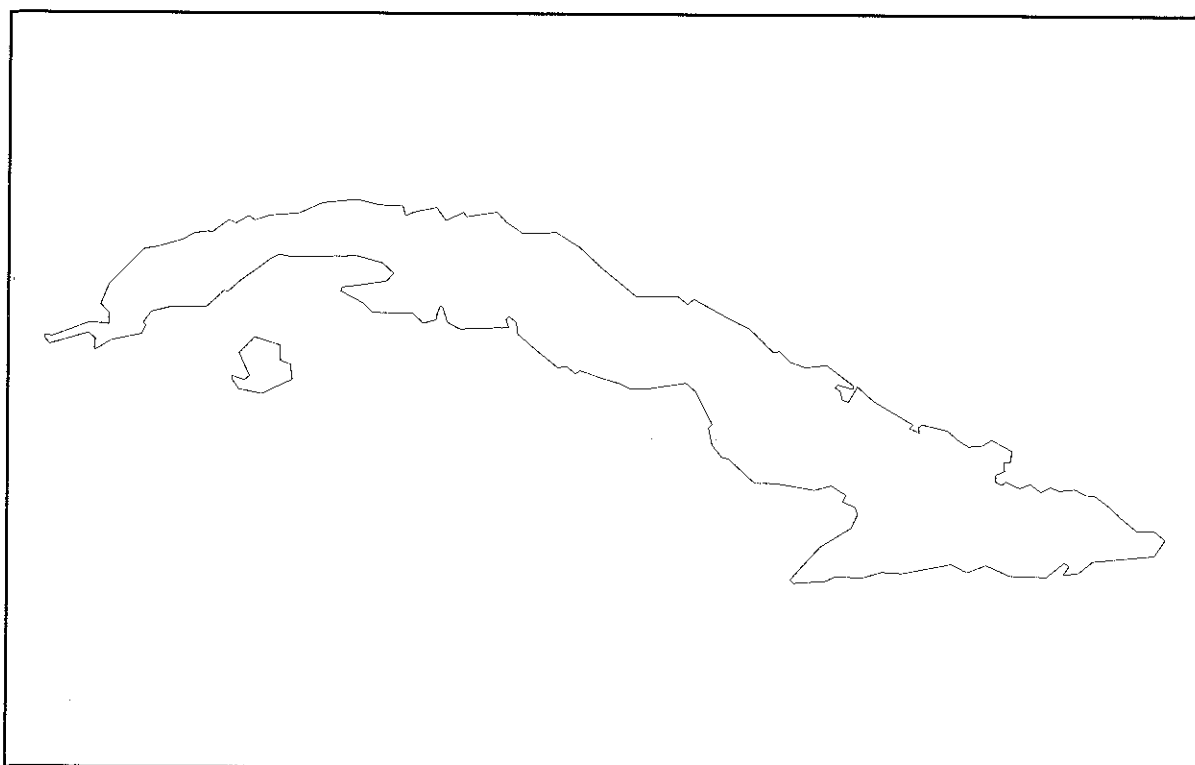


Country Report 1

DRAFT

Soil Reference Profiles of Cuba

Field and Analytical Data



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Instituto Nacional de Investigaciones de la Caña de Azucar
International Soil Reference and Information Centre

October 1995

Soil Reference Profiles of Cuba

Field and Analytical Data

Published by

**Instituto Nacional de Investigaciones de la Caña de Azucar
International Soil Reference and Information Centre**

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FOREWORD

National Soil Reference Collection and Database of Cuba

The objective of this Country Report is to provide comprehensive field and analytical data of a number of reference soils representative for the major soil types of Cuba. The soils were carefully selected, described and sampled. Soil samples are analyzed by INICA and ISRIC laboratories. Additional information on the reference soils is provided in a series of Soil Briefs, comprising information on the environment and soils. The soil information include characterization, classification, evaluation of soil/land qualities and fertilizer recommendation for sugarcane.

The soils described are located throughout the country. Dominant land use in most sites is sugar cane. Some sites situated in mountains support a tropical pine forest (*Pinus caribea*).

The sites were selected on a number of criteria, such as major soil type, production potential, a high water table (in the Central Region), high salt content (in the Guantanamo Valley), and advanced stage of weathering (e.g. the Nipe clay in the oriental mountain region).

At present the collection comprises 23 soil reference profiles. From each reference soil two undisturbed columns were taken, and specially preserved and prepared into monoliths, ready for exposition. The monolith exposition is housed in Villa Clara in the centre of the country. Duplicate monoliths are included in ISRIC's world soil collection in the Netherlands. It is INICA's intention that the collection will become the "Regional Reference and Information Centre" with reference soils of Latin America and the Caribbean.

The plans for a national collection existed already a long time. It could be realized as a joint cooperation project of INICA and ISRIC in the period 1990 to 1994. The joint project functioned within ISRIC's National Soil Reference Collection Programme (NASREC).

The establishment of the soil reference collection, comprising exposition, database and accompanying documentation has been made possible with the support of many persons, some are mentioned here: Dr. W.G. Sombroek (former director of ISRIC), Dr. L.R. Oldeman (director ISRIC), Drs. J.H.V. van Baren (dep. director ISRIC), Ir. J.H. Kauffman (coordinator NASREC programme), Mr. N. Noguera (University of Zulia, Venezuela), staff of the Soil Department of INICA and the Provincial Sugarcane Experiment Station of Villa Clara.

Rafael Villegas Delgado, Dep. Director INICA

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 over 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 for 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 INICA in their efforts to bring together a National Soil Reference Collection of Cuba.

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 varying needs of those working in one of many fields of research using soils data and soil related data. One of this series is the Country Reports.

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 Cuba Country Report at the occasion of the XVth World Congress of Soil Science.

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:

INICA
Ave Van Troi 17203
La Habana
Cuba

ISRIC
P.O.Box 353
6700 AJ Wageningen
The Netherlands

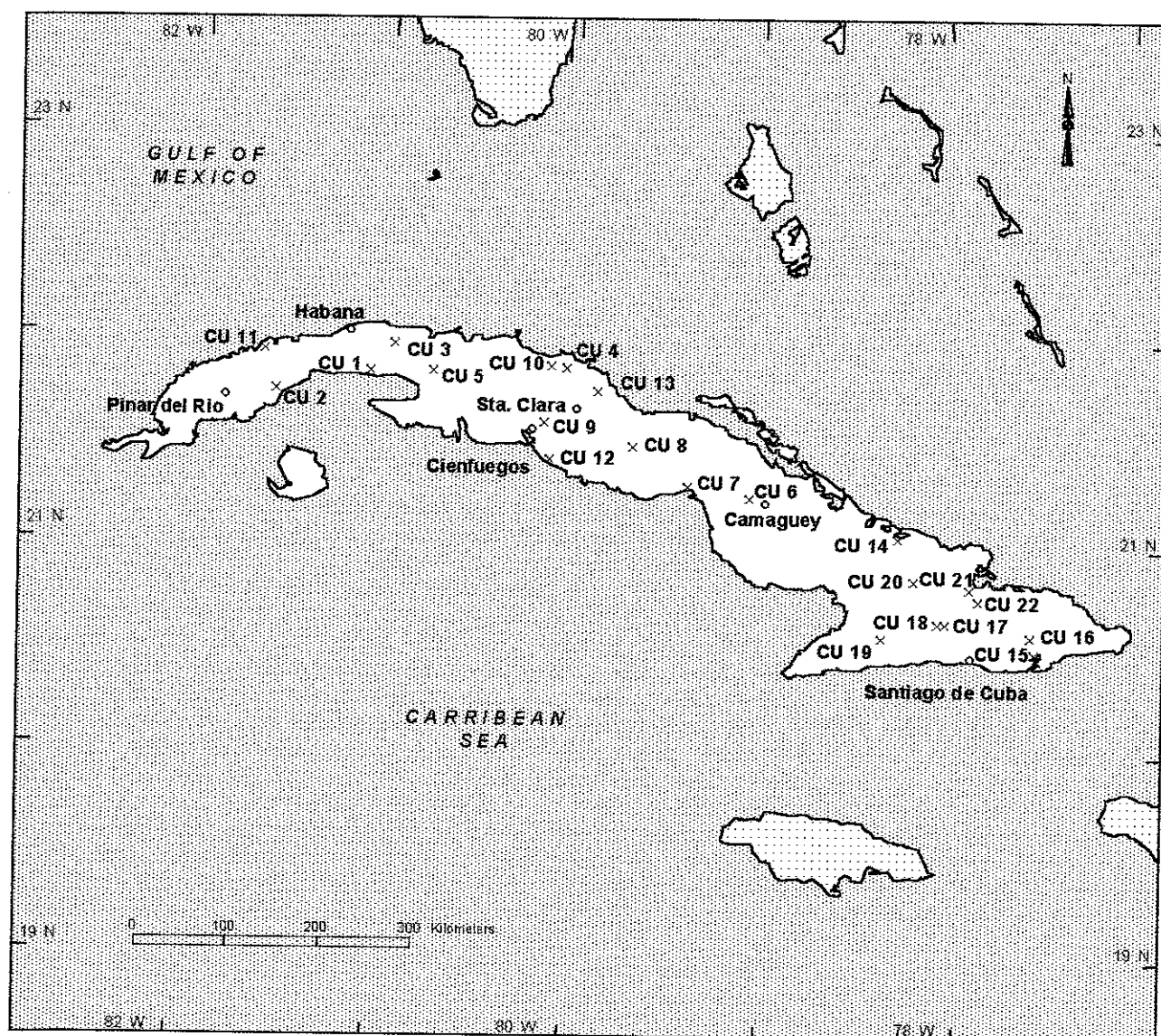
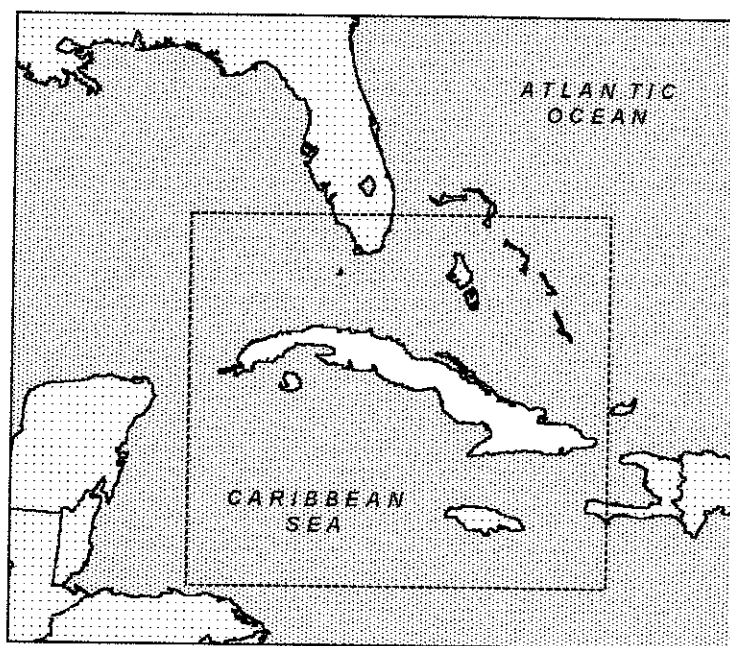
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REFERENCE SOILS OF CUBA

- × Reference soil
- Town
- State boundary
- ~ River
- ▨ Ocean, lake

October 1995
Projection Lambert

The designation employed and the presentation of material in this map do not imply the expression of any opinion whatsoever on the part of ISRIC concerning the legal status of any country, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.



SUMMARIZED INFORMATION OF REFERENCE SOILS CU 01 TO CU 22

ISIS-ID ¹⁾	FAO-88 ²⁾	ST-92 ³⁾	PARENT MATERIAL	CLIM. ⁴⁾	LANDFORM	LAND UTILIZATION TYPE	VEGETATION	DRAINAGE CLASS	ALT. ⁵⁾
CU 01	Eutric Gleysol	Endoaquept	marine sediments	Aw	marine terrace	high level arable farming	dwarf shrub	poorly to imperfectly	8
CU 02	Eutric Cambisol	Ustropept	alluvium	Aw	marine terrace	high level arable farming	semi deciduous woodland	moderately well	20
CU 03	Ferralic Cambisol	Ustropept	marine sediments	Aw	plain	high level arable farming	dwarf shrub	well	100
CU 04	Eutric Gleysol	Tropaquept	marine sediments	Aw	plain	high level arable farming	dwarf shrub	imperfect-moderately well	8
CU 05	Rhodic Ferralsol	Eutrustox	solid rock	Aw	plain	high level arable farming	semi deciduous woodland	well	25
CU 06	Eutric Vertisol	Haplustert	solid rock	Aw	penplain	high level arable farming	semi deciduous woodland	moderately well	80
CU 07	Haplic Ferralsol	Eutrustox	solid rock	Aw	penplain	high level arable farming	shrub	well	25
CU 08	Calcic Cambisol	Ustropept	solid rock	Aw	low hill	high level arable farming	shrub	moderately well	80
CU 09	Eutric Vertisol	Haplustert	solid rock	Aw	alluvial plain	high level arable farming	shrub	imperfect-moderately well	45
CU 10	Calcic Phaeozem	Haplustoll	marine sediments	Aw	valley	high level arable farming		well	50
CU 11	Eutric Cambisol	Ustropept	marine sediments	Aw	low hill	high level arable farming		moderately well	25
CU 12	Ferralic Cambisol	Dystropept	residual material	Aw	intermontane basin	high level arable farming	evergreen woodland	well	1140
CU 13	Eutric Gleysol	Eplaquept	marine sediments	Aw	coastal plain	high level arable farming	semi deciduous woodland	imperfectly	8
CU 14	Calcic Cambisol	Eutropept	marine sediments	Aw	plain	high level arable farming	dwarf shrub	well	40
CU 15	Calcic Solonchak	Halaquept	alluvium	Bs	alluvial plain	high level arable farming	shrub	poor	21
CU 16	Calcic Kastanozem	Calcitustoll	colluvium	Aw	low hill	high level arable farming	semi deciduous shrub	moderately well	54
CU 17	Calcic Cambisol	Eutropept	residual material	Aw	low hill	high level arable farming	dwarf shrub	well	105
CU 18	Haplic Phaeozem	Haplustoll	alluvium	Aw	stagn. all. plain	high level arable farming	semi deciduous shrub	moderately well	100
CU 19	Calcic Vertisol	Calcitustert	marine sediments	Aw	penplain	high level arable farming	semi deciduous shrub	imperfectly	60
CU 20	Calcic Vertisol	Calcitustert	marine sediments	Aw	low hill	high level arable farming	grassland	imperfectly	106
CU 21	Eutric Vertisol	Haplustert	marine sediments	Aw	low hill	high level arable farming	shrub	imperfectly	20
CU 22	Geric Ferralsol	Acrudox	solid rock	Aw	mountain	cultivated pasture	closed forest	well	650

1) ISIS Identification code

2) FAO-Unesco, 1988

3) USDA Soil Taxonomy, 1992

4) Köppen

5) Altitude in meters

SUMMARIZED INFORMATION OF REFERENCE SOILS CU 01 TO CU 22

ISIS-ID ¹⁾	FAO-88 ²⁾	ST-92 ³⁾	PARENT MATERIAL	CLIM. ⁴⁾	LANDFORM	LAND UTILIZATION TYPE	VEGETATION	DRAINAGE CLASS	ALT. ⁵⁾
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CU 03	Ferralic Cambisol	Ustropept	marine sediments	Aw	plain	high level arable farming	dwarf shrub	well	100
CU 04	Eutric Gleysol	Tropaquept	marine sediments	Aw	plain	high level arable farming	dwarf shrub	imperfect-moderately well	8
CU 05	Rhodic Ferralsol	Eutrustox	solid rock	Aw	plain	high level arable farming	semi deciduous woodland	well	25
CU 06	Eutric Vertisol	Haplustert	solid rock	Aw	pediplain	high level arable farming	semi deciduous woodland	moderately well	80
CU 07	Haplic Ferralsol	Eutrustox	solid rock	Aw	pediplain	high level arable farming	shrub	well	25
CU 08	Calcic Cambisol	Ustropept	solid rock	Aw	low hill	high level arable farming	shrub	moderately well	80
CU 09	Eutric Vertisol	Haplustert	solid rock	Aw	alluvial plain	high level arable farming	shrub	imperfect-moderately well	45
CU 10	Calcic Phaeozem	Haplustoll	marine sediments	Aw	valley	high level arable farming		well	50
CU 11	Eutric Cambisol	Ustropept	marine sediments	Aw	low hill	high level arable farming		moderately well	25
CU 12	Ferralic Cambisol	Dystropept	residual material	Aw	intermontane basin	high level arable farming	evergreen woodland	well	1140
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CU 22	Geric Ferralsol	Acridox	solid rock	Aw	mountain	cultivated pasture	closed forest	well	650

1) ISIS Identification code

2) FAO-Unesco, 1988

3) USDA Soil Taxonomy, 1992

4) Köppen

5) Altitude in meters

SOIL INFORMATION SHEETS

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

FAO/UNESCO (1988)	: Fluvi-Eutric Gleysol	(1974 : Eutric Gleysol)
USDA/SCS SOIL TAXONOMY (1992)	: Ustic Endoaquert, clayey, montmorillonitic, isohyperthermic	(1975 : typic tropaquept)
LOCAL CLASSIFICATION	: Gley Ferralitico	
DIAGNOSTIC CRITERIA	FAO (1988)	: Diagnostic horizons : ochric A, cambic B
	USDA/SCS (1992)	: Diagnostic properties : gleyic properties
		: Diagnostic horizons : ochric epipedon, cambic horizon
		: Diagnostic properties : slickensides
		: Soil moisture regime : aquic
LOCATION	: Cuba Habana Melena del Sur CAI G.A. Manalich Bloque 41 Campo 4006	
AUTHOR(S)	Latitude : 22°44' 0'' N	Longitude : 82°10' 0'' W Altitude : 8 (m.a.s.l.)
	: Kauffman/Villegas	Date (mm.yy) : 4.90
GENERAL LANDFORM	: marine terrace	Topography : flat or almost flat
PHYSIOGRAPHIC UNIT	: flat or almost flat	
SLOPE	Gradient : 0%	Aspect : Form : straight
POSITION OF SITE	: flat	
MICRO RELIEF	Kind :	
SURFACE CHAR.	Rock outcrop : nil	Stoniness : nil
	Cracking : small cracks	Slaking/crusting : nil
SLOPE PROCESSES	Soil erosion : nil	Aggradation : nil
PARENT MATERIAL	1 : marine sediments	derived from : claystone
	Texture : clayey	
Remarks	:	
EFFECTIVE SOIL DEPTH(cm)	: 100	
WATER TABLE	Depth(cm) : 300	Kind : groundwater table
DRAINAGE	: poorly to imperfectly	
PERMEABILITY	:	No slow permeable layer(s) cm
FLOODING	Frequency : irregular	Run off : slow
MOISTURE CONDITIONS PROFILE	: 0 - 200 cm moist	
LAND USE	: high level arable farming; Crops : sugar cane; seasonal irrigated; Rotation : not relevant; Improvements : none	
VEGETATION	Type : dwarf shrub	Status : secondary
ADDITIONAL REMARKS :		
Short field description		
Deep, poorly to imperfectly drained, grayish brown clay. The subsoil is strongly mottled, a wedge-shaped angular blocky structure and slickensides.		
Water table is present during the rainy season at a depth of about 50 to 100 cm (verbal communications).		
Geology: Quaternary Era, Pleistocene; Guevarra Formation: Clays and sandy clay.		
Geomorphology: marine plain and terrace, abrasive and accumulative abrasive, slightly undulating.		
The poor drainage is somewhat compensated by the cultivation of sugarcane on machine prepared large ridges with a height of 40 to 50 cm.		

