Soil Survey Investigations Report No. 12

Soil Survey Laboratory Data and

1. SAMPLE COLLECTION AND PREPARATION
   A. Field sampling
      1. Site selection
      2. Soil sampling
         a. Stony soils
   B. Laboratory preparation
      1. Standard (airdry)
         a. Square-hole 2-mm sieve
         b. Round-hole 2-mm sieve
      2. Field moist
      3. Carbonate-containing material
      4. Carbonate-indurated material
2. CONVENTIONS
   A. Size-fraction base for reporting
      1. <2-mm
      2. <size specified
   B. Data-sheet symbols
      tr: trace, not measurable by quantitative procedure used or less than reportable amount
      tr(s): trace, detectable only by qualitative procedure more sensitive than quantitative procedure used
      - : analysis run but none detected
      -(s): none detected by sensitive qualitative test
      blank: analysis not run
      nd: analysis not run
      <: less than reported amount or none present
3. PARTICLE-SIZE ANALYSES
   A. <2-mm fraction (pipet method)
      1. Airdry samples
         a. Carbonate and noncarbonate clay
      2. Moist samples
         a. Carbonate and noncarbonate clay
   B. >2-mm fraction
      1. Weight estimates
      2. Volume estimates
4. FABRIC-RELATED ANALYSES
   A. Bulk density
      1. Saran-coated clods
         a. Field state
         b. Airdry
         c. 30-cm absorption
         d. 1/3-bar desorption I
         e. 1/3-bar desorption II
         f. 1/3-bar desorption III
         g. 1/10-bar desorption

5A. Cation-exchange capacity (cont.)
      2. NaOAc, pH 8.2
         a. Centrifuge method
      3. Sum of cations
         a. Acidity by $BaCl_2$-TEA, pH 8.2; bases by NH_4OAc, pH 7.0
      4. KOAc, pH 7.0
      5. $BaCl_2$, pH 8.2
         a. Barium by flame photometry
   B. Extractable bases
      1. NH_4OAc extraction
         a. Uncorrected
         b. Corrected (exchangeable)
      2. KCl-TEA extraction, pH 8.2
   C. Base saturation
      1. NH_4OAc, pH 7.0
      2. NaOAc, pH 8.2
      3. Sum of cations
   D. Sodium saturation (exchangeable Na pct.)
      1. NaOAc, pH 8.2
      2. NH_4OAc, pH 7.0
   E. Sodium adsorption ratio

6. CHEMICAL ANALYSES
   A. Organic carbon
      1. Acid-dichromate digestion
         a. $FeSO_4$ titration
         b. CO_2 evolution, gravimetric
      2. Dry combustion
         a. CO_2 evolution I
         b. CO_2 evolution II
      3. Peroxide digestion
         a. Weight loss
   B. Nitrogen
      1. Kjeldahl digestion
         a. Ammonia distillation
      2. Semimicro Kjeldahl
         a. Ammonia distillation
   C. Iron
      1. Dithionite extraction
         a. Dichromate titration
         b. EDTA titration
      2. Dithionite-citrate extraction
         a. Orthophenanthroline colorimetry
      3. Dithionite-citrate-bicarbonate extraction
         a. Potassium-thiocyanate colorimetry
      4. Pyrophosphate-dithionite extraction
   D. Manganese
      1. Dithionite extraction
         a. Permanganate colorimetry

6. CHEMICAL ANALYSES (cont.)
   J. Bicarbonate
      1. Saturation extract
         a. Acid titration
   K. Chloride
      1. Saturation extract
         a. Mohr titration
         b. Potentiometric titration
   L. Sulfate
      1. Saturation extract
         a. Gravimetric, $BaSO_4$
      2. NH_4OAc extraction
         a. Gravimetric, $BaSO_4$
   M. Nitrate
      1. Saturation extract
         a. PDS acid colorimetry
   N. Calcium
      1. Saturation extract
         a. EDTA titration
      2. NH_4OAc extraction
         a. EDTA-alcohol separation
         b. Oxalate-permanganate I
         c. Oxalate-permanganate II
         Fe, Al, and Mn removed
         d. Oxalate-cerate
      3. NH_4Cl-EtOH extraction
         a. EDTA titration
      4. KCl-TEA extraction
         a. Oxalate-permanganate
   O. Magnesium
      1. Saturation extract
         a. EDTA titration
      2. NH_4OAc extraction
         a. EDTA-alcohol separation
         b. Phosphate titration
         c. Gravimetric, $Mg_2P_2O_7$
      3. NH_4Cl-EtOH extraction
         a. EDTA titration
   P. Sodium
      1. Saturation extract
         a. Flame photometry
      2. NH_4OAc extraction
         a. Flame photometry
   Q. Potassium
      1. Saturation extract
         a. Flame photometry
      2. NH_4OAc extraction
         a. Flame photometry
   R. Sulfur
      1. $NaHCO_3$ extraction, pH 8.5
         a. Methylene blue
   S. Total phosphorus
      1. Perchloric-acid digestion
         a. Molybdovanadophosphoric-

PREFACE

This publication is one in a new U.S. Department of Agriculture series established to preserve and make available technical information resulting from soil survey investigations. These investigations have been going on for about two decades. Data from them have been distributed in unpublished form to those immediately concerned. Some of the data and descriptions have appeared in technical journals, in regional bulletins, in USDA technical bulletins, and in the text of published soil surveys. But most were not available to all who might use them.

