
3	2	-	-	4	-	-	3	2	-	2	-	0.00	0.00	0.00	0.00	0.00	-	-	-	-	-
4	-	-	-	4	-	-	3	2	-	3	-	0.00	0.10	0.00	0.00	0.10	-	-	-	-	-
5	-	-	-	5	-	-	3	2	-	3	-	0.00	0.70	0.10	0.00	0.50	-	-	-	-	-
6	-	-	-	4	-	-	3	2	3	3	-	0.10	2.10	0.70	0.20	0.50	-	-	-	-	-

FAO/UNESCO (1988)	: Haplic Arenosol	(1974 : Cambic Arenosol)
USDA/SCS SOIL TAXONOMY (1992)	: Quartzipsamment, sandy, siliceous	(1975 : typic quartzipsamment)
LOCAL CLASSIFICATION	: Areia Quartzosa dist	
DIAGNOSTIC CRITERIA	USDA/SCS (1992) : Soil moisture regime : ustic FAO (1974) & USDA (1975) : Soil moisture regime : ustic	
LOCATION	Paraiba, Mamanguape, 4 km south of Camaratuba river, see topomap	
	Latitude : 6°40' 0'' S	Longitude : 35° 8' 0'' W
AUTHOR(S)	Altitude : 150 (m.a.s.l.) Kauffman, J.H. Date (mm.yy) : 4.86	
GENERAL LANDFORM	marine terrace Topography : undulating	
PHYSIOGRAPHIC UNIT	not dissected part of ct	
SLOPE	Gradient : 1%	Aspect :
POSITION OF SITE	Kind : flat	Form : straight
MICRO RELIEF		
SURFACE CHAR.	Rock outcrop : nil Cracking : nil Salt : nil	Stoniness : nil Slaking/crusting : nil Alkali : nil
SLOPE PROCESSES	Soil erosion : nil Slope stability : stable	
PARENT MATERIAL	1 : marine sediments	derived from :
	Texture : sandy	
Remarks	Tertiary sediments *	
EFFECTIVE SOIL DEPTH(cm)	275	
WATER TABLE	Depth(cm) :	Kind : no watertable observed
DRAINAGE	:	somewhat excessive
PERMEABILITY	:	No slow permeable layer(s) cm
FLOODING	Frequency : nil	Run off : rapid
MOISTURE CONDITIONS PROFILE	:	0 - 275 cm moist
LAND USE	(semi)natural vegetation	
VEGETATION	Type : deciduous woodland	
Landuse/vegetation remarks	Veg:low trees, shrubs + herbs/grasses	

ADDITIONAL REMARKS :

Brief field description:

Very deep, excessively drained, light yellowish brown sand derived from Tertiary sediments.

Parent material: Tertiary sediments of the "Barreiras-group", the genesis of these sediments is not yet understood.
Climate of site is considered to be the average of station Guarabira and Joao Pessoa (see bra19). Year sum precipitation

of

Mamanguape is: 1245mm.

At a depth of 175cm is present an iron fibre, irregular, wavy, with a thickness of a few mm.

See Boletim tecnico no35, ISRIC-library. Slides no 9827-9831

CLIMATE : Köppen: As
 Station: GUARABIRA 6 51 S/ 35 29 W 101 m a.s.l 35 km SW of site Relevance: moderate

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
relative humidity %		61	62	65	69	72	77	73	68	61	56	53	51	64
precipitation mm		42	63	98	123	151	203	88	56	22	12	20	46	924
T mean °C		26.9	27.0	27.0	26.3	25.4	24.2	23.6	23.5	24.6	25.6	26.3	26.7	25.6
bright sunshine %		69	68	65	61	59	53	57	62	69	73	76	77	66

PROFILE DESCRIPTION :

Ah1 0 - 6 cm. very dark grayish brown (10 YR 3.0/2.0, moist) sand; structureless single grain structure; non sticky, non plastic, loose; many very fine interstitial pores; many fine roots throughout and common medium roots; clear smooth boundary to
Ah2 6 - 19 cm. dark grayish brown (10 YR 4.0/2.0, moist) sand; structureless single grain structure; non sticky, non plastic, loose; many very fine interstitial pores; many fine roots throughout and common medium roots; gradual smooth boundary to
Ah3 19 - 50 cm. dark yellowish brown (10 YR 4.0/4.0, moist) sand; structureless single grain structure; non sticky, non plastic, loose; many very fine interstitial pores; many fine roots throughout and common medium roots; clear smooth boundary to
AC 50 - 75 cm. light yellowish brown (10 YR 6.0/4.0, moist) sand; structureless single grain structure; non sticky, non plastic, loose; many very fine interstitial pores; few fine roots throughout; clear smooth boundary to
1C 75 - 175 cm. yellowish brown (10 YR 5.0/6.0, moist) sand; structureless single grain structure; non sticky, non plastic, loose; many very fine interstitial pores; nil roots; abrupt wavy boundary to
2C 175 - 225 cm. strong brown (7.5 YR 4.0/6.0, moist) loamy sand; structureless single grain structure; non sticky, non plastic, loose; many very fine interstitial pores; nil roots; gradual smooth boundary to
2Cg 225 - 275 cm. strong brown (7.5 YR 4.0/6.0, moist) loamy sand; structureless single grain structure; non sticky, non plastic, loose;;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2	2000	1000	500	250	100	TOT	50	20	TOT	<2	DISP	BULK	pF-	---	---	---	---	---		
		mm	1000	500	250	100	50	SAND	20	2	SILT	μm	DENS	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2	
1	0 - 6	-	2	16	40	30	7	94	1	2	4	3	0.5	-	-	-	-	-	-	-	-	
2	6 - 19	-	2	14	31	39	10	95	2	0	3	2	0.5	-	-	-	-	-	-	-	-	
3	19 - 50	-	3	18	32	34	9	96	1	1	2	2	1.0	1.46	41	37	25	7	6	5	2	2
4	50 - 75	-	2	16	31	37	5	92	2	1	2	2	1.4	-	-	-	-	-	-	-	-	
5	75 - 175	-	3	15	28	37	10	94	2	1	3	3	1.4	1.57	36	35	28	8	6	5	3	3
6	175 - 225	-	3	14	29	34	10	90	2	2	4	6	4.7	-	-	-	-	-	-	-	-	
7	225 - 275	20	3	12	25	32	10	82	5	6	10	8	5.6	-	-	-	-	-	-	-	-	

Hor. no.	pH-	--	CaCO ₃	ORG-	MAT.	EXCH	CAT.	-----	EXCH	AC.		CEC	-----	-----	BASE	Al	EC	2.5	
	H ₂ O	KCl	%	%	%	Ca	Mg	K	Na sum	H+Al	Al	soil clay	OrgC	ECEC	SAT	SAT	mS/cm		
1	5.4	4.7	-	1.00	0.07	2.2	0.3	0.1	0.0	2.6	0.0	0.0	3.8	146	3.5	2.6	68	0	0.21
2	5.5	4.4	-	0.42	0.03	0.6	0.1	0.0	0.0	0.7	0.2	0.0	1.6	70	1.5	0.9	44	0	0.04
3	6.2	4.8	-	0.29	-	0.6	0.1	0.0	0.0	0.7	0.1	0.0	1.0	43	1.0	0.8	70	0	0.02
4	6.1	4.7	-	0.10	-	0.2	0.1	0.0	0.1	0.4	0.1	0.0	0.3	20	0.4	0.5	133	0	0.01
5	6.1	4.8	-	0.16	-	0.2	0.1	0.0	0.0	0.3	0.1	0.0	0.9	28	0.6	0.4	33	0	0.01
6	6.2	4.9	-	0.16	-	0.2	0.1	0.0	0.2	0.5	0.1	0.0	0.7	11	0.6	0.6	71	0	0.01
7	6.2	5.1	-	0.49	-	0.4	0.2	0.0	0.2	0.8	0.1	0.0	0.7	9	1.7	0.9	114	0	0.01

CLAY MINERALOGY (1 very weak, ..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.
no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	6	-	2	-	3	4	-	-	-	0.10	0.00	-	-	-	-	-
2	-	-	-	6	-	2	-	3	4	-	-	-	0.10	0.10	-	-	-	-	-
3	-	-	-	6	-	2	-	3	4	-	-	-	0.10	0.00	-	-	-	-	-
4	-	-	-	6	-	2	-	3	4	-	-	-	0.20	0.10	-	-	-	-	-
5	-	-	-	6	-	2	-	4	4	-	-	-	0.30	0.10	-	-	-	-	-
6	-	-	-	6	-	2	-	4	4	-	-	-	0.50	0.40	-	-	-	-	-
7	-	-	-	5	-	2	-	4	4	-	-	-	-	-	-	-	-	-	-

FAO/UNESCO (1988)	: Haplic Lixisol	(1974 : Chromic Luvisol)
USDA/SCS SOIL TAXONOMY (1992)	: Typic Haplustalf, clayey, thermic	(1975 : aridic argiustoll)
LOCAL CLASSIFICATION	: Bruno nao calcico	
DIAGNOSTIC CRITERIA		
	FAO (1988) : Diagnostic horizons : argic B	
	USDA/SCS (1992) : Diagnostic horizons : argillic horizon	
	: Soil moisture regime : ustic	
LOCATION	Latitude : Paraiba, Sume, 14km south of Meio river, see topomap Longitude : 7°16' 0'' S 37° 0' 0'' W	Altitude : 510 (m.a.s.l.)
AUTHOR(S)	: Kauffman, J.H.	Date (mm.yy) : 4.86
GENERAL LANDFORM	: plain	Topography : undulating
PHYSIOGRAPHIC UNIT	:	Form : convex
SLOPE	Gradient : 3%	Aspect :
POSITION OF SITE	: upper slope	
MICRO RELIEF	Kind :	Stoniness : fairly stony
SURFACE CHAR.	Rock outcrop : nil	Av.Size (cm) : 8
	Form : (sub)rounded	Slaking/crusting : nil
	Cracking : nil	Alkali : nil
	Salt : nil	
SLOPE PROCESSES	Soil erosion : slight sheet	
PARENT MATERIAL	1 : residual material	derived from : basic gneiss
	Texture : clayey	
	Weathering degree : partial or moderate	Resistance :
	: Biot.gneiss precambr	
Remarks		
EFFECTIVE SOIL DEPTH(cm)	: 70	Kind : no watertable observed
WATER TABLE	Depth(cm) :	No slow permeable layer(s) cm
DRAINAGE	:	Run off : rapid
PERMEABILITY	:	
FLOODING	Frequency : nil	
MOISTURE CONDITIONS PROFILE	: 0 - 110 cm moist	
LAND USE	: shrubland, grazed; seasonal irrigated	Status : degraded
VEGETATION	Type : extremely xeromorphic shrub	
Landuse/vegetation remarks	: *)See general remarks	

ADDITIONAL REMARKS :

Brief field description:
 Moderately deep, well drained, brown clay soil derived from gneiss; topsoil is sandy loam, the transition to weathered gneiss is at 70cm depth. C-horizon: multicoloured banded rotten gneissrock. Stones at the soil surface and in the CB-horizon are rounded quartz stones with a desert varnish.
 Soil moisture regime is ustic bordering to aridic.
 Landscape: moderately dissected denudational plain with a few inselbergs.
 Vegetation (Brasilian name): Caatinga Hiperxerofolia.
 Near the site some arable farming, maize, cotton with supplementary irrigation.
 See SNLCS-Embrapa Boletim tecnico no 15. Slides no 9832, 9833.