CLIMATE :	Köppen: Aw														
Station:	22 46 N/ 82 8 W	25 m a.s.l	10 km NE of site	Relevance: very good											
MELENA DEL SUR															
	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	
EA class A pan mm	11	128	139	185	205	193	175	171	159	149	140	122	119	1890	
EP Penman mm	14	110	114	143	146	139	123	129	133	129	133	118	113	1535	
relative humidity %	21	81	79	78	75	79	83	82	83	84	83	82	81	81	
precipitation mm	15	32	48	64	66	175	266	188	231	218	116	60	24	1493	
tot.glob.rad. MJ/m2	13	13.8	16.9	20.2	22.4	21.7	20.4	20.2	19.7	17.5	15.0	13.0	12.7	17.8	
T max °C	21	27.2	27.4	29.1	30.6	31.6	32.0	32.9	32.8	32.1	31.0	29.4	28.0	30.4	
T min °C	21	15.4	15.6	17.2	18.4	20.5	21.8	21.9	22.2	21.8	20.7	18.7	16.7	19.2	
windspeed(at 2m) m/s	5	2.9	3.5	3.9	3.8	3.4	2.8	2.7	2.5	2.2	3.4	3.1	3.0	3.1	
bright sunshine h/d	14	6.9	7.7	8.3	8.8	8.0	7.4	7.3	7.3	7.2	6.9	6.9	6.8	7.4	

PROFILE DESCRIPTION :

Ap	0 - 18 cm.	dark grayish brown (10YR 4.0/2.0, moist) clay; moderate coarse angular blocky and moderate medium crumb structure; very sticky, very plastic; none mottles; no cutans; common fine pores; moderately porous; many fine roots and many medium roots; no inclusions; no fragments; frequent channels; non calcareous (10% HCL) throughout; clear smooth boundary to
Bw	18 - 45 cm.	grayish brown (10YR 5.0/2.0, moist) clay; strong medium angular blocky structure;; many fine distinct diffuse mottles (7.5YR 5.0/6.0); no cutans; common fine roots; very few small spherical hard ferruginous concretions; no fragments; frequent channels; gradual smooth boundary to
Cg1	45 - 105 cm.	gray (10YR 5.0/1.0, moist) clay; strong coarse wedge-shaped ang.bl. structure;; common medium prominent clear mottles (10R 4.0/6.0); continuous thin slickensides cutans; few fine pores; common fine roots; no inclusions; no fragments; few channels; diffuse smooth boundary to
Cg2	105 - 175 cm.	grayish brown (10YR 5.0/1.5, moist) clay; moderate very coarse wedge-shaped ang.bl. structure; , very plastic; many coarse prominent clear mottles (2.5YR 4.0/8.0); continuous thin slickensides cutans; few fine pores; few fine roots; no inclusions; no fragments; gradual smooth boundary to
CG	175 - 200 cm.	strong brown (7.5YR 4.0/6.0, moist) clay; moderate very coarse wedge-shaped ang.bl. structure; very sticky, very plastic; many coarse prominent clear mottles (10YR 5.0/1.0); continuous thin slickensides cutans; few fine pores; slightly porous; few fine roots throughout; no inclusions; no fragments; non calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000	500 250	100 50	TOT SAND	50 20	TOT 2	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 18	-	1	1	1	3	6	8	22	29	65	44.3	-	-	-	-	-	-	-
2	18 - 45	-	1	1	1	2	6	7	12	19	76	49.2	-	-	-	-	-	-	-
3	45 - 75	-	1	2	1	2	8	12	12	24	68	45.4	-	-	-	-	-	-	-
4	75 - 105	-	1	1	1	2	7	11	9	21	73	35.9	-	-	-	-	-	-	-
5	105 - 175	-	0	1	1	2	4	7	11	18	78	1.1	-	-	-	-	-	-	-
6	175 - 200	-	0	1	11	9	22	6	11	17	61	57.9	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH. Ca	CAT. Mg	---- K	---- Na	--- sum	EXCH. H+Al	AC. Al	CEC soil	---- clay	---- OrgC	---- ECEC	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	7.7	6.8	2.9	1.02	-	28.9	12.4	0.2	0.9	42.4	-	-	38.3	59	3.6	42.4	111	-	0.54
2	5.4	4.3	-	0.55	-	23.6	10.5	0.2	2.1	36.4	-	-	35.7	47	1.9	36.4	102	-	0.52
3	4.4	3.3	-	0.43	-	17.8	8.8	0.2	2.4	29.2	-	-	34.3	50	1.5	29.2	85	-	0.57
4	4.5	3.4	-	0.42	-	18.4	9.9	0.3	4.2	32.8	-	-	38.4	53	1.5	32.8	85	-	0.62
5	4.6	3.4	-	0.40	-	21.0	12.4	0.2	5.0	38.6	-	-	42.3	54	1.4	38.6	91	-	0.69
6	6.1	4.8	-	0.14	-	22.8	14.4	0.2	6.0	43.4	-	-	41.7	69	0.5	43.4	104	-	0.79

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	5	-	-	3	-	-	3	-	0.55	0.18	0.13	4.34	0.32	-	-	-	-
2	-	-	-	8	5	-	-	2	-	-	3	-	0.32	0.21	0.03	3.81	0.26	-	-	-	-
3	-	-	-	8	6	-	-	1	-	-	-	-	0.24	0.19	0.03	3.58	0.23	-	-	-	-
4	-	-	-	8	5	-	-	1	-	-	-	-	0.29	0.19	0.03	3.38	0.22	-	-	-	-
5	-	-	-	8	5	-	-	1	-	-	1	-	0.28	0.23	0.03	2.87	0.26	-	-	-	-
6	-	-	-	8	4	-	-	1	-	-	2	-	0.18	0.16	0.05	2.22	0.20	-	-	-	-

FAO/UNESCO (1988)	: Orthi-Eutric Cambisol	(1974 : Eutric Cambisol)
USDA/SCS SOIL TAXONOMY (1992)	: Typic Ustropept, clayey, mixed, isohyperthermic	(1975 : typic ustropept)
LOCAL CLASSIFICATION	: Ferralitico cuarcitico	
DIAGNOSTIC CRITERIA	FAO (1988)	: Diagnostic horizons : ochric A, cambic B
	USDA/SCS (1992)	: Diagnostic horizons : ochric epipedon, cambic horizon
		: Soil moisture regime : ustic
LOCATION	: Cuba, P. Rio, San Cristobal, CAI 30 de Noviembre Bloque 120 Campo 145	
	Latitude : 22°32' 0'' N	Longitude : 83° 9' 0'' W
AUTHOR(S)	: Kauffman/Villega/pon	Altitude : 20 (m.a.s.l.)
		Date (mm.yy) : 4.91
GENERAL LANDFORM	: marine terrace	Topography : flat or almost flat
PHYSIOGRAPHIC UNIT	: flat or almost flat	
SLOPE	Gradient : 1%	Aspect :
POSITION OF SITE	: flat	Form : straight
MICRO RELIEF	Kind :	
SURFACE CHAR.	Rock outcrop : nil	Stoniness : nil
	Cracking : nil	Slaking/crusting : nil
SLOPE PROCESSES	Soil erosion : nil	Aggradation : nil
	Slope stability : stable	
PARENT MATERIAL	1 : alluvium	derived from : limestone
	Texture : sandy clay	
Remarks	:	
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 : medium
MOISTURE CONDITIONS PROFILE	: 0 - 5 cm dry 5 - 200 cm moist	
LAND USE	: high level arable farming; Crops : sugar cane; no irrigation; Rotation : not relevant	
VEGETATION	Type : semi deciduous woodland	Status : secondary

ADDITIONAL REMARKS :

Short field description:

Deep, moderately well drained, yellowish brown, clay. Subsoil is mottled. The soil show slickensides in the subsoil. This site was cultivated with rice before 1979; now the sugarcane variety is Ja 60-5, age 19 months, first ratoon. Geology: Pleistocene, Guevarra Formation: variegated clays and clayey sand with gravels, sometimes guijarros. Geomorphology: fluvio-marine plain, plain, slightly undulated and undulated deltaics.

CLIMATE :		Köppen: Aw													
Station:		22 33 N/ 83 18 W				43 m a.s.l			24 km ENE of site			Relevance: good			
PASO REAL SAN DIEGO															
		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EA class A pan	mm	14	109	115	161	176	174	154	169	160	130	133	115	104	1705
EP Penman	mm	21	79	90	130	147	152	137	149	144	123	112	88	76	1433
relative humidity	%	21	79	77	76	73	78	81	80	81	84	83	81	80	80
precipitation	mm	38	47	55	55	77	181	238	139	178	237	144	67	25	1448
tot.glob.rad.	MJ/m2	17	14.3	17.1	20.7	23.1	21.8	20.2	20.7	20.7	17.7	16.0	14.0	13.1	18.2
T mean	°C	38	20.9	21.4	22.9	24.4	25.9	26.6	27.0	27.1	26.4	25.2	23.4	21.6	24.4
T max	°C	38	26.8	27.2	29.0	30.3	31.3	31.4	32.2	32.5	31.6	30.4	28.8	27.3	29.9
T min	°C	38	16.3	16.6	18.0	19.4	21.2	22.5	22.7	22.9	22.6	21.3	19.1	17.1	20.0
windspeed(at 2m)	m/s	4	2.6	3.1	3.5	2.9	3.0	2.4	2.5	2.2	2.4	2.8	2.8	2.6	2.7
bright sunshine	h/d	18	7.2	7.6	8.6	9.2	8.1	7.1	7.6	7.6	7.0	7.3	7.3	7.2	7.6

PROFILE DESCRIPTION :

Ap	0 - 15 cm.	very dark grayish brown (10YR 3.0/2.0, moist) clay; moderate medium subangular blocky structure; sticky, plastic, friable, hard; none mottles; no cutans; common fine pores and few medium pores; moderately porous; many fine roots throughout; no inclusions; no fragments; frequent worm channels; non calcareous (10% HCL) throughout; abrupt smooth boundary to
Bw	15 - 75 cm.	yellowish brown (10YR 5.0/4.0, moist) clay; moderate very coarse subangular blocky into moderate medium subangular blocky structure; sticky, plastic, firm; many medium prominent clear mottles (10YR 6.0/6.0); no cutans; common very fine pores and few medium pores; common fine roots throughout; very few medium spherical hard manganiferous concretions; no fragments; few worm channels; diffuse smooth boundary to
Bc	75 - 140 cm.	brownish yellow (10YR 6.0/6.0, moist) clay; moderate coarse angular blocky structure; sticky, very plastic, firm; few fine distinct clear mottles (10YR 5.0/2.0); patchy moderately thick cutans on pedfaces; few fine pores; few fine roots throughout; few large irregular hard calcareous concretions; no fragments; gradual smooth boundary to
Cg	140 - 190 cm.	yellowish brown (10YR 5.0/8.0, moist) sandy clay; weak to moderate coarse angular blocky structure; sticky, plastic, friable; many coarse prominent clear mottles (10YR 6.0/2.0); no cutans; few very fine pores;; no inclusions; no fragments;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000 500 250 100	TOT	50 20	TOT	<2 µm	DISP	BULK DENS	pH- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 15	-	3	2	4	13	10	31	14	25	39	30	19.3	-	-	-	-
2	15 - 40	-	3	3	3	10	9	28	14	17	30	42	26.4	-	-	-	-
3	40 - 75	-	5	3	4	10	8	30	11	17	28	42	27.3	-	-	-	-
4	75 - 105	-	4	2	4	10	9	28	12	17	29	43	29.5	-	-	-	-
5	105 - 140	-	3	3	6	11	9	33	10	17	28	40	31.1	-	-	-	-
6	140 - 190	-	1	2	6	18	12	39	9	15	24	38	29.9	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	6.6	5.7	1.1	1.56	-	12.6	2.1	0.5	0.1	15.3	-	-	13.4	44	5.5	15.3	114	-	0.34
2	5.8	4.4	-	0.58	-	15.4	2.4	0.2	0.5	18.5	-	-	17.2	41	2.0	18.5	108	-	0.18
3	5.3	4.1	-	0.27	-	17.0	1.7	0.2	1.2	20.1	-	-	17.4	41	0.9	20.1	116	-	0.48
4	8.0	7.1	4.1	0.13	-	30.5	1.7	0.1	1.9	34.2	-	-	19.1	45	0.5	34.2	179	-	0.77
5	8.1	7.3	4.7	0.10	-	37.5	2.1	0.2	3.1	42.9	-	-	18.3	46	0.4	42.9	234	-	0.85
6	8.2	7.3	3.1	0.02	-	24.0	2.3	0.2	3.2	29.7	-	-	17.7	47	0.1	29.7	168	-	0.84

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	-	-	4	-	-	2	-	0.47	0.08	0.03	2.38	0.18	-	-	-	-
2	-	-	-	6	5	-	-	2	-	-	3	-	0.36	0.13	0.00	3.29	0.31	-	-	-	-
3	-	-	-	5	5	-	-	2	-	-	3	-	0.31	0.10	0.00	3.42	0.28	-	-	-	-
4	-	-	-	6	5	-	-	4	-	-	3	-	0.15	0.08	0.03	2.53	0.19	-	-	-	-
5	-	-	-	5	5	-	-	3	-	-	3	-	0.10	0.05	0.05	2.17	0.22	-	-	-	-
6	-	-	-	8	4	-	-	2	-	-	3	-	0.05	0.05	0.03	2.51	0.28	-	-	-	-

FAO/UNESCO (1988) : Chromi-Ferralic Cambisol (1974 : Ferralic Cambisol)
 USDA/SCS SOIL TAXONOMY (1992) : Oxic Ustropept, clayey, kaolinitic, isothermic (1975 : oxic ustropept)
 LOCAL CLASSIFICATION : Ferralitico amarillento

DIAGNOSTIC CRITERIA FAO (1988) : Diagnostic horizons : ochric A, cambic B
 : Diagnostic properties : ferralic properties
 USDA/SCS (1992) : Diagnostic horizons : ochric epipedon, cambic horizon
 : Soil moisture regime : ustic

LOCATION : Cuba, Provincia Habana, Madruga, CAI R.M. Villena, Bloque 213, Campo 4
 Latitude : 23° 0' 0'' N Longitude : 81°55' 0'' W Altitude : 100 (m.a.s.l.)
 AUTHOR(S) : Marin/Regla/Balmas. Date (mm.yy) : 4.91

GENERAL LANDFORM : plain Topography : flat or almost flat
 PHYSIOGRAPHIC UNIT : flat or almost flat
 SLOPE Gradient : 1% Aspect : Form : straight
 POSITION OF SITE : flat
 MICRO RELIEF Kind :
 SURFACE CHAR. Rock outcrop : nil Stoniness : nil
 Cracking : nil Slaking/crusting : nil
 SLOPE PROCESSES Soil erosion : nil Aggradation : nil
 Slope stability : stable

PARENT MATERIAL 1 : marine sediments derived from : limestone
 Texture : clayey
 PARENT MATERIAL 2 : Derived from :
 Texture :
 Weathering degree : Resistance :
 Remarks :

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 : slow
 MOISTURE CONDITIONS PROFILE : 0 - 25 cm dry 25 - 300 cm moist

LAND USE : high level arable farming; Crops : sugar cane; seasonal irrigated; Improvements : none
 VEGETATION Type : dwarf shrub Status : degraded

ADDITIONAL REMARKS :

Short field description:

Very deep, well drained, strong brown clay. Weak subangular blocky to porous massive structure. Third and fourth horizons somewhat tongued. The third horizon is variegated. Hard limestone from about 5 meter.

Geology: Neogene Era, lower Miocene. Jaruco Formation: marl and clayey limestone. Geomorphology: marine plain, abrasive and denudative abrasive.

First ratoon, Variety: C1616, Yield: 75 ton/ha.

CLIMATE : Köppen: Aw
 Station: BAINOA 340 23 2 N/ 81 55 W 80 m a.s.l. 3 km NW of site Relevance: very good

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EA class A pan mm	5	139	149	193	222	238	215	208	202	175	148	127	115	2138
EP Penman mm	6	73	87	129	144	152	139	150	139	118	105	80	69	1392
relative humidity %	6	82	80	79	76	79	83	83	84	86	85	85	84	82
precipitation mm	6	45	61	73	54	165	248	162	178	165	119	104	62	1440
tot.glob.rad. MJ/m2	19	13.1	16.3	21.0	22.9	22.0	20.7	21.7	20.7	17.8	15.5	13.1	12.2	18.1
T mean °C	6	19.5	20.6	21.5	22.6	24.6	25.9	26.0	25.9	25.3	24.0	22.6	21.0	23.3
T max °C	6	25.7	26.9	27.8	29.3	30.6	31.3	32.0	32.0	31.4	29.7	28.5	26.8	29.3
T min °C	6	14.3	15.2	16.2	16.3	19.3	21.6	21.2	21.4	21.0	19.7	18.0	16.1	18.4
windspeed(at 2m) m/s	6	3.6	4.3	5.0	4.4	4.1	3.2	3.1	2.4	2.5	3.2	3.0	3.2	3.5
bright sunshine h/d	19	6.8	7.2	8.7	9.1	8.2	7.4	8.3	7.9	7.2	7.1	6.9	6.5	7.5

PROFILE DESCRIPTION :

Ap	0 - 24 cm.	dark brown (7.5YR 3.0/2.0, moist) clay; weak coarse subangular blocky into moderate fine crumb structure; sticky, slightly plastic; none mottles; no cutans; many fine pores and many medium pores; highly porous; common fine roots throughout; no inclusions; no fragments; frequent channels; non calcareous (10% HCL) throughout; clear smooth boundary to
Bw	24 - 50 cm.	brown (7.5YR 4.0/4.0, moist) sandy clay; weak medium subangular blocky structure; slightly sticky, slightly plastic, friable; none mottles; no cutans; many very fine to fine pores; few fine roots throughout; no inclusions; no fragments; frequent channels; diffuse wavy boundary to
Bg1	50 - 115 cm.	strong brown (7.5YR 4.0/6.0, moist) clay; moderately coherent porous massive structure; slightly sticky, firm; many medium distinct clear mottles (10YR 4.0/6.0); no cutans; many very fine to fine pores; few fine roots throughout; frequent medium spherical soft manganiferous concretions; no fragments; few channels; diffuse wavy boundary to
Bg2	115 - 250 cm.	light gray (10YR 7.0/2.0, moist) gravelly clay; moderately coherent porous massive structure;; many medium prominent clear mottles (10YR 4.0/6.0); no cutans; many very fine pores and few fine pores;; very frequent medium irregular hard manganiferous concretions; no fragments;

ANALYTICAL DATA :

Hor. no.	Top - Bot mm	>2 mm	2000 1000 500 250 100 50 SAND	TOT 50 20 10 5	TOT 20 10 5	<2 µm	DISP	BULK DENS	pF- 0.0 1.0 1.5 2.0 2.3 2.7 3.4 4.2
1	0 - 24	-	7 7 4 5 4	27	7 22	29	44	32.1	- - - - - - - -
2	24 - 50	-	7 6 3 3 3	23	6 14	20	47	26.6	- - - - - - - -
3	50 - 80	-	9 7 3 3 3	26	13 7	20	55	6.4	- - - - - - - -
4	80 - 115	-	9 8 4 4 4	28	7 16	22	50	67.2	- - - - - - - -
5	115 - 160	-	9 7 4 4 4	28	7 15	22	51	5.9	- - - - - - - -
6	160 - 190	-	9 7 4 4 4	28	8 12	20	53	0.0	- - - - - - - -

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	----- Na	sum	EXCH H+Al	AC. Al	CEC soil	----- clay	OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	6.6	5.7	1.5	1.98	-	11.0	1.5	0.3	0.3	13.1	-	-	12.7	29	6.9	13.1	103	-	0.14
2	6.2	5.4	-	0.86	-	6.8	1.5	0.1	0.1	8.5	-	-	9.4	20	3.0	8.5	90	-	0.09
3	6.4	5.8	-	0.39	-	6.6	1.6	0.0	0.0	8.2	-	-	8.9	16	1.4	8.2	92	-	0.02
4	6.5	5.7	0.9	0.38	-	6.2	1.9	0.1	0.3	8.5	-	-	8.9	18	1.3	8.5	96	-	0.01
5	6.3	5.6	-	0.25	-	5.0	2.9	0.0	0.2	8.1	-	-	8.9	18	0.9	8.1	91	-	0.01
6	5.4	4.8	-	0.09	-	3.0	4.0	0.1	0.2	7.3	-	-	8.7	17	0.3	7.3	84	-	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	-	-	-	2	4	-	-	-	-	-	3	-	0.69	0.56	0.05	6.41	1.08	-	-	-	-
2	-	-	-	2	4	-	-	-	-	-	3	-	0.40	0.30	0.03	6.81	0.98	-	-	-	-
3	-	-	-	2	5	-	-	-	-	-	3	-	0.36	0.26	0.03	6.63	0.83	-	-	-	-
4	-	-	-	2	5	-	-	-	-	-	3	-	0.44	0.26	0.03	8.17	0.96	-	-	-	-
5	-	-	-	2	6	-	-	-	-	-	3	-	0.40	0.23	0.03	5.70	0.74	-	-	-	-
6	-	-	-	2	6	-	-	-	-	-	3	-	0.36	0.26	0.03	5.81	0.75	-	-	-	-

FAO/UNESCO (1988) : Verti-Eutric Gleysol (1974 : Eutric Gleysol)
 USDA/SCS SOIL TAXONOMY (1992) : Typic Tropaequet, clayey, montmorillonitic, isothermic (1975 : typic tropaequet)
 LOCAL CLASSIFICATION : Gley ferralitico

DIAGNOSTIC CRITERIA
 FAO (1988) : Diagnostic horizons : ochric A, cambic B
 : Diagnostic properties : gleyic properties, vertic properties
 USDA/SCS (1992) : Diagnostic horizons : ochric epipedon, cambic horizon
 : Diagnostic properties : aquic conditions, slickensides
 : Soil moisture regime : aquic

LOCATION : Cuba, Villa Clara, Sagua La Grande, CAI Antonio Finalet, Bloque 50
 Latitude : 22°58' 0'' N Longitude : 82° 2' 0'' W Altitude : 8 (m.a.s.l.)
 AUTHOR(S) : Marin/Regla/Balmas. Date (mm.yy) : 5.91

GENERAL LANDFORM : plain Topography : flat or almost flat
 PHYSIOGRAPHIC UNIT : flat or almost flat
 SLOPE Gradient : 1% Aspect : Form : straight
 POSITION OF SITE : flat
 MICRO RELIEF Kind :
 SURFACE CHAR. Rock outcrop : nil Stoniness : nil
 Cracking : nil Slaking/crusting : nil
 SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL 1 : marine sediments derived from : claystone
 Texture : clayey
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 95

WATER TABLE Depth(cm) : 300 Kind : groundwater table
 DRAINAGE : imperfect-moderately well
 PERMEABILITY : No slow permeable layer(s) cm
 FLOODING Frequency : irregular, fresh water Run off : slow
 MOISTURE CONDITIONS PROFILE : 0 - 20 cm dry 20 - 175 cm moist

LAND USE : high level arable farming; Crops : sugar cane; seasonal irrigated
 VEGETATION Type : dwarf shrub Status : degraded

ADDITIONAL REMARKS :

Short field description

Deep, poorly to imperfectly drained, brownish grey, clay. The subsoil is strongly mottled, has a strong prismatic structure and slickensides.

Geology: Quarternary Era, Higher Pleistocene. Camacho Formation: grey-green and brown clays and sandy clay, sometimes with gravels and small 'guijarros'.

Geomorphology: fluvio-marine deltaic plain, very flat.