We intend to publish in this series all data from the soil survey laboratories that form reasonably complete characterizations of soils. Already-assembled data and descriptions will be published just as rapidly as they can be prepared for printing. Fragmentary data collected as reference points for specific soil surveys will not be included.

While these data were being assembled, there were many changes in laboratory methods. Some were improved and some new ones were devised. Consequently, laboratory data for different soils cannot always be directly compared without allowance for the method.

The method used is indicated by symbol in the column headings of the data table. These symbols are identified in the code sheet on the opposite page. Each method is described in the first number of this series, "Soil Survey Laboratory Methods and Procedures for Collecting Soil Samples," SSIR No. 1.

Ways of describing soils have also changed. Soil descriptions have become explicit on more and more features. The systems for designating horizons and for classifying soils have been changed.

The soil descriptions published here were prepared as working documents to meet a specific need of a soil survey at the time the soil samples were collected. The soil scientists who wrote them had no idea they would be published. Editing has been limited for the most part to that necessary for conformance to the "Soil Survey Manual." Field textural estimates have been retained, even though some are at variance with the laboratory data, because the field estimates themselves are important data.

There were several reasons for sampling these soils. Some were sampled to study soil genesis, some to facilitate classification, and some to obtain data to permit more useful interpretations. Those sampled for genesis or classification studies do not always fit neatly into our present concepts of soil series. Partly because

FOREWORD

This volume contains descriptions and laboratory data for 93 pedons sampled in Puerto Rico and the Virgin Islands. Each has an identifying soil number in which the letters PR or VI are followed by the number of the soil conservation district in which the pedon was sampled. The districts in Puerto Rico and their numbers are shown on the map on the back cover. The Virgin Islands constitute district 18.

Three indices are provided to help the reader find the descriptions and data for specific pedons. In the first, the pedons are grouped by soil conservation districts and arranged within a given district according to the soil order in which they are classified.

The second index arranges the soils according to their classification. The arrangement follows the system used in Soil Classification, A Comprehensive System, 7th Approximation, and its last supplement, issued March 1967. The classification is based on this supplement, which is an interim working document, and is subject to change.

The third index is an alphabetical arrangement according to the soil series names. Because many of the pedons have not been classified into soil series, this index does not include all of the pedons studied.

Much of the work reported here was to help develop a classification of soils of tropical areas. Consequently many of the pedons were selected because they had a particular position in the landscape and not because they represented a particular kind of soil.

Thirteen such pedons were sampled in the Bayamonquitas soil study area, located in the northeastern corner

Puerto Rico and the Virgin Islands

GEOGRAPHICAL INDEX

District	District No.	Classification	Soil Survey No.	Soil Series	Page
Cibuco	4	Inceptisols	S58PR-4-7	SND 1/	41
			S58PR-4-9	SND	33
			S61PR-4-2	SND	35
			S61PR-4-3	SND	37
		Mollisols	S58PR-4-5	Colinas	53
			S58PR-4-6	SND	51
		Alfisols	S61PR-4-1	SND	95
		Ultisols	S58PR-4-1	*Corozal 2/	137
			S58PR-4-2	SND	147
			S58PR-4-3	Cialitos	121
			S58PR-4-4	SND	135
			S58PR-4-8	Cialitos	123
Noroeste	6	Oxisols	S61PR-6-2	Matanzas	159
			S63PR-6-1	Coto	175
			S63PR-6-2	Coto	177
Norte	7	Oxisols	S63PR-7-1	Bayamón	157
Oeste	8	Inceptisols	S61PR-8-2	*Morado	31
			S61PR-8-5	*Anones	25
		Mollisols	S63PR-8-1	Toa	55
		Alfisols	S63PR-8-4	SND	97
		Ultisols	S61PR-8-1	*Humatas	109
			S61PR-8-3	*Daguey	129
			S61PR-8-4	*Humatas	111
			S61PR-8-6	*Daguey	131
			S63PR-8-2	Lares	117
			S63PR-8-3	SND	133
		Oxisols	S57PR-8-1	Nipe	155
			S57PR-8-2	SND	161
San Juan	9	Alfisols	S61PR-9-1	Vega Baja	91
		Ultisols	S58PR-9-1	Sabana Seca	107
			S61PR-9-2	Vega Alta	151
Torrecillas	10	Ultisols	S59PR-10-10	*Aibonito	119
			S61PR-10-1	SND	115
		Oxisols	S59PR-10-1	SND	181
			S59PR-10-2	SND	185
			S59PR-10-3	*Comerio	171
			S59PR-10-4	SND	187
			S59PR-10-5	SND	189
			S59PR-10-6	SND	191
			S59PR-10-7	Catalina	165
			S59PR-10-8	Catalina	169
			S59PR-10-9	*Comerio	173
Noreste	11	Oxisols	S58PR-11-1	SND	179
Este	12	Inceptisols	S63PR-12-1	Mayo	27
			S63PR-12-3	SND	39
			S63PR-12-4	Josefa	23
			S63PR-12-5	Maunabo	21
		Alfisols	S61PR-12-3	Cayagua	89
			S63PR-12-8	Candelero	87
		Ultisols	S61PR-12-1	SND	149
			S63PR-12-2	*Limones	125
			S63PR-12-6	*Ingenio	139
			S63PR-12-7	SND	141
			S63PR-12-9	*Limones	127
			S63PR-12-10	*Jagueyes	143
			S63PR-12-11	*Jagueyes	145
Sudeste	13	Inceptisols	S61PR-13-3	Pandura	29
		Mollisols	S63PR-13-2	SND	71
		Alfisols	S63PR-13-1	Machete	93
		Ultisols	S61PR-13-2	Los Guineos	113

1/ SND. Series not designated.
2/ Soil series names preceded by an asterisk are names of tentative series.