CLIMATE : Station: MONTEIRO	Köppen: BSh 7 53 S/ 37 7 W	590 m a.s.l	20 km SW of site	Relevance: good												
				No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
precipitation	mm	40	38	67	132	102	62	37	16	6	2	11	13	19	507	

PROFILE DESCRIPTION :

PROFILE DESCRIPTION :

A 0 - 9 cm. dark brown (10 YR 3.0/3.0, moist) sandy clay; weak medium subangular blocky structure; sticky, plastic, friable, soft; many very fine to fine pores; many fine roots and medium roots; clear smooth boundary to

AB 9 - 27 cm. brown (7.5 YR 4.0/4.0, moist) clay; moderate fine to medium subangular blocky structure; very sticky, very plastic, friable, slightly hard; many very fine to fine pores; few fine roots; gradual smooth boundary to

Bt 27 - 60 cm. 6 YR 4.0/4.0, moist clay; moderate fine to medium subangular blocky structure; very sticky, very plastic, very friable, slightly hard; many very fine to fine pores; few fine roots; abrupt boundary to

CB 60 - 70 cm. yellowish brown (10 YR 5.0/4.0, moist) slightly stony clay; moderate medium angular blocky structure; sticky, very plastic, friable, slightly hard; broken moderately thick pressure cutans on pedfaces; few very fine pores; few fine roots; abrupt boundary to

C 70 - 110 cm. sandy loam; nil roots; dominant fine strongly weathered gneiss fragments;

ANALYTICAL DATA :

ANALYTICAL DATA :																			
Hor. no.	Top - Bot	>2 mm	2000	1000	500	250	100	TOT	50	20	TOT	<2 µm	DISP	BULK DENS	PF	-	-		
		1000	500	250	100	50	SAND	20	2	SILT	µm	0.0	1.0	1.5	2.0	2.3	2.7		
1	0 - 9	7	6	11	15	18	11	62	8	11	19	19	10.0	-	-	-	-		
2	9 - 27	-	4	10	16	19	9	59	7	11	18	23	13.1	1.48	43	39	33		
3	27 - 60	-	4	9	13	15	7	48	6	10	16	37	17.7	1.56	42	39	33		
4	60 - 70	-	2	8	11	13	6	40	6	10	16	44	15.2	1.52	45	43	39		
5	70 - 110	-	4	14	23	22	9	71	5	9	14	15	7.0	-	-	-	-		
<hr/>																			
Hor. no.	pH- H ₂ O	Caco ₃ KCl	ORG-C %	MAT. %	EXCH Ca	EXCH Mg	CAT. K	Na sum	H+Al cmol(+)/kg	AC Al	CEC soil clay	OrgC	ECEC	BASE SAT %	BASE SAT %	AL EC mS/cm			
			%	%															
1	7.2	5.4	1.3	1.16	0.14	0.0	3.2	0.0	0.9	4.1	-	12.5	65	4.1	4.1	33	-	0.42	
2	7.1	5.5	1.3	0.72	0.09	6.0	3.3	0.0	0.5	9.8	-	9.7	42	2.5	9.8	101	-	0.08	
3	5.8	4.8	1.2	0.28	-	9.6	4.8	0.3	0.0	14.7	0.0	10.5	29	1.0	14.7	140	0	0.46	
4	6.2	4.6	1.7	0.19	-	8.8	14.0	0.3	0.1	23.2	0.0	0.0	14.8	33	0.7	23.2	157	0	0.10
5	6.4	4.3	1.6	0.04	-	5.7	7.6	0.2	0.2	13.7	0.0	0.0	10.6	73	0.1	13.7	129	0	0.04

CLAY MINERALOGY (1 very weak, ..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) &

no.	MI	VE	CH	SM	KA	HA	ML	QU	FE	GT	GU	HL	PC(%)					
1	8	-	-	4	6	-	-	-	4	-	0.10	0.10	0.00	1.30	0.10	-	-	-
2	8	-	-	3	6	-	-	-	4	-	0.10	0.10	0.00	1.60	0.20	-	-	-
3	8	-	-	3	7	-	-	-	4	-	0.10	0.10	0.00	2.60	0.20	-	-	-
4	8	-	-	3	7	-	-	-	4	-	0.10	0.10	0.00	2.90	0.30	-	-	-
4	6	-	-	4	6	-	-	-	4	-	0.10	0.10	0.00	1.20	0.10	-	-	-
5	4	-	-	8	6	-	-	-	3	-	0.00	0.00	0.00	-	-	-	-	-

FAO/UNESCO (1988)	: Eutric Planosol	(1974 : Eutric Planosol)
USDA/SCS SOIL TAXONOMY (1992)	: Grossarenic Paleustalf, loamy, isohyperthermic	(1975 : psammentic paleustalf)
LOCAL CLASSIFICATION	: Solonetz solodizado	
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	: Diagnostic horizons : ochric A, natric B : Diagnostic horizons : ochric epipedon, natric horizon : Soil moisture regime : ustic
LOCATION	: Paraiba, Boa Vista, 5km ENE of Boa Vista, see topomap	
AUTHOR(S)	Latitude : 7°14' 0'' S Longitude : 36°12' 0'' W : Kauffman, J.H.	Altitude : 500 (m.a.s.l.) Date (mm.yy) : 4.86
GENERAL LANDFORM	: plain	Topography : undulating
PHYSIOGRAPHIC UNIT	: mod.diss.denudational plain	
SLOPE	Gradient : 5%	Aspect :
POSITION OF SITE	: middle slope	Form : straight
MICRO RELIEF	Kind :	
SURFACE CHAR.	Rock outcrop : fairly rocky Cracking : nil Salt : nil	Stoniness : very few stones Slaking/crusting : slaked Alkali : slight
SLOPE PROCESSES	Soil erosion : slight sheet and slight rill	
PARENT MATERIAL	1 : residual material Texture : Weathering degree : partial or moderate	derived from : gneiss Resistance :
Remarks	: with Calcite veins	
EFFECTIVE SOIL DEPTH(cm)	: 70	
WATER TABLE	Depth(cm) :	Kind : no watertable observed
DRAINAGE	: imperfectly	
PERMEABILITY	: slow	Slow permeable layer from : 30 to 70 cm
FLOODING	Frequency : nil	Run off : rapid
MOISTURE CONDITIONS PROFILE	: 0 - 90 cm moist	
LAND USE	: shrubland, grazed	
VEGETATION	Type : extremely xeromorphic shrub	Status : degraded
Landuse/vegetation remarks	: Local veg.: Caatinga Hiperxerofila	
ADDITIONAL REMARKS :		
Short field description:		
Moderately deep; imperfectly drained, sandy clay derived from gneiss; abruptly overlain by a sandy topsoil.		
The transition of E to B horizon is tongued. The columns of the B-horizon have prominent rounded tops, which are locally called "cabeca de gato" (literally: "cat head").		
Classification: the abrupt textural change (duplex) from sandy topsoil to sandy clay subsoil consisting of rounded columnar		
structure are pointing to a "solodized solonet".		
Boa Vista has a slightly higher rainfall than Cabeceiras. The annual precipitation of Boa Vista=370mm, the annual precipitation of Cabaceiras=217mm (1931-1960). Soil moisture regime is ustic to aridic.		
Slides no 9834-9854.		
CLIMATE :	Köppen: BSh	Relevance: moderate
Station: CABACEIRAS	7 30 S / 36 17 W	
	390 m a.s.l	
	25 km S of site	
	No. years of record	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Annual
precipitation	mm	40 15 32 41 55 38 37 24 9 1 3 3 4 261

PROFILE DESCRIPTION :

A 0 - 18 cm. dark brown (10 YR 4.0/3.0, moist) sand; structureless single grain structure; non sticky, non plastic, very friable; many very fine interstitial pores; common fine roots and few medium roots; clear boundary to
 E 18 - 30 cm. light gray (10 YR 6.5/2.0, moist) gravelly sand; structureless single grain structure; non sticky, non plastic, loose; many very fine interstitial pores; common fine roots and few medium roots; abrupt irregular boundary to
 Bt1 30 - 51 cm. grayish brown (10 YR 5.0/2.0, moist) slightly gravelly sandy clay loam; strong very coarse columnar structure; sticky, very plastic, extremely firm; common medium prominent clear mottles (5 YR 4.0/6.0); few fine inped tubular pores; few very fine roots; gradual boundary to
 Bt2 51 - 70 cm. gray (10 YR 5.0/1.0, moist) sandy clay loam; strong very coarse columnar structure; sticky, very plastic, extremely firm; few medium faint diffuse mottles; few fine inped tubular pores; nil roots ; very few medium weathered calcite fragments; clear boundary to
 R 70 - 90 cm. ; dominant medium weathered calcite+gneiss fragments;

ANALYTICAL DATA :

Hor. no.	Top - Bot mm	>2 mm	2000	1000	500	250	100	50	TOT SAND	50	20	TOT SILT	<2 µm	DISP	BULK DENS	PF- 0.0	0.1	1.5	2.0	2.3	2.7	3.4	4.2
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1	0 - 18	-	5	8	17	36	17	83	9	4	13	4	1.8	1.43	40	37	29	17	12	10	4	4
2	18 - 30	30	9	13	23	33	11	88	6	2	8	3	2.9	-	-	-	-	-	-	-	-	-
3	30 - 51	20	4	12	22	19	6	63	5	2	7	30	28.1	1.72	37	36	34	33	30	29	28	27
4	51 - 70	-	2	9	21	22	8	61	6	3	9	30	26.7	-	-	-	-	-	-	-	-	

Hor. no.	pH-H ₂ O	-- CaCO ₃ -KCl	ORG-C%	MAT-N%	EXCH Ca---	CAT-Mg%	-----	EXCH K-Na sum	CEC H+Al	AC.- Al	CEC soil	CEC clay	CEC OrgC	--- ECEC	BASE SAT	AL SAT	EC 2.5
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1	4.8	4.1	-	0.56	-	1.4	0.7	0.1	0.3	2.5	0.3	0.0	1.9	48	2.0	2.8	132	0	0.26
2	5.9	4.4	-	0.23	-	0.4	0.8	0.1	0.5	1.8	0.1	0.0	1.9	56	0.8	1.9	95	0	0.12
3	5.8	4.2	-	0.38	-	1.4	5.0	0.1	2.8	9.3	0.4	0.0	11.0	36	1.3	9.7	85	0	0.28
4	7.5	6.0	0.7	0.16	-	2.0	7.0	0.1	4.0	13.1	-	-	11.7	39	0.6	13.1	112	-	0.85

CLAY MINERALOGY (1 very weak,.., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	4	-	-	4	5	-	-	-	-	0.00	0.00	0.00	0.10	0.00	-	-	-	-
2	4	-	-	4	5	-	-	-	-	0.00	0.00	0.00	0.10	0.00	-	-	-	-
3	3	-	-	5	8	-	-	-	-	0.10	0.00	0.00	0.40	0.10	-	-	-	-
4	3	-	-	6	7	-	-	-	-	0.00	0.10	0.00	0.20	0.00	-	-	-	-

FAO/UNESCO (1988)	:	Ferric Alisol	(1974 : Ferric Acrisol)
USDA/SCS SOIL TAXONOMY (1992)	:	Oxyaquitic Hapludult, clayey, mixed, isohyperthermic	(1975 : aquic tropudult)
LOCAL CLASSIFICATION	:	Podzolico-VA-Ta-Alic	
DIAGNOSTIC CRITERIA	FAO (1988)	: Diagnostic horizons : ochric A, argic B	
	USDA/SCS (1992)	: Soil moisture regime : udic	
LOCATION	:	Pernambuco, Cabo, 11km from Cabo on road to Ipojuca	
AUTHOR(S)	Latitude :	8°21' 0'' S	Longitude : 35° 1' 0'' W
			Altitude : 80 (m.a.s.l.)
			Date (mm.yy) : 4.86
GENERAL LANDFORM	:	hill	Topography : rolling
PHYSIOGRAPHIC UNIT	:	low steep hil *)	
SLOPE	Gradient :	40%	Aspect : W
POSITION OF SITE	:	middle slope	Form : convex
MICRO RELIEF	Kind :		
SURFACE CHAR.	Rock outcrop :	nil	Stoniness : nil
	Cracking :	nil	Slaking/crusting : nil
	Salt :	nil	Alkali : nil
SLOPE PROCESSES	Soil erosion :	moderate sheet	
PARENT MATERIAL	1 :	colluvium	derived from : conglomerate
	Texture :	sandy clay	
	Weathering degree :	high	Resistance :
Remarks	:	Tertiary, (arkosic)	
EFFECTIVE SOIL DEPTH(cm)	:	150	
WATER TABLE	Depth(cm) :		Kind : no watertable observed
DRAINAGE	:	moderately well	
PERMEABILITY	:	moderate	No slow permeable layer(s) cm
FLOODING	Frequency :	nil	Run off : rapid
MOISTURE CONDITIONS PROFILE	:	0 - 150 cm moist	
LAND USE	:	medium level arable farming; Crops : sugar cane; no irrigation; Rotation : monoculture ; Improvements : none	
Landuse/vegetation remarks	:	Floresta tropical subperenifolia	

ADDITIONAL REMARKS :

Brief field description:

Moderately deep, imperfectly drained, light brown clay derived from conglomerate with a strongly mottled subsoil.

The Bg1 and Bg2 horizons are multicoloured, no real matrix colour can be given.