CLIMATE : Köppen: Aw
 Station: 22 49 N/ 80 5 W 22 m a.s.l. 4 km SW of site Relevance: very good
 SAGUA LA GRANDE 338

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
act. evapotransp. mm	21	130	137	191	215	208	180	210	200	162	145	120	118	2021
EP Penman mm	21	76	89	132	149	158	146	164	157	126	116	87	71	1476
relative humidity %	21	82	79	77	75	79	82	80	81	83	84	84	83	81
precipitation mm	21	45	46	47	46	151	179	95	105	156	152	74	37	1139
tot.glob.rad. MJ/m ²	10	412.3	465.0	629.0	690.0	682.0	648.0	703.7	675.8	534.0	489.0	399.0	384.4	6711.5
T mean °C	21	20.8	21.2	22.7	24.0	25.4	26.4	27.1	27.1	26.2	25.3	23.5	21.9	24.3
T max °C	21	26.5	27.0	28.5	29.7	31.0	31.7	32.4	32.5	31.9	30.1	28.5	27.2	29.7
T min °C	21	15.7	16.0	17.0	18.4	20.4	21.6	22.0	22.0	21.7	20.9	18.7	16.9	19.3
windspeed(at 2m) m/s	4	2.9	3.5	4.5	3.7	3.8	3.1	3.3	2.9	2.5	2.9	3.1	2.6	3.2
bright sunshine h/d	10	6.6	7.4	8.3	9.3	8.6	7.9	8.9	8.7	7.4	7.8	7.1	6.7	7.8

PROFILE DESCRIPTION :

Ap	0 - 20 cm.	very dark grayish brown (10YR 3.0/2.0, moist) clay; moderate medium angular blocky structure; slightly sticky, slightly plastic, very hard; none mottles; no cutans; common fine pores and few medium pores; moderately porous; many fine roots throughout; few medium spherical hard manganiferous concretions; no fragments; few worm channels; non calcareous (HCL) throughout; abrupt wavy boundary to
BA	20 - 47 cm.	light gray (10YR 7.0/2.0, moist) clay; strong coarse prismatic and moderate medium angular blocky structure; slightly sticky, plastic, firm; few medium distinct clear mottles (2.5YR 5.0/8.0); patchy thin slickensides cutans on horizontal pedfaces; few fine pores and few medium pores; few fine roots; very few small spherical soft manganiferous concretions; no fragments; non calcareous (HCL); gradual smooth boundary to
Bg	47 - 95 cm.	light brownish gray (10YR 6.0/2.0, moist) clay; strong fine to medium prismatic structure; slightly sticky, plastic, firm; common coarse distinct clear mottles (10R 4.0/6.0); continuous moderately thick slickensides cutans on horizontal pedfaces; few fine pores and few medium pores; few very fine roots; very few small spherical soft manganiferous concretions; no fragments; non calcareous (HCL); clear irregular boundary to
BCg	95 - 130 cm.	light brownish gray (2.5Y 6.0/2.0, moist) clay; strong fine to medium prismatic structure; slightly sticky, plastic, firm; many coarse prominent clear mottles (10R 4.0/6.0); continuous moderately thick slickensides cutans on horizontal pedfaces; few very fine pores;; no inclusions; no fragments; non calcareous (HCL); gradual smooth boundary to
Cg	130 - 175 cm.	brown (7.5YR 5.0/4.0, moist) clay; moderate medium to coarse subangular blocky into moderate fine to medium prismatic structure; slightly sticky, plastic, friable; many coarse prominent clear mottles (2.5Y 2.0/0.0) and common medium distinct diffuse mottles (2.5Y 5.0/2.0); no cutans; few very fine pores;; no inclusions; no fragments; non calcareous (HCL);

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000 500 250 100 50 SAND	TOT 50 20 TOT <2 DISK BULK DENS	pF- 0.0 1.0 1.5 2.0 2.3 2.7 3.4 4.2
1	0 - 20	-	1 1 1 2 1	5 1 20 20 74 50.1	- - - - - - - -
2	20 - 47	-	1 1 1 1 1	4 1 11 12 85 65.2	- - - - - - - -
3	47 - 95	-	0 0 0 1 1	3 2 10 12 85 60.5	- - - - - - - -
4	95 - 130	-	0 0 0 1 1	2 1 10 11 87 67.2	- - - - - - - -
5	130 - 175	-	0 0 1 1 1	4 2 10 12 85 65.8	- - - - - - - -

Hor. no.	pH- H2O	CaCO3 %	ORG- C %	MAT. N %	EXCH. Ca Mg K Na sum	EXCH. H+Al Al	CEC soil	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	6.6	5.1	3.0	1.43	-	29.9 12.2 0.2 1.7 44.0	- -	46.3 62	5.0 44.0	95 - 0.19
2	5.7	4.0	-	0.42	-	34.5 14.7 0.2 2.6 52.0	- -	48.3 57	1.5 52.0	108 - 0.18
3	5.1	3.6	-	0.17	-	30.3 14.7 0.3 4.3 49.6	- -	52.2 61	0.6 49.6	95 - 0.28
4	5.3	3.8	-	0.11	-	36.3 18.8 0.3 6.7 62.1	- -	65.2 75	0.4 62.1	95 - 0.38
5	6.1	4.4	-	0.03	-	38.6 21.3 0.4 8.7 69.0	- -	69.2 82	0.1 69.0	100 - 0.50

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	4	-	-	-	-	0.29	0.24	0.11	1.98	0.13	-	-	-	-
2	-	-	-	8	2	-	3	4	-	-	-	-	0.59	0.17	0.06	0.89	0.16	-	-	-	-
3	-	-	-	8	2	-	3	3	-	-	-	-	0.26	0.20	0.06	1.46	0.14	-	-	-	-
4	-	-	-	8	2	-	3	3	-	-	-	-	0.23	0.20	0.06	1.40	0.16	-	-	-	-
5	-	-	-	8	5	-	2	3	-	-	-	-	0.17	0.25	0.06	0.94	0.13	-	-	-	-

FAO/UNESCO (1988) : Eutri-Rhodic Ferralsol (1974 : Rhodic Ferralsol)
 USDA/SCS SOIL TAXONOMY (1992) : Rhodic Eustrustox, clayey, kaolinitic, isohyperthermic (1975 : tropeptic eustrustox)
 LOCAL CLASSIFICATION : Ferralitico rojo típico

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

LOCATION : Cuba, Matanzas, Jovellanos, EPICA, Banco de Semilla (CAI J.R. Cairo)
 Latitude : 22°45' 0'' N Longitude : 81°30' 0'' W Altitude : 25 (m.a.s.l.)
 AUTHOR(S) : Marin/Regla/Balmas. Date (mm.yy) : 5.91

GENERAL LANDFORM : plain Topography : flat or almost flat
 PHYSIOGRAPHIC UNIT : flat or almost flat
 SLOPE Gradient : 1% Aspect : Form : straight
 POSITION OF SITE : flat
 MICRO RELIEF Kind :
 SURFACE CHAR. Rock outcrop : nil Stoniness : nil
 Cracking : nil Slaking/crusting : nil
 SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL 1 : solid rock derived from : limestone
 Texture :
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 160

WATER TABLE Depth(cm) : Kind : no watertable observed
 DRAINAGE : well
 PERMEABILITY : high Slow permeable layer from : 170 to 200 cm
 FLOODING Frequency : nil Run off : rapid
 MOISTURE CONDITIONS PROFILE : 0 - 200 cm moist

LAND USE : high level arable farming; Crops : sugar cane; seasonal irrigated
 VEGETATION Type : semi deciduous woodland Status : secondary

ADDITIONAL REMARKS :

Short field description:

Very deep, well drained, red clay. Diffuse horizon boundaries and moderately structured. From 3 meter starts the hard rock.

The profile was studied and sampled after a heavy rainy season, which ended about 10 days ago.

Geology: mid-low Miocene, Neogene Era. Guines Formation: biogenous limestone, detritic, dolomitics.

Geomorphology: marine plain, abrasive and accumulative abrasive, slightly undulated and plain.

CLIMATE : Köppen: Aw
 Station: 22 47 N/ 81 11 W 25 m a.s.l. 1 km NNE of site Relevance: very good
 JOVELLANOS 330

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EA class A pan mm	15	124	142	202	218	206	172	188	181	146	151	124	119	1977
EP Penman mm	21	72	82	122	139	141	130	142	137	118	103	82	70	1345
relative humidity %	21	80	78	76	73	77	82	82	83	84	85	83	82	80
precipitation mm	21	47	50	43	49	208	297	193	183	225	138	54	32	1524
tot.glob.rad. MJ/m2	19	403.0	467.0	600.0	682.0	630.0	600.0	630.0	630.0	540.0	480.0	415.0	403.0	5850.0
T mean °C	21	20.6	20.8	22.6	24.3	25.6	26.2	26.7	26.6	26.1	25.0	23.2	21.5	24.1
T max °C	21	25.9	26.4	28.2	29.7	30.5	30.5	31.2	31.2	30.6	29.2	27.6	26.6	29.0
T min °C	21	14.4	14.6	16.1	17.5	19.9	21.5	21.7	21.5	21.5	20.3	17.9	15.7	18.5
windspeed(at 2m) m/s	4	1.8	2.1	2.4	2.1	1.7	1.2	1.2	1.1	1.1	1.3	1.8	1.8	1.7
bright sunshine h/d	23	6.9	7.5	8.5	8.9	7.8	7.2	8.0	7.9	7.3	7.2	7.2	6.9	7.6

PROFILE DESCRIPTION :

Ap	0 - 27 cm.	dark red (2.5YR 3.0/6.0, moist) clay loam; moderate medium granular structure; non sticky, slightly plastic; none mottles; no cutans; common fine pores and few medium pores; highly porous; many coarse roots throughout; few small spherical hard ferruginous concretions; no fragments; few worm channels; non calcareous (10% HCL) throughout; gradual smooth boundary to
B	27 - 60 cm.	dark red (2.5YR 3.0/6.0, moist) clay; moderate medium subangular blocky structure; non sticky, slightly plastic; none mottles; no cutans; few fine pores and few medium pores; common fine roots throughout; few small spherical hard ferruginous concretions; no fragments; few worm channels; non calcareous (10% HCL) throughout; diffuse smooth boundary to
Bs1	60 - 128 cm.	dark red (2.5YR 3.0/6.0, moist) clay; moderate medium subangular blocky into moderate fine to very fine subangular blocky structure; slightly sticky, slightly plastic; none mottles; no cutans; common very fine pores and few fine pores; few fine roots throughout; frequent medium spherical hard ferruginous concretions; no fragments; non calcareous (10% HCL) throughout; diffuse smooth boundary to
Bs2	128 - 170 cm.	red (2.5YR 4.0/8.0, moist) clay; moderate medium subangular blocky into moderate fine to very fine subangular blocky structure; slightly sticky, slightly plastic; none mottles; no cutans; few very fine pores and few fine pores; few fine roots throughout; frequent medium spherical hard ferruginous concretions; no fragments; non calcareous (10% HCL) throughout; diffuse smooth boundary to
BC	170 - 200 cm.	red (2.5YR 4.0/8.0, moist) clay loam; moderate medium subangular blocky structure; slightly sticky, non plastic; few fine distinct diffuse mottles (7.5YR 6.0/8.0); no cutans; common very fine pores and common fine pores; few fine roots throughout; few small spherical hard ferruginous concretions; no fragments; non calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT 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	27	-	2	3	1	3	2	10	3	7	10	80	38.0	1.33	49	48	48	47	46	42	38	37
2	27	60	-	5	2	1	2	1	11	0	7	7	82	4.7	1.41	50	50	49	46	46	44	42	41
3	60	90	-	4	2	1	1	1	9	0	5	5	85	5.9	1.43	50	50	48	46	45	44	40	39
4	90	128	-	3	2	1	1	1	8	5	5	10	83	1.6	1.45	48	48	47	45	44	41	36	34
5	128	170	-	3	2	1	1	1	7	0	10	11	82	7.7	1.39	52	52	51	49	49	47	45	43
6	170	200	-	1	1	0	1	1	5	4	10	14	82	8.7	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH. Ca	CAT. Mg	----	----	----	EXCH. H+Al	AC. Al	CEC soil	----	----	----	BASE ECEC	AL SAT %	EC 2.5 mS/cm
1	5.2	4.2	-	1.49	-	5.8	1.5	0.3	0.1	7.7	-	-	13.2	16	5.2	7.7	58	-	0.02
2	5.8	5.1	-	0.69	-	6.2	1.2	0.1	0.0	7.5	-	-	9.1	11	2.4	7.5	82	-	0.02
3	6.2	5.6	-	0.35	-	7.2	0.9	0.0	0.0	8.1	-	-	9.3	11	1.2	8.1	87	-	0.01
4	6.4	5.8	-	0.23	-	8.3	1.2	0.0	0.2	9.7	-	-	10.5	13	0.8	9.7	92	-	0.01
5	6.5	5.9	1.1	0.15	-	10.2	1.6	0.0	0.0	11.8	-	-	13.4	16	0.5	11.8	88	-	0.01
6	6.6	5.9	1.1	0.10	-	12.2	1.6	0.1	0.3	14.2	-	-	15.2	19	0.4	14.2	93	-	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	-	-	-	2	5	-	-	-	3	-	-	0.20	0.28	0.03	8.54	0.49	-	-	-	-
2	-	-	-	-	5	-	-	-	3	-	-	0.20	0.23	0.03	7.47	0.46	-	-	-	-
3	-	-	-	-	5	-	-	-	3	-	-	0.20	0.20	0.03	7.86	0.49	-	-	-	-
4	-	-	-	-	5	-	-	-	3	-	-	0.18	0.21	0.03	7.38	0.53	-	-	-	-
5	-	-	-	-	6	-	-	-	2	-	-	0.16	0.18	0.03	7.83	0.54	-	-	-	-
6	-	-	-	4	7	-	-	-	1	-	-	0.13	0.18	0.03	7.40	0.58	-	-	-	-

FAO/UNESCO (1988) : Calcari-Vertisols (1974 : Chromic Vertisol)
 USDA/SCS SOIL TAXONOMY (1992) : Leptic Haplustert, very fine, montmorillonitic, isohyperthermic (1975 : typic chromustert)
 LOCAL CLASSIFICATION : Pardo con carbonato plast.

DIAGNOSTIC CRITERIA
 FAO (1988) : Diagnostic horizons : ochric A, cambic B
 : Diagnostic properties : vertic properties
 USDA/SCS (1992) : Diagnostic horizons : ochric epipedon, cambic horizon
 : Diagnostic properties : slickensides
 : Soil moisture regime : ustic

LOCATION : Cuba, Prov. Camaguey, Florida, CAI "Argentina", Bloque 58, Campo 25
 Latitude : 21°33' 0'' N Longitude : 78° 8' 0'' W Altitude : 80 (m.a.s.l.)
 AUTHOR(S) : Marín/Regla/Balmas. Date (mm.yy) : 7.91

GENERAL LANDFORM : peneplain Topography : flat or almost flat
 PHYSIOGRAPHIC UNIT : flat or almost flat
 SLOPE Gradient : 1% Aspect : Form : straight
 POSITION OF SITE : flat
 MICRO RELIEF Kind :
 SURFACE CHAR. Rock outcrop : nil Stoniness : very few stones
 Form : angular irregular Av. Size (cm) : 5
 Cracking : large cracks Slaking/crusting : nil
 SLOPE PROCESSES Soil erosion : nil Aggradation : nil

PARENT MATERIAL 1 : solid rock derived from : limestone
 Texture :
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 85

WATER TABLE Depth(cm) : Kind : no watertable observed
 DRAINAGE : moderately well
 PERMEABILITY : No slow permeable layer(s) cm
 FLOODING Frequency : nil Run off : medium
 MOISTURE CONDITIONS PROFILE : 0 - 170 cm moist

LAND USE : high level arable farming; Crops : sugar cane; seasonal irrigated; Rotation: monoculture
 VEGETATION Type : semi deciduous woodland Status : secondary

ADDITIONAL REMARKS :

Short field description
 Deep, moderately well drained, brown clay, with large cracks at the surface. (Sub)angular blocky structure, slickensides and hard calcareous nodules.
 Geology: Middle Eocene, 'Vertientes' Formation: marls, sandstone, radiolaritas limestone.
 Geomorphology: Denudative erosive undulating plains.
 First ratoon: yield 51.4 ton/ha.

CLIMATE : Köppen: Aw
 Station: 21 31 N/ 78 14 W 57 m a.s.l. 11 km SW of site Relevance: good
 FLORIDA 350

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EA class A pan mm	21	148	162	214	244	226	194	214	211	196	163	139	138	2253
EP Penman mm	21	88	97	135	149	147	141	164	150	129	116	96	86	1504
relative humidity %	21	80	77	75	72	77	80	78	80	83	84	83	81	79
precipitation mm	21	32	42	52	46	212	265	149	166	188	165	56	23	1399
tot.glob.rad. MJ/m2	9	474.3	509.6	663.4	693.0	666.5	627.0	678.9	660.3	573.0	523.9	450.0	437.1	6957.0
T mean °C	21	22.1	22.4	23.5	24.9	25.9	26.7	27.4	27.1	26.5	25.7	24.3	22.8	24.9
T max °C	21	28.3	29.0	30.6	31.6	32.0	32.2	33.1	33.2	32.6	31.3	29.7	28.6	31.0
T min °C	21	17.4	17.5	18.4	19.5	21.1	22.3	22.7	22.7	22.3	21.8	20.4	18.6	20.4
windspeed(at 2m) m/s	4	3.0	3.1	3.3	2.9	2.3	2.2	2.4	2.1	1.9	2.3	3.0	3.0	2.6
bright sunshine h/d	8	7.7	8.2	8.9	9.1	7.9	7.6	8.4	8.3	7.8	7.8	7.9	7.8	8.1

PROFILE DESCRIPTION :

Ap	0 - 20 cm.	very dark grayish brown (10YR 3.0/2.0, moist) clay loam; strong medium to coarse angular blocky structure; sticky, plastic; none mottles; no cutans; common fine pores and common medium pores; highly porous; common fine roots throughout and few medium roots throughout; no inclusions; no fragments; few worm channels; non calcareous (10% HCL) throughout; abrupt smooth boundary to
Bw1	20 - 55 cm.	brown (10YR 5.0/3.0, moist) clay loam; strong medium to coarse subangular blocky structure; slightly sticky, slightly plastic, slightly hard; none mottles; broken moderately thick slickensides cutans throughout; common fine pores and few medium pores; highly porous; few medium roots throughout; very few small irregular hard calcareous nodules; no fragments; slightly calcareous (10% HCL) throughout; clear wavy boundary to
Bw2	55 - 80 cm.	light yellowish brown (10YR 6.0/4.0, moist) sandy clay loam; strong coarse subangular blocky structure; slightly sticky, slightly plastic; common heterogeneous faint diffuse mottles (10YR 6.0/8.0) and common medium distinct clear mottles (2.5Y 8.0/2.0); no cutans; common fine pores and common medium pores; highly porous; common fine roots throughout; very few small irregular hard calcareous nodules; no fragments; strongly calcareous (10% HCL) throughout; gradual smooth boundary to
CB	80 - 90 cm.	pale brown (10YR 6.0/3.0, moist) sandy clay loam; moderate medium to coarse subangular blocky structure; slightly sticky, slightly plastic, friable; none mottles; no cutans; few fine pores; moderately porous; few fine roots throughout; dominant medium irregular soft calcareous nodules; no fragments; strongly calcareous (10% HCL) throughout; gradual smooth boundary to
Ck1	100 - 130 cm.	white (10YR 8.0/2.0, moist) sandy clay loam; weakly coherent structure; non sticky, non plastic, friable; many coarse distinct clear mottles (10YR 6.0/8.0) and few fine distinct clear mottles (10YR 2.0/1.0); no cutans; common fine pores; moderately porous; few fine roots throughout; very frequent large spherical soft calcareous nodules; no fragments; strongly calcareous (10% HCL) throughout; gradual smooth boundary to
Ck2	140 - 170 cm.	white (10YR 8.0/2.0, moist) sandy clay loam; weakly coherent structure; non sticky, non plastic, friable; many coarse distinct clear mottles (10YR 6.0/8.0) and few fine distinct clear mottles (10YR 2.0/1.0); no cutans; common fine pores; moderately porous; few fine roots throughout; dominant large spherical hard calcareous nodules; no fragments; strongly calcareous (10% HCL) throughout; gradual smooth 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 2	TOT SILT	<2 µm	DISP	BULK DENS	pH	---	---	---	---	---	---	---	---
				0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2													
1	0	22	-	1	1	2	5	4	12	3	6	9	79	-	1.08	59	59	58	57	57	55	48	46	
2	22	55	-	0	0	2	5	4	12	4	14	18	71	-	1.03	62	62	61	60	60	58	48	46	
3	55	80	-	0	0	3	7	5	15	9	19	28	57	-	1.30	50	50	49	46	46	43	38	38	
4	80	90	-	0	0	0	2	3	6	12	40	51	43	-	1.32	51	50	48	46	46	43	36	33	
5	100	130	-	0	0	0	4	8	13	16	41	57	30	-	1.30	48	47	46	42	42	39	28	27	
6	140	170	-	0	0	0	4	7	11	12	36	49	40	-	-	-	-	-	-	-	-	-	-	

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	----- Na	----- sum	EXCH H+Al	AC. Al	CEC soil	----- clay	----- OrgC	----- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	6.9	5.4	3.7	1.59	-	53.8	8.3	0.4	0.3	62.8	-	-	63.3	80	5.6	62.8	99	-	0.23
2	7.5	6.0	3.7	0.45	-	56.6	6.2	0.3	0.4	63.5	-	-	-	-	1.6	63.5	-	-	0.29
3	8.4	7.0	31.3	0.24	-	64.2	4.4	0.2	0.3	69.1	-	-	46.2	80	0.8	69.1	150	-	0.24
4	8.5	7.0	41.1	0.15	-	64.2	4.1	0.2	0.2	68.7	-	-	45.5	105	0.5	68.7	151	-	0.23
5	8.6	7.0	33.9	0.11	-	63.8	5.2	0.2	0.3	69.5	-	-	44.3	147	0.4	69.5	157	-	0.20
6	8.6	6.9	30.4	0.01	-	61.1	7.0	0.2	0.4	68.7	-	-	45.0	112	****	68.7	153	-	0.21

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 MX Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	8	3	-	-	2	2	-	-	-	-	0.53	0.35	0.08	1.10	0.19	-	-	-	-
2	-	-	-	8	3	-	-	2	1	-	-	-	-	0.43	0.30	0.08	1.21	0.22	-	-	-	-
3	-	-	-	8	3	-	-	3	3	-	-	-	-	0.08	0.13	0.05	0.63	0.07	-	-	-	-
4	-	-	-	8	3	-	-	3	3	-	-	-	-	0.05	0.11	0.03	0.30	0.03	-	-	-	-
5	-	-	-	8	3	-	-	3	3	-	-	-	2	0.03	0.08	0.00	0.41	0.03	-	-	-	-
6	-	-	-	8	3	-	-	3	3	-	-	-	2	0.03	0.08	0.03	0.50	0.03	-	-	-	-

remarks (hor. 5 - 6): MINX=talc.

FAO/UNESCO (1988) : Eutri-Haplic Ferralsol (1974 : Orthic Ferralsol)
 USDA/SCS SOIL TAXONOMY (1992) : Typic Eutruxox, clayey, kaolinitic, isohyperthermic (1975 : tropeptic eutruxox)
 LOCAL CLASSIFICATION : Ferralitico rojo tipico

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

LOCATION : Cuba Prov. Ciego de Avila Municipio y CAI Venezuela EPICA Campo 17
 Latitude : 21°40' 0'' N Longitude : 78°47' 0'' W Altitude : 25 (m.a.s.l.)
 AUTHOR(S) : Marin/Regla/Balmas. Date (mm.yy) : 7.91

GENERAL LANDFORM : peneplain Topography : flat or almost flat
 PHYSIOGRAPHIC UNIT : flat or almost flat
 SLOPE Gradient : 1% Aspect : Form : straight
 POSITION OF SITE : flat
 MICRO RELIEF Kind :
 SURFACE CHAR. Rock outcrop : nil Stoniness : nil
 Cracking : nil Slaking/crusting : nil
 SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL 1 : solid rock derived from : limestone
 Texture :
 Remarks :

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 - 150 cm moist

LAND USE : high level arable farming; Crops : sugar cane; seasonal irrigated
 VEGETATION Type : shrub Status : secondary

ADDITIONAL REMARKS :

Short field description:

Very deep, well drained, red clay. Well structured, with small iron concretions.

Geology: Neogene Era. mid-higher Miocene. Guines Formation: clays, marl, limestones and dolomitic.

Geomorphology: marine plains, abrasive and accumulative abrasive, undulated and nearly plain.