Puerto Rico and the Virgin Islands

GEOGRAPHICAL INDEX

District	District No.	Classification	Soil Survey No.	Soil Series	Page
Suroeste	14	Vertisols	S57PR-14-3	Aguirre	17
			S57PR-14-5	Cartagena	11
			S57PR-14-7	Santa Isabel	19
			S57PR-14-8	Cartagena	13
			S61PR-14-1	Fé	7
			S61PR-14-2	Fé	9
			S61PR-14-9	Fraternidad	15
		Inceptisols	S57PR-14-6	SND 1/	47
			S57PR-14-11	SND	49
			S61PR-14-11	Mucara	45
		Mollisols	S57PR-14-4	SND	61
			S57PR-14-10	SND	81
			S61PR-14-6	SND	79
			S61PR-14-7	SND	67
			S61PR-14-8	Descalabrado	77
			S63PR-14-1	Toa	57
			S61PR-14-4	Jacana	83
			S61PR-14-5	SND	73
		Alfisols	S57PR-14-1	SND	105
			S57PR-14-9	Amelia	99
			S61PR-14-3	Guayama	101
		Ultisols	S57PR-14-2	Palmarejo	153
		Oxisols	S61PR-14-10	*Delicias 2/	163
Turabo	16	Vertisols	S63PR-16-2	Mabi	3
		Inceptisols	S63PR-16-1	*Gurabo	43
Virgin Islands	18	Vertisols	S64VI-18-2	SND	5
		Mollisols	S64VI-18-1	Glynn	59
			S64VI-18-3	Parasol	69
			S64VI-18-4	Hesselberg	85
			S64VI-18-5	SND	75
			S64VI-18-6	*Cramer	63
			S64VI-18-9	*Cramer	65
		Alfisols	S64VI-18-8	*Dorothea	103

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CLASSIFICATION INDEX

Classification	Soil Survey No.	Soil Series	Page
VERTISOLS			
Chromuderts			
Aquic	S63PR-16-2	Mabi	3
Chromusterts			
Entic	S64VI-18-2	SND	5
Paleustollic	S61PR-14-1	Fé	7
	S61PR-14-2	Fé	9
Udic	S57PR-14-5	Cartagena	11
	S57PR-14-8	Cartagena	13
	S61PR-14-9	Fraternidad	15
Pellusterts			
Chromudic	S57PR-14-3	Aguirre	17
	S57PR-14-7	Santa Isabel	19
INCEPTISOLS			
Tropaquepts			
Typic	S63PR-12-5	Maunabo	21
Aeric	S63PR-12-4	Josefa	23
Dystropepts			
Typic	S61PR-8-5	*Anones	25
	S63PR-12-1	Mayo	27
	S61PR-13-3	Pandura	29

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Puerto Rico and the Virgin Islands

CLASSIFICATION INDEX

Classification	Soil Survey No.	Soil Series	Page
Eutropepts			
Typic	S61PR-8-2	*Morado 1/	31
	S58PR-4-9	SND 2/	33
	S61PR-4-2	SND	35
	S61PR-4-3	SND	37
	S63PR-12-3	SND	39
Lithic	S58PR-4-7	SND	41
Vertic	S63PR-16-1	*Gurabo	43
	S61PR-14-11	Mucara	45
Ustropepts			
Lithic	S57PR-14-6	SND	47
Vertic	S57PR-14-11	SND	49
MOLLISOLS			
Rendolls			
Typic	S58PR-4-6	SND	51
Eutropeptic	S58PR-4-5	Colinas	53
Hapludolls			
Aquic Fluventic	S63PR-8-1	Toa	55
	S63PR-14-1	Toa	57
Argiustolls			
Typic	S64VI-18-1	Glynn	59
	S57PR-14-4	SND	61
Lithic	S64VI-18-6	*Cramer	63
	S64VI-18-9	*Cramer	65
	S61PR-14-7	SND	67
Udic	S64VI-18-3	Parasol	69
	S63PR-13-2	SND	71
Haplustolls			
Typic	S61PR-14-5	SND	73
	S64VI-18-5	SND	75
Lithic	S61PR-14-8	Descalabrado	77
	S61PR-14-6	SND	79
Udic	S57PR-14-10	SND	81
Vertic	S61PR-14-4	Jacana	83
Paleustolls			
Petrocalcic	S64VI-18-4	Hesselberg	85
ALFISOLS			
Tropaqualfs			
Aeric	S63PR-12-8	Candelero	87
	S61PR-12-3	Cayagua	89
	S61PR-9-1	Vega Baja	91
Tropudalfs			
Typic	S63PR-13-1	Machete	93
Ultic	S61PR-4-1	SND	95
	S63PR-8-4	SND	97
Haplustalfs			
Typic	S57PR-14-9	Amelia	99
Lithic	S61PR-14-3	Guayama	101
Udic	S64VI-18-8	*Dorothea	103
Paleustalfs			
Typic	S57PR-14-1	SND	105
ULTISOLS			
Plinthaquults			
Oxic	S58PR-9-1	Savana Seca	107
Tropohumults			
Typic	S61PR-8-1	*Humatas	109
	S61PR-8-4	*Humatas	111
	S61PR-13-2	Los Guineos	113
	S61PR-10-1	SND	115
Aquic	S63PR-8-2	Lares	117
Orthoxic	S59PR-10-10	*Aibonito	119
	S58PR-4-3	Cialitos	121
	S58PR-4-8	Cialitos	123
	S63PR-12-2	*Limones	125
	S63PR-12-9	*Limones	127
	S61PR-8-3	*Daguey	129
	S61PR-8-6	*Daguey	131
	S63PR-8-3	SND	133