The CB horizon consisting of highly weathered conglomerate shows different texture types from sandy to clayey materials.

Climate: registration period precipitation 1931-1970

*) Geomorphology is a characteristic 'demi-orange' relief ('meia laranja'). Steep hills with flat valley floor.

Analytical data present extremely high exchangeable Aluminim, comparable to e.g. soil reference profile China number 21 (CN021).

For more information see thesis I.A.Gomes july 1985 Piracicaba S.Paula/Brasil.

Slides no 9855-9862

CLIMATE :	Köppen: Ams											
Station:	8 1 S/ 34 51 W	56 m a.s.l	40 km N of site	Relevance:								
OLINDA-RECIFE												

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
relative humidity %	30	78	79	79	81	82	82	82	81	78	77	76	77	79
precipitation mm	40	55	97	212	259	333	327	228	143	58	36	24	43	1824
T mean °C	30	27.1	27.1	27.0	26.6	25.9	25.0	24.3	24.4	25.3	26.2	26.6	26.9	26.0
windspeed(at 2m) m/s	30	3.0	2.8	2.6	2.9	2.8	3.6	4.0	3.3	3.4	3.2	2.1	2.0	2.9
bright sunshine h/d		8.3	7.1	6.8	6.5	6.0	5.7	5.1	6.6	7.5	7.7	7.8	8.5	7.0

PROFILE DESCRIPTION :

A	0 -	8 cm.	dark brown (10 YR 4.0/3.0, moist) sandy clay loam; weak fine to medium subangular blocky structure; sticky, very plastic, firm; common very fine pores and few medium pores; common fine roots and medium roots; clear smooth boundary to
AB	8 -	28 cm.	brown (10 YR 5.0/3.0, moist) clay; weak to moderate fine to medium subangular blocky structure; sticky, very plastic, firm; common very fine pores and few medium pores; few fine roots and medium roots; clear smooth boundary to
Bg1	28 -	56 cm.	light brown (7.5 YR 6.0/4.0, moist) clay; moderate fine to medium subangular blocky structure; sticky, very plastic, firm; many coarse prominent mottles (2.5 YR 3.0/6.0); continuous moderately thick pressure cutans on pedfaces; few very fine pores and few very fine random inped tubular pores; few fine roots and medium roots; gradual smooth boundary to
Bg2	56 -	88 cm.	light yellowish brown (10 YR 6.0/4.0, moist) clay; moderate fine to medium subangular blocky structure; sticky, very plastic, firm; many coarse prominent mottles (2.5 YR 3.0/6.0); broken moderately thick pressure cutans on pedfaces; few very fine pores and few very fine random inped tubular pores; few fine roots and medium roots; clear wavy boundary to
CB	88 -	150 cm.	reddish yellow (7.5 YR 7.0/6.0, moist) loamy sand; weakly coherent porous massive structure; non sticky, non plastic, friable;; frequent coarse strongly weathered conglomerate fragments;

ANALYTICAL DATA :

Hor. no.	pH-	H2O	CaCO ₃ %	ORG- C %	MAT. %	EXCH Ca -----	CAT. Mg -----	K Na sum cmol(+) / kg	EXCH H+Al -----	AC. Al -----	CEC soil clay OrgC -----	ECEC -----	BASE SAT %	Al SAT %	EC 2.5 mS/cm				
	KCl																		
1	5.0	4.0	-	1.74	0.10	0.8	1.2	0.4	0.0	2.4	1.2	1.1	18.1	84	6.1	3.6	13	6	0.09
2	5.0	3.7	-	1.15	0.11	0.4	1.6	0.4	0.1	2.5	7.5	7.8	12.7	22	4.0	10.0	20	61	0.03
3	5.0	3.8	-	0.59	0.07	0.2	1.5	0.2	0.1	2.0	10.1	10.5	12.0	23	2.1	12.1	17	88	0.03
4	5.1	3.8	-	0.27	-	0.0	1.0	0.1	0.0	1.1	7.0	7.3	10.0	27	0.9	8.1	11	73	0.03
5	5.0	3.7	-	0.14	-	0.0	1.3	0.1	0.2	1.6	10.7	10.5	13.6	52	0.5	12.3	12	77	0.03
6	5.0	4.0	-	0.06	-	0.0	0.4	0.0	0.1	0.5	3.0	2.9	2.8	22	0.2	3.5	18	104	0.02
7	5.0	3.6	-	0.07	-	0.0	1.8	0.2	0.1	2.1	11.7	11.9	14.7	71	0.2	13.8	14	81	0.03

remarks (hor. 3) : Spec.Surf.=98

remarks (hor. 3) : Spec.Surf.=98

CLAY MINERALOGY (1 very weak,.., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p)

Hor.

no.	MI	VE	CH	SM	KA	HA	ML	QU	FE	GI	GO	HE	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Fe(p)	Al(p)	Pret	pHNaF
1	3	-	-	4	8	-	3	-	-	3	-	0.20	0.10	0.00	0.80	0.10	-	-	-	-	
2	3	-	-	4	8	-	3	-	-	3	-	0.30	0.20	0.00	2.00	0.30	-	-	-	-	
3	2	-	-	3	8	-	3	-	-	2	-	0.30	0.20	0.00	2.00	0.30	-	-	-	-	
4	1	-	-	2	8	-	3	-	-	2	-	0.10	0.20	0.00	1.40	0.20	-	-	-	-	
5	1	-	-	2	6	-	3	-	-	2	-	0.10	0.20	0.00	1.30	0.20	-	-	-	-	
6	1	-	-	2	6	-	3	-	-	2	-	0.00	0.10	0.00	0.40	0.10	-	-	-	-	
7	1	-	-	4	6	-	3	-	-	2	-	0.00	0.10	0.00	0.60	0.10	-	-	-	-	

FAO/UNESCO (1988) (1974)	: Ferralic Arenosol : Aeric Ferralsol, cerrado phase	
USDA/SCS SOIL TAXONOMY (1992)	: Oxic Ultropept, loamy, isohyperthermic	(1975 : quartzipsammentic haplustox)
LOCAL CLASSIFICATION	: Latossolo VA media	
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	: Diagnostic horizons : ochric A : Diagnostic properties : geric properties : Soil moisture regime : ustic
LOCATION	Latitude : 19° 9'16'' S	Minas Gerais, road Ueberlandia-Uberaba, 69km Nof Uberaba river Longitude : 48° 9'54'' W Altitude : 800 (m.a.s.l.)
AUTHOR(S)	: Kaufman, J.H. Date (mm.yy) : 4.80	
GENERAL LANDFORM	: plain	Topography : undulating
PHYSIOGRAPHIC UNIT	: low, very broad hill *)	
SLOPE	Gradient : 3%	Aspect :
POSITION OF SITE	: upper slope	Form : convex
MICRO RELIEF	Kind :	
SURFACE CHAR.	Rock outcrop : nil Cracking : nil Salt : nil	Stoniness : nil Slaking/crusting : nil Alkali : nil
SLOPE PROCESSES	Soil erosion : slight sheet	
PARENT MATERIAL	1 : colluvium Texture : loamy Weathering degree : high	derived from : highly weathered material Resistance :
Remarks	: Bauru arenite	
EFFECTIVE SOIL DEPTH(cm)	: 200	
WATER TABLE	Depth(cm) :	Kind : no watertable observed
DRAINAGE	: well-somewhat excessive	
PERMEABILITY	: high	No slow permeable layer(s) cm
FLOODING	Frequency : nil	Run off : rapid
MOISTURE CONDITIONS PROFILE	: 0 - 500 cm moist	
LAND USE	: semi natural grassland, grazed; Improvements : land clearing	
Landuse/vegetation remarks	: Original vegetation:"Cerrado"	
ADDITIONAL REMARKS :		
Brief field description:		
Very deep, well drained, brown loamy sand.		
At the soil surface frequent ant "craters" present.		
The whole profile contains dark coloured fill-ins, probably old termite/ant cavities filled with darker coloured A or AB material. From 0-200cm observations from soil pit, deeper than 200cm auger observations.		
Geomorphology: moderately dissected planation surface.		
Precipitation of site is probably somewhat lower than Uberaba (yearsum Monte Alegre de Minas=1351mm)		
At nearby ranch improved pasture and contourline terraces as erosion control measures.		
Slides no 9863-9877.		

CLIMATE :	Köppen: Aw													
Station: UBERABA	19 44 S/ 47 55 W			739 m a.s.l			70 km S of site			Relevance: good				
	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
relative humidity %		79	81	73	59	50	43	42	45	66	80	78	84	65
precipitation mm		274	240	202	107	38	30	13	10	70	130	218	292	1623
T mean °C		22.8	23.0	22.8	22.2	20.4	18.9	18.8	21.2	23.2	23.6	23.0	22.7	21.9
bright sunshine %		51	47	57	70	78	83	84	82	64	49	52	44	63

PROFILE DESCRIPTION :

Ap 0 - 15 cm. 7.5 YR 3.0/3.0, moist loamy sand; weak fine to very fine granular and weak fine to very fine crumb structure; non sticky, non plastic, friable; many very fine pores and common fine pores; many fine roots and medium roots; gradual smooth boundary to
 AB 15 - 40 cm. dark brown (7.5 YR 3.0/4.0, moist) loamy sand; weakly coherent porous massive structure; non sticky, non plastic, very friable; many very fine pores and common fine pores; many fine roots and few coarse roots; gradual smooth boundary to
 BA 40 - 80 cm. brown (7.5 YR 4.0/4.0, moist) loamy sand; weakly coherent porous massive structure; non sticky, non plastic, very friable; common very fine pores and few fine pores; few fine roots; diffuse smooth boundary to
 Bw1 80 - 129 cm. strong brown (7.5 YR 4.0/6.0, moist) sandy loam; weakly coherent porous massive structure; non sticky, non plastic, very friable; common very fine pores and few fine pores;; diffuse smooth boundary to
 Bw2 120 - 300 cm. yellowish red (5 YR 4.0/6.0, moist) sandy loam; weakly coherent porous massive structure; non sticky, non plastic, very friable; common very fine pores and few fine pores;;
 Bg 300 - 400 cm. yellowish red (5 YR 4.0/6.0, moist) sandy clay loam; slightly sticky, slightly plastic; common medium distinct mottles;;
 B 400 - 500 cm. dark reddish brown (2.5 YR 3.0/4.0, moist) sandy clay; slightly sticky, slightly plastic; many coarse prominent mottles;; very few fine quartz fragments and few fragments;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2	2000	1000	500	250	100	50	SAND	TOT	50	20	TOT	<2	DISP	BULK	PF-	---	---	---	---	---	---
		mm	1000	500	250	100	50	SAND	20	2	SILT	μm	DENS	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2		
1	0 - 15	-	0	3	16	47	16	84	5	1	6	10	3.3	1.48	42	41	33	16	12	11	8	7	
2	15 - 40	-	0	3	17	47	15	82	6	1	7	11	2.4	-	-	-	-	-	-	-	-	-	
3	40 - 80	-	0	3	15	45	17	81	6	1	7	13	2.4	1.41	43	42	36	17	13	11	7	7	
4	80 - 120	-	1	3	15	42	17	77	8	1	9	14	2.4	-	-	-	-	-	-	-	-	-	
5	120 - 200	-	1	3	14	40	18	75	9	2	10	15	1.0	-	-	-	-	-	-	-	-	-	
6	200 - 300	-	1	3	13	40	19	75	9	3	11	13	4.6	-	-	-	-	-	-	-	-	-	
7	300 - 400	-	1	3	12	39	19	74	8	3	11	15	4.3	-	-	-	-	-	-	-	-	-	
8	400 - 440	-	2	4	12	37	19	73	7	5	12	16	0.4	-	-	-	-	-	-	-	-	-	
9	440 - 500	23	3	4	12	31	16	66	9	9	18	17	0.0	-	-	-	-	-	-	-	-	-	