CLIMATE : Köppen: Aw
 Station: 21 47 N/ 78 47 W 26 m a.s.l. 4 km SE of site Relevance: very good
 CIEGO DE AVILA 346

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
act. evapotransp. mm	21	133	154	215	236	215	189	205	198	160	148	122	131	2110
EP Penman mm	21	86	97	139	154	152	139	158	151	124	113	93	85	1497
relative humidity %	21	79	76	74	72	77	82	79	82	85	85	84	81	80
precipitation mm	21	22	31	41	47	154	227	150	173	175	144	47	12	1226
tot.glob.rad. MJ/m2	13	450.0	504.0	651.3	690.3	651.3	600.0	682.0	651.2	555.0	480.2	465.0	434.0	6814.3
T mean °C	21	21.7	21.9	23.3	24.8	26.2	26.7	27.3	27.0	26.3	25.5	24.0	22.6	24.8
T max °C	21	28.3	28.9	30.4	31.7	32.4	32.2	33.2	33.1	32.4	31.2	29.6	28.8	31.0
T min °C	21	16.5	16.4	17.4	18.6	20.6	22.0	22.2	22.2	22.0	21.5	19.9	17.8	19.8
windspeed(at 2m) m/s	21	2.9	3.4	3.9	3.5	3.0	2.5	2.8	2.6	2.1	2.5	3.2	3.1	2.9
bright sunshine h/d	13	7.5	7.9	8.9	9.2	7.8	7.4	8.3	8.3	7.4	7.3	7.6	7.6	7.9

PROFILE DESCRIPTION :

Ap	0 - 16 cm.	red (2.5YR 4.0/6.0, moist) clay; moderate medium to coarse granular structure; slightly sticky, slightly plastic, friable; none mottles; no cutans; common fine pores and few very fine pores; highly porous; many medium roots throughout; no inclusions; no fragments; non calcareous (10% HCL) throughout; gradual smooth boundary to
B	16 - 35 cm.	dark red (2.5YR 3.0/6.0, moist) clay; strong medium to coarse subangular blocky structure; slightly sticky, slightly plastic, firm; none mottles; no cutans; many fine pores and few very fine pores; highly porous; common medium roots throughout; few small spherical hard ferruginous concretions; no fragments; non calcareous (10% HCL) throughout; gradual smooth boundary to
Bs1	35 - 75 cm.	red (2.5YR 4.0/6.0, moist) clay; moderate medium subangular blocky structure; slightly sticky, slightly plastic, very firm; none mottles; no cutans; common fine pores and few coarse pores; few fine roots throughout; frequent medium spherical hard ferruginous concretions; no fragments; non calcareous (10% HCL) throughout; diffuse smooth boundary to
Bs2	75 - 150 cm.	red (2.5YR 4.0/6.0, moist) clay; moderate medium subangular blocky structure; slightly sticky, slightly plastic, firm; none mottles; no cutans; common fine pores; moderately porous; few fine roots throughout; frequent medium spherical hard ferruginous concretions; no fragments; non calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top	-	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT 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	-	16	-	1	5	7	6	5	24	5	5	11	66	-	1.13	52	51	41	34	33	30	25	22
2	16	-	35	-	1	5	7	6	4	24	4	4	8	68	-	1.31	47	46	43	38	38	35	31	30
3	35	-	75	-	5	5	5	5	3	23	4	3	7	70	-	1.48	47	44	43	42	41	39	35	33
4	75	-	150	-	7	7	4	4	3	26	4	4	8	67	-	1.56	45	44	43	42	41	39	35	34

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH. Ca	CAT. Mg	----- K	----- Na	sum	EXCH. H+Al	AC. Al	CEC soil	----- clay	----- OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	6.7	5.6	1.0	1.56	-	8.0	2.7	0.5	0.0	11.2	-	-	12.0	18	5.5	11.2	93	-	0.10
2	7.0	6.0	1.0	1.31	-	8.2	2.5	0.1	0.1	10.9	-	-	11.3	17	4.6	10.9	96	-	0.09
3	7.3	6.3	0.7	0.63	-	6.4	1.8	0.1	0.1	8.4	-	-	8.8	13	2.2	8.4	95	-	0.07
4	7.4	6.5	0.8	0.13	-	7.2	1.3	0.0	0.2	8.7	-	-	8.8	13	0.5	8.7	99	-	0.10

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	1	-	-	-	7	-	-	-	-	-	4	-	0.13	0.15	0.03	5.60	0.36	-	-	-	-
2	1	-	-	-	7	-	-	-	-	-	4	-	0.13	0.16	0.03	5.77	0.33	-	-	-	-
3	-	-	-	-	7	-	-	-	-	-	4	-	0.15	0.15	0.03	5.57	0.40	-	-	-	-
4	-	-	-	-	6	-	-	-	-	-	4	-	0.15	0.13	0.05	5.66	0.37	-	-	-	-

FAO/UNESCO (1988) : Orthi-Calcaric Cambisol (1974 : Eutric Cambisol)
 USDA/SCS SOIL TAXONOMY (1992) : Typic Ustropept, clayey over loamy, montmorillonitic(calc.), iso(1975 : typic ustropept)
 LOCAL CLASSIFICATION : Fersialitico pardo rojizo

DIAGNOSTIC CRITERIA
 FAO (1988) : Diagnostic horizons : ochric A, cambic B
 USDA/SCS (1992) : Diagnostic horizons : ochric epipedon, cambic horizon
 : Soil moisture regime : ustic

LOCATION : Cuba Prov. S.Spiritus Mun. Cabaiguan CAI Remberto Abad EPICA Bloq.Exp.
 Latitude : 22° 3' 0'' N Longitude : 79°22' 0'' W Altitude : 80 (m.a.s.l.)
 AUTHOR(S) : Marin/Regla/Balmas. Date (mm.yy) : 7.91

GENERAL LANDFORM : low hill Topography : undulating
 PHYSIOGRAPHIC UNIT : undulated
 SLOPE Gradient : 3% Aspect : Form : convex
 POSITION OF SITE : middle slope
 MICRO RELIEF Kind : termite mounds
 SURFACE CHAR. Rock outcrop : nil Stoniness : nil
 Cracking : small cracks Slaking/crusting : nil
 SLOPE PROCESSES Soil erosion : slight sheet Aggradation : not apparent
 Slope stability : stable

PARENT MATERIAL 1 : solid rock derived from : conglomerate
 Texture : mixed
 Weathering degree : partial or moderate Resistance : moderate
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 95

WATER TABLE Depth(cm) : Kind : no watertable observed
 DRAINAGE : moderately well
 PERMEABILITY : No slow permeable layer(s) cm
 FLOODING Frequency : nil Run off : rapid
 MOISTURE CONDITIONS PROFILE : 0 - 110 cm moist

LAND USE : high level arable farming; Crops : sugar cane; no irrigation
 VEGETATION Type : shrub Status : secondary

ADDITIONAL REMARKS :

Short field description:

Moderately deep, well drained, light brown clay. Flagstone of flattened hard rock are present in the soil from 120 cm and deeper.

Variety: Cu 323 68, plant ratoon-yield 150 ton/ha, first and second ratoon 120 ton/ha, third and fourth ratoon-100 ton/ha.

Geology: Neogene Era, mid-higher undifferentiated Eocene. Bijabo formation: conglomerate, sandstone, limestone.

Geomorphology: undulating erosive denudative plains.

CLIMATE : Köppen: Aw
 Station: 21 56 N/ 79 27 W 96 m a.s.l. 11 km E of site Relevance: good
 SANCTI SPIRITUS 349

		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
EP Penman	mm	21	76	85	124	143	142	131	144	138	117	106	83	73	1367
relative humidity	%	21	80	78	75	73	78	83	81	83	85	85	84	81	80
precipitation	mm	21	37	56	51	48	223	278	170	220	223	207	57	24	1600
tot.glob.rad.	MJ/m2	6	14.1	16.8	20.3	23.6	21.9	21.0	21.8	21.0	18.2	16.1	13.7	12.8	18.4
T mean	°C	21	21.2	21.6	23.2	24.5	25.5	26.0	26.6	26.2	25.7	25.0	23.6	22.1	24.3
T max	°C	21	27.1	27.7	29.4	30.8	31.1	31.1	32.1	31.9	31.1	30.0	28.4	27.6	29.9
T min	°C	21	15.9	15.8	17.3	18.4	20.2	21.3	21.5	21.5	21.3	20.6	19.0	16.9	19.1
windspeed(at 2m)	m/s	4	1.8	2.0	2.4	2.0	1.5	1.2	1.1	1.1	1.1	1.4	1.5	1.5	1.5
bright sunshine	h/d	6	7.0	7.4	8.2	9.5	8.1	7.6	8.3	8.1	7.3	7.4	7.1	6.9	7.7

PROFILE DESCRIPTION :

Ap	0 - 22 cm.	dark brown (10YR 3.0/3.0, moist) clay loam; strong medium granular and strong coarse subangular blocky structure; slightly sticky, slightly plastic, firm; few medium distinct clear mottles (10YR 4.0/4.0); no cutans; common fine pores and few medium pores; moderately porous; common fine roots throughout; no inclusions; no fragments; frequent channels; slightly calcareous (10% HCL) throughout; clear smooth boundary to
Bw	22 - 53 cm.	dark yellowish brown (10YR 4.0/4.0, moist) clay loam; strong coarse subangular blocky structure; slightly sticky, plastic, very firm; none mottles; patchy thin clay cutans throughout; common fine pores and few medium pores; moderately porous; common fine roots throughout and common very fine roots throughout; no inclusions; no fragments; frequent channels; slightly calcareous (10% HCL) throughout; gradual broken boundary to
BC	53 - 80 cm.	2.5Y 6.0/3.0, moist sandy clay loam; moderate medium subangular blocky to moderate fine crumb structure; slightly sticky, plastic, firm; common medium distinct diffuse mottles (2.5Y 5.0/4.0); no cutans; common fine pores; moderately porous; few fine roots throughout; frequent small spherical soft calcareous nodules; very few medium weathered fragments and very few coarse weathered fragments; frequent channels; slightly calcareous (10% HCL) throughout; gradual smooth boundary to
Ck	80 - 95 cm.	pale yellow (2.5Y 8.0/4.0, moist) sandy loam; structureless structure; slightly sticky, slightly plastic, friable; none mottles; no cutans; few fine pores; slightly porous; nil roots; few small spherical soft calcareous nodules; frequent coarse weathered fragments; frequent channels; calcareous (10% HCL) throughout; diffuse broken boundary to
Crk	96 - 110 cm.	2.5Y 8.0/3.0, moist medium sand; structureless structure; non sticky, non plastic, firm; none mottles; no cutans; none pores; nil roots; no inclusions; very frequent very coarse weathered fragments; strongly calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000 500 250 100 50 SAND	TOT 50 20 2 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 - 22	-	0 0 0 0 1	2 9 17	25 73	-	1.24	54 53 53 50 49 48 47 41
2	22 - 53	-	0 0 0 0 1	2 3 19	21 77	-	1.14	57 56 56 54 53 51 49 43
3	53 - 80	-	0 0 0 0 1	1 3 32	35 64	-	1.37	54 53 53 52 52 50 49 43
4	80 - 95	-	1 1 1 2 2	5 8 51	59 36	-	-	- - - - - - - -
5	95 - 110	-	1 1 1 2 3	8 19 46	65 28	-	-	- - - - - - - -
6	110 -	-	- - - - -	- - - - -	- - - - -	-	-	- - - - - - - -

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	---- K	---- Na	--- sum	EXCH H+Al	AC. Al	CEC soil	---- clay	---- OrgC	--- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	6.7	4.6	-	1.75	-	33.6	8.7	0.5	0.2	43.0	-	-	49.6	68	6.1	43.0	87	-	0.13
2	7.3	5.5	3.5	0.49	-	38.5	7.6	0.4	0.7	47.2	-	-	48.3	62	1.7	47.2	98	-	0.19
3	7.6	5.4	4.9	0.22	-	46.6	5.8	0.3	0.2	52.9	-	-	50.8	80	0.8	52.9	104	-	0.09
4	8.6	6.7	38.1	0.08	-	65.4	2.1	0.1	0.1	67.7	-	-	34.8	96	0.3	67.7	195	-	0.16
5	8.6	6.9	45.1	-	-	60.4	1.7	0.2	0.1	62.4	-	-	30.9	112	-	62.4	202	-	0.14
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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	-	-	-	7	1	-	-	5	-	-	-	-	0.60	0.34	0.05	1.44	0.19	-	-	-	-
2	-	-	-	8	1	-	-	5	-	-	-	-	0.48	0.29	0.05	1.57	0.19	-	-	-	-
3	-	-	-	8	1	-	-	5	-	-	-	-	0.26	0.21	0.03	1.11	0.15	-	-	-	-
4	-	-	-	4	1	-	-	7	-	-	-	-	0.11	0.11	0.03	0.54	0.06	-	-	-	-
5	-	-	-	4	1	-	-	7	-	-	-	-	0.07	0.07	0.02	0.49	0.03	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FAO/UNESCO (1988)		: Pelli-Vertisols		(1974 : Pellic Vertisol)	
USDA/SCS SOIL TAXONOMY (1992)		: Udic Haplustert, fine, montmorillonitic, isohyperthermic		(1975 : udic pellustert)	
LOCAL CLASSIFICATION		: Pardo sin carbonato plast.			
DIAGNOSTIC CRITERIA		FAO (1988)	: Diagnostic horizons		: mollic A, argic B
			: Diagnostic properties		: slickensides
		USDA/SCS (1992)	: Diagnostic horizons		: mollic epipedon, argillic horizon
			: Diagnostic properties		: slickensides
			: Soil moisture regime		: ustic
LOCATION		: Cuba Prov. Cienfuegos Mun.Palmira CAI Espartaco EPICA Banco de semilla			
AUTHOR(S)		Latitude	: 22°16' 0'' N	Longitude	: 80°19' 0'' W
			: Marín/Regla/Balmas.	Altitude	: 45 (m.a.s.l.)
				Date (mm.yy)	: 7.91
GENERAL LANDFORM		: alluvial plain		Topography : undulating	
PHYSIOGRAPHIC UNIT		: undulated			
SLOPE		Gradient	: 3%	Aspect	: Form : undulating
POSITION OF SITE		: middle slope			
MICRO RELIEF		Kind	:		
SURFACE CHAR.		Rock outcrop	: nil	Stoniness	: very few stones
			Form : angular irregular	Av.Size (cm)	: 20
		Cracking	: large cracks	Slaking/crusting	: nil
SLOPE PROCESSES		Soil erosion	: moderate rill	Aggradation	: not apparent
		Slope stability	: stable		
PARENT MATERIAL		1	: solid rock	derived from : coarse-basic igneous rock	
		Texture	:		
PARENT MATERIAL		2	:	Derived from : coarse-intermediate igneous	
		Texture	:		
		Weathering degree	:	Resistance	:
Remarks		:			
EFFECTIVE SOIL DEPTH(cm)		:	100		
WATER TABLE		Depth(cm)	:	Kind : no watertable observed	
DRAINAGE		: imperfect-moderately well			
PERMEABILITY		: moderate		Slow permeable layer from : 60 to 70 cm	
FLOODING		Frequency	: irregular, fresh water	Run off : medium	
MOISTURE CONDITIONS PROFILE		:	0 - 150 cm moist		
LAND USE		: high level arable farming; Crops : sugar cane; seasonal irrigated			
VEGETATION		Type	: shrub	Status : secondary	
ADDITIONAL REMARKS :					
Short field description:					
Deep, moderately well drained, dark yellowish brown clay with gravel. The soil is moderately porous and has a strong angular blocky structure, showing slickensides on the tilted shearplanes.					
Undulating site with different slope gradient toward the lowest parts. The site is flooded during the raining season. There is a not well defined prismatic structure in the third horizon. Small gravels throughout the profile; increasing gravel size with depth.					
Geology: Aptiano-Albiano lower Cretaceous. Ataguá formation: calcareous tuff, basic and intermediate lavas, limestone and clastic rock. Geomorphology: abrasive, erosive, undulating marine plains.					
CLIMATE :		Köppen: Aw			
Station: CIENFUEGOS		22 18 N/ 80 19 W	45 m a.s.l	15 km SW of site	Relevance: good
		No. years of record	Jan	Feb	Mar
			Apr	May	Jun
			Jul	Aug	Sep
			Oct	Nov	Dec
			Annual		
EP Penman	mm	13	78	92	131
relative humidity	%	12	79	78	75
precipitation	mm	12	38	38	57
tot.glob.rad.	MJ/m2	6	14.1	16.8	20.3
T mean	°C	13	21.2	21.8	23.1
T max	°C	13	27.4	28.0	29.1
T min	°C	13	16.2	16.6	17.6
windspeed(at 2m)	m/s	12	7.3	11.2	12.4
bright sunshine	h/d	6	7.0	7.4	8.2

PROFILE DESCRIPTION :

Ap	0 - 20 cm.	very dark gray (10YR 3.0/1.0, moist) clay loam; strong coarse subangular blocky and strong medium granular structure; slightly sticky, slightly plastic, firm; few fine pores and few medium pores; moderately porous; common fine roots throughout; frequent channels; non calcareous (10% HCL) throughout; gradual smooth boundary to
Ah	20 - 60 cm.	very dark gray (10YR 3.0/1.0, moist) clay loam; strong coarse subangular blocky into strong medium granular structure; slightly sticky, slightly plastic, firm; few medium distinct diffuse mottles (10YR 5.0/4.0); no cutans; common medium pores and common fine pores; moderately porous; few fine roots throughout; no inclusions; no fragments; frequent channels; non calcareous (10% HCL) throughout; clear irregular boundary to
Bt1	60 - 105 cm.	dark yellowish brown (10YR 4.0/4.0, moist) clay loam; strong coarse subangular blocky and moderate medium prismatic structure; sticky, plastic, very firm; none mottles; broken moderately thick slickensides cutans throughout; common fine pores and common medium pores; moderately porous; nil roots; no inclusions; no fragments; few channels; non calcareous (10% HCL) throughout; diffuse smooth boundary to
CB	105 - 130 cm.	yellowish brown (10YR 5.0/4.0, moist) gravelly clay loam; structureless structure; non sticky, non plastic, friable; none mottles; no cutans; common fine pores and few medium pores; moderately porous; nil roots; no inclusions; few medium weathered fragments; non calcareous (10% HCL) throughout; diffuse irregular boundary to
Cr	130 - 150 cm.	dark brown (10YR 4.0/3.0, moist) gravelly clay loam; structureless structure; non sticky, non plastic, friable; none mottles; no cutans; common fine pores and few medium pores; moderately porous; nil roots; no inclusions; very few medium weathered fragments; non calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000 500 250 100 50	TOT SAND	50 20	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 20	-	2 2 2 4 3	13	5 51	57	31	-	1.21	54	54	54	53	52	51	48	42
2	20 - 60	-	1 2 2 4 4	13	9 18	27	56	-	1.19	56	56	56	55	55	53	48	42
3	60 - 105	-	4 4 3 4 3	18	5 25	30	52	-	1.21	56	56	56	55	54	53	49	43
4	105 - 130	-	11 12 9 8 5	44	7 18	25	31	-	1.43	46	46	45	41	40	39	36	32
5	130 - 150	-	12 14 10 9 5	49	7 17	24	27	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE ECEC	Al SAT	EC 2.5 mS/cm
1	7.1	5.6	4.8	-	-	41.4	16.4	1.1	0.3	59.2	-	-	57.3	188	-	59.2	103	-	0.27
2	7.5	6.4	7.0	-	-	48.7	15.1	2.0	0.2	66.0	-	-	54.8	99	-	66.0	120	-	0.39
3	7.9	5.8	5.4	-	-	39.9	17.3	0.4	0.5	58.1	-	-	50.4	97	-	58.1	115	-	0.19
4	8.0	5.4	6.4	-	-	34.6	13.4	0.2	0.5	48.7	-	-	40.9	132	-	48.7	119	-	0.14
5	7.9	5.1	5.9	-	-	33.1	12.3	0.2	0.6	46.2	-	-	37.2	137	-	46.2	124	-	0.10

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	1	-	-	8	4	-	3	-	-	-	-	-	0.96	0.24	0.43	-	-	-	-	-	-
2	1	-	-	8	4	-	3	-	-	-	-	-	0.98	0.25	0.44	-	-	-	-	-	-
3	1	-	-	8	4	-	3	-	-	-	-	-	0.48	0.29	0.29	-	-	-	-	-	-
4	1	-	-	8	3	-	3	-	-	-	-	-	0.17	0.42	0.69	-	-	-	-	-	-
5	1	-	-	8	3	-	3	-	-	-	-	-	0.11	0.46	0.86	-	-	-	-	-	-

FAO/UNESCO (1988) : Calcaric Phaeozem (1974 : Rendzinas)
 USDA/SCS SOIL TAXONOMY (1992) : Entic Haplustoll, clayey over fine silty, montmorillonitic (calc(1975 : entic haplustoll)
 LOCAL CLASSIFICATION : Humico carbonatico

DIAGNOSTIC CRITERIA
 FAO (1988) : Diagnostic horizons : mollic A
 USDA/SCS (1992) : Diagnostic horizons : mollic epipedon
 : Soil moisture regime : ustic

LOCATION : Cuba Prov. V. Clara Mun. Q.de Guines CAI P.G.Toro Bloque 37 Campo 19
 Latitude : 22°49' 0'' N Longitude : 80°15' 0'' W Altitude : 50 (m.a.s.l.)
 AUTHOR(S) : Marin/Regla/Balmas. Date (mm.yy) : 7.91

GENERAL LANDFORM : valley Topography : undulating
 PHYSIOGRAPHIC UNIT : undulated
 SLOPE Gradient : 3% Aspect : Form : undulating
 POSITION OF SITE : middle slope
 MICRO RELIEF Kind : termite mounds
 SURFACE CHAR. Rock outcrop : nil Stoniness : very few stones
 Form : angular irregular Av.Size (cm) : 10
 Cracking : nil Slaking/crusting : capped
 SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL 1 : marine sediments derived from :
 Texture : clayey
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 100

WATER TABLE Depth(cm) : 140 Kind : apparent
 DRAINAGE : well
 PERMEABILITY : No slow permeable layer(s) cm
 FLOODING Frequency : nil Run off : medium
 MOISTURE CONDITIONS PROFILE : 0 - 120 cm moist

LAND USE : high level arable farming; Crops : sugar cane; no irrigation

ADDITIONAL REMARKS :

Short field description:

Shallow, moderately well drained, dark greyish brown clay. The soil has a subangular blocky structure and contains small calcareous nodules and gravels.

Geology: Neogene Era, mid-lower Miocene. Arabos formation: clays, marls, sandstone, limestone and aleurolitas.

Geomorphology: abrasive, erosive, undulating marine plains.