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2/ SND. Series not designated.

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CLASSIFICATION INDEX

Classification	Soil Survey No.	Soil Series	Page
Tropudults			
Typic	S58PR-4-4	SND	135
Aquic	S58PR-4-1	*Corozal	137
Oxic	S63PR-12-6	*Ingenio	139
	S63PR-12-7	SND	141
	S63PR-12-10	*Jagueyes	143
	S63PR-12-11	*Jagueyes	145
	S58PR-4-2	SND	147
	S61PR-12-1	SND	149
Plinthic	S61PR-9-2	Vega Alta	151
Tropustults			
Typic	S57PR-14-2	Palmarejo	153
OXISOLS			
Acrorthox			
Typic	S57PR-8-1	Nipe	155
Eutrorthox			
Tropeptic	S63PR-7-1	Bayamón	157
	S61PR-6-2	Matanzas	159
	S57PR-8-2	SND	161
Haplorthox			
Typic	S61PR-14-10	*Delicias	163
Tropeptic	S59PR-10-7	Catalina	165
	S59PR-10-8	Catalina	169
	S59PR-10-3	*Comerio	171
	S59PR-10-9	*Comerio	173
	S63PR-6-1	Coto	175
	S63PR-6-2	Coto	177
	S58PR-11-1	SND	179
	S59PR-10-1	SND	181
	S59PR-10-2	SND	185
	S59PR-10-4	SND	187
	S59PR-10-5	SND	189
	S59PR-10-6	SND	191

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SOIL SERIES

Soil Series	District	Soil Survey No.	Page
Aguirre	Suroeste	S57PR-14-3	17
*Aibonito	Torrecillas	S59PR-10-10	119
Amelia	Suroeste	S57PR-14-9	99
*Anones	Oeste	S61PR-8-5	25
Bayamón	Norte	S63PR-7-1	157
Candelero	Este	S63PR-12-8	87
Cartagena	Suroeste	S57PR-14-5	11
		S57PR-14-8	13
Catalina	Torrecillas	S59PR-10-7	165
		S59PR-10-8	169
Cayagua	Este	S61PR-12-3	89
Cialitos	Cibuco	S58PR-4-3	121
		S58PR-4-8	123
Colinas		S58PR-4-5	53
*Comerio	Torrecillas	S59PR-10-3	171
		S59PR-10-9	173
*Corozal	Cibuco	S58PR-4-1	137
Coto	Noroeste	S63PR-6-1	175
		S63PR-6-2	177
*Cramer	Virgin Islands	S64VI-18-6	63
		S64VI-18-9	65
*Daguey	Oeste	S61PR-8-3	129
		S61PR-8-6	131

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SOIL SERIES

Soil Series	District	Soil Survey No.	Page
*Delicias 1/	Suroeste	S61PR-14-10	163
Descalabrado		S61PR-14-8	77
*Dorothea	Virgin Islands	S64VI-18-8	103
Fé	Suroeste	S61PR-14-1	7
		S61PR-14-2	9
Fraternidad		S61PR-14-9	15
Glynn	Virgin Islands	S64VI-18-1	59
Guayama	Suroeste	S61PR-14-3	101
*Gurabo	Turabo	S63PR-16-1	43
Hesselberg	Virgin Islands	S64VI-18-4	85
*Humatas	Oeste	S61PR-8-1	109
		S61PR-8-4	111
*Ingenio	Este	S63PR-12-6	139
Jacana	Suroeste	S61PR-14-4	83
*Jagueyes	Este	S63PR-12-10	143
		S63PR-12-11	145
Josefa		S63PR-12-4	23
Lares	Oeste	S63PR-8-2	117
*Limones	Este	S63PR-12-2	125
		S63PR-12-9	127
Los Guineos	Sudeste	S61PR-13-2	113
Mabi	Turabo	S63PR-16-2	3
Machete	Sudeste	S63PR-13-1	93
Matanzas	Noroeste	S61PR-6-2	159
Maunabo	Este	S63PR-12-5	21
Mayo		S63PR-12-1	27
*Morado	Oeste	S61PR-8-2	31
Mucara	Suroeste	S61PR-14-11	45
Nipe	Oeste	S57PR-8-1	155
Palmarejo	Suroeste	S57PR-14-2	153
Pandura	Sudeste	S61PR-13-3	29
Parasol	Virgin Islands	S64VI-18-3	69
Sabana Seca	San Juan	S58PR-9-1	107
Santa Isabel	Suroeste	S57PR-14-7	19
Toa	Oeste	S63PR-8-1	55
	Suroeste	S63PR-14-1	57
Vega Alta	San Juan	S61PR-9-2	151
Vega Baja	San Juan	S61PR-9-1	91