Hor. no.	pH-	--	CaCO ₃	ORG-	MAT.	EXCH	CAT.	-----	EXCH	AC.	CEC	-----	---	BASE	Al	EC 2.5			
	H ₂ O	KCl	%	C	N	Ca	Mg	K	Na	sum	H+Al	Al	soil clay	OrgC	ECEC	SAT	SAT	%	%
1	4.8	4.3	-	0.66	-	0.4	0.0	0.0	0.1	0.5	0.6	0.4	1.6	16	2.3	1.1	31	25	0.05
2	4.9	4.4	-	0.45	-	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.9	8	1.6	0.4	0	22	0.03
3	5.2	4.5	-	0.35	-	0.0	0.0	0.0	0.1	0.1	0.3	0.0	0.7	6	1.2	0.4	14	0	0.03
4	5.1	4.6	-	0.29	-	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.9	7	1.0	0.2	0	0	0.02
5	5.2	5.4	-	0.20	-	0.0	0.0	0.0	0.1	0.1	-	-	0.3	2	0.7	0.1	33	-	0.01
6	5.1	6.0	-	0.12	-	0.0	0.0	0.0	0.2	0.2	-	-	0.2	2	0.4	0.2	100	-	0.02
7	5.7	6.1	-	0.08	-	0.0	0.0	0.0	0.2	0.2	-	-	0.2	1	0.3	0.2	100	-	0.01
8	5.9	5.8	-	0.08	-	0.0	0.1	0.0	0.1	0.2	-	-	0.2	1	0.3	0.2	100	-	0.03
9	5.5	4.5	-	0.02	-	0.0	0.1	0.0	0.1	0.2	0.3	0.0	0.3	2	0.1	0.5	67	0	0.01

remarks (hor. 3) : Spec.Surf.=16

remarks (hor. 4) : Spec.Surf.=19

remarks (hor. 5) : Spec.Surf.=17

CLAY MINERALOGY (1 very weak, ..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	2	-	4	-	-	2	5	4	-	0.10	0.10	0.00	1.10	0.30	-	-	-	-
2	-	-	2	-	5	-	-	2	5	4	-	0.10	0.10	0.00	1.20	0.30	-	-	-	-
3	-	-	2	-	4	-	-	2	4	4	-	0.00	0.10	0.00	1.20	0.30	-	-	-	-
4	-	-	2	-	5	-	-	2	5	4	-	0.00	0.10	0.00	1.40	0.30	-	-	-	-
5	-	-	1	-	4	-	-	2	4	4	-	0.00	0.10	0.00	1.40	0.30	-	-	-	-
6	-	-	2	-	4	-	-	2	5	4	-	0.00	0.10	0.00	1.40	0.20	-	-	-	-
7	-	-	2	-	5	-	-	2	4	4	-	0.00	0.10	0.00	1.60	0.20	-	-	-	-
8	1	-	2	-	6	-	-	2	3	3	-	0.10	0.00	0.00	1.90	0.20	-	-	-	-
9	2	-	1	-	7	-	-	2	1	3	-	0.00	0.00	0.00	2.20	0.10	-	-	-	-

FAO/UNESCO (1988) (1974)	: Geric Ferralsol : Acris Ferralsol, cerrado phase													
USDA/SCS SOIL TAXONOMY (1992)	: Rhodic Acrustox, fine clayey, isohyperthermic													
LOCAL CLASSIFICATION	: Latossolo Roxo													
	(1975 : typic haplustox)													
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)													
	: Diagnostic horizons : umbric A, ferralic B : Diagnostic properties : geric properties : Diagnostic horizons : umbric epipedon, oxic horizon : Soil moisture regime : ustic													
LOCATION	: Minas Gerais, Pirajuba, 6km south of Pirajuba													
AUTHOR(S)	Latitude : 19°57'16'' S Longitude : 48°41'15'' W Altitude : 480 (m.a.s.l.) : Kauffman, J.H. Date (mm.yy) : 4.86													
GENERAL LANDFORM	: plain													
PHYSIOGRAPHIC UNIT	: planatation surf.occas.dissect													
SLOPE	Gradient : -%													
POSITION OF SITE	: flat													
MICRO RELIEF	Kind :													
SURFACE CHAR.	Rock outcrop : nil Cracking : nil Salt : nil													
SLOPE PROCESSES	Soil erosion : nil Slope stability : stable													
	Stoniness : nil Slaking/crusting : nil Alkali : nil													
	Aggradation : nil													
PARENT MATERIAL	1 : residual material													
	Texture : clayey													
Remarks	Weathering degree : high : Serra geral/SaoBento													
derived from : fine-basic igneous rock														
Resistance :														
EFFECTIVE SOIL DEPTH(cm)	: 450													
WATER TABLE	Depth(cm) :													
DRAINAGE	: well													
PERMEABILITY	: high													
FLOODING	Frequency : nil													
MOISTURE CONDITIONS PROFILE	: 0 - 450 cm moist													
Kind : no watertable observed														
No slow permeable layer(s) cm														
LAND USE	: high level arable farming; Crops : soya bean; no irrigation; Rotation : crop rotation													
Landuse/vegetation remarks	: Major crops:1-soja 2-maize 3-rice													
ADDITIONAL REMARKS :														
Brief field description:														
Very deep, well drained dusky red clay; weakly coherent, porous massive structured subsoil.														
Local classification: Latossolo roxo bordering to Latossolo ferrifero. Soil taxonomy: Acrustox bordering to Haplustox.														
Soil is slightly moist during description. Moist colours are identical to dry colours.														
Original vegetation: wooded savanna ('cerrado').														
Slides no 9878-9881.														
CLIMATE :	Köppen: Aw													
Station: FRUTAL	20°2' S / 48°56' W													
	563 m a.s.l													
	25 km E of site													
	Relevance: very good													
	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
relative humidity %		78	82	74	60	52	47	45	47	69	81	75	82	66
precipitation mm		269	238	199	87	43	25	11	12	57	132	203	254	1530
T mean °C		24.6	24.6	24.4	22.9	20.8	19.4	19.6	21.9	23.5	24.5	24.6	24.5	22.9
bright sunshine %		52	47	57	70	76	80	82	80	61	49	55	47	63

PROFILE DESCRIPTION :

Ah 0 - 5 cm. dusky red (2.5 YR 3.0/2.0, moist) clay; weak very fine crumb structure; sticky, slightly plastic, very friable, soft; many very fine to fine pores; many fine roots and very fine roots; clear smooth boundary to
 AB 5 - 23 cm. 2.5 YR 3.0/3.0, moist clay; fine to very fine subangular blocky and weak fine to very fine crumb structure; slightly sticky, slightly plastic, very friable, soft; many very fine to fine pores; many fine roots and very fine roots; gradual smooth boundary to
 BA 23 - 55 cm. 1 YR 3.0/4.0, moist clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, soft; many very fine to fine pores; common fine roots and many very fine roots; diffuse smooth boundary to
 Bw1 55 - 100 cm. dusky red (10 R 3.0/4.0, moist) clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, soft; many very fine to fine pores; common fine roots; diffuse smooth boundary to
 Bw2 100 - 170 cm. dusky red (10 R 3.0/4.0, moist) clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, soft; many very fine to fine pores; common fine roots;
 Auger 170 - 450 cm. dusky red (10 R 3.0/4.0, moist) clay; slightly sticky, slightly plastic, very friable, soft; many very fine to fine pores;;

ANALYTICAL DATA :

Hor. no.	Top - Bot mm	>2 1000	2000 500	1000 250	500 100	250 50	100 SAND	TOT 20	50 20	TOT 2 SILT	<2 μm	DISP	BULK DENS	PF- 0.0	---	---	---	---	---	---	---	---
		mm	1000	500	250	100	50	SAND	20	2	μm		DENS	0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2	
1	0 - 5	-	0	1	16	39	9	64	6	10	15	21	7.4	-	-	-	-	-	-	-	-	-
2	5 - 23	-	0	1	12	35	10	57	6	10	16	27	9.1	1.36	49	48	42	23	19	17	18	17
3	23 - 55	-	0	1	10	31	10	52	7	11	17	31	11.3	1.31	51	50	41	25	22	20	18	17
4	55 - 100	-	0	1	9	31	9	50	8	8	17	33	6.8	-	-	-	-	-	-	-	-	-
5	100 - 170	-	0	1	9	30	9	49	10	8	18	33	4.0	1.10	55	54	44	24	20	18	17	16
6	180 - 250	-	0	1	9	31	10	50	11	8	19	31	13.5	-	-	-	-	-	-	-	-	-
7	250 - 350	-	0	1	8	28	10	47	13	6	19	35	18.4	-	-	-	-	-	-	-	-	-
8	350 - 450	-	0	1	7	28	10	45	13	10	23	31	15.9	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- CaCO3 KCl	ORG- C %	MAT. %	EXCH Ca %	CAT. %	--- EXCH Mg %	CAT. %	--- EXCH K %	AC. %	CEC sum H+Al cmol(+)/kg	CEC Al soil cmol(+)/kg	CEC clay cmol(+)/kg	CEC OrgC %	--- ECEC SAT %	BASE SAT %	Al SAT %	EC mS/cm	2.5
1	4.6	4.2	-	1.17	0.09	0.2	0.1	0.1	0.0	0.4	0.8	0.7	4.7	23	4.1	1.2	9	15	0.11
2	5.2	4.3	-	0.97	0.06	0.0	0.0	0.0	0.0	0.0	0.8	0.5	2.5	9	3.4	0.8	0	20	0.03
3	5.1	4.3	-	0.84	0.05	0.0	0.0	0.0	0.0	0.0	0.6	0.5	3.0	10	2.9	0.6	0	17	0.03
4	5.3	4.7	-	0.64	0.10	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.4	4	2.2	0.1	0	0	0.68
5	5.5	5.3	-	0.45	-	0.0	0.0	0.0	0.0	0.0	-	-	1.2	4	1.6	0.0	0	-	0.08
6	5.9	5.8	-	0.31	-	0.0	0.0	0.0	0.0	0.0	-	-	1.4	5	1.1	0.0	0	-	0.03
7	5.9	6.2	-	0.18	-	0.0	0.0	0.0	0.0	0.0	-	-	0.9	3	0.6	0.0	0	-	0.01
8	6.1	6.2	-	0.12	-	0.0	0.0	0.0	0.0	0.0	-	-	0.4	1	0.4	0.0	0	-	0.01

remarks (hor. 4 - 5): Spec.Surf.=40

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p)

Hor. no.	MI	VE	CH	SM	KA	HA	ML	QU	FE	GI	GO	HE	Fe(o)	Al(o)	Si(o)	Fe(d)	Al(d)	Fe(p)	Al(p)	Pret	pHNaF
1	-	-	-	-	4	-	-	2	4	2	-	0.20	0.20	0.00	5.70	0.30	-	-	-	-	
2	1	-	-	-	4	-	-	2	4	2	-	0.20	0.20	0.00	6.80	0.30	-	-	-	-	
3	-	-	-	-	4	-	-	2	4	2	-	0.20	0.20	0.00	7.40	0.40	-	-	-	-	
4	-	-	-	-	3	-	-	2	4	2	-	0.20	0.20	0.00	7.50	0.40	-	-	-	-	
5	-	-	-	-	3	-	-	2	4	1	-	0.20	0.20	0.00	8.10	0.40	-	-	-	-	
6	-	-	-	-	3	-	-	2	4	1	-	0.20	0.10	0.00	7.60	0.30	-	-	-	-	
7	-	-	-	-	3	-	-	2	4	1	-	0.20	0.10	0.00	8.50	0.30	-	-	-	-	
8	-	-	-	-	3	-	-	2	4	1	-	0.20	0.10	0.00	8.50	0.30	-	-	-	-	