CLIMATE : Köppen: Aw
 Station: 22 49 N/ 80 5 W 22 m a.s.l. 29 km NE of site Relevance: good
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	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
act. evapotransp. mm	21	130	137	191	215	208	180	210	200	162	145	120	118	2021
EP Penman mm	21	76	89	132	149	158	146	164	157	126	116	87	71	1476
relative humidity %	21	82	79	77	75	79	82	80	81	83	84	84	83	81
precipitation mm	21	45	46	47	46	151	179	95	105	156	152	74	37	1139
tot.glob.rad. MJ/m ²	10	412.3	465.0	629.0	690.0	682.0	648.0	703.7	675.8	534.0	489.0	399.0	384.4	6711.5
T mean °C	21	20.8	21.2	22.7	24.0	25.4	26.4	27.1	27.1	26.2	25.3	23.5	21.9	24.3
T max °C	21	26.5	27.0	28.5	29.7	31.0	31.7	32.4	32.5	31.9	30.1	28.5	27.2	29.7
T min °C	21	15.7	16.0	17.0	18.4	20.4	21.6	22.0	22.0	21.7	20.9	18.7	16.9	19.3
windspeed(at 2m) m/s	4	2.9	3.5	4.5	3.7	3.8	3.1	3.3	2.9	2.5	2.9	3.1	2.6	3.2
bright sunshine h/d	10	6.6	7.4	8.3	9.3	8.6	7.9	8.9	8.7	7.4	7.8	7.1	6.7	7.8

PROFILE DESCRIPTION :

Ap	0 - 34 cm.	very dark gray (10YR 3.0/1.0, moist) clay; strong medium to coarse subangular blocky structure; slightly sticky, slightly plastic, friable; none mottles; no cutans; few fine pores; slightly porous; many medium roots throughout and many fine roots throughout; few medium spherical hard calcareous unsp. inclusions; no fragments; very frequent worm channels and channels; calcareous (10% HCL) throughout; diffuse smooth boundary to
AC	34 - 46 cm.	dark grayish brown (10YR 4.0/2.0, moist) clay; strong medium to coarse subangular blocky structure; slightly sticky, slightly plastic, friable; none mottles; no cutans; few fine pores; slightly porous; many medium roots throughout and many fine roots throughout; few medium spherical hard calcareous inclusions; no fragments; very frequent worm channels and channels; calcareous (10% HCL) throughout; clear irregular boundary to
CA	46 - 75 cm.	very pale brown (10YR 8.0/3.0, moist) slightly gravelly silt; moderately coherent structure; non sticky, non plastic, firm; none mottles; no cutans; common fine pores; moderately porous; few fine roots throughout; few medium spherical hard calcareous inclusions; no fragments; few worm channels and channels; strongly calcareous (10% HCL) throughout; diffuse smooth boundary to
Ck	75 - 105 cm.	white (10YR 8.0/2.0, moist) slightly gravelly silt; structureless structure; non sticky, non plastic, firm; few medium distinct clear mottles (10YR 7.0/8.0); no cutans; common fine pores; moderately porous; few fine roots throughout; no inclusions; no fragments; few channels and worm channels; strongly calcareous (10% HCL) throughout; diffuse smooth boundary to
R	105 - 120 cm.	white (10YR 8.0/1.0, moist) structureless structure; non sticky, non plastic, firm; common coarse prominent clear mottles (10YR 7.0/8.0); no cutans; few fine pores; slightly porous; nil roots; no inclusions; no fragments; strongly calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top	Bot	>2000 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT 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	34	-	1	1	1	2	3	8	7	8	15	77	-	1.27	56	54	54	50	49	47	44	37	
2	34	46	-	0	1	2	1	2	6	7	0	7	86	-	1.14	60	60	60	57	56	55	54	47	
3	46	75	-	11	8	4	3	2	28	5	36	41	31	-	-	-	-	-	-	-	-	-	-	
4	75	105	-	2	2	1	1	2	9	11	55	66	25	-	-	-	-	-	-	-	-	-	-	
5	105	120	-	0	0	0	0	1	2	4	81	85	14	-	-	-	-	-	-	-	-	-	-	

Hor. no.	pH-H2O	--KCl	CaCO3 %	ORG-C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	8.2	7.1	36.6	-	-	74.4	7.9	0.5	0.2	83.0	-	-	49.3	64	-	83.0	168	-	0.38
2	8.3	7.2	32.6	-	-	74.0	8.7	0.6	0.3	83.6	-	-	49.0	57	-	83.6	171	-	0.38
3	8.7	7.6	75.7	-	-	44.6	4.4	0.1	0.3	49.4	-	-	14.7	47	-	49.4	336	-	0.20
4	9.0	7.9	85.2	-	-	39.3	5.0	0.1	0.3	44.7	-	-	8.7	35	-	44.7	514	-	0.17
5	9.2	8.2	90.2	-	-	36.5	8.0	0.1	0.3	44.9	-	-	5.3	39	-	44.9	847	-	0.14

remarks (hor. 3 - 5): Dolomite

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	3	-	2	3	2	-	-	-	0.19	0.35	0.08	-	-	-	-	-	-
2	-	-	-	7	3	-	3	3	2	-	-	-	0.19	0.36	0.08	-	-	-	-	-	-
3	-	-	-	6	3	-	4	1	1	-	-	-	0.03	0.08	0.05	-	-	-	-	-	-
4	-	-	-	6	3	-	5	-	1	-	-	-	0.03	0.03	0.05	-	-	-	-	-	-
5	-	-	-	6	4	-	6	-	1	-	-	-	0.05	0.00	0.02	-	-	-	-	-	-

FAO/UNESCO (1988)		: Orthi-Eutric Cambisol		(1974 : Eutric Cambisol)											
USDA/SCS SOIL TAXONOMY (1992)		: Typic Ustropept, montmorillonitic, isohyperthermic		(1975 : typic ustropept)											
LOCAL CLASSIFICATION		: Pardo sin carbonato													
DIAGNOSTIC CRITERIA		FAO (1988)	: Diagnostic horizons		: ochric A, cambic B										
		USDA/SCS (1992)	: Diagnostic horizons		: ochric epipedon, cambic horizon										
			: Soil moisture regime		: ustic										
LOCATION		: Cuba Prov. Pinar del Rio Mun. Bahia Honda CAI"Harlem" Bloque 91													
AUTHOR(S)		Latitude : 22°55' 0'' N	Longitude : 83°17' 0'' W	Altitude : 25 (m.a.s.l.)											
		: Marín/Regla/Balmas.		Date (mm.yy) : 11.91											
GENERAL LANDFORM		: low hill		Topography : rolling											
PHYSIOGRAPHIC UNIT		: undulated													
SLOPE		Gradient : 12%	Aspect :		Form : undulating										
POSITION OF SITE		: crest													
MICRO RELIEF		Kind :													
SURFACE CHAR.		Rock outcrop : nil	Stoniness : very few stones												
		Form : angular irregular	Av.Size (cm) : 15												
		Cracking : nil	Slaking/crusting :												
SLOPE PROCESSES		Soil erosion : slight sheet													
		Slope stability : stable													
PARENT MATERIAL		1 : marine sediments		derived from : sedimentary rock											
		Texture :													
Remarks		:													
EFFECTIVE SOIL DEPTH(cm)		: 55													
WATER TABLE		Depth(cm) :		Kind : no watertable observed											
DRAINAGE		: moderately well													
PERMEABILITY		: slow		Slow permeable layer from : 18 to 44 cm											
FLOODING		Frequency : nil		Run off : rapid											
MOISTURE CONDITIONS PROFILE		: 0 - 90 cm moist													
LAND USE		: high level arable farming; Crops : sugar cane													
ADDITIONAL REMARKS :															
Short field description:															
Shallow, well drained, dark yellowish brown clay. There are mottles, hard calcareous and soft managanese nodules, and a massive fragipan which is weakly cemented.															
Geology: Cretaceous superior, Campaniano-maestrichtiano. Formation: San Juan y Martinez, biodetritic limestone, conglomerate, marls, at the site igneous rocks.															
Geomorphology: marine plains and terrace abrasive and abrasive accumulative, undulating and slightly undulating.															
CLIMATE :															
Station:		Köppen: Aw	3 m a.s.l		14 km ENE of site										
BAHIA HONDA		22 55 N/ 83 10 W		Relevance: good											
		No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
act. evapotransp. mm		21	151	148	184	201	215	190	196	198	173	168	151	148	2128
EP Penman mm		21	79	88	131	147	156	146	151	147	127	111	88	78	1455
relative humidity %		21	78	78	77	76	79	81	81	82	83	83	82	80	80
precipitation mm		21	75	79	85	70	160	209	165	155	168	190	100	78	1538
tot.glob.rad. MJ/m2		21	403.2	448.0	638.6	690.1	682.0	630.0	651.0	651.0	540.0	486.7	390.0	372.0	6582.6
T mean °C		21	21.1	21.3	22.9	24.4	25.9	26.7	26.9	26.3	25.1	23.6	22.2	24.5	
T max °C		21	26.2	26.4	28.3	29.6	30.7	31.4	32.1	32.3	31.6	29.9	28.3	27.0	29.5
T min °C		21	16.4	16.5	18.0	19.1	21.2	22.5	22.7	22.8	22.5	21.6	19.8	17.8	20.1
windspeed(at 2m) m/s		21	2.3	2.5	3.2	2.6	2.6	2.2	1.9	1.9	2.1	2.2	2.4	2.5	2.3
bright sunshine h/d		21	6.4	7.3	8.5	9.2	8.5	7.9	8.1	8.1	7.4	7.2	6.9	6.4	7.6

PROFILE DESCRIPTION.:

Ap	0 - 18 cm.	very dark grayish brown (10YR 3.0/2.0, moist) clay loam; strong medium angular blocky structure; slightly sticky, plastic; none mottles; no cutans; few very fine pores and common medium pores; moderately porous; common medium roots throughout; no inclusions; no fragments; frequent worm channels and channels; non calcareous (10% HCL); gradual irregular boundary to
Bw	18 - 44 cm.	dark yellowish brown (10YR 3.0/4.0, moist) clay loam; strong medium subangular blocky structure; slightly sticky, plastic, firm; common fine distinct clear mottles (10YR 5.0/8.0); no cutans; few micro pores; slightly porous; few very fine roots throughout; no inclusions; no fragments; few worm channels; non calcareous (10% HCL); clear irregular boundary to
BC	44 - 55 cm.	dark yellowish brown (10YR 4.0/4.0, moist) sandy clay loam; structureless structure; slightly sticky, slightly plastic, firm; many heterogeneous distinct diffuse mottles (10YR 5.0/8.0) and few fine faint clear mottles (10YR 5.0/1.0); no cutans; few micro pores and few very fine pores; slightly porous; nil roots; few large spherical hard calcareous nodules and frequent large irregular hard manganiferous soft segregations; frequent medium weathered hor.bed.clayst. fragments; non calcareous (10% HCL); clear irregular boundary to
C	55 - 90 cm.	dark yellowish brown (10YR 4.0/4.0, moist) structureless structure; non sticky, firm; many coarse prominent diffuse mottles (7.5YR 2.0/0.0); no cutans; none pores; nil roots; frequent large spherical hard calcareous nodules and few large irregular hard manganiferous soft segregations; frequent coarse weathered hor.bed.clayst. fragments; slightly calcareous (10% HCL) locally; gradual irregular boundary to
CR	90 - 115 cm.	yellowish brown (10YR 5.0/8.0, moist) structureless structure; non sticky, non plastic, firm; many coarse distinct diffuse mottles (7.5YR 5.0/8.0) and common medium distinct diffuse mottles (2.5Y 5.0/2.0); no cutans; none pores; nil roots; frequent large spherical hard calcareous nodules; very frequent medium fresh hor.bed.clayst. fragments; slightly calcareous (10% HCL) locally;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pF- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	5 - 18	-	-	-	-	-	-	-	-	-	-	-	-	1.08	59	59	59	58	58	57	-	-
2	20 - 25	-	-	-	-	-	-	-	-	-	-	-	-	0.99	63	62	62	62	62	61	-	-
3	50 - 55	-	-	-	-	-	-	-	-	-	-	-	-	1.14	57	56	56	54	54	53	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE ECEC	Al SAT %	EC 2.5 mS/cm
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

FAO/UNESCO (1988)		: Ferralic Cambisol		(1974 : Ferralic Cambisol)	
USDA/SCS SOIL TAXONOMY (1992)		: Oxic Dystropept, clayey, mixed, isohyperthermic		(1975 : oxic dystropept)	
LOCAL CLASSIFICATION		: Ferralitico rojo amarillo lix.			
DIAGNOSTIC CRITERIA		FAO (1988)	: Diagnostic horizons		: ochric A, cambic B
			: Diagnostic properties		: ferralic properties
		USDA/SCS (1992)	: Diagnostic horizons		: ochric epipedon, calcic horizon
			: Soil moisture regime		: udic
LOCATION		: Cuba Prov. Cienfuegos Mun. Cumanayagua EPICA Lote de Hibradacion			
AUTHOR(S)		Latitude : 21°55' 0'' N	Longitude : 80°15' 0'' W	Altitude : 1140 (m.a.s.l.)	
		: Marin/Regla/Balmas.		Date (mm.yy) : 12.91	
GENERAL LANDFORM		: intermontane basin		Topography : mountainous	
PHYSIOGRAPHIC UNIT		: mountainous			
SLOPE		Gradient : 4%	Aspect :		Form : undulating
POSITION OF SITE		: lower slope			
MICRO RELIEF		Kind :			
SLOPE PROCESSES		Soil erosion : slight sheet			
		Slope stability : stable			
PARENT MATERIAL		1 : residual material		derived from : limestone	
Remarks		Texture :			
		:			
EFFECTIVE SOIL DEPTH(cm)		: 150			
WATER TABLE		Depth(cm) : 400		Kind :	
DRAINAGE		: well			
PERMEABILITY		:		No slow permeable layer(s) cm	
FLOODING		Frequency : nil		Run off : rapid	
MOISTURE CONDITIONS PROFILE		: 0 - 160 cm moist			
LAND USE		: high level arable farming; Crops : sugar cane; no irrigation			
VEGETATION		Type : evergreen woodland		Status : cut over	
ADDITIONAL REMARKS :					
Short field description:					
Very deep, well drained, strong brown, clay loam. Well structured, with diffuse boundaries, porous ferromanganese concretions.					
Geology: Jurassic higher, oxfordiano and tithoniano: limestones, marbles. Geomorphology: tectonic-lithological low mountain.					
The monolith was taken in a small area (40 cm x 40 cm), surrounded by coffee and degraded forest.					
CLIMATE :					
Station:		Köppen: Aw	21 55 N/ 80 1 W		771 m a.s.l
TOPES DE COLLANTES				13 km ESE of site	Relevance: very good
		No. years of record	Jan	Feb	Mar
			Apr	May	Jun
			Jul	Aug	Sep
			Oct	Nov	Dec
			Annual		
EP Penman	mm	12	63	70	97
relative humidity	%	12	86	84	82
precipitation	mm	12	60	67	67
tot.glob.rad.	MJ/m2	12	420.1	476.0	600.3
T mean	°C	12	17.4	17.5	17.8
T max	°C	12	22.2	22.6	24.2
T min	°C	12	13.9	13.8	15.1
windspeed(at 2m)	m/s	12	1.6	1.6	1.6
bright sunshine	h/d	12	7.0	7.4	8.2

PROFILE DESCRIPTION :

Ap	0 - 21 cm.	strong brown (7.5YR 4.0/6.0, moist) clay loam; strong very fine granular and strong medium subangular blocky structure; slightly sticky, slightly plastic, firm; none mottles; no cutans; common very fine pores; moderately porous; few medium roots throughout; few small spherical soft manganiferous concretions; no fragments; few worm channels; non calcareous (10% HCL) throughout; gradual smooth boundary to
AB	21 - 48 cm.	strong brown (7.5YR 4.0/6.0, moist) clay loam; moderate fine subangular blocky structure; sticky, slightly plastic, firm; none mottles; no cutans; few medium pores and common very fine pores; moderately porous; few medium roots throughout; frequent small spherical soft manganiferous concretions; no fragments; few channels and worm channels; non calcareous (10% HCL) throughout; gradual smooth boundary to
Bs	48 - 75 cm.	strong brown (7.5YR 5.0/8.0, moist) clay; moderate medium subangular blocky to weak to moderate fine angular blocky structure; sticky, plastic, firm; none mottles; patchy thin clay and sesquioxides cutans throughout; few medium pores and common very fine pores; moderately porous; few medium roots throughout; frequent small spherical soft manganiferous nodules; no fragments; few channels; non calcareous (10% HCL) throughout; gradual smooth boundary to
Bc1	75 - 118 cm.	strong brown (7.5YR 5.0/8.0, moist) clay; moderate fine to medium angular blocky and moderate medium subangular blocky structure; sticky, plastic, very firm; none mottles; broken moderately thick clay cutans throughout; few very fine pores; moderately porous; few fine roots throughout; frequent medium spherical soft manganiferous nodules; no fragments; few channels; non calcareous (10% HCL) throughout; gradual smooth boundary to
Bc2	118 - 160 cm.	yellowish brown (10YR 5.0/8.0, moist) clay loam; weak to moderate medium angular blocky and weak to moderate medium subangular blocky structure; slightly sticky, slightly plastic, firm; none mottles; patchy thin clay cutans throughout; few very fine pores; moderately porous; nil roots; very frequent medium spherical soft manganiferous nodules; no fragments; few channels; non calcareous (10% HCL);

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH- 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0 - 21	-	5	5	3	5	6	25	38	10	49	27	-	1.42	44	42	38	31	30	25	21	16
2	21 - 48	-	5	4	3	4	7	22	25	24	49	29	-	-	-	-	-	-	-	-	-	-
2	25 - 30	-	-	-	-	-	-	-	-	-	-	-	-	1.41	39	37	34	30	29	27	20	16
2	40 - 45	-	-	-	-	-	-	-	-	-	-	-	-	1.27	47	43	37	31	30	27	18	15
3	48 - 75	-	4	4	3	4	6	22	26	23	48	30	-	-	-	-	-	-	-	-	-	-
4	75 - 90	-	3	3	3	4	6	18	28	21	50	32	-	-	-	-	-	-	-	-	-	-
5	90 - 118	-	2	2	2	3	6	16	29	24	53	32	-	-	-	-	-	-	-	-	-	-
6	118 - 140	-	2	3	2	4	7	17	33	24	56	26	-	-	-	-	-	-	-	-	-	-
7	140 - 160	-	2	3	2	4	7	18	30	26	56	26	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	----- Na	sum H+Al	EXCH AC. Al	CEC soil	----- clay	----- OrgC	----- ECEC	BASE SAT %	AL SAT %	EC 2.5 mS/cm	
1	4.8	4.4	-	1.04	-	1.0	0.3	0.3	0.0	1.6	-	-	5.7	21	3.6	1.6	28	-	0.10
2	4.6	4.2	-	0.76	-	1.2	0.3	0.3	0.0	1.8	-	-	5.3	18	2.7	1.8	34	-	0.08
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	5.1	4.5	-	0.34	-	1.0	0.3	0.3	0.1	1.7	-	-	3.2	11	1.2	1.7	53	-	0.07
4	5.0	4.6	-	0.21	-	1.4	0.3	0.3	0.1	2.1	-	-	3.9	12	0.7	2.1	54	-	0.07
5	5.2	4.3	-	0.16	-	1.4	0.3	0.1	0.0	1.8	-	-	3.4	11	0.6	1.8	53	-	0.06
6	4.7	4.1	-	0.33	-	1.2	0.3	0.2	0.0	1.7	-	-	3.5	13	1.2	1.7	49	-	0.06
7	4.3	4.1	-	0.06	-	0.6	0.0	0.1	0.0	0.7	-	-	2.8	11	0.2	0.7	25	-	0.07

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	-	-	-	3	-	4	-	2	-	4	-	-	-	-	-	-	-	-	-	-
2	2	-	-	-	3	-	4	-	2	-	4	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	2	-	-	-	3	-	4	-	2	-	4	-	-	-	-	-	-	-	-	-	-
4	2	-	-	-	4	-	4	-	2	-	4	-	-	-	-	-	-	-	-	-	-
5	2	-	-	-	4	-	4	-	2	-	4	-	-	-	-	-	-	-	-	-	-
6	2	-	-	-	4	-	4	-	2	-	4	-	-	-	-	-	-	-	-	-	-
7	2	-	-	-	4	-	4	-	2	-	4	-	-	-	-	-	-	-	-	-	-

FAO/UNESCO (1988)	: Verti-Eutric Gleysol	(1974 : Eutric Gleysol)
USDA/SCS SOIL TAXONOMY (1992)	: Ustic Epiaquept, clayey, montmorillonitic, isohyperthermic	(1975 : typic haplaquoll)
LOCAL CLASSIFICATION	: Gley humico	
DIAGNOSTIC CRITERIA	FAO (1988)	: Diagnostic horizons : ochric A
	USDA/SCS (1992)	: Diagnostic properties : gleyic properties, vertic properties
		: Diagnostic horizons : ochric epipedon
		: Diagnostic properties : aquic conditions, slickensides
		: Soil moisture regime : ustic
LOCATION	: Cuba Prov. Villa Clara, Camajuani CAI Batalla de Sta Clara Bloque Exp.	
AUTHOR(S)	Latitude : 22°35' 0'' N	Longitude : 79°45' 0'' W Altitude : 8 (m.a.s.l.)
	: MARIN/REGLA/BALMAS.	Date (mm.yy) : 12.91
GENERAL LANDFORM	: coastal plain	Topography : flat or almost flat
PHYSIOGRAPHIC UNIT	: flat or almost flat	
SLOPE	Gradient : 1%	Aspect : Form : straight
POSITION OF SITE	: flat	
MICRO RELIEF	Kind :	
SURFACE CHAR.	Rock outcrop :	Stoniness :
	Cracking : small cracks	Slaking/crusting :
SLOPE PROCESSES	Soil erosion :	
PARENT MATERIAL	1 : marine sediments	derived from : claystone
	Texture :	
Remarks	:	
EFFECTIVE SOIL DEPTH(cm)	: 60	
WATER TABLE	Depth(cm) : 120	Kind : groundwater table
	Estimated highest level : 100	Estimated lowest level : 200
DRAINAGE	: imperfectly	
PERMEABILITY	: slow	Slow permeable layer from : 25 to 40 cm
FLOODING	Frequency : irregular, fresh water	Run off : slow
MOISTURE CONDITIONS PROFILE	: 0 - 150 cm moist	
LAND USE	: high level arable farming; Crops : sugar cane; no irrigation	
VEGETATION	Type : semi deciduous woodland	Status : secondary

ADDITIONAL REMARKS :

Short field description

Deep, poorly drained, grey clay. The subsoil has blackish mottles, a strong prismatic structure and slickensides.

Geomorphology: fluvio-marine terrace, deltaic, flat to slightly undulating.

Geology: Pleistocene, clays, gravels.