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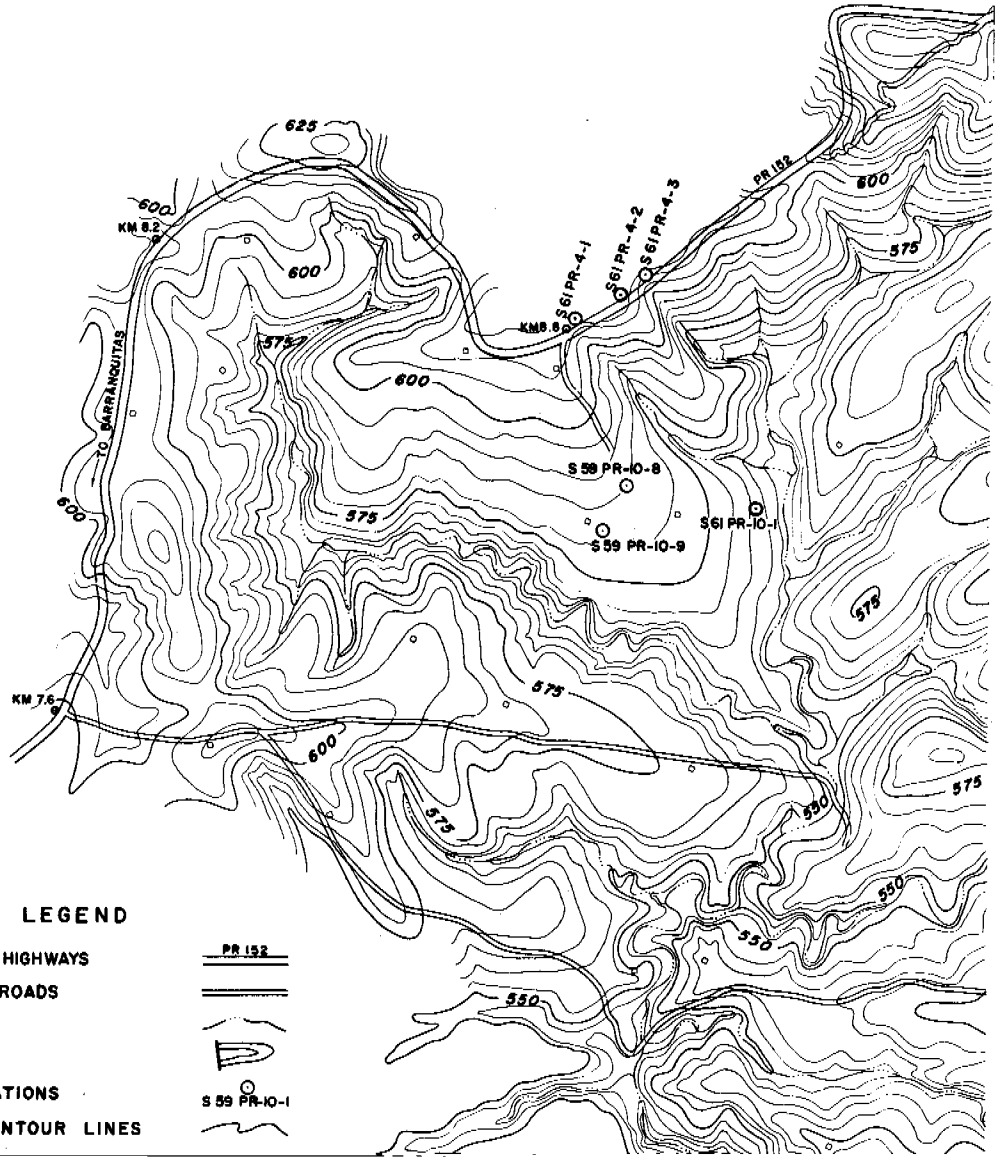
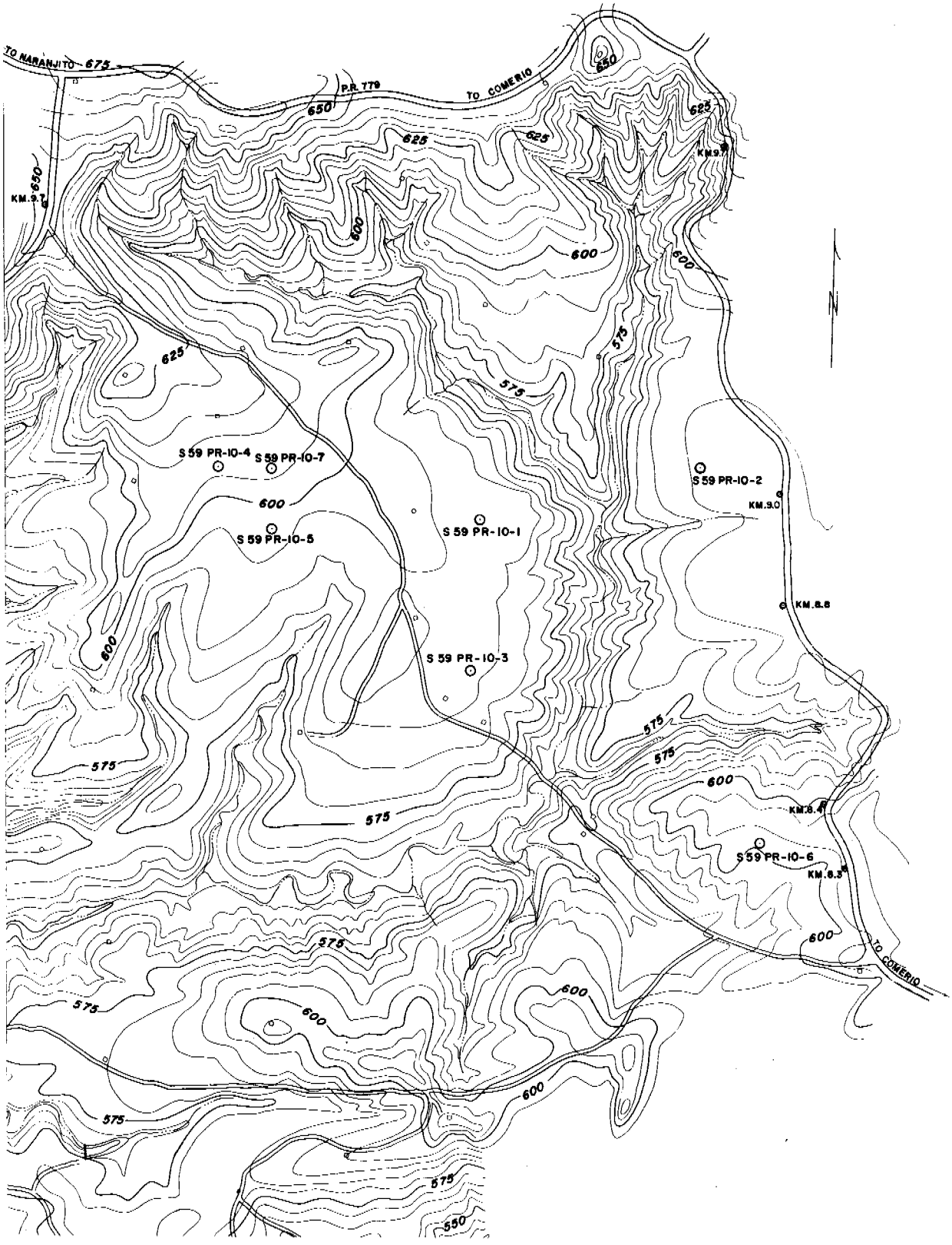
TOPOGRAPHIC MAP SHOWING LOCATION OF PEDONS SAMPLED IN THE BARRANQUITAS SOIL STUDY AREA[1/]