FAO/UNESCO (1988) (1974)	: Geric Ferralsol : Acric Ferralsol, cerrado phase												
USDA/SCS SOIL TAXONOMY (1992)	: Acrustox, fine clayey, isohyperthermic	(1975 : typic haplustox)											
LOCAL CLASSIFICATION	: Latossolo VE												
DIAGNOSTIC CRITERIA	FAO (1988) USDA/SCS (1992)	: Diagnostic horizons : ferralic B : Diagnostic properties : geric properties : Diagnostic horizons : oxic horizon : Soil moisture regime : ustic											
LOCATION	: Distrito federal, Brasilia, Jardim Botanico												
AUTHOR(S)	Latitude : 15°54'32'' S : Kauffman, J.H.	Longitude : 47°50' 0'' W Altitude : 1150 (m.a.s.l.) Date (mm.yy) : 4.86											
GENERAL LANDFORM	: plateau	Topography : flat or almost flat											
PHYSIOGRAPHIC UNIT	: "chapada"=nearly flat plateau												
SLOPE	Gradient : 1%	Aspect :											
POSITION OF SITE	: flat	Form : straight											
MICRO RELIEF	Kind :												
SURFACE CHAR.	Rock outcrop : nil Cracking : nil Salt : nil	Stoniness : nil Slaking/crusting : nil Alkali : nil											
SLOPE PROCESSES	Soil erosion : nil Slope stability : stable	Aggradation : nil											
PARENT MATERIAL	1 : colluvium Texture : clayey	derived from : highly weathered material											
Remarks	:												
EFFECTIVE SOIL DEPTH(cm)	: 550												
WATER TABLE	Depth(cm) :	Kind : no watertable observed											
DRAINAGE	: well												
PERMEABILITY	: high	No slow permeable layer(s) cm											
FLOODING	Frequency : nil	Run off : rapid											
MOISTURE CONDITIONS PROFILE	: 0 - 550 cm moist												
LAND USE	: (semi)natural vegetation												
VEGETATION	Type : semi deciduous woodland	Status : primary											
Landuse/vegetation remarks	: Cerradão=dense cerrado												
ADDITIONAL REMARKS :													
Brief field description:													
Very deep, well drained, dark red clay derived from highly weathered parent material; weakly coherent porous massive structure.													
Consistency Ah/AB is soft to slightly hard.													
Brazilian structure description: 'ultrapequena' granular. Porosity is extremely high (more than 5 pores/cm ²)													
The very high water dispersable clay content is waived for classification (because otherwise not a Ferralic B-horizon).													
Climate: Aw bordering to Cwa due to altitude induced lower temperatures.													
Slides no 9886-9890.													
CLIMATE :	Köppen: Aw												
Station: FORMOSA	15 32 S/ 47 18 W	912 m a.s.l.											
		60 km NNE of site											
		Relevance:											
No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
relative humidity %	84	78	77	64	52	38	36	41	69	78	88	91	66
precipitation mm	252	204	227	93	17	3	6	3	30	127	255	343	1560
T mean °C	22.0	22.1	21.9	21.5	20.1	19.0	18.9	20.7	22.8	22.9	21.9	21.6	21.3
bright sunshine %	44	52	53	66	76	87	88	85	61	51	38	33	61

PROFILE DESCRIPTION :

Ah 0 - 12 cm. 2.5 YR 3.0/5.0, moist clay; weak fine to very fine subangular blocky structure; slightly sticky, slightly plastic, very friable, slightly hard; many very fine to fine pores; many fine roots and medium roots; gradual smooth boundary to
AB 12 - 35 cm. dark red (2.5 YR 3.0/6.0, moist) clay; weak fine to very fine subangular blocky structure; slightly sticky, slightly plastic, very friable, slightly hard; many very fine to fine pores; many fine roots and medium roots; diffuse smooth boundary to
BA 35 - 60 cm. dark red (2.5 YR 3.0/6.0, moist) clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, soft; many very fine to fine pores; common fine roots and medium roots; diffuse smooth boundary to
BW1 60 - 270 cm. red (2.5 YR 3.5/6.0, moist) clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, soft; many very fine to fine pores; common very fine roots and few fine roots; diffuse smooth boundary to
BW2 270 - 350 cm. red (2.5 YR 4.0/8.0, moist) clay; weakly coherent porous massive structure; slightly sticky, slightly plastic, very friable, soft; common medium faint mottles (5 YR 4.0/6.0); many very fine to fine pores; few very fine roots; diffuse smooth boundary to
Auger 350 - 550 cm. red (10 R 4.0/8.0, moist) clay; slightly sticky, slightly plastic, very friable, soft;;

ANALYTICAL DATA :

Hor. no.	Top - Bot mm	>2000	2000	1000	500	250	100	TOT 50	20	TOT 2	<2 SILT	DISP μm	BULK DENS	PF- 0.0	0.1	1.5	2.0	2.3	2.7	3.4	4.2	
1	0 - 12	-	1	1	1	4	1	8	5	18	23	69	27.5	0.90	60	48	40	35	33	31	27	27
2	12 - 35	-	0	1	1	4	1	7	6	11	16	77	30.0	-	-	-	-	-	-	-	-	-
3	35 - 60	-	0	0	1	4	1	7	6	10	16	78	12.4	0.93	61	60	42	32	30	28	26	26
4	60 - 100	-	0	1	1	4	1	7	8	13	21	72	0.9	-	-	-	-	-	-	-	-	-
5	100 - 150	-	0	1	1	4	2	8	11	14	24	68	15.4	0.85	61	59	47	31	27	25	24	24
6	150 - 250	-	0	1	1	4	2	7	14	15	29	64	27.4	0.91	58	57	49	37	33	31	26	26
7	250 - 350	-	0	1	1	4	2	7	12	14	26	67	45.5	-	-	-	-	-	-	-	-	-
8	350 - 450	-	0	0	1	3	2	6	8	10	18	76	53.3	-	-	-	-	-	-	-	-	-
9	450 - 550	-	0	0	1	4	2	7	10	12	22	71	55.5	-	-	-	-	-	-	-	-	-

Hor. no.	pH-H ₂ O	-- CaCO ₃ HCl	ORG-C %	MAT-N %	EXCH Ca %	CAT-Mg %	--- EXCH K %	AC. Na sum --- cmol(+) / kg	CEC H+Al	soil Al	clay	--- BASE ECEC %	AL SAT %	EC SAT %	2.5 mS/cm				
1	4.1	4.1	-	2.89	0.22	0.0	0.1	0.1	0.0	0.2	1.5	1.1	11.6	17	10.0	1.7	2	9	0.17
2	4.4	4.5	-	1.74	0.11	0.0	0.0	0.0	0.0	0.5	0.2	5.5	7	6.1	0.5	0	4	0.05	
3	4.7	4.8	-	1.36	0.09	0.0	0.0	0.0	0.0	0.2	0.0	3.4	4	4.8	0.2	0	0	0.08	
4	5.0	5.3	-	1.00	0.07	0.0	0.0	0.0	0.0	0.0	-	-	2.8	4	3.5	0.0	0	-	0.01
5	5.3	5.7	-	0.85	0.05	0.0	0.0	0.0	0.0	0.0	-	-	1.4	2	3.0	0.0	0	-	0.01
6	5.7	6.2	-	0.67	0.04	0.0	0.0	0.0	0.0	0.0	-	-	0.5	1	2.3	0.0	0	-	0.01
7	5.8	6.4	-	0.51	0.04	0.0	0.0	0.0	0.0	0.0	-	-	0.4	1	1.8	0.0	0	-	0.00
8	6.0	6.2	-	0.37	-	0.0	0.0	0.0	0.0	0.0	-	-	0.5	1	1.3	0.0	0	-	0.00
9	6.1	6.1	-	0.23	-	0.0	0.0	0.0	0.0	0.0	-	-	0.7	1	0.8	0.0	0	-	0.00

remarks (hor. 3) : Spec.Surf.=86

remarks (hor. 4) : Spec.Surf.=81

remarks (hor. 5) : Spec.Surf.=83

remarks (hor. 6) : Spec.Surf.=86

remarks (hor. 7) : Spec.Surf.=84

remarks (hor. 8) : Spec.Surf.=68

remarks (hor. 9) : Spec.Surf.=56

CLAY MINERALOGY (1 very weak..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor.

no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	6	-	-	3	4	4	-	0.30	0.50	0.00	6.90	1.40	-	-	-	-	-
2	-	-	-	6	-	-	3	4	4	-	0.20	0.50	0.00	7.00	1.20	-	-	-	-	-
3	-	-	-	6	-	-	3	4	4	-	0.20	0.40	0.10	6.90	1.00	-	-	-	-	-
4	-	-	-	6	-	-	3	4	4	-	0.10	0.40	0.10	6.30	0.80	-	-	-	-	-
5	-	-	-	6	-	-	3	4	4	-	0.10	0.30	0.10	6.40	0.80	-	-	-	-	-
6	-	-	-	5	-	-	3	4	4	-	0.10	0.40	0.10	6.30	1.00	-	-	-	-	-
7	-	-	-	4	-	-	3	4	4	-	0.10	0.30	0.10	6.50	0.80	-	-	-	-	-
8	-	-	-	4	-	-	3	4	4	-	0.10	0.30	0.00	7.40	0.50	-	-	-	-	-
9	-	-	-	5	-	-	3	4	4	-	0.10	0.20	0.10	7.50	0.30	-	-	-	-	-

DIAGNOSTIC CRITERIA	FAO (1988)	: Diagnostic horizons : umbric A
	USDA/SCS (1992)	: Diagnostic properties : strongly humic, gleyic properties : Diagnostic horizons : umbric epipedon : Diagnostic properties : aquic conditions : Soil moisture regime : peraqueic

LOCATION : Goias, projecto de Formoso do Araguaia (canal c4/d4)
AUTHOR(S) Latitude : 11°53' 0'' S Longitude : 49°40' 0'' W Altitude : 200 (m.a.s.l.)
 : Kauffman, J.H. Date (mm yy) : 5 86

GENERAL LANDFORM	:	floodplain	Topography : flat or almost flat
PHYSIOGRAPHIC UNIT	:	backswamp, 250m to formosoriver	
SLOPE	Gradient :	-%	Aspect :
POSITION OF SITE	:	flat	Form : straight
MICRO RELIEF	Kind :		
SURFACE CHAR.	Rock outcrop :	nil	Stoniness : nil
	Cracking :	nil	Slaking/crusting : nil
	Salt :	nil	Alkali : nil
SLOPE PROCESSES	Soil erosion :	nil	

EFFECTIVE SOIL DEPTH(cm) : 50

WATER TABLE Depth(cm) : 120 Kind : flooded
 Estimated highest level : 0 Estimated lowest level : 300
 DRAINAGE : poor
 PERMEABILITY : high No slow permeable layer(s) c
 FLOODING Frequency : yearly, fresh water Run off : ponded
 MOISTURE CONDITIONS PROFILE : 0 - 120 cm moist 120 - 350 cm wet

LAND USE : high level arable farming; Crops : rice; seasonal irrigated; Rotation : crop rotation continuous
Landuse/vegetation remarks : Major crops rice and soia, see file

ADDITIONAL REMARKS :

BRIEF FIELD DESCRIPTION:

Very deep, poorly drained grey clay soil derived from kaolinitic sediments; with a thick high organic matter containing topsoil and a strongly mottled subsoil.

Effective soil depth depends on depth of the strongly fluctuating water table, which is determined by the water level of the Formoso river. Vertical and especially lateral water transport in the subsoil is extremely fast because of very high permeability. The permeability of the subsoil is extremely high due to very high stable biopores. The pit wall shows a tongued character caused by infilled vertical channels due to foundering in the soil.

Classification: although derived from alluvial deposits the soil does not show anymore sediment stratification. It is assumed that the strongly mottled clay is plinthite, based on the observation that hard ironstone is protruding from banks of the nearby Fermeos river.

The climate: Aw or Am. Original vegetation: semi-deciduous forest.