CLIMATE :	Köppen: Aw													
Station:	22 49 N/ 80 5 W	22 m a.s.l	45 km NW of site	Relevance: moderate										
SAGUA LA GRANDE 338														
	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
act. evapotransp. mm	21	130	137	191	215	208	180	210	200	162	145	120	118	2021
EP Penman mm	21	76	89	132	149	158	146	164	157	126	116	87	71	1476
relative humidity %	21	82	79	77	75	79	82	80	81	83	84	84	83	81
precipitation mm	21	45	46	47	46	151	179	95	105	156	152	74	37	1139
tot.glob.rad. MJ/m2	10	412.3	465.0	629.0	690.0	682.0	648.0	703.7	675.8	534.0	489.0	399.0	384.4	6711.5
T mean °C	21	20.8	21.2	22.7	24.0	25.4	26.4	27.1	27.1	26.2	25.3	23.5	21.9	24.3
T max °C	21	26.5	27.0	28.5	29.7	31.0	31.7	32.4	32.5	31.9	30.1	28.5	27.2	29.7
T min °C	21	15.7	16.0	17.0	18.4	20.4	21.6	22.0	22.0	21.7	20.9	18.7	16.9	19.3
windspeed(at 2m) m/s	4	2.9	3.5	4.5	3.7	3.8	3.1	3.3	2.9	2.5	2.9	3.1	2.6	3.2
bright sunshine h/d	10	6.6	7.4	8.3	9.3	8.6	7.9	8.9	8.7	7.4	7.8	7.1	6.7	7.8

PROFILE DESCRIPTION :

Ap	0 - 25 cm.	very dark gray (10YR 3.0/1.0, moist) clay; strong coarse prismatic structure; sticky, plastic, hard; none mottles; no cutans; few very fine pores and common coarse pores; highly porous; many coarse roots throughout; no inclusions; no fragments; frequent worm channels and channels; non calcareous (10% HCL) throughout; clear irregular boundary to
Cg1	25 - 60 cm.	light gray (10YR 7.0/2.0, moist) clay; strong medium to coarse prismatic structure; sticky, plastic, slightly hard; many coarse prominent clear mottles (10YR 4.0/4.0); broken moderately thick slickensides cutans throughout; few very fine pores and common coarse pores; moderately porous; common coarse roots throughout; no inclusions; no fragments; frequent worm channels; non calcareous (10% HCL); gradual irregular boundary to
Cg2	60 - 110 cm.	grayish brown (10YR 5.0/2.0, moist) clay loam; moderate fine to medium prismatic structure; slightly sticky, slightly plastic, slightly hard; common medium prominent clear mottles (10YR 4.0/4.0) and common coarse prominent clear mottles (10YR 3.0/2.0); broken thick slickensides cutans throughout; few very fine pores and few fine pores; slightly porous; few medium roots throughout; no inclusions; no fragments; non calcareous (10% HCL) throughout; gradual smooth boundary to
Ck3	110 - 150 cm.	dark brown (10YR 4.0/3.0, moist) massive structure; slightly sticky, slightly plastic, slightly hard; none mottles; no cutans; common very fine pores and many fine pores; slightly porous; nil roots; few large irregular hard calcareous nodules; no fragments; calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT 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	25	-	0	0	1	4	4	9	7	20	26	65	-	1.09	58	57	57	56	56	55	47	39	
2	25	60	-	0	0	1	5	4	12	6	18	24	65	-	-	-	-	-	-	-	-	-	-	
2	25	30	-	-	-	-	-	-	-	-	-	-	-	-	1.18	59	58	58	57	57	55	45	36	
2	45	50	-	-	-	-	-	-	-	-	-	-	-	-	1.19	58	57	57	56	56	55	45	36	
3	60	110	-	0	0	1	7	5	14	7	19	26	60	-	-	-	-	-	-	-	-	-	-	
4	110	150	-	0	0	4	14	8	27	11	18	29	44	-	-	-	-	-	-	-	-	-	-	

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	----- Na	----- sum	EXCH H+Al	AC. Al	CEC soil	----- clay	----- OrgC	----- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	6.4	5.3	-	1.28	-	35.3	28.0	0.2	0.6	64.1	-	-	60.2	93	4.5	64.1	106	-	0.13
2	7.7	6.6	-	0.17	-	51.2	26.2	0.2	0.9	78.5	-	-	52.6	82	0.6	78.5	149	-	0.28
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	8.3	6.9	-	0.08	-	61.9	27.5	0.2	0.7	90.3	-	-	45.3	75	0.3	90.3	199	-	0.22
4	8.4	7.0	-	0.07	-	48.3	22.4	0.2	1.0	71.9	-	-	38.3	86	0.2	71.9	188	-	0.20

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	-	-	-	8	4	-	-	4	3	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	8	4	-	-	4	3	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	8	4	-	-	4	3	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	8	4	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-

FAO/UNESCO (1988) : Orthi-Calcaric Cambisol (1974 : Calcic Cambisol)
 USDA/SCS SOIL TAXONOMY (1992) : Typic Eutropept, montmorillonitic(calc.), isohyperthermic (1975 : typic eutropept)
 LOCAL CLASSIFICATION : Pardo con carbonato

DIAGNOSTIC CRITERIA
 FAO (1988) : Diagnostic horizons : ochric A, cambic B
 : Diagnostic properties : soft powdery lime
 USDA/SCS (1992) : Diagnostic horizons : ochric epipedon, cambic horizon
 : Soil moisture regime : ustic

LOCATION : Cuba Prov. Las Tunas, Puerto Padre CAI "Antonio Guiteras" Bloque Exp.
 Latitude : 21°10' 0'' N Longitude : 76°35' 0'' W Altitude : 40 (m.a.s.l.)
 AUTHOR(S) : REGLA/MARIN/SIXTO Date (mm.yy) : 12.91

GENERAL LANDFORM : plain Topography : undulating
 PHYSIOGRAPHIC UNIT : undulated
 SLOPE Gradient : 3% Aspect : Form : undulating
 POSITION OF SITE : flat
 MICRO RELIEF Kind :
 SURFACE CHAR. Rock outcrop : nil Stoniness : nil
 Cracking : small cracks Slaking/crusting :
 SLOPE PROCESSES Soil erosion :

PARENT MATERIAL 1 : marine sediments derived from : calcareous
 Texture :
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 100

WATER TABLE Depth(cm) : Kind : no watertable observed
 DRAINAGE : well
 PERMEABILITY : moderate Slow permeable layer from : 65 to 80 cm
 FLOODING Frequency : nil Run off : rapid
 MOISTURE CONDITIONS PROFILE : 0 - 150 cm moist

LAND USE : high level arable farming; Crops : sugar cane; no irrigation
 VEGETATION Type : dwarf shrub Status : secondary

ADDITIONAL REMARKS :
 Short field description
 Moderately deep, well drained, brown clay. Small surface cracks, (sub)angular blocky structure, with weathered calcareous fragments.
 Geology: mid-lower Miocene, formation 'Vazquez': marls, limestones, clays.
 Geomorphology: marine plain and terrace, abrasive, erosive and undulating.

CLIMATE : Köppen: Aw
 Station: 21 12 N/ 76 37 W 13 m a.s.l. 10 km NNE of site Relevance: good
 PUERTO PADRE

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
act. evapotransp. mm	21	155	176	224	231	246	239	261	260	219	188	165	151	2520
EP Penman mm	21	89	98	139	151	157	158	178	171	141	123	101	89	1600
relative humidity %	21	81	79	78	76	80	82	79	79	82	84	83	82	80
precipitation mm	21	41	42	37	48	121	107	54	74	98	144	98	44	914
tot.glob.rad. MJ/m2	10	412.3	464.8	629.3	693.0	694.4	648.0	703.7	675.8	534.0	505.3	399.0	384.4	6744.0
T mean °C	21	22.9	22.8	24.0	25.2	26.5	27.5	28.2	28.0	27.4	26.5	25.2	23.7	25.0
T max °C	21	27.8	28.1	29.1	30.0	31.1	32.0	32.6	32.9	32.4	31.4	29.6	28.1	30.0
T min °C	21	18.5	18.3	19.4	20.3	21.9	22.9	23.7	23.3	22.6	22.0	21.2	19.4	21.0
windspeed(at 2m) m/s	21	2.3	2.7	3.1	2.5	2.6	2.4	3.1	2.7	2.1	1.9	2.5	2.5	2.6
bright sunshine h/d	10	6.6	7.4	8.3	9.3	8.6	7.9	8.9	8.7	7.4	7.8	7.1	6.7	7.8

PROFILE DESCRIPTION :

Ap	0 - 20 cm.	very dark grayish brown (10YR 3.0/2.0, moist) clay; strong fine to medium granular and strong medium subangular blocky structure; slightly sticky, slightly plastic, friable; none mottles; no cutans; many fine pores and common medium pores; highly porous; many fine roots throughout; no inclusions; no fragments; few channels and worm channels; slightly calcareous (10% HCL) throughout; clear irregular boundary to
Bw	20 - 45 cm.	brown (10YR 5.0/3.0, moist) clay; strong medium granular and strong medium subangular blocky structure; slightly sticky, plastic, firm; common fine pores and few medium pores; highly porous; common medium roots throughout; few channels and worm channels; slightly calcareous (10% HCL) throughout; clear irregular boundary to
CB	45 - 66 cm.	light yellowish brown (2.5Y 6.0/4.0, moist) slightly gravelly loam; strong medium to coarse subangular blocky structure; slightly sticky, slightly plastic, firm; common fine pores and common medium pores; moderately porous; few medium roots throughout and many fine roots throughout; frequent medium weathered calcareo fragments; slightly calcareous (10% HCL) throughout; gradual irregular boundary to
C	66 - 90 cm.	white (2.5Y 8.0/2.0, moist) slightly gravelly loam; massive structure; non sticky, non plastic, very firm; common fine pores and common coarse pores; moderately porous; few medium roots throughout; frequent medium weathered calcareo fragments; calcareous (10% HCL) throughout; gradual smooth boundary to
Cr	90 - 150 cm.	light olive brown (2.5Y 5.0/6.0, moist) stony; massive structure; non sticky, non plastic, very firm; none pores; nil roots; very frequent coarse strongly weathered calcareo fragments; calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT 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 - 20	-	1	1	2	5	4	13	8	15	23	64	-	0.92	63	61	56	49	46	44	37	30
2	20 - 45	-	1	2	2	5	4	13	8	13	22	65	-	1.00	60	59	55	52	50	49	43	36
3	45 - 66	-	4	8	10	14	8	45	13	19	32	24	-	1.54	40	39	35	30	29	27	26	26
4	66 - 90	-	2	7	10	14	9	41	12	19	32	27	-	-	-	-	-	-	-	-	-	-
5	90 - 150	-	5	8	11	16	10	50	12	16	28	22	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	7.0	6.7	-	1.98	-	80.6	10.1	0.6	0.9	92.2	-	-	68.4	107	6.9	92.2	135	-	0.29
2	8.2	6.8	-	0.98	-	97.2	12.4	0.4	1.0	111	-	-	73.2	112	3.4	111	152	-	0.26
3	8.4	6.8	-	0.24	-	89.8	10.9	0.2	3.2	104	-	-	70.0	297	0.8	104	149	-	0.15
4	8.5	7.2	-	0.20	-	71.8	14.8	0.1	1.5	88.2	-	-	47.3	173	0.7	88.2	186	-	0.28
5	8.6	7.1	-	0.13	-	59.9	15.6	0.1	1.8	77.4	-	-	52.2	234	0.5	77.4	148	-	0.22

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	-	-	8	1	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-
2	2	-	-	8	1	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-
3	2	-	-	8	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
4	2	-	-	8	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
5	2	-	-	8	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-

FAO/UNESCO (1988) : Sodi-Calcic Solonchak
 (1974) : Orthic Solonchak, sodic phase
 USDA/SCS SOIL TAXONOMY (1992) : Aeric Halaquept, clayey, montmorillonitic(calc.), isohyperthermi(1975 : aeric halaquept)
 LOCAL CLASSIFICATION : Solonchak tipico

DIAGNOSTIC CRITERIA FAO (1988) : Diagnostic horizons : ochric A, cambic B
 : Diagnostic properties : salic properties
 USDA/SCS (1992) : Diagnostic horizons : ochric epipedon, cambic horizon, calcic horizon
 : Soil moisture regime : ustic

LOCATION : Cuba Prov. y Mun. Guantanamo CAI "Paraguay" Bloque El Algarrobo.
 Latitude : 20° 2' 0'' N Longitude : 75°10' 0'' W Altitude : 21 (m.a.s.l.)
 AUTHOR(S) : MARIN/REGLA/CABRERA Date (mm.yy) : 12.91

GENERAL LANDFORM : alluvial plain Topography : flat or almost flat
 PHYSIOGRAPHIC UNIT : almost flat slightly undulated
 SLOPE Gradient : 4% Aspect : Form : straight
 POSITION OF SITE : flat
 MICRO RELIEF Kind : level Pattern : linear Height (cm) : 30
 SURFACE CHAR. Rock outcrop : nil Stoniness :
 Cracking : large cracks Slaking/crusting :
 Salt : strong Alkali : moderate
 SLOPE PROCESSES Soil erosion : slight sheet
 Slope stability : stable

PARENT MATERIAL 1 : alluvium derived from : sedimentary rock
 Texture :
 PARENT MATERIAL 2 : Derived from : claystone
 Texture :
 Weathering degree : Resistance :
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 100

WATER TABLE Depth(cm) : 102 Kind : groundwater table
 Estimated highest level : 60 Estimated lowest level : 200
 DRAINAGE : poor
 PERMEABILITY : moderate Slow permeable layer from : 43 to 85 cm
 FLOODING Frequency : nil Run off : medium
 MOISTURE CONDITIONS PROFILE : 0 - 160 cm moist 160 - 180 cm wet

LAND USE : high level arable farming; Crops : sugar cane; continuously irrigated
 VEGETATION Type : shrub Status : degraded

ADDITIONAL REMARKS :

Short field description:

Moderately deep, imperfectly drained, brown to light olive brown clay loam. Soil structure moderate angular blocky and medium prismatic to columnar. There are frequent calcareous nodules in the subsoil.

Geology: Eogene mid-higher. San Luis Formation: limestone, marls, conglomerate, sandstones.

Geomorphology: marine plain and terrace, erosive and undulating.

CLIMATE :	Köppen: Bs													
Station: HORQUETA	30 30 N/340 23 W	100 m a.s.l	12 km SW of site										Relevance: very good	
	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1 (see remarks)	28	75.0	73.0	72.0	72.0	76.0	77.0	73.0	74.0	79.0	81.0	78.0	75.0	75.0
act. evapotransp. mm	28	164	173	197	225	203	219	238	237	199	185	158	147	2345
EP (see remarks)	21	20.5	20.8	22.6	24.1	25.8	26.6	26.9	26.7	26.1	25.1	23.2	21.6	24.2
EP Penman mm	28	102	107	141	148	147	140	157	154	129	115	104	101	1546
precipitation mm	28	24	40	48	63	147	82	48	69	98	152	49	25	838
T mean °C	28	23.3	23.4	25.2	25.3	26.3	26.9	27.9	27.9	27.3	26.7	25.4	23.8	25.8
T max °C	28	30.2	30.4	31.0	31.5	31.7	32.6	33.7	34.0	33.4	32.2	31.5	30.9	31.9
T min °C	28	17.1	17.2	18.3	19.3	20.9	21.7	21.9	21.8	21.7	21.3	20.9	17.8	20.0
windspeed(at 2m) m/s	28	1.9	2.2	2.4	2.4	1.9	1.9	2.1	2.2	1.8	1.6	1.6	1.9	2.0

PROFILE DESCRIPTION :

Ap	0 - 20 cm.	brown (10YR 5.0/3.0, moist) clay loam; moderate medium prismatic to strong medium angular blocky structure; slightly sticky, slightly plastic, friable; none mottles; no cutans; common fine pores; moderately porous; many very fine to coarse roots throughout; no inclusions; no fragments; frequent channels; non calcareous (10% HCL) throughout; clear smooth boundary to
B1	20 - 43 cm.	light olive brown (2.5Y 5.0/4.0, moist) clay loam; strong medium to coarse prismatic and moderate medium columnar structure; slightly sticky, slightly plastic, firm; none mottles; no cutans; common fine pores; moderately porous; common medium roots throughout and common fine roots throughout; no inclusions; no fragments; non calcareous (10% HCL) throughout; gradual smooth boundary to
BC	43 - 85 cm.	10Y 6.0/3.0, moist clay loam; moderate fine to medium prismatic and moderate medium columnar structure; sticky, plastic, very firm; none mottles; no cutans; few medium pores; moderately porous; few very fine to coarse roots throughout; no inclusions; no fragments; strongly cemented continuous massive salt pan; non calcareous (10% HCL) throughout; gradual wavy boundary to
Cg1	85 - 120 cm.	10Y 6.0/3.0, moist clay loam; moderate medium columnar structure; sticky, slightly plastic, firm; none mottles; no cutans; few medium pores; moderately porous; few medium roots throughout and few fine roots throughout; very frequent medium spherical soft calcareous nodules; no fragments; non calcareous (10% HCL) throughout; clear smooth boundary to
Cg2	120 - 180 cm.	10Y 6.0/4.0, moist loam; massive structure; non sticky, non plastic, friable; none mottles; no cutans; few medium pores; moderately porous; nil roots; very frequent medium spherical soft calcareous nodules; no fragments; non calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT 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	20	-	0	0	0	0	1	1	9	31	40	59	-	1.21	54	53	50	45	43	41	36	34
2	20	43	-	0	0	0	0	1	1	10	27	36	63	-	1.27	52	51	49	46	45	44	37	31
3	43	85	-	0	0	0	0	0	1	15	18	33	67	-	1.32	51	51	50	49	47	46	41	32
4	85	120	-	0	0	0	0	1	2	8	27	36	63	-	-	-	-	-	-	-	-	-	-
5	120	150	-	0	0	0	0	2	2	12	29	40	58	-	-	-	-	-	-	-	-	-	-
6	150	180	-	0	0	0	0	2	3	18	33	50	47	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	---- K	---- Na	---- sum	EXCH H+Al	AC. Al	CEC soil	---- clay	---- OrgC	---- ECEC	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	8.4	7.4	-	2.23	-	60.2	11.3	0.9	17.1	89.5	-	-	37.0	62	7.8	89.5	242	-	3.10
2	8.2	7.5	-	1.25	-	74.2	14.2	0.4	21.4	110	-	-	36.4	58	4.4	110	303	-	10.00
3	8.5	7.7	-	0.76	-	82.8	14.9	0.3	28.9	127	-	-	35.3	53	2.7	127	359	-	10.00
4	8.8	7.9	-	0.34	-	58.1	12.0	0.4	27.5	98.0	-	-	31.4	50	1.2	98.0	312	-	7.00
5	9.0	7.9	-	0.28	-	52.9	11.5	0.4	24.7	89.5	-	-	30.0	52	1.0	89.5	298	-	2.10
6	9.2	7.7	-	0.18	-	48.6	11.1	0.3	6.9	66.9	-	-	26.7	56	0.6	66.9	251	-	4.20

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	-	-	-	8	4	-	5	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	8	5	-	5	3	3	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	8	5	-	5	3	3	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	8	5	-	5	3	3	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	8	5	-	5	3	3	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	8	4	-	5	3	3	-	-	-	-	-	-	-	-	-	-	-	-

FAO/UNESCO (1988) : Orthi-Calciic Kastanozem (1974 : Calcaric Phaeozem)
 USDA/SCS SOIL TAXONOMY (1992) : Typic Calciustoll, clayey, mixed(calcareous), isohyperthermic (1975 : typic calciustoll)
 LOCAL CLASSIFICATION : Pardo con carbonato secundario

DIAGNOSTIC CRITERIA
 FAO (1988) : Diagnostic horizons : mollic A, cambic B, calcic
 USDA/SCS (1992) : Diagnostic horizons : mollic epipedon, cambic horizon, calcic horizon
 : Soil moisture regime : ustic

LOCATION : Cuba Provincia Guantánamo Municipio y CAI El Salvador Bloque 5
 Latitude : 20°12' 0'' N Longitude : 75°12' 0'' W Altitude : 54 (m.a.s.l.)
 AUTHOR(S) : REGLA/MARIN/CABRERA Date (mm.yy) : 12.91

GENERAL LANDFORM : low hill Topography : undulating
 PHYSIOGRAPHIC UNIT : Undulated
 SLOPE Gradient : 3% Aspect : Form : undulating
 POSITION OF SITE : lower slope
 MICRO RELIEF Kind : levees (artificial) Pattern : reticulate Height (cm) : 70
 SURFACE CHAR. Rock outcrop : nil Stoniness : fairly stony
 Form : platy, flat Av.Size (cm) : 45
 Cracking : small cracks Slaking/crusting :
 SLOPE PROCESSES Soil erosion : moderate gully
 Slope stability : locally unstable

PARENT MATERIAL 1 : colluvium derived from : limestone
 Texture :
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 100

WATER TABLE Depth(cm) : 300 Kind : no watertable observed
 Estimated highest level : 300 Estimated lowest level : 500
 DRAINAGE : moderately well
 PERMEABILITY : moderate Slow permeable layer from : 28 to 60 cm
 FLOODING Frequency : irregular, fresh water Run off : medium
 MOISTURE CONDITIONS PROFILE : 0 - 150 cm moist

LAND USE : high level arable farming; Crops : sugar cane
 VEGETATION Type : semi deciduous shrub Status : secondary

ADDITIONAL REMARKS :

Short field description

Deep, moderately well drained, yellowish brown clay. (Sub)angular blocky structure, medium porous, soft calcareous nodules.

Geology: middle high Eocene: sandstone, marls, limestones and conglomerate.

Geomorphology: marine plains and terrace, abrasive, denudative and hilly.