SCALE 0 1000 2000 3000 FEET

SCALE 0 1 KILOMETER




TO NARANJITO
675
P.R. 779
TO COMERIO
650
625
600
575
550
KM.9.7
KM.9.0
KM.8.6
KM.8.4
KM.8.3
S 59 PR-10-4
S 59 PR-10-7
S 59 PR-10-5
S 59 PR-10-1
S 59 PR-10-2
S 59 PR-10-3
S 59 PR-10-6
N

SOIL CLASSIFICATION: Aquic Chromudert; very fine, montmorillonitic, isohyperthermic

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL: Mabi clay SOIL Nos. S63PR-16-2 LOCATION: Turabo SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska LAB. Nos. 19059-19066 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: (0.05-0.02)	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.0002	<0.074	Coarse fragments: 2A2 ≥ 2 (<19) Pct	2-19	19-76
		Pct. of < 2 mm														Pct	Pct of < 76mm	
0-7	Ap	14.5a	37.8	47.7	1.3	2.5	1.8	3.5	5.4	11.8	26.0	19.3	9.1		89.4	2		
7-15	A12	9.1a	29.5	61.4	0.6	1.2	1.1	2.3	3.9	9.1	20.4	14.4	5.2		93.6	tr		
15-24	C1	6.9a	29.4	63.7	0.4	0.7	0.5	1.6	3.7	8.9	20.5	13.7	3.2		95.8	tr		
24-38	C2	7.1a	33.7	59.2	0.5	0.8	0.4	1.5	3.9	9.8	23.9	14.7	3.2	41.2	95.7	tr		
38-53	C3	7.4b	34.6	58.0	0.4	0.4	0.4	1.7	4.5	10.1	24.5	15.8	2.9		95.9	tr		
53-67	C4	9.4b	32.5	58.1	1.1	1.2	0.8	2.3	4.0	8.8	23.7	14.3	5.4		93.4	tr		
67-90	C5	2.9b	37.9	59.2	0.7	0.5	0.3	0.5	0.9	5.5	32.4	6.7	2.0		97.7	4		
90-113	C6	5.3c	39.9	54.8	0.2	0.7	0.7	1.9	1.8	5.1	34.8	8.1	3.5		95.8	tr		