Slides no 0891-0003

CLIMATE : Köppen: Aw
Station: 10 31 S / 48 43 W 160 m a.s.l 160 km NE of site **Relevance:** moderate
PORTO NACIONAL

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
relative humidity %		85	84	85	73	54	41	38	42	68	81	87	88	69
precipitation mm		274	229	273	150	36	1	2	3	35	142	233	284	1662
T mean °C		25.3	25.3	25.4	26.0	25.8	24.8	24.8	26.4	27.9	27.0	25.9	25.5	25.8
bright sunshine %		43	44	42	57	75	85	86	84	63	48	40	39	52

PROFILE DESCRIPTION :

Ap 0 - 12 cm. very dark gray (10 YR 2.5/1.0, moist) silty clay loam; weak fine to medium subangular blocky structure; slightly sticky, slightly plastic, very friable; many very fine pores and many fine random continuous exped-inped tubular pores; highly porous; common fine roots; abrupt smooth boundary to
 Ah 12 - 35 cm. very dark grayish brown (10 YR 3.0/2.0, moist) silty clay loam; moderately coherent porous massive into very weak medium subangular blocky structure; slightly sticky, slightly plastic, very friable; many fine pores and many fine random continuous exped-inped tubular pores; highly porous; common fine roots; clear wavy boundary to
 AE 35 - 52 cm. dark yellowish brown (10 YR 3.5/4.0, moist) clay loam; moderately coherent porous massive into very weak medium subangular blocky structure; slightly sticky, slightly plastic, friable; common mottles (10 YR 4.5/6.0) and (10 YR 4.5/1.0); many very fine pores and many fine random continuous exped-inped tubular pores; highly porous; few fine roots; clear smooth boundary to
 E 52 - 75 cm. yellowish brown (10 YR 4.5/4.0, moist) clay; moderately coherent porous massive into very weak medium subangular blocky structure; slightly sticky, slightly plastic, friable; common mottles (10 YR 5.5/6.0) and (10 YR 5.0/2.0); many fine pores and many medium random continuous exped-inped tubular pores; highly porous; few fine roots; frequent channels; diffuse smooth boundary to
 Bg1 75 - 95 cm. gray (10 YR 6.0/1.0, moist) clay; moderately coherent porous massive into very weak medium subangular blocky structure; slightly sticky, slightly plastic, friable; many medium prominent sharp mottles (10 YR 5.5/6.0) and few fine distinct sharp mottles (7.5 YR 2.5/0.0); many fine pores and many medium random continuous exped-inped tubular pores; highly porous;; very few medium spherical hard ferrigenous concretions; frequent channels; diffuse smooth boundary to
 Bg2 95 - 245 cm. light gray (10 YR 7.0/1.0, moist) clay; moderately coherent porous massive into very weak medium subangular blocky structure; slightly sticky, slightly plastic, friable; many medium prominent sharp mottles (10 YR 5.0/8.0) and many medium prominent sharp mottles (2.5 YR 4.0/8.0); many fine pores and many medium random continuous exped-inped tubular pores; highly porous;; very few medium spherical hard ferrigenous concretions; frequent channels;
 Auger 245 - 350 cm. light gray (10 YR 7.0/1.0, moist) clay; many medium prominent sharp mottles (10 R 4.0/8.0);;

ANALYTICAL DATA :

Hor. no.	Top - Bot mm	>2000 mm	2000 mm	1000 mm	500 mm	250 mm	100 mm	50 mm	SAND	TOT 20	TOT 20	<2 µm	DISP SILT	BULK DENS	pF- 0.0	- - -	- - -	- - -	- - -	- - -	- - -	- - -
1	0 - 12	-	1	1	1	3	3	8	9	30	39	53	19.9	0.94	61	60	57	53	50	48	44	43
2	12 - 35	-	1	1	1	3	3	9	10	37	47	43	11.2	-	-	-	-	-	-	-	-	-
3	35 - 52	-	1	1	2	6	7	17	12	21	33	50	9.5	0.87	64	62	55	43	38	34	29	28
4	52 - 75	-	0	1	4	10	11	26	12	12	24	50	4.0	-	-	-	-	-	-	-	-	-
5	75 - 95	-	1	1	3	8	9	22	9	9	19	60	1.0	1.41	47	46	42	39	37	34	32	31
6	95 - 130	-	1	1	2	7	8	19	10	10	20	61	0.4	-	-	-	-	-	-	-	-	-
7	130 - 230	-	1	1	2	7	8	20	12	15	27	54	0.0	-	-	-	-	-	-	-	-	-
8	230 - 330	-	1	1	3	6	8	19	11	11	22	59	1.0	-	-	-	-	-	-	-	-	-
9	330 - 430	-	1	3	9	14	13	39	9	6	15	46	1.0	-	-	-	-	-	-	-	-	-

Hor. no.	pH-H ₂ O	-- CaCO ₃ HCl	ORG-C %	MAT-N %	EXCH Ca EXCH Mg CAT-K	----- Na sum H+Al Al	CEC soil clay OrgC	--- ECEC	BASE SAT	Al SAT	EC 2.5 mS/cm									
		%	%	%	----- ----- ----- cmol(+) / kg	----- ----- ----- -----	----- ----- ----- -----	----- ----- ----- -----	----- ----- ----- -----	----- ----- ----- -----	----- ----- ----- -----									
1	5.0	4.4	-	6.55	-	3.4	1.4	0.8	0.2	5.8	1.4	2.3	20.6	39	23.0	7.2	28	11	0.24	
2	5.8	4.7	-	3.78	-	0.7	0.4	0.3	0.0	1.4	0.6	1.6	14.4	33	13.0	2.0	10	11	0.03	
3	5.2	4.3	-	1.45	-	0.7	0.3	0.1	0.0	1.1	2.0	2.0	11.9	24	5.1	3.1	9	17	0.03	
4	5.1	4.1	-	0.35	-	0.2	0.1	0.0	0.0	0.3	2.3	2.1	11.1	22	1.2	2.6	3	19	0.01	
5	4.8	4.1	-	0.33	-	0.0	0.1	0.0	0.0	0.1	2.0	1.8	6.1	10	1.2	2.1	2	30	0.03	
6	5.1	4.2	-	0.20	-	0.6	0.2	0.0	0.0	0.8	1.4	1.2	6.0	10	0.7	2.2	13	20	0.01	
7	5.7	4.9	-	0.11	-	1.2	0.9	0.0	0.0	2.1	0.1	0.0	5.6	10	0.4	2.2	38	0	0.01	
8	6.0	4.6	-	0.05	-	2.3	2.0	0.0	0.0	4.3	0.1	0.0	7.3	12	0.2	4.4	59	0	0.01	
9	6.0	4.3	-	0.00	-	1.4	1.4	0.0	0.2	3.0	0.5	0.5	5.3	12	0.0	3.5	57	9	0.01	

remarks (hor. 3) : Spec.Surf.=159
 remarks (hor. 6 - 7) : Spec.Surf.=104
 remarks (hor. 4) : Spec.Surf.=95
 remarks (hor. 8) : Spec.Surf.=98
 remarks (hor. 5) : Spec.Surf.=94
 remarks (hor. 9) : Spec.Surf.=69

CLAY MINERALOGY (1 very weak,,, 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHO(p))

Hor. no. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	4	-	-	-	1	2	-	0.60	2.00	0.50	3.00	1.20	-	-	-	-	-	-	-
2	-	-	-	4	-	-	-	1	2	-	0.30	2.20	0.70	4.40	1.70	-	-	-	-	-	-	-
3	-	-	-	7	-	3	-	2	2	-	0.20	0.90	0.20	3.30	1.10	-	-	-	-	-	-	-
4	-	-	-	8	-	3	-	3	2	-	0.10	0.30	0.00	2.00	0.40	-	-	-	-	-	-	-
5	-	-	-	8	-	3	-	3	2	-	0.10	0.20	0.00	1.60	0.30	-	-	-	-	-	-	-
6	-	-	-	8	-	3	-	3	2	-	0.00	0.20	0.00	2.40	0.40	-	-	-	-	-	-	-
7	2	-	-	8	-	3	-	2	2	-	0.00	0.20	0.00	2.90	0.60	-	-	-	-	-	-	-
8	2	-	-	8	-	3	-	2	2	-	0.00	0.10	0.00	2.90	0.40	-	-	-	-	-	-	-
9	2	-	-	8	-	3	-	2	2	-	0.00	0.10	0.00	1.60	0.20	-	-	-	-	-	-	-

FAO/UNESCO (1988) : Eutric Gleysol
 (1974) : Eutric Gleysol, cerrado phase
 USDA/SCS SOIL TAXONOMY (1992) : Typic Tropaquept, clayey, isohyperthermic
 LOCAL CLASSIFICATION : Laterita hidromorfic (1975 : typic tropaquept)

DIAGNOSTIC CRITERIA FAO (1988) : Diagnostic horizons : umbric A
 USDA/SCS (1992) : Diagnostic properties : gleyic properties
 : Diagnostic horizons : umbric epipedon
 : Diagnostic properties : aquic conditions
 : Soil moisture regime : peraqueic

LOCATION : Goias, Ilha do Bananal, Canuana, 2km west of river Javaes
 Latitude : 12° 0' 0'' S Longitude : 50° 0' 0'' W

AUTHOR(S) : Kauffman, J.H. Altitude : 200 (m.a.s.l.)
 Date (mm.yy) : 5.86

GENERAL LANDFORM : floodplain Topography : flat or almost flat
 PHYSIOGRAPHIC UNIT : transition levee-backswamp Aspect :
 SLOPE Gradient : -% Form : straight
 POSITION OF SITE : flat
 MICRO RELIEF Kind :
 SURFACE CHAR. Rock outcrop : nil Stoniness : nil
 Cracking : nil Slaking/crusting : nil
 Salt : nil Alkali : nil
 SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL 1 : alluvium derived from : highly weathered material
 Texture : clayey
 Weathering degree : high Resistance :
 Remarks : Caolinitic alluvium

EFFECTIVE SOIL DEPTH(cm) : 70

WATER TABLE Depth(cm) : 120 Kind : flooded
 Estimated highest level : 0 Estimated lowest level : 300
 DRAINAGE : imperfectly
 PERMEABILITY : high No slow permeable layer(s) cm
 FLOODING Frequency : yearly, fresh water Run off : ponded
 MOISTURE CONDITIONS PROFILE :

LAND USE : (semi)natural vegetation
 VEGETATION Type : deciduous forest Status : primary
 Landuse/vegetation remarks : Occasionally some shifting cultivation

ADDITIONAL REMARKS :
 Brief field description:
 Very deep, imperfectly drained, greyish brown silty loam with a thin dark grey topsoil and a strongly mottled subsoil.
 Effective soil depth depends on fluctuating water table, determined by water level of the river.
 Porosity and permeability of whole soil profile is very high. Deep augering shows different strata due to variation in mottling.
 The profile show some river-sedimentation stratification. The soil classifies as Gleysol bordering to Fluvisol.
 Slides no 9904-9909.

CLIMATE : Köppen: Aw
 Station: 10 31 S/ 48 43 W 160 m a.s.l 160 km NE of site Relevance: moderate
 PORTO NACIONAL

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
relative humidity %		85	84	85	73	54	41	38	42	68	81	87	88	69
precipitation mm		274	229	273	150	36	1	2	3	35	142	233	284	1662
T mean °C		25.3	25.3	25.4	26.0	25.8	24.8	24.8	26.4	27.9	27.0	25.9	25.5	25.8
bright sunshine %		43	44	42	57	75	85	86	84	63	48	40	39	59

PROFILE DESCRIPTION :

Ah	0 - 10 cm.	very dark gray (10 YR 2.5/1.0, moist) clay; weak fine to very fine subangular blocky and weak fine to very fine crumb structure; sticky, plastic, very friable; many fine to medium pores; many very fine roots and fine roots; abrupt smooth boundary to
AB	10 - 22 cm.	grayish brown (10 YR 4.5/1.5, moist) clay; weak medium subangular blocky structure; sticky, plastic, very friable; common fine prominent clear mottles (5 YR 5.0/8.0); many fine to medium pores; many very fine roots and fine roots; clear smooth boundary to
Bg1	22 - 70 cm.	grayish brown (10 YR 5.0/2.0, moist) clay; weak medium subangular blocky structure; sticky, plastic, friable; many medium prominent clear mottles (5 YR 5.0/8.0); many fine to medium pores; common very fine roots and fine roots; gradual smooth boundary to
Bg2	70 - 103 cm.	light brownish gray (10 YR 6.0/2.0, moist) silty clay loam; medium subangular blocky structure; slightly sticky, slightly plastic, friable; common medium prominent clear mottles (2.5 YR 3.0/6.0) and many medium prominent clear mottles (5 YR 4.0/6.0); many fine to medium pores; common very fine roots and fine roots; clear smooth boundary to
Bg3	103 - 126 cm.	light brownish gray (10 YR 6.0/1.5, moist) clay; weak medium subangular blocky structure; sticky, plastic, friable; common fine prominent clear mottles (7.5 YR 1.0/0.0) and many medium prominent clear mottles; many fine to medium pores; few very fine roots and fine roots; clear smooth boundary to
Bg4	126 - 135 cm.	gray (10 YR 5.5/1.0, moist) sandy clay; sticky, plastic, friable;;
Auger	135 - 435 cm.	gray (10 YR 6.0/1.0, moist) sandy clay;;

ANALYTICAL DATA :

CLAY MINERALOGY (1 very weak, ..., 8 very strong) / EXTRACTABLE Fe Al Si Mn (by AMM. OXALATE(o), Na DITHIONITE(d) & PYROPHOS(p))

P7R0
Wor

DO. MI VE CH SM KA HA ML QL FF ST CO HE Esco Alco Sico E-1 D-11 K-1

No. MI VE CH SM KA HA ML QU FE GI GO HE Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) F

1 4 - - 4 7 - - 2 - - - - 0.40 0.10 0.10 0.60 0.00 - -

1 4 - - 4 7 - - 2 - - - - 0.40 0.10 0.10 0.60 0.00 - -

21 4 7 - - 2 - - - 0.30 0.10 0.00 0.80 0.10 - -

6 - - - - - 0.20 0.10 0.00 1.20 0.10 - -

5 6 - - - - - - 0.20 0.10 0.00 1.00 0.10 -

5 34 - - 6 8 - - 2 - - - - 0.20 0.10 0.00 1.90 0.20 - -

6 3 - - 3 8 - - 2 - - - - 0.10 0.10 0.00 1.40 0.10 - -

7 2 - - 3 8 - 3 - - - 1 - 0.00 0.10 0.00 0.70 0.10 - -

8 2 - - 3 8 - 3 - - 1 - 0.00 0.00 0.00 0.70 0.10 - -

10 - - - - 8 - 1 - - - 3 - 0.00 0.00 0.00 0.00 0.00 0.00 0.00

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ANNEX 1 REFERENCES

General

- FAO, 1977. Guidelines for soil profile description (2nd edition). FAO, Rome.
- FAO, 1988. FAO-Unesco Soil Map of the World, revised Legend. World Resources Report 60. FAO, Rome, Italy.
Also reprinted as Technical Paper 20, 1989. ISRIC, Wageningen.
- Reeuwijk, L.P. van, (Ed.), 1993. Procedures for soil analysis. Technical Paper 9 (4th edition). ISRIC, Wageningen.
- Soil Survey Staff, 1975. Soil Taxonomy. Agricultural Handbook 436. Soil Conservation Service, USDA, Washington D.C.
- Soil Survey Staff, 1992. Keys to Soil Taxonomy (5th edition). SMSS Technical Monograph no.19. Pacohontas Press, Blacksburg.