CLIMATE : Köppen: Aw
 Station: 20° 8' N/ 75° 14' W 15 m a.s.l. 10 km S of site Relevance: good
 GUANTANAMO 368

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
act. evapotransp. mm	12	154	167	197	195	177	189	204	204	171	141	133	137	1870
EP Penman mm	21	89	95	137	139	141	135	152	160	123	107	95	97	1460
relative humidity %	21	76	74	72	72	77	78	74	76	80	81	79	76	76
precipitation mm	21	32	35	69	97	158	87	61	99	138	128	69	26	1002
tot.glob.rad. MJ/m2	4	486.7	501.2	638.6	654.0	657.2	606.0	632.4	616.9	534.0	492.9	456.0	458.8	6734.7
T mean °C	21	23.1	23.2	24.3	25.2	26.1	27.1	27.8	27.4	26.8	25.9	25.0	23.7	25.5
T max °C	21	30.0	30.1	31.0	31.6	31.8	32.6	33.8	33.9	32.8	32.3	31.2	30.4	31.0
T min °C	21	17.1	17.4	18.2	19.2	20.8	21.7	21.9	21.9	21.6	21.2	19.9	17.9	20.0
windspeed(at 2m) m/s	4	1.3	1.6	1.9	1.5	1.1	1.1	1.7	1.5	1.1	0.7	1.3	1.3	1.3
bright sunshine h/d	4	7.7	7.7	8.2	8.3	7.8	7.2	7.5	7.4	6.9	6.8	7.7	7.9	7.5

PROFILE DESCRIPTION :

Ap	0 - 20 cm.	dark brown (10YR 3.0/3.0, moist) clay; strong medium subangular blocky and strong fine granular structure; slightly sticky, slightly plastic, firm; none mottles; no cutans; common very fine pores and few medium pores; moderately porous; many medium roots throughout and common fine roots throughout; no inclusions; no fragments; frequent worm channels and channels; slightly calcareous (10% HCL) throughout; clear irregular boundary to
AB	20 - 28 cm.	dark brown (10YR 3.0/3.0, moist) clay; strong medium subangular blocky structure; slightly sticky, slightly plastic, firm; none mottles; no cutans; common very fine pores and few medium pores; moderately porous; many medium roots throughout and common fine roots throughout; no inclusions; no fragments; frequent worm channels and termite channels; slightly calcareous (10% HCL) throughout; clear irregular boundary to
Bw	28 - 60 cm.	yellowish brown (10YR 5.0/6.0, moist) silty clay; strong medium subangular blocky and strong medium angular blocky structure; sticky, plastic, very firm; none mottles; no cutans; few medium pores and few coarse pores; moderately porous; many medium roots throughout and few fine roots throughout; no inclusions; no fragments; weakly cemented continuous massive plough pan; frequent worm channels and channels; slightly calcareous (10% HCL) throughout; clear irregular boundary to
Bck	60 - 80 cm.	pale brown (10YR 6.0/3.0, moist) silt loam; weak to moderate fine subangular blocky structure; non sticky, slightly plastic, firm; none mottles; no cutans; common medium pores and many medium pores; moderately porous; few medium roots throughout and few fine roots throughout; few medium spherical soft calcareous nodules; frequent coarse fresh fragments; few worm channels and channels ; calcareous (10% HCL) throughout; abrupt smooth boundary to
Ck1	80 - 100 cm.	pale brown (10YR 6.0/3.0, moist) gravelly silt loam; massive structure; non sticky, non plastic , friable; common medium prominent clear mottles (2.5Y 5.0/4.0); no cutans; common fine pores and common medium pores; slightly porous; nil roots; frequent medium spherical soft calcareous nodules ; very frequent coarse weathered fragments; strongly calcareous (10% HCL) throughout; abrupt irregular boundary to
CRk	100 - 150 cm.	brown (10YR 5.0/3.0, moist) very gravelly silt loam; massive structure; non sticky, non plastic , friable; common medium prominent clear mottles (10Y 6.0/4.0); no cutans; few fine pores and few coarse pores; slightly porous; nil roots; frequent medium spherical soft calcareous nodules; very frequent coarse strongly weathered fragments; strongly calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT 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	20	-	0	0	0	0	1	1	5	26	31	68	-	1.11	51	51	46	45	44	43	39	33
2	20	60	-	0	0	0	0	1	1	4	23	27	72	-	1.23	51	51	49	47	46	46	45	37
3	60	80	-	0	0	0	1	1	2	11	36	47	51	-	1.25	50	50	45	42	40	40	34	27
4	80	100	-	0	0	0	1	0	2	17	47	64	35	-	-	-	-	-	-	-	-	-	-
5	100	150	-	0	0	0	1	1	2	17	46	63	35	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	---- K	---- Na	sum	EXCH H+Al	AC. Al	CEC soil	---- clay	---- OrgC	---- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	7.8	6.9	-	2.03	-	54.2	5.4	0.5	0.2	60.3	-	-	62.6	92	7.1	60.3	96	-	0.22
2	8.0	6.8	-	0.82	-	50.5	8.1	0.5	0.4	59.5	-	-	62.1	86	2.9	59.5	96	-	0.26
3	8.3	6.9	-	0.59	-	70.1	9.9	0.3	0.4	80.7	-	-	41.7	81	2.1	80.7	194	-	0.20
4	8.4	7.0	-	0.27	-	57.5	8.4	0.2	0.4	66.5	-	-	35.4	103	0.9	66.5	188	-	0.18
5	8.5	6.9	-	0.15	-	70.2	9.1	0.2	0.8	80.3	-	-	34.3	98	0.5	80.3	234	-	0.18

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	3	-	4	3	3	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	8	3	-	4	3	3	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	6	4	-	5	4	3	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	6	4	-	5	4	3	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	6	4	-	5	4	3	-	-	-	-	-	-	-	-	-	-	-	-

FAO/UNESCO (1988) : Orthi-Calcaric Cambisol (1974 : Calcic Cambisol)
 USDA/SCS SOIL TAXONOMY (1992) : Typic Eutropept, clayey, montmorillonitic(calc.), isohyperthermi(1975 : typic eutropept)
 LOCAL CLASSIFICATION : Pardo con carbonato tipico

DIAGNOSTIC CRITERIA
 FAO (1988) : Diagnostic horizons : ochric A, cambic B
 USDA/SCS (1992) : Diagnostic horizons : ochric epipedon, cambic horizon
 : Soil moisture regime : ustic

LOCATION : Cuba Prov. Stgo de Cuba Mun. Contramaestre CAI America Libre Bloque120
 Latitude : 20°20' 0'' N Longitude : 76° 5' 0'' W Altitude : 105 (m.a.s.l.)
 AUTHOR(S) : MARIN/REGLA/REYNOSA. Date (mm.yy) : 12.91

GENERAL LANDFORM : low hill Topography : rolling
 PHYSIOGRAPHIC UNIT : strongly undulated
 SLOPE Gradient : 9% Aspect : Form : complex
 POSITION OF SITE : middle slope
 MICRO RELIEF Kind :
 SURFACE CHAR. Rock outcrop : nil Stoniness : very few stones
 Form : platy, flat Av.Size (cm) : 15
 Cracking : small cracks Slaking/crusting :
 SLOPE PROCESSES Soil erosion : moderate rill
 Slope stability : locally unstable

PARENT MATERIAL 1 : residual material derived from : sandstone
 Texture :
 PARENT MATERIAL 2 : Derived from : limestone
 Texture :
 Weathering degree : Resistance :
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 60

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 - 180 cm moist

LAND USE : high level arable farming; Crops : sugar cane
 VEGETATION Type : dwarf shrub Status : degraded

ADDITIONAL REMARKS :

Short field description:

Moderately deep, well drained, dark brown clay. Small surface cracks, (sub)angular blocky structure, very porous, frequent hard calcareous nodules.

Geology: middle-high Eocene. Unit A: sandstones, marls, limestones and conglomerate.

Geomorphology: pre-mountainous, slightly dissected.

CLIMATE : Köppen: Aw
 Station: 20 17 N/ 76 15 W 100 m a.s.l. 6 km W of site Relevance: very good
 CONTRAMAESTRE-STGO

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
act. evapotransp. mm	13	129	144	195	209	179	183	188	189	155	142	117	110	1943
EP Penman mm	13	77	88	122	131	133	128	138	135	117	106	82	74	1331
relative humidity %	13	76	74	72	73	77	78	79	78	81	80	81	79	77
precipitation mm	13	24	46	55	112	201	123	110	109	131	131	75	33	1156
tot.glob.rad. MJ/m2	13	449.0	476.1	651.0	657.0	641.7	606.2	657.2	635.9	552.0	517.0	432.0	430.0	6709.3
T mean °C	13	22.0	22.3	23.3	24.4	25.5	26.3	26.5	26.4	25.8	25.3	24.0	22.4	24.5
T max °C	13	29.4	29.9	30.9	31.5	31.6	32.5	33.3	33.5	32.7	31.9	30.6	29.6	31.4
T min °C	13	15.7	15.6	16.8	18.2	20.1	21.0	20.8	20.4	20.2	20.2	18.6	16.4	18.7
windspeed(at 2m) m/s	13	0.7	0.9	1.1	1.0	0.7	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.6
bright sunshine h/d	13	6.9	7.2	8.5	8.4	7.5	7.2	7.9	7.8	7.3	7.4	7.1	7.3	7.5

PROFILE DESCRIPTION :

Ap	0 - 20 cm.	dark brown (10YR 3.0/3.0, moist) clay; strong fine to medium granular and strong medium subangular blocky structure; slightly sticky, slightly plastic, firm, slightly hard; none mottles; no cutans; common fine pores and few medium pores; highly porous; common very fine to coarse roots throughout; no inclusions; no fragments; frequent worm channels and channels; slightly calcareous (10% HCL) throughout; clear irregular boundary to
Bw	20 - 50 cm.	dark brown (10YR 4.0/3.0, moist) clay; strong fine to medium granular and strong medium to coarse subangular blocky structure; slightly sticky, plastic, firm, hard; none mottles; no cutans; common fine pores and few medium pores; highly porous; few medium roots throughout; no inclusions; no fragments; frequent worm channels and channels; slightly calcareous (10% HCL) throughout; clear irregular boundary to
CB	50 - 80 cm.	very pale brown (10YR 7.0/4.0, moist) loam; weak irregular structure; slightly sticky, slightly plastic, friable, soft; none mottles; no cutans; many fine pores and common medium pores; moderately porous; nil roots; frequent medium spherical hard calcareous nodules and frequent medium irregular hard calcareous nodules; few coarse strongly weathered fragments; calcareous (10% HCL) throughout; abrupt smooth boundary to
CRk	80 - 130 cm.	very pale brown (10YR 7.0/4.0, moist) slightly stony loam; irregular and rock structure; slightly sticky, slightly plastic, friable, slightly hard; none mottles; no cutans; common fine pores and common coarse pores; moderately porous; nil roots; very frequent medium spherical hard calcareous nodules and very frequent medium irregular hard calcareous nodules; no fragments; calcareous (10% HCL) throughout; gradual smooth boundary to
R	130 - 180 cm.	dark brown (10YR 4.0/3.0, moist) very stony coarse loamy sand; rock structure; non sticky, non plastic, firm, very hard; none mottles; no cutans; none pores; nil roots; frequent medium spherical hard calcareous nodules and frequent medium irregular hard calcareous nodules; dominant coarse strongly weathered fragments; calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT 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	- 20	-	0	0	0	2	8	11	11	18	29	61	-	1.05	58	56	51	46	45	44	36	27
2	20	- 50	-	0	0	0	2	9	12	13	16	29	59	-	1.21	55	53	49	47	45	44	40	31
3	50	- 80	-	1	1	0	6	17	25	22	28	50	25	-	1.36	46	46	43	38	36	33	22	19
4	80	- 130	-	0	0	0	6	18	24	20	23	42	34	-	1.46	41	41	39	35	33	30	29	19
5	130	- 180	-	0	0	0	13	28	41	22	22	44	15	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----	----	----	BASE OrgC	Al ECEC	Al SAT	EC 2.5 mS/cm
1	7.6	6.6	-	2.39	-	52.4	6.8	0.8	1.0	61.0	-	-	51.2	84	8.4	61.0	119	-	-	0.40
2	7.7	6.7	-	1.26	-	55.8	4.0	0.5	0.2	60.5	-	-	48.8	82	4.4	60.5	124	-	-	0.29
3	8.4	7.2	-	0.19	-	63.1	2.1	0.1	0.2	65.5	-	-	19.9	79	0.7	65.5	329	-	-	0.15
4	8.3	7.1	-	0.38	-	63.1	1.7	0.1	0.3	65.2	-	-	19.4	58	1.3	65.2	336	-	-	0.16
5	8.5	7.3	-	0.08	-	62.3	5.8	0.1	0.4	68.6	-	-	22.2	146	0.3	68.6	309	-	-	0.17

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	-	-	-	8	2	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	8	3	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	8	2	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	8	3	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	8	3	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-

FAO/UNESCO (1988) : Verti-Haplic Phaeozem (1974 : Haplic Phaeozem)
 USDA/SCS SOIL TAXONOMY (1992) : , fine, montmorillonitic, isohyperthermic (1975 : vertic haplustoll)
 LOCAL CLASSIFICATION : Aluvial diferenciado

DIAGNOSTIC CRITERIA
 FAO (1988) : Diagnostic horizons : mollic A, cambic B
 : Diagnostic properties : vertic properties
 USDA/SCS (1992) : Diagnostic horizons : mollic epipedon, cambic horizon
 : Diagnostic properties : slickensides
 : Soil moisture regime : ustic

LOCATION : Cuba Prov. Stgo de Cuba Mun. Contramaestre CAI America Libre Bloque124
 Latitude : 20°20' 0'' N Longitude : 76°10' 0'' W Altitude : 100 (m.a.s.l.)
 AUTHOR(S) : MARIN/REGLA/REYNOSA Date (mm.yy) : 12.91

GENERAL LANDFORM : stagnant alluvial plain Topography : flat or almost flat
 PHYSIOGRAPHIC UNIT : flat or almost flat
 SLOPE Gradient : 1% Aspect : Form : straight
 POSITION OF SITE : flat
 MICRO RELIEF Kind :
 SURFACE CHAR. Rock outcrop : nil Stoniness : nil
 Cracking : small cracks Slaking/crusting :
 SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL 1 : alluvium derived from : mixed lithology
 Texture :
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 150

WATER TABLE Depth(cm) : Kind : no watertable observed
 DRAINAGE : moderately well
 PERMEABILITY : No slow permeable layer(s) cm
 FLOODING Frequency : irregular, fresh water Run off : medium
 MOISTURE CONDITIONS PROFILE : 0 - 25 cm dry 25 - 150 cm moist

LAND USE : high level arable farming; Crops : sugar cane; seasonal irrigated
 VEGETATION Type : semi deciduous shrub Status : secondary

ADDITIONAL REMARKS :

Short field description:

Very deep, moderately well to well drained, dark yellowish brown clay derived from alluvium. Small slickensides are present in the subsoil.

Geology: Holocene silty clay and alluvials sands.

Geomorphology: alluvial plain and terrace, eroded and hilly.

CLIMATE : Köppen: Aw
 Station: 20 17 N/ 76 15 W 100 m a.s.l. 6 km SW of site Relevance: good
 CONTRAMAESTRE-STGO

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
act. evapotransp. mm	13	129	144	195	209	179	183	188	189	155	142	117	110	1943
EP Penman mm	13	77	88	122	131	133	128	138	135	117	106	82	74	1331
relative humidity %	13	76	74	72	73	77	78	79	78	81	80	81	79	77
precipitation mm	13	24	46	55	112	201	123	110	109	131	131	75	33	1156
tot.glob.rad. MJ/m2	13	449.0	476.1	651.0	657.0	641.7	606.2	657.2	635.9	552.0	517.0	432.0	430.0	6709.3
T mean °C	13	22.0	22.3	23.3	24.4	25.5	26.3	26.5	26.4	25.8	25.3	24.0	22.4	24.5
T max °C	13	29.4	29.9	30.9	31.5	31.6	32.5	33.3	33.5	32.7	31.9	30.6	29.6	31.4
T min °C	13	15.7	15.6	16.8	18.2	20.1	21.0	20.8	20.4	20.2	20.2	18.6	16.4	18.7
windspeed(at 2m) m/s	13	0.7	0.9	1.1	1.0	0.7	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.6
bright sunshine h/d	13	6.9	7.2	8.5	8.4	7.5	7.2	7.9	7.8	7.3	7.4	7.1	7.3	7.5

PROFILE DESCRIPTION :

Ap	0 - 25 cm.	very dark grayish brown (10YR 3.0/2.0, moist) clay loam; strong medium subangular blocky structure; slightly sticky, non plastic, slightly hard; none mottles; continuous thin humus cutans throughout; common fine pores and few medium pores; highly porous; many fine roots throughout and many medium roots throughout; no inclusions; no fragments; few worm channels and channels; slightly calcareous (10% HCL) throughout; gradual irregular boundary to
AB	25 - 45 cm.	dark grayish brown (10YR 4.0/2.0, moist) clay loam; moderate medium to coarse subangular blocky structure; slightly sticky, slightly plastic, firm; none mottles; patchy thin slickensides cutans throughout; common fine pores and few medium pores; highly porous; common fine roots throughout and common medium roots throughout; no inclusions; no fragments; few worm channels and channels; slightly calcareous (10% HCL) throughout; clear irregular boundary to
Bw1	45 - 80 cm.	dark yellowish brown (10YR 4.0/4.0, moist) clay loam; moderate medium wedge-shaped ang.bl. to moderate fine to medium crumb structure; slightly sticky, slightly plastic, friable; none mottles; patchy thin slickensides cutans throughout; common fine pores; moderately porous; few fine roots throughout and few medium roots throughout; no inclusions; no fragments; slightly calcareous (10% HCL) throughout; gradual smooth boundary to
Bw2	80 - 115 cm.	dark yellowish brown (10YR 4.0/4.0, moist) loam; moderate medium subangular blocky structure; sticky, plastic, friable; none mottles; continuous moderately thick slickensides cutans throughout; common medium pores and common fine pores; moderately porous; few fine roots throughout; no inclusions; no fragments; slightly calcareous (10% HCL) throughout; gradual smooth boundary to
BC	115 - 150 cm.	dark yellowish brown (10YR 3.0/4.0, moist) clay; moderate fine to medium subangular blocky structure; sticky, plastic, firm; none mottles; no cutans; few fine pores; slightly porous; nil roots; no inclusions; no fragments; slightly calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT 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	25	-	1	1	2	12	10	25	13	22	35	41	-	1.45	45	45	43	41	40	39	34	26
2	25	45	-	0	0	1	10	9	20	17	17	33	47	-	1.43	45	45	44	43	43	42	34	30
3	45	80	-	0	0	0	7	10	17	14	21	35	48	-	1.52	47	47	46	45	44	43	36	29
4	80	115	-	0	0	1	14	13	28	16	23	39	34	-	1.57	44	44	43	41	40	39	34	28
5	115	150	-	0	1	2	7	7	16	11	25	36	48	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	---- K	---- Na	---- sum	EXCH H+Al	AC. Al	CEC soil	---- clay	---- OrgC	---- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	7.7	6.8	-	1.53	-	41.5	5.6	0.7	0.4	48.2	-	-	32.4	80	5.4	48.2	149	-	0.22
2	6.7	5.2	-	0.86	-	26.1	6.0	0.5	0.6	33.2	-	-	31.8	67	3.0	33.2	104	-	0.10
3	6.7	5.3	-	0.35	-	33.2	7.5	0.4	1.1	42.2	-	-	38.9	82	1.2	42.2	108	-	0.14
4	8.4	6.0	-	0.17	-	33.5	7.4	0.4	1.6	42.9	-	-	37.0	110	0.6	42.9	116	-	0.21
5	8.2	6.1	-	0.07	-	33.6	9.6	0.6	2.3	46.1	-	-	40.2	84	0.2	46.1	115	-	0.21

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	-	-	8	4	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-
2	2	-	-	8	4	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
3	2	-	-	8	4	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
4	2	-	-	8	4	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
5	2	-	-	8	4	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-

FAO/UNESCO (1988)	: Orthi-Calciic Vertisol	(1974 : Chromic Vertisol)
USDA/SCS SOIL TAXONOMY (1992)	: Typic Calciustert, clayey, montmorillonitic, isohyperthermic	(1975 : typic chromustert)
LOCAL CLASSIFICATION	: Oscuro plastico gleysoso	
DIAGNOSTIC CRITERIA	FAO (1988)	: Diagnostic horizons : ochric A, cambic B
		: Diagnostic properties : vertic properties
	USDA/SCS (1992)	: Diagnostic horizons : ochric epipedon, cambic horizon, calcic horizon
		: Diagnostic properties : slickensides
		: Soil moisture regime : ustic
LOCATION	: Cuba Prov. Granma Mun. Bayamo CAI Arquimides Colina Bloque Exp.1 EPICA	
	Latitude : 20°12' 0'' N	Longitude : 76°45' 0'' W
AUTHOR(S)	: REGLA/MARIN/BATLE	Altitude : 60 (m.a.s.l.)
		Date (mm.yy) : 12.91
GENERAL LANDFORM	: peneplain	Topography : flat or almost flat
PHYSIOGRAPHIC UNIT	: flat or almost flat	
SLOPE	Gradient : 0%	Aspect : Form : straight
POSITION OF SITE	: flat	
MICRO RELIEF	Kind :	
SURFACE CHAR.	Rock outcrop : nil	Stoniness : nil
	Cracking : large cracks	Slaking/crusting :
SLOPE PROCESSES	Soil erosion :	
PARENT MATERIAL	1 : marine sediments	derived from : claystone
	Texture :	
Remarks	:	
EFFECTIVE SOIL DEPTH(cm)	: 150	
WATER TABLE	Depth(cm) :	Kind : no watertable observed
DRAINAGE	: imperfectly	
PERMEABILITY	: high	Slow permeable layer from : 30 to 60 cm
FLOODING	Frequency :	Run off : slow
MOISTURE CONDITIONS PROFILE	: 0 - 150 cm moist	
LAND USE	: high level arable farming; Crops : sugar cane; Improvements : levelling	
VEGETATION	Type : semi deciduous shrub	Status : secondary
ADDITIONAL REMARKS :		
Short field description:		
Deep, imperfectly drained, very dark brown clay. Large cracks when dry, prismatic angular structure, with presence of slickensides, moderately porous.		
Geology: Cauto Formation: clays, sandstones, limestones and silt.		
Geomorphology: fluvio-marine deltaic plain and terrace, plain and slightly undulating.		
CLIMATE :	Köppen: Aw	
Station:	20 41 N/ 76 54 W	11 m a.s.l
JUCARITO GRANMA		1 km SW of site
		Relevance: very good
	No. years	
	of record	Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Annual
act. evapotransp. mm	5	168 178 238 243 214 193 202 188 180 162 141 139 2250
EP Penman mm	21	89 103 142 154 148 138 156 149 128 117 94 86 1504
relative humidity %	21	77 75 72 71 76 80 77 78 82 82 82 79 78
precipitation mm	21	28 39 36 48 176 183 120 125 166 141 36 15 1117
tot.glob.rad. MJ/m2	21	468.1 504.0 660.3 675.0 654.1 624.0 672.7 647.9 570.0 539.4 450.0 437.1 6902.6
T mean °C	21	22.6 22.9 24.5 25.9 26.5 27.1 27.6 27.4 26.7 26.1 24.6 23.1 25.0
T max °C	21	30.1 30.5 31.7 32.4 32.6 33.1 34.1 34.1 33.5 32.7 31.2 30.1 32.2
T min °C	21	16.2 16.3 17.6 18.9 20.9 22.1 21.9 22.1 21.5 20.9 19.4 17.2 19.0
windspeed(at 2m) m/s	21	1.8 2.2 2.5 2.4 1.8 1.2 1.7 1.5 1.2 1.1 1.6 1.9 0.7
bright sunshine h/d	21	7.4 7.9 8.7 8.8 7.7 7.5 8.3 8.1 7.7 8.0 7.7 7.5 1.0

PROFILE DESCRIPTION :