Depth (In.)	6A1a Organic carbon d Pct.	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$: 6E2a 6E1b < 2mm. Pct	<0.002 mm. Pct.	Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in./in.		pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-7	1.96	0.200	10	5.5			1.20	1.28	1.61	0.078	39.8	31.3	22.4	0.11		4.0	4.8
7-15	1.17	0.121	10	4.1			1.15	1.17	1.81	0.16	44.8	39.7	26.1	0.16		4.4	5.3
15-24	0.44	0.053	8	4.1			1.29e	1.23	1.88	0.16	36.0	37.2	26.2	0.14		5.0	5.9
24-38	0.13			3.3	tr(s)		1.35	1.28	1.91	0.14	33.2	35.4	23.6	0.15		5.8	6.8
38-53	0.10			2.9	1	-	1.46	1.34	1.96	0.14	28.6	32.7	22.6	0.14		6.5	7.5
53-67	0.06			2.6	2	-	1.49	1.33	1.96	0.14	27.1	33.5	24.2	0.12		6.6	7.6
67-90				3.4	1	-							25.6			6.6	7.8
90-113				5.8	tr								23.1			6.6	7.7

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	6L2a NH_4OAc Ext. SO_4						Base saturation: 5C3 Sum Cations	5C1 NH_4OAc
	meq/100 g															Pct	Pct.
0-7	5.8	11.0	0.4	0.4	17.6	16.9	34.5	25.5	0.5	0.6						51	69
7-15	9.9	17.1	1.0	0.2	28.2	13.6	41.8	26.9	0.4	0.5						67	105
15-24	10.8	22.1	1.9	0.4	35.2	7.6	42.8	32.2		0.3						82	109
24-38	10.2	23.8	2.5	0.4	36.9	3.8	40.7	32.0		0.2						91	115
38-53	9.5f	22.9g	3.3	0.5	36.2	3.2	39.4	29.4		0.1							
53-67	9.5f	24.7g	3.8	0.5	38.5	1.8	40.3	31.9		0.1							
67-90	9.1f	24.8g	3.8	0.4	38.1	1.9	40.0	32.5		tr							
90-113	6.7f	17.8g	2.6	0.3	27.4	2.6	30.0	24.1		0.1							

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-7	0.53	0.12	0.47
7-15	0.44	0.07	0.43
15-24	0.51	0.06	0.41
24-38	0.54	0.06	0.40
38-53	0.51	0.05	0.39
53-67	0.55	0.04	0.42
67-90	0.55	0.06	0.43
90-113	0.55	0.11	0.42

a. Earthy nodules: > 50 percent (2-0.25 mm.); 5-25 percent (0.25-0.05 mm.).
b. Carbonate grains: 25-50 percent (2-0.25 mm.); 5-10 percent (0.25-0.05 mm.).
c. Earthy nodules: > 50 percent (2-0.05 mm.).
d. 9.7 kg/m^2 to 60 inches (Method 6A).
e. Range in duplicate clods is 0.14 g/cc.
f. NH_4Cl-EtOH extraction (Method 6N3a).
g. NH_4Cl-EtOH extraction (Method 6O3a).

USDA SCS HYATTSVILLE MD 1964

Soil Classification: Aquic Chromudert; very fine, montmorillonitic, isohyperthermic
Soil type: Mabi clay.
Soil Nos.: S63PR-16-2
Location: Turabo SCD, Puerto Rico, 1.2 kilometers west of town of Gurabo, 800 feet north and 600 feet west of Gurabo Experiment Station headquarters. Photo No. GS-LR 15-72.
Vegetation and use: Guava orchard with native pasture undergrowth.
Slope and land form: 2 **percent. Alluvial fan.**
Drainage and permeability: Somewhat poorly drained, slow runoff and slow permeability.
Parent material: Fine-textured alluvial fan sediments derived from volcanic rocks.
Samples collected by and date: R. B. Grossman, W. E. McKinzie and L. H. Rivera on October 1, 1965.
Profile described by: L. H. Rivera.