(to be completed by CNPS)

ANNEX 2 FIELD METHODS

The soils were described in the field according to ISRIC's Guidelines for the description and coding of soil data (Van Waveren & Bos, 1988; 1994). These guidelines follow closely those for soil description given by FAO (1977, 1990). Soil columns were taken for monolith preparation using the methods described by Van Baren & Bomer (1979). In addition, disturbed and undisturbed samples are collected for physical, chemical and mineralogical analyses and for thin section preparation, where possible using the guidelines for the sampling of soil horizons for a soil reference collection (NASREC Newsletter no. 1 (March, 1991).

Of all sites slides and photographs were taken showing, the landscape, vegetation, land use, soil profile and important profile details. Furthermore, data are collected with each pedon on climate, land use history, crops and crop yields, soil management practices, etc.

Soils are classified according to the FAO-Unesco Legend of the Soil Map of the World (1974) and its Revised Legend (FAO-Unesco-ISRIC, 1988). Soil subunit modifiers ("third level") were added using the guidelines described by Nachtergaelle *et al.* (1994). In addition soil were given their classification according to Soil Taxonomy (Soil Survey Staff, 1975; 1992), and, if available, the local classification.

All data are stored in ISIS version 4.0 (ISRIC, 1994), ISRIC's soil pedon data management system for micro computers. The information given on the soil data sheets in this publication have been generated from the ISIS files.

ANNEX 3 ANALYTICAL METHODS

Abstract from ISRIC TP 9 (Van Reeuwijk, 1993).

Preparation

Each sample is air-dried, cleaned, crushed (not ground), passed through 2 mm sieve, homogenized. Moisture content is determined at 105° C.

pH H₂O

(1:2.5): 20 g of soil is shaken with 50 ml of deionised water for 2 hours, electrode in upper part of suspension.

pH-KCl

likewise but shaken with 1 M KCl.

EC

(1:2.5): Conductivity of pH-H₂O suspension.

Particle-size distribution

Soil is treated with 15% hydrogen peroxide overnight in the cold, then on waterbath at about 80°C. Then boiled on hot plate for 1 hour. Washings until dispersion. Dispersing agent is added (20 ml solution of 4% Na-hexametaphosphate and 1% soda) and suspension shaken overnight. Suspension sieved through 50 µm sieve. Sand fraction remaining on sieve dried and weighed. Clay and silt determined by pipetting from sedimentation cylinder.

Water-dispersable clay

Pipetting after shaking 20 g of soil overnight (16 hours) with deionized water.

Exchangeable bases and CEC

Percolation with 1 M ammonium acetate pH 7 using automatic extractor.

(If EC > 0.5 mS pre-leaching with ethanol 80%). Cations are determined in the leachate by AAS.

CEC: saturation with sodium acetate 1 M pH 7; washed with ethanol 80% and then leached with ammonium acetate 1 M pH 7. Na determined by FES.

Exchangeable acidity and Aluminium

The sample is extracted with 1 M KCl solution and the exchange acidity (H+Al) titrated with NaOH. Al is measured by AAS.

Carbonate

Piper's procedure. Sample is treated with dilute acid and the residual acid is titrated.

Organic carbon

Walkley-Black procedure. The sample is treated with a mixture of potassium dichromate and sulphuric acid at about 125°C. The residual dichromate is titrated with ferrous sulphate. The result expressed in % carbon (because of incomplete oxidation a correction factor of 1.3 is applied).

Total nitrogen

Micro-Kjeldahl. Digested in H₂SO₄ with Se as catalyst. Then ammonia is distilled, trapped in boric acid and titrated with standard acid.

P-Bray 1

Phosphate is extracted with a mixture of 0.025 M HCl + 0.03 M NH₄F and determined colorimetrically.

P-Olsen

Phosphate is extracted with 0.5 M NaHCO₃ solution pH 8.5 and determined colorimetrically.

P-Retention

Blakemore *et al.* Shaken with (KH_2PO_4 + NaAc) solution, 1000 mg/L P pH 4.6 for 16 hours.

Determination of residual P colorimetrically after centrifuging.

pH-NaF

To 1g of soil 50 ml of NaF 1 M is added and stirred for 1 minute.

Reading pH by continuous stirring exactly 2 minutes after adding NaF solution.

Extractable Iron, Aluminium, Manganese and Silicon

All determinations by AAS.

1. "Free" (Fe, Al, Mn): Holmgren Shaken with sodium citrate (17%) + sodium dithionite (1.7%) solution for 16 hours.
2. "Active" (Fe, Al, Si): Shaken with acid ammonium acetate 0.2 M pH 3 for 4 hours in the dark.
3. "Organically bound" (Fe, Al): Shaken with sodium pyrophosphate 0.1 M for 16 hours.

Clay mineralogy

Clay is separated as indicated for particle-size analysis.

about 10-20 mg of clay is brought on porous ceramic tile by suction and analyzed using a Philips diffractometer.

Soluble salts

Measuring pH, EC, cations and anions in water extracts.

1. 1:5 extract. Shaking 30 g of fine earth + 150 ml of water for 2 hours.

2. saturation extract. Adding to 200-1000 g fine earth just enough water to saturate the sample.

Standing overnight.

After filtration Ca, Mg, Na, K are measured by AAS. Cl with the Chlorocounter and SO_4 turbidimetrically.

Gypsum

To 10 g of fine earth 100 ml of water is added, shaken overnight and centrifuged.

Precipitation by adding acetone. Precipitate redissolved in water and determination of Ca by AAS.

Elemental composition

The fine earth is dried, ignited and fused with lithium tetraborate.

The formed bead is analyzed by X-ray fluorescence spectroscopy.

Moisture retention

Moisture determinations on undisturbed core samples in silt box (pF1.0;1.5;2.0) and kaolinite box (pF2.3;2.7) respectively and on disturbed samples in high pressure pan (pF3.4;4.2).

Bulk density obtained from dry weight of core sample.

ANNEX 4 SLIDES OF SOIL REFERENCE PROFILES AVAILABLE AT ISRIC

Monolith	Slide nr.	Subject	Remarks
BR000	7266	profile details	concretionary profile
BR000	7267	profile details	cl.up and
BR000	7268	profile details	concretionary profile, layer
BR000	7269	profile details	concretionary profile, close-up
BR000	7270	profile details	concretionary profile, Ipixuna layer
BR001	7157	profile	profile pit, oblique
BR001	7158	profile	profile, vertical
BR001	7159	landscape	landscape panoramic serie, 1
BR001	7159	landscape	landscape panoramic serie, 1
BR001	7160	landscape	landscape panoramic serie, 2
BR001	7161	landscape	landscape panoramic serie, 3
BR001	7162	other	technique of monolith taking, 1
BR001	7163	other	technique of monolith taking, 2
BR001	7164	other	technique of monolith taking, 3
BR001	7165	other	technique of pF sampling
BR001	7166	other	technique of micromorphology sampling
BR002	7167	landscape	landscape panoramic serie, 1
BR002	7168	landscape	landscape panoramic serie, 2
BR002	7169	landscape	landscape panoramic serie, 3
BR002	7170	landscape	landscape panoramic serie, 4
BR002	7171	erosion / conservation	eroded spots on former cultivated land
BR002	7172	land use	land use
BR002	7173	landscape	dissected slopes nearby BR002
BR002	7174	landscape	dissected slopes nearby BR002
BR002	7175	profile details	good root penetration of the top B horiz
BR002	7176	profile details	close-up of biocavity filled w/ minerals
BR002	7177	other	technique of monolith sampling, 1
BR002	7178	other	technique of monolith sampling, 2
BR002	7179	other	technique of monolith sampling, 3. boxes horiz. w/ excess of soil
BR002	7180	other	technique of monolith sampling, 4. Boxes horizontal smoothened
BR002	7181	other	technique of monolith sampling, 5. Boxes horizontal with tools
BR002	7182	landscape	broad flat valleys w/ paddy rice cultiv.
BR002	7183	landscape	broad flat valleys w/ paddy rice cultiv.
BR003	7184	surface characteristics	small termite hill
BR003	7185	landscape	landscape panoramic serie, 1
BR003	7186	landscape	landscape panoramic serie, 2
BR003	7187	landscape	landscape panoramic serie, 3
BR003	7188	landscape	landscape panoramic serie, 4. Broad flat valley with paddy rice
BR003	7189	landscape	site of BR003