Ap	0 - 26 cm.	very dark grayish brown (10YR 3.0/2.0, moist) clay; strong medium prismatic and strong coarse prismatic structure; sticky, plastic, very firm; none mottles; patchy thin slickensides cutans throughout; few very fine pores and few medium pores; moderately porous; common fine roots throughout and common very fine roots throughout; very few medium spherical hard manganiferous concretions; no fragments; few channels; non calcareous (10% HCL) throughout; gradual irregular boundary to
Aw	26 - 60 cm.	very dark brown (10YR 2.0/2.0, moist) clay; very strong coarse angular blocky structure; very sticky, very plastic, firm; patchy moderately thick slickensides cutans throughout; few medium pores and few fine pores; moderately porous; few fine roots throughout and few very fine roots throughout; very few medium spherical hard manganiferous concretions; non calcareous (10% HCL) throughout; clear wavy boundary to
Cw	60 - 100 cm.	dark grayish brown (10YR 4.0/2.0, moist) clay; moderate coarse subangular blocky structure; slightly sticky, slightly plastic, firm; common fine pores and common medium pores; moderately porous; nil roots; very few medium spherical hard manganiferous concretions; calcareous (10% HCL) throughout; gradual irregular boundary to
C	100 - 150 cm.	dark yellowish brown (10YR 4.0/4.0, moist) clay loam; moderate medium subangular blocky structure; slightly sticky, slightly plastic, friable; common fine pores and common medium pores; moderately porous; nil roots; very few medium spherical hard manganiferous concretions; calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT 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 - 26	-	0	0	2	7	10	14	24	38	52	-	1.22	49	48	49	46	44	43	40	32
2	26 - 60	-	0	0	1	3	6	10	12	18	29	-	-	-	-	-	-	-	-	-	-
2	20 - 40	-	-	-	-	-	-	-	-	-	-	-	1.37	48	48	48	47	46	45	44	39
2	40 - 60	-	-	-	-	-	-	-	-	-	-	-	1.30	51	51	51	51	50	49	48	38
3	60 - 100	-	0	0	5	10	16	12	23	35	49	-	-	-	-	-	-	-	-	-	-
4	100 - 150	-	0	0	7	12	20	19	23	41	39	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----	----	----	EXCH H+Al	AC. Al	CEC soil	----- clay	----- OrgC	ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	6.3	4.9	-	1.52	-	21.1	14.6	0.4	1.2	37.3	-	-	39.1	75	5.3	37.3	95	-	0.16
2	6.6	5.1	-	0.94	-	22.4	22.1	0.3	2.2	47.0	-	-	49.0	80	3.3	47.0	96	-	0.18
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	8.6	7.2	-	0.24	-	56.3	21.0	0.4	2.8	80.5	-	-	38.9	79	0.8	80.5	207	-	0.29
4	8.7	7.1	-	0.07	-	61.1	19.7	0.2	2.9	83.9	-	-	34.6	89	0.2	83.9	242	-	0.30

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	4	-	-	2	2	-	1	-	-	-	-	-	-	-	-	-	-
2	-	-	-	8	6	-	-	2	2	-	2	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	8	6	-	-	2	2	-	2	-	-	-	-	-	-	-	-	-	-
4	-	-	-	8	5	-	-	2	2	-	2	-	-	-	-	-	-	-	-	-	-

FAO/UNESCO (1988) : Pelli-Calci Vertisol (1974 : Pellic Vertisol)
 USDA/SCS SOIL TAXONOMY (1992) : Typic Calciustert, clayey, montmorillonitic, isohyperthermic (1975 : typic pellustert)
 LOCAL CLASSIFICATION : Oscuro plastico gleysoso negro

DIAGNOSTIC CRITERIA
 FAO (1988) : Diagnostic horizons : ochric A, cambic B
 : Diagnostic properties : vertic properties
 USDA/SCS (1992) : Diagnostic horizons : ochric epipedon, cambic horizon, calcic horizon
 : Diagnostic properties : slickensides
 : Soil moisture regime : ustic

LOCATION : Cuba Prov. Holguin Mun. San Pedro de Cacocum CAI Cristino Naranjo
 Latitude : 20°45' 0'' N Longitude : 76°25' 0'' W Altitude : 106 (m.a.s.l.)
 AUTHOR(S) : REGLA/MARIN/ANGARICA Date (mm.yy) : 12.91

GENERAL LANDFORM : low hill Topography : flat or almost flat
 PHYSIOGRAPHIC UNIT : flat or almost flat
 SLOPE Gradient : 1% Aspect : Form : straight
 POSITION OF SITE : flat
 MICRO RELIEF Kind :
 SURFACE CHAR. Rock outcrop : Stoniness : very few stones
 Form : angular blocky Av.Size (cm) : 4
 Cracking : large cracks Slaking/crusting :
 SLOPE PROCESSES Soil erosion : nil

PARENT MATERIAL 1 : marine sediments derived from : claystone
 Texture :
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 120

WATER TABLE Depth(cm) : 150 Kind : flooded
 Estimated highest level : 100 Estimated lowest level : 150
 DRAINAGE : imperfectly
 PERMEABILITY : slow Slow permeable layer from : 45 to 60 cm
 FLOODING Frequency : nil Run off : medium
 MOISTURE CONDITIONS PROFILE : 0 - 117 cm moist 117 - 150 cm wet

LAND USE : high level arable farming; Crops : sugar cane
 VEGETATION Type : grassland Status : degraded

ADDITIONAL REMARKS :

Short field description:

Deep, imperfectly drained, black clay. Large cracks when dry, subangular to angular structure with presence of slickensides, slightly porous.

Geology: Pleistocene. undifferentiated, marine-alluvial deposits. Cauto Formation: sands, clayey sands and guijarros-sands, with intercalation of silt, gravels and guijarros-gravels (colors: grey and greyish yellow).

Geomorphology: marine plain and terrace, abrasive-erosive undulating.

CLIMATE : Köppen: Aw
 Station: 20 56 N/ 76 32 W 105 m a.s.l. 6 km ENE of site Relevance: moderate
 LA JIQUIMA-HOLGUIN

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
act. evapotransp. mm	21	163	177	237	249	226	214	244	240	196	174	149	146	2421
EP Penman mm	21	87	96	137	148	149	137	158	151	128	115	96	87	1496
relative humidity %	21	82	79	77	76	80	83	81	82	84	85	84	83	81
precipitation mm	21	37	36	31	49	178	184	102	131	158	138	54	25	1128
tot.glob.rad. MJ/m2	15	471.2	509.6	672.7	681.0	663.4	618.6	682.0	657.2	567.0	523.9	444.0	437.1	6927.1
T mean °C	21	22.3	22.4	23.5	24.8	25.8	26.5	27.1	26.8	26.3	25.5	24.2	22.8	24.8
T max °C	21	28.4	28.8	29.9	30.7	31.6	32.5	33.1	33.3	32.9	31.8	30.2	28.8	31.0
T min °C	21	17.6	17.4	18.5	19.3	20.7	21.8	22.2	22.1	21.6	21.0	20.0	18.5	20.1
windspeed(at 2m) m/s	4	2.2	2.3	2.9	2.7	2.5	2.0	2.5	2.4	1.8	1.6	2.6	2.7	0.3
bright sunshine h/d	15	7.5	8.1	9.0	8.9	7.9	7.4	8.4	8.2	7.6	7.7	7.6	7.6	7.9

PROFILE DESCRIPTION :

Ap	0 - 20 cm.	black (2.5Y 2.0/0.0, moist) clay; strong medium to coarse subangular blocky and strong medium to coarse angular blocky structure; slightly sticky, plastic, friable; none mottles; no cutans; few medium pores and few fine pores; slightly porous; many very fine to coarse roots throughout; no inclusions; no fragments; frequent worm channels and pedotubules; slightly calcareous (10% HCL) throughout; gradual smooth boundary to
Aw	20 - 65 cm.	2.5Y 5.0/1.0, moist clay; strong coarse- very coarse prismatic structure; sticky, very plastic, firm; none mottles; continuous moderately thick slickensides cutans throughout; few medium pores and few fine pores; slightly porous; common very fine to coarse roots throughout; no inclusions; no fragments; few worm channels; slightly calcareous (10% HCL) throughout; clear irregular boundary to
CA	65 - 90 cm.	10Y 3.0/1.0, moist sandy clay; weak medium prismatic and strong medium subangular blocky structure; slightly sticky, slightly plastic, friable; few fine faint diffuse mottles (2.5Y 5.0/4.0); patchy thin slickensides cutans throughout; many medium pores and few fine pores; slightly porous; few fine roots throughout; no inclusions; no fragments; calcareous (10% HCL) throughout; clear irregular boundary to
C	90 - 117 cm.	light olive brown (2.5Y 5.0/4.0, moist) sandy clay; massive structure; slightly sticky, slightly plastic, friable; few fine faint diffuse mottles (10Y 5.0/2.0); no cutans; many medium pores and few fine pores; slightly porous; few fine roots throughout; no inclusions; no fragments; strongly calcareous (10% HCL) throughout; clear irregular boundary to

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000 500 250 100 50 SAND	TOT 50 20 2 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 - 20	-	1 2 4 8 7	21	9 15 24	56	-	- - - - - - - -
2	20 - 65	-	0 1 3 5 5	13	7 16 23	64	-	- - - - - - - -
3	65 - 90	-	1 2 4 8 8	23	15 6 21	56	-	- - - - - - - -
4	90 - 117	-	7 6 6 12 12	41	11 10 21	38	-	- - - - - - - -
5	117 - 150	-	19 14 11 12 6	62	7 5 12	26	-	- - - - - - - -

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH. Ca	CAT. Mg	----- K	----- Na	sum	EXCH H+Al	AC. Al	CEC soil	----- clay	----- OrgC	ECEC	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	7.5	6.3	-	2.25	-	35.3	27.3	0.5	0.8	63.9	-	-	76.7	138	7.9	63.9	83	-	0.27
2	7.9	6.6	-	1.34	-	26.6	60.0	0.3	4.7	91.6	-	-	-	-	4.7	91.6	-	-	1.00
3	8.1	7.1	-	0.65	-	19.0	49.8	0.2	4.7	73.7	-	-	50.3	90	2.3	73.7	147	-	1.10
4	8.9	7.8	-	0.15	-	35.3	68.0	0.1	1.6	105	-	-	22.5	60	0.5	105	467	-	0.38
5	8.9	7.7	-	0.07	-	29.8	26.2	0.1	1.1	57.2	-	-	19.9	78	0.2	57.2	287	-	0.28

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 MX Fe(o) Al(o) Si(o) Fe(d) Al(d) Fe(p) Al(p) Pret pHNaF

1	-	-	-	8	2	-	3	-	-	-	-	-	3	-	-	-	-	-	-	-
2	-	-	-	8	2	-	3	-	-	-	-	-	4	-	-	-	-	-	-	-
3	-	-	-	8	2	-	3	-	-	-	-	-	5	-	-	-	-	-	-	-
4	-	-	-	8	3	-	3	-	-	-	-	-	5	-	-	-	-	-	-	-
5	-	-	-	8	3	-	3	-	-	-	-	-	5	-	-	-	-	-	-	-

remarks (hor. 1 - 5): MINX=PALYGORSKITE

FAO/UNESCO (1988) : Orthi-Haplic Vertisol, sodic phase
 (1974) : Chromic Vertisol, sodic phase
 USDA/SCS SOIL TAXONOMY (1992) : Sodic Haplustert, clayey, montmorillonitic, isohyperthermic (1975 : typic chromustert)
 LOCAL CLASSIFICATION : Oscuro plastico gleysoso gris

DIAGNOSTIC CRITERIA FAO (1988) : Diagnostic horizons : ochric A, cambic B
 : Diagnostic properties : vertic properties
 USDA/SCS (1992) : Diagnostic horizons : ochric epipedon, cambic horizon
 : Diagnostic properties : slickensides
 : Soil moisture regime : ustic

LOCATION : Cuba Prov. Holguin Mun. Mayari CAI Guatemala area 3
 Latitude : 20°40' 0'' N Longitude : 75°50' 0'' W Altitude : 20 (m.a.s.l.)
 AUTHOR(S) : MARIN/REGLA/BEATRIZ Date (mm.yy) : 12.91

GENERAL LANDFORM : low hill Topography : undulating
 PHYSIOGRAPHIC UNIT : undulated
 SLOPE Gradient : 5% Aspect : Form : undulating
 POSITION OF SITE : flat
 MICRO RELIEF Kind :
 SURFACE CHAR. Rock outcrop : Stoniness : very few stones
 Av.Size (cm) : 4
 Cracking : large cracks Slaking/crusting :
 Salt : slight Alkali :
 SLOPE PROCESSES Soil erosion : slight rill
 Slope stability : stable

PARENT MATERIAL 1 : marine sediments derived from : claystone
 Texture :
 Remarks :

EFFECTIVE SOIL DEPTH(cm) : 100

WATER TABLE Depth(cm) : 300 Kind : no watertable observed
 DRAINAGE : imperfectly
 PERMEABILITY : moderate Slow permeable layer from : 120 to 150 cm
 FLOODING Frequency : nil Run off : medium
 MOISTURE CONDITIONS PROFILE : 0 - 150 cm wet

LAND USE : high level arable farming; Crops : sugar cane
 VEGETATION Type : shrub Status : degraded

ADDITIONAL REMARKS :

Short field description:

Deep, imperfectly drained, yellowish brown clay. Large cracks when dry, moderately, (sub)angular blocky structure, presence of calcareous conglomerates. Third and fourth horizon are very hard. The inclusions in the first and second horizon are gravels.

Geology: mid-lower Miocene, clays, sands, marls, limestones and conglomerate.

Geomorphology: marine plain and terrace, abrasive, slightly undulating and plain.

CLIMATE : Köppen: Aw
 Station: 20 41 N/ 75 47 W 20 m a.s.l. 8 km ENE of site Relevance: moderate
 GUARO-HOLGUIN

	No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
act. evapotransp. mm	21	126	142	204	213	207	196	232	226	184	156	124	117	2131
EP Penman mm	21	87	95	138	150	151	148	167	160	136	121	98	88	1545
relative humidity %	21	82	80	78	77	79	81	79	80	82	82	83	83	80
precipitation mm	21	62	53	61	87	116	91	38	75	88	118	146	75	1014
tot.glob.rad. MJ/m2	10	461.9	487.2	654.1	693.1	669.6	642.4	678.9	657.2	558.0	511.5	432.4	430.9	6876.3
T mean °C	21	22.3	22.4	23.4	24.4	25.6	26.8	27.3	27.1	26.9	25.9	24.7	23.3	25.0
T max °C	21	28.0	28.4	29.3	30.0	31.1	32.1	32.5	32.8	32.6	31.6	29.8	28.5	30.5
T min °C	21	19.4	19.1	20.2	21.0	22.2	23.1	23.6	23.4	23.0	22.4	21.6	20.2	21.6
windspeed(at 2m) m/s	4	2.1	2.5	3.4	3.1	2.8	2.5	3.6	3.2	2.6	2.2	2.5	2.5	2.8
bright sunshine h/d	10	7.5	7.7	8.7	9.1	7.9	7.9	8.3	8.2	7.5	7.6	7.5	7.6	7.9

PROFILE DESCRIPTION :

Ap	0 - 27 cm.	brown (10YR 5.0/3.0, moist) clay; moderate fine subangular blocky structure; slightly sticky, slightly plastic; none mottles; no cutans; few fine pores and few medium pores; slightly porous; common very fine to coarse roots throughout; very frequent large irregular hard calcareous unsp. inclusions; no fragments; frequent channels; non calcareous (10% HCL) throughout; clear irregular boundary to
B	27 - 75 cm.	yellowish brown (10YR 5.0/4.0, moist) clay; moderate medium angular blocky and moderate medium prismatic structure; sticky, plastic; common coarse distinct clear mottles (10YR 6.0/6.0); patchy slickensides cutans throughout; few medium pores and few fine pores; slightly porous; few fine roots throughout; very frequent large irregular hard manganiferous unsp. inclusions and very frequent large irregular hard calcareous unsp. inclusions; no fragments; frequent channels; non calcareous (10% HCL) throughout; gradual wavy boundary to
BC	75 - 95 cm.	brownish yellow (10YR 6.0/6.0, moist) clay; moderate coarse angular blocky and moderate coarse prismatic structure; sticky, plastic; few coarse distinct clear mottles (10YR 5.0/8.0); continuous slickensides cutans throughout; common fine pores and common very fine pores; moderately porous; nil roots; few medium irregular soft calcareous nodules; no fragments; weakly cemented continuous petroferic; non calcareous (10% HCL) throughout; gradual irregular boundary to
C	95 - 150 cm.	brownish yellow (10YR 6.0/8.0, moist) clay; structureless massive structure; plastic; few distinct clear mottles (10YR 5.0/8.0); patchy moderately thick slickensides cutans on pedfaces; few to common, fine pores; slightly porous; frequent small irregular hard manganiferous concretions; slightly calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top	Bot	>2 mm	2000 1000	1000 500	500 250	250 100	100 50	TOT SAND	50 20	20 2	TOT SILT	<2 µm	DISP	BULK DENS	pH 0.0	1.0	1.5	2.0	2.3	2.7	3.4	4.2
1	0	27	-	5	5	5	5	4	24	7	16	23	53	-	1.22	52	52	51	50	49	48	39	32
2	27	75	-	4	4	4	5	3	20	3	16	19	60	-	-	-	-	-	50	49	48	-	-
2	25	40	-	-	-	-	-	-	-	-	-	-	-	-	1.34	51	50	47	45	44	44	43	33
2	65	70	-	-	-	-	-	-	-	-	-	-	-	-	1.35	51	50	49	48	47	46	43	33
3	75	95	-	1	2	2	4	3	12	2	22	24	65	-	-	-	-	-	-	-	-	-	-
4	95	150	-	0	0	0	1	1	2	3	27	30	68	-	-	-	-	-	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	----- K	----- Na	----- sum	EXCH H+Al	AC. Al	CEC soil	----- clay	----- OrgC	----- ECEC	BASE SAT %	Al SAT %	EC 2.5 mS/cm
1	8.1	7.2	-	1.60	-	60.9	7.5	1.0	0.6	70.0	-	-	49.7	94	5.6	70.0	141	-	0.29
2	8.7	7.2	-	0.32	-	56.0	11.0	0.4	4.7	72.1	-	-	45.3	75	1.1	72.1	159	-	0.36
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	9.0	7.3	-	0.19	-	53.9	12.8	0.4	11.2	78.3	-	-	44.1	68	0.7	78.3	178	-	0.72
4	8.8	7.2	-	0.06	-	47.9	12.6	0.4	19.0	79.9	-	-	45.9	68	0.2	79.9	174	-	1.20

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	-	-	-	8	4	-	-	3	-	-	2	-	-	-	-	-	-	-	-	-	-
2	-	-	-	8	4	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	8	4	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-
4	-	-	-	8	4	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-

FAO/UNESCO (1988)	: Ferri-Geric Ferralsol	(1974 : Acric Ferralsol)
USDA/SCS SOIL TAXONOMY (1992)	: Anionic Acrudox, clayey, gibbsitic, isohyperthermic	(1975 : plinthic acrothox)
LOCAL CLASSIFICATION	: Ferritico purpura	

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 : udic

LOCATION	: Cuba Provincia Holguin Municipio Mayari, Pinares de Mayari		
AUTHOR(S)	Latitude : 20°33' 0'' N	Longitude : 75°45' 0'' W	Altitude : 650 (m.a.s.l.)
	: MARIN/REGLA/PEREZ		Date (mm.yy) : 12.91

GENERAL LANDFORM	: mountain	Topography : mountainous
PHYSIOGRAPHIC UNIT	: mountain	
SLOPE	Gradient : 7%	Aspect : Form : concave
POSITION OF SITE	: lower slope	
MICRO RELIEF	Kind :	
SURFACE CHAR.	Rock outcrop : nil	Stoniness : nil
	Cracking : nil	Slaking/crusting :
SLOPE PROCESSES	Soil erosion : moderate gully	

PARENT MATERIAL	1 : solid rock	derived from : serpentinite
Remarks	Texture :	
	:	

EFFECTIVE SOIL DEPTH(cm)	: 150
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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 - 150 cm moist	

LAND USE	: cultivated pasture; Crops : crops, see remarks
VEGETATION	Type : closed forest Status : cut over

ADDITIONAL REMARKS :

Short field description:

Very deep, well drained, dark red, gravelly clay. Moderately structured, iron concretions and diffuse horizon boundaries. The gravel consists of iron concretions ("mocarreros").

Geology: serpentine, peridotite, serpentine-dune.

Geomorphology: mountain horst.

Surroundings of the site has severe erosion.

CLIMATE :	Köppen: Aw													
Station: PINARES	0 0 / 0 0	0 m a.s.l	0 km of site	Relevance:										
No. years of record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	

PROFILE DESCRIPTION :

Ap	0 - 21 cm.	2.5YR 2.0/4.0, moist clay loam; strong fine to medium granular structure; non sticky, non plastic, firm; none mottles; no cutans; common fine pores and few medium pores; highly porous; many very fine to coarse roots throughout; frequent medium spherical hard manganiferous concretions; no fragments; frequent channels and worm channels; non calcareous (10% HCL) throughout; gradual smooth boundary to
Bc1	21 - 70 cm.	dusky red (2.5YR 2.5/2.0, moist) clay loam; moderate medium granular to strong medium subangular blocky structure; non sticky, slightly plastic, firm; none mottles; no cutans; common fine pores and common medium pores; highly porous; many very fine to coarse roots throughout; frequent medium spherical hard manganiferous concretions; no fragments; non calcareous (10% HCL) throughout; diffuse smooth boundary to
Bc2	70 - 150 cm.	dusky red (10R 3.0/3.0, moist) clay loam; moderate medium granular to moderate medium subangular blocky structure; non sticky, non plastic, friable; none mottles; no cutans; many medium pores and common fine pores; highly porous; many very fine to coarse roots throughout; very frequent large spherical hard manganiferous concretions; no fragments; non calcareous (10% HCL) throughout;

ANALYTICAL DATA :

Hor. no.	Top - Bot	>2 mm	2000 1000 500 250 100 50 SAND	TOT 50 20 10 5	TOT 20 10 5	<2 µm	DISP	BULK DENS	pF- 0.0 1.0 1.5 2.0 2.3 2.7 3.4 4.2
1	0 - 20	-	26 13 5 4 2 50	5 15 20 31	-	-	-	-	-
2	20 - 70	-	25 12 5 3 2 46	5 11 16 38	-	-	-	-	-
3	70 - 110	-	22 15 6 4 2 49	7 10 17 34	-	-	-	-	-
4	110 - 150	-	23 13 5 4 2 46	7 11 19 35	-	-	-	-	-

Hor. no.	pH- H2O	-- KCl	CaCO3 %	ORG- C %	MAT. N %	EXCH Ca	CAT. Mg	---- K	---- Na	---- sum	EXCH H+Al	AC. Al	CEC soil	---- clay	---- OrgC	---- ECEC	BASE SAT %	AL SAT %	EC 2.5 mS/cm
1	5.8	5.1	-	1.65	-	0.0	0.3	0.1	0.1	0.5	-	-	5.2	17	5.8	0.5	10	-	0.12
2	6.0	6.4	-	0.28	-	0.0	0.0	0.0	0.0	0.0	-	-	2.3	6	1.0	0.0	0	-	0.11
3	5.1	6.6	-	0.04	-	0.0	0.0	0.0	0.0	0.0	-	-	1.4	4	0.1	0.0	0	-	0.06
4	5.6	6.6	-	0.04	-	0.0	0.0	0.0	0.0	0.0	-	-	1.4	4	0.1	0.0	0	-	0.06

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	2	-	-	-	-	5	6	-	-	-	-	-	-	-	-
2	-	-	-	2	2	-	-	-	-	4	6	-	-	-	-	-	-	-	-
3	-	-	-	2	2	-	-	-	-	4	6	-	-	-	-	-	-	-	-
4	-	-	-	2	2	-	-	-	-	3	6	-	-	-	-	-	-	-	-

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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 Nachtergaele *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-hexameta-phosphate 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 1M ammonium acetate pH7 using automatic extractor.

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

CEC: saturation with sodium acetate 1M pH7; washed with ethanol 80% and then leached with ammonium acetate 1M pH7. 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 1M 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.

Country Reports¹
(ISSN: 1381-5571)

No.	Country	No. of soils	No.	Coutry	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