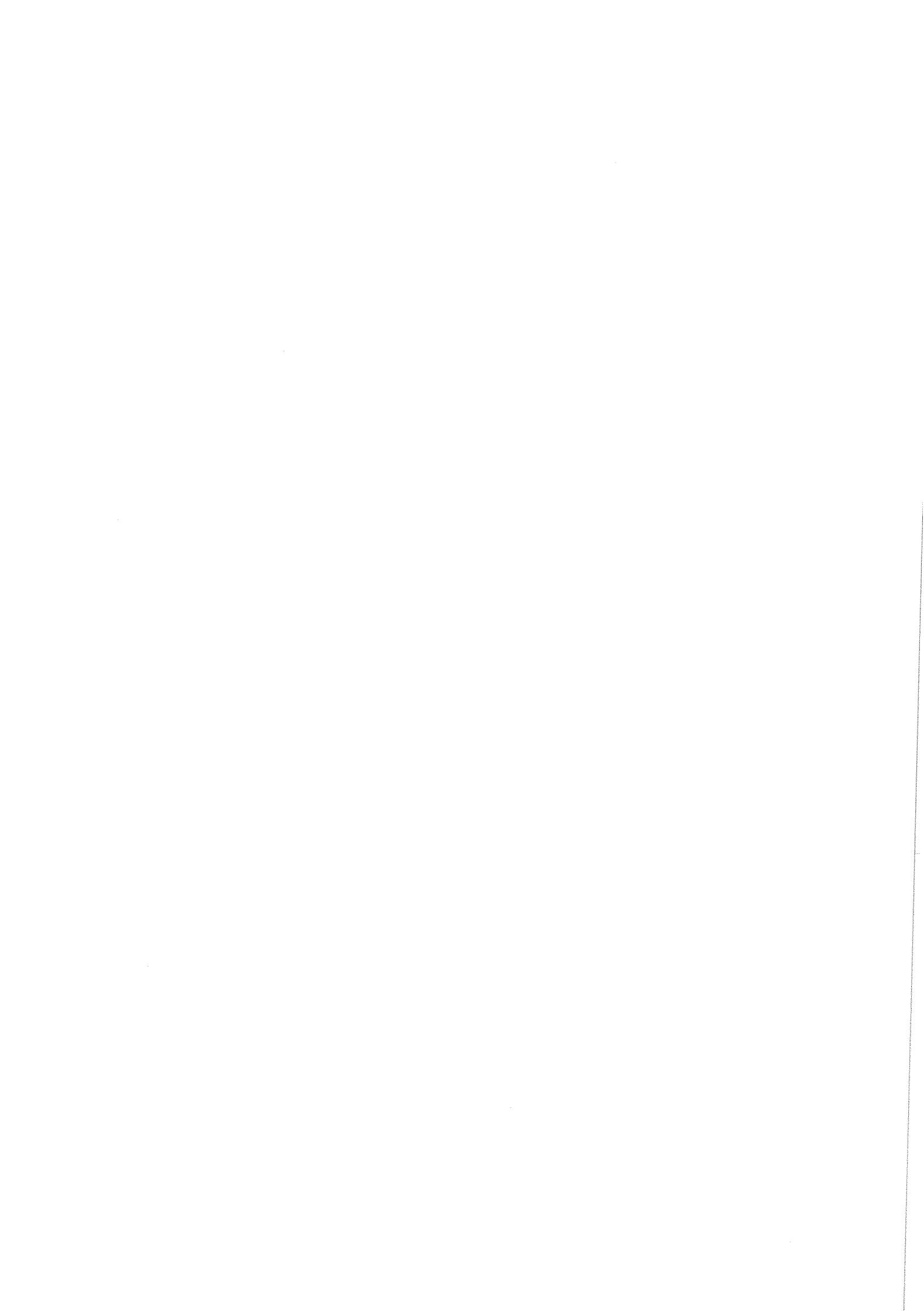
BR004	7193	landscape	landscape panoramic serie, 1
BR004	7194	landscape	landscape panoramic serie, 2
BR004	7195	landscape	landscape panoramic serie, 3
BR004	7196	landscape	landscape panoramic serie, 4
BR004	7197	landscape	landscape panoramic serie, 5
BR004	7198	landscape	landscape panoramic serie, 6
BR004	7199	landscape	landscape panoramic serie, 7
BR004	7200	landscape	landscape panoramic serie, 8
BR004	7201	landscape	landscape panoramic serie, 9
BR004	7202	land use	land use, sugarcane
BR004	7203	profile details	close-up profile to show high porosity
BR005	7204	profile	profile
BR005	7205	landscape	landscape panoramic serie, 1
BR005	7206	landscape	landscape panoramic serie, 2
BR005	7207	landscape	landscape panoramic serie, 3
BR005	7208	landscape	landscape panoramic serie, 4
BR005	7209	landscape	landscape panoramic serie, 5 + roadcut
BR005	7210	land use	coffee
BR005	7211	profile details	close-up profile runaway termites
BR005	7212	profile details	close-up profile runaway termites
BR006	7213	profile	profile
BR006	7214	surface characteristics	ant activity on soil surface, 1
BR006	7215	surface characteristics	ant activity on soil surface, 2
BR006	7216	surface characteristics	ant activity on soil surface, 3
BR006	7217	vegetation	vegetation at profile site
BR006	7218	landscape	landscape
BR007	7219	profile	site (roadcut)
BR007	7220	profile	profile
BR007	7221	profile	profile
BR007	7222	profile details	close-up profile of shallow subsoil
BR007	7223	profile details	close-up of profile of deeper subsoil
BR007	7224	other	close-up beetle in subsoil
BR007	7225	profile details	close-up beetle in subsoil
BR007	7226	profile details	insect in subsoil
BR007	7227	landscape	landscape panoramic serie, 1
BR007	7228	landscape	landscape panoramic serie, 2
BR007	7229	landscape	landscape panoramic serie, 3
BR007	7230	land use	landscape + landuse near BR007
BR008	7231	profile	profile
BR008	7232	other	deep augering at site
BR008	7233	other	deep augering at site
BR008	7234	landscape	landscape/land use panoramic serie 1a
BR008	7235	landscape	landscape/land use panoramic serie 1b

BR008	7236	landscape	landscape/land use panoramic serie 2
BR008	7237	landscape	landscape/land use panoramic serie 3
BR008	7238	surface characteristics	cracks at soil surf(recent.ploughed land
BR008	7239	surface characteristics	cracks at soil surf(recent.ploughed land
BR008	7240	surface characteristics	cracks at soil surf(recent.ploughed land
BR009	7241	profile	profile
BR009	7242	landscape	landscape/vegetation panoramic serie 1
BR009	7243	landscape	landscape/vegetation panoramic serie 2
BR009	7244	landscape	landscape/vegetation panoramic serie 3
BR009	7245	landscape	landscape/vegetation panoramic serie 4
BR009	7246	landscape	landscape/vegetation panoramic serie 5
BR009	7247	landscape	lands./veg.panor.serie 6, site of BR009
BR009	7248	vegetation	close-up ferns
BR009	7249	vegetation	close-up grasses
BR009	7250	other	rain protected monolith site
BR009	7251	other	rain protected monolith site
BR010	7252	profile	profile
BR010	7253	profile	profile
BR010	7254	profile details	cl.up microgran.struc. w/ large biopores
BR010	7255	profile details	cl.up microgran.struct. w/large biopores
BR010	7256	profile details	holes in subsoil filled w/darker topsoil
BR010	7257	profile details	cl.up of shiny ped surfaces (skins)
BR010	7258	other	rain protected monolith site
BR010	7259	other	monolith in box
BR010	7260	vegetation	vegetation at site
BR010	7261	landscape	landscape seen from broad depression
BR011	7262	land use	lands./land use after forest clearing
BR011	7263	vegetation	vegetation
BR011	7264	vegetation	vegetation
BR011	7265	vegetation	vegetation
BR012	7271	profile	profile
BR012	7272	profile	profile (too dark)
BR012	7273	profile	profile(shows good dark channel fillings
BR012	7274	vegetation	vegetation / land use
BR012	7275	vegetation	vegetation / land use
BR012	7276	landscape	landscape, vegetation
BR012	7277	landscape	landscape, vegetation
BR012	7278	land use	rubber tapping
BR012	7279	land use	rubber tapping
BR012	7280	land use	rubber tapping
BR013	7281	profile	profile
BR013	7282	other	monolith site
BR013	7283	other	monolith in box

BR013	7284	vegetation	forest
BR013	7285	surface characteristics	ants in litter layer
BR013	7286	surface characteristics	ants in litter layer
BR014	9781	landscape	plateau edge
BR014	9782	landscape	plateau chapada
BR014	9783	vegetation	cerrado brazilian savanna
BR014	9784	vegetation	close-up no.9783 termite nest
BR014	9785	vegetation	termite nest in cerrado vegetation
BR014	9786	profile	smooth prepared pit wall
BR014	9788	profile details	topsoil
BR014	9789	profile details	subsoil partly moist due to watertable
BR014	9790	profile	hydromorphic soil on plateau edge
BR014	9781	landscape	plateau edge
BR014	9787	profile	roughly prepared pitwall compare 9785
BR015	9796	profile	
BR015	9797	profile details	topsoil
BR015	9798	profile details	subsoil, note the red bio infill/m.gran.s
BR015	9794	vegetation	cerradao=dense wooded savanna
BR015	9795	vegetation	close-up wild ananas, see 9794
BR016	9911	profile	diffuse sunlight, comp.9912
BR016	9912	profile	direct sunlight, compare with 9911
BR016	9913	profile	smooth cut pit wll, comp.9799
BR016	9799	profile	rough prpared pit wall, comp.9913/9911
BR016	9800	profile	3 monolith sampling
BR016	9801	people	
BR016	9802	landscape	fuji film comp.9803
BR016	9803	landscape	agfa film compare with 9802
BR016	9804	landscape	fuji film compare with9805
BR016	9805	landscape	agfa film compare with 9804
BR017	9806	people	
BR017	9807	landscape	
BR017	9808	landscape	fuji film
BR017	9810	profile	
BR017	9811	profile details	topsoil a-hor. and transition to b-hor.
BR017	9812	profile details	subsoil b-horizon
BR017	9808	landscape	fuji film
BR017	9814	land use	palma forragen=fodder cactus
BR017	9815	land use	pal,a forragen=fodder cactus
BR017	9816	land use	close-up see9814/9815
BR017	9809	landscape	agfa film comp.9808
BR018	9817	profile	agfa film
BR018	9818	profile details	topsoil
BR018	9819	profile details	subsoil

BR018	9820	landscape	
BR019	9821	landscape	
BR019	9822	profile	
BR019	9823	land use	
BR019	9824	crops	inhame=dioscorea batata
BR019	9825	profile	note the dark grey colour due to moist
BR019	9826	profile details	abrupt transition between E and Bir
BR020	9827	profile	abrupt trans. between arenosol and other
BR020	9828	crops	inhame=dioscorea batata
BR020	9829	vegetation	
BR020	9830	landscape	
BR020	9831	landscape	
BR021	9832	landscape	
BR021	9833	profile	
BR022	9834	vegetation	caatinga=semi-desert vegetation
BR022	9835	vegetation	dry caatinga vegetation(1967) see9833
BR022	9836	vegetation	moist caatinga vegetation(1986)see9835
BR022	9837	vegetation	moist caatinga vegetation(1986)see9835
BR022	9838	vegetation	green caatinga vegetation(1986)
BR022	9839	land use	extensive grazing of caatinga vegetation
BR022	9840	vegetation	close-up caatinga vegetation
BR022	9841	vegetation	close-up caatinga vegetation
BR022	9842	vegetation	close-up vegetation and ant
BR022	9843	surface characteristics	bio activity, ant
BR022	9844	vegetation	cactus=
BR022	9845	vegetation	cactus=
BR022	9846	vegetation	cactus=
BR022	9847	vegetation	bromeliaceae
BR022	9848	vegetation	cactus=
BR022	9849	profile	
BR022	9850	profile	
BR022	9851	profile details	abrupt transition between E and r.column
BR022	9852	profile details	
BR022	9853	profile	rounded columns exposed(A and E removed)
BR022	9854	profile	rounded columns exposed(A andE removed)
BR023	9855	profile	superficial prepared pitwall,comp.9856
BR023	9856	profile	well prepared profile,see 9855
BR023	9857	profile details	topsoil, see9856
BR023	9858	profile details	shallow subsoil, see9857
BR023	9859	profile details	subsoil, see9857
BR023	9860	people	monolith sampling in steep roadcut
BR023	9861	landscape	demi-orange(=meia laranje) relief
BR023	9862	landscape	demi-orange(=meia laranja) relief

BR024	9863	profile	
BR024	9864	profile details	
BR024	9865	profile details	
BR024	9866	profile details	bio-activity, see 9867/68/69
BR024	9867	profile details	bio-activity, ant fungus garden, see 9868
BR024	9868	profile details	bio-activity, see 9867
BR024	9869	other	bio-activity, see 9867
BR024	9870	surface characteristics	bio-activity, ant
BR024	9871	landscape	
BR024	9872	landscape	moist seepage zone at valley head
BR024	9873	erosion / conservation	contourlines
BR024	9874	erosion / conservation	contourlines, panoramic view, see 9875
BR024	9875	erosion / conservation	see 9874
BR024	9876	erosion / conservation	contourlines, panoramic view
BR024	9877	erosion / conservation	contourlines panoramic view
BR025	9878	vegetation	cerrado = brazilian savanna vegetation
BR025	9879	vegetation	cerrado = brazilian savanna vegetation
BR025	9880	profile	
BR025	9881	people	four monolith sampling
BR025	9883	people	monolith sampling see 9882
BR026	9882	people	
BR026	9884	people	monolith sampling
BR026	9885	people	second box, deep subsoil monolith sampl.
BR026	9886	vegetation	open cerrado = brazilian savanna
BR026	9887	vegetation	cerrado (background Brasilia)
BR026	9888	vegetation	cerradao = dense wooded savanna
BR026	9889	aerial photographs	false-color landsat of Brasilia
BR026	9890	maps	cerrado region of Brasil



Country Reports¹
(ISSN: 1381-5571)

No.	Country	No. of soils	No.	Country	No. of soils
1	Cuba	22	15	Gabon	6
2	P.R. of China	51	16	Ghana	in prep.
3	Turkey	15	17	Philippines	6
4	Côte d'Ivoire	7	18	Zimbabwe	13
5	Thailand	13	19	Spain	20
6	Colombia	18	20	Italy	17
7	Indonesia	48	21	Greece	in prep.
8	Ecuador	in prep.	22	India	in prep.
9	Brazil	28	23	Kenya	in prep.
10	Peru	21	24	Mali	in prep.
11	Nicaragua	11	25	Nigeria	in prep.
12	Costa Rica	12	26	Mozambique	in prep.
13	Zambia	11	27	Botswana	in prep.
14	Uruguay	10	28	Malaysia	18

¹ as of June 1995