Horizon and Lincoln Lab. Number	
Ap 19059	0 to 7 inches, very dark grayish brown (10YR 3/2) clay with few fine faint yellowish brown mottles and red (2.5YR 4/6) coatings along root channels; weak fine granular structure; hard very firm, slightly sticky, plastic; common fine roots; common fine black nodules; few fine volcanic fragments; slightly acid; clear smooth boundary. Field moisture 42.1 percent.
A12 19060	7 to 15 inches, dark yellowish brown (10YR 4/4) clay with few fine distinct gray (10YR 5/1), common medium distinct yellowish brown (10YR 5/6) mottles, brown (10YR 4/3) rubbed color; weak fine and medium angular blocky structure with many pressure faces; very firm, slightly sticky, plastic; common fine roots; few fine black nodules; few fine volcanic fragments; slightly acid; clear wavy boundary. Field moisture 45.1 percent.
C1 19061	15 to 24 inches, yellowish brown (10YR 5/6) clay with many medium distinct gray (10YR 5/1) mottles, brown (10YR 4/3) rubbed color; weak fine and medium angular blocky structure with many pressure faces and slickensides; very firm, slightly sticky, plastic; few fine roots; few fine black nodules; few fine volcanic fragments; coatings along root channels; slightly acid; clear wavy boundary. Field moisture 40.3 percent.
C2 19062	24 to 38 inches, yellowish brown (10YR 5/4) clay with few fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium and coarse angular blocky structure with many pressure faces and slickensides; very firm, slightly sticky, plastic; common fine black nodules; few fine volcanic fragments;neutral; abrupt wavy boundary. Field moisture 34.8 percent.
C3 19063	38 to 53 inches, yellowish brown (10YR 5/4) clay with common fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium angular blocky structure with common pressure faces and slickensides; very firm, slightly sticky, plastic; few fine black nodules; few fine volcanic fragments; few fine and medium carbonatic concretions; alkaline; gradual smooth boundary. Field moisture 31.3 percent.
C4 19064	53 to 67 inches, yellowish brown (10YR 5/4) clay with common fine distinct gray (10YR 5/1) and few fine distinct greenish gray (5GY 6/1) mottles; weak medium angular blocky structure with few pressure faces and slickensides; very firm, slightly sticky, plastic; few fine black nodules; few fine and medium volcanic fragments; few fine carbonatic concretions; alkaline.
C5 19065	67 to 90 inches, auger sample, mixed yellowish brown (10YR 5/4) and greenish gray (5GY 6/1) clay; massive; very firm, slightly sticky, plastic; few fine black nodules; weak effervescence with dilute HCL; alkaline.
C6 19066	90 to 113 inches, auger sample, yellowish brown (10YR 5/6) clay with few medium distinct greenish gray (5GY 6/1); massive; very firm; slightly sticky, plastic; weak effervescence with dilute HCL, alkaline.

Remarks: Ap, C1, C3 horizons sampled for the Bureau of Public Roads. Colors given are for the moist soil. Soil was at field capacity when sampled, except first four horizons which were above field capacity. Water table at 10 feet at time of sampling. Reaction determined by Soiltex. Soil has been in guava for the last five years and before that in native grasses. This site is in an old army camp. Since establishment of the Experiment Substation, 5 years ago, no fertilizer or lime has been applied to this field.

Mineralogy (Methods 7A, 7B1): C2 horizon. The clay contains abundant to dominant montmorillonite, a moderate to abundant amount of kaolinite, and small amounts of mica, feldspar, quartz, and amphibole. A 4.00Å spacing remains after heating to 300 degrees but disappears upon heating to 500 degrees (small peak). A 3.11Å spacing persists after 300 degrees C. but is apparently destroyed in samples heated to 500 degrees C. Patterns are similar to those for the Cramer soils of the Virgin Islands, S64VI-18-6 and S64VI-18-9. The coarse silt and very fine sand are high (over 50 percent) in mafic minerals. The epidote group, hornblende, and pyroxene are major constituents.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Entic Chromustert; fine, mixed, isohyperthermic

SOIL Series not designated SOIL Nos. S64VI-18-2 LOCATION Virgin Islands

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 20063-20070 November 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1: Total: Sand (2-0 05)	Total: Silt (0.05-0 002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0 5-0.25)	Sand: Fine (0 25-0 1)	Sand: Very fine (0 1-0.05)	Silt: 0 05-0.02	Silt: Int. III (0 02-0 002)	Int. II (0.2-0.02)	(2-0.1)	Clay: 3A1a Carbonate	Clay: Non-carbonate	Coarse fragments 2A2: 3B2 > 2 Vol. Pct.	3B1 > 2 Pct.	2-19 Pct. of < 19
		Pct. of < 2 mm																
0-6	Ap	26.3	39.7	34.0	3.3a	3.1a	2.2b	7.2b	10.5b	17.0	22.7	32.3	15.8	-	34	6	11	11
6-13	A12	26.5	40.0	33.5	2.6a	3.0a	2.4b	8.1b	10.4b	16.9	23.1	32.6	16.1	-	34	3	6	6
13-23	A3	17.1	36.9	46.0	1.7b	1.8b	1.6b	5.0b	7.0b	12.5	24.4	22.8	10.1	tr.	46		2	2
23-31	C1	14.2	37.2	48.6	0.9b	1.3b	1.3b	4.3b	6.4b	11.6	25.6	20.9	7.8	1	48		tr.	tr.
31-43	C2	12.9	35.7	51.4	0.8b	1.1b	1.2b	4.1b	5.7b	11.3	24.4	19.7	7.2	tr.	51		tr.	tr.
43-62	C3ca	13.9	35.6	50.5	1.5b	1.7b	1.4b	3.8b	5.5b	10.7	24.9	18.8	8.4	tr.	51		tr.	tr.
62-76	IIB2b	46.7	25.8	27.5	8.5	8.8	6.0	13.7	9.7	10.7	15.1	27.6	37.0	-	28		51	51
76-88	IIIBtb	30.6	38.6	30.8	1.6b	2.4b	2.3b	10.8b	13.5b	16.9	21.7	37.7	17.1	-	31		3	3

Depth (In.)	6A1a Organic carbon c Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	6E1b 6E2a Carbonate as $CaCO_3$ Pct	Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar d g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in. per in.		pH: 8C1b Sat. Paste	8C1a 1:1	8C1a 1:10
0-6	1.03	0.094	11	1.3	3	1.49	1.36	1.45	1.76	0.064	19.6	25.3	14.4	0.15			7.8	
6-13	1.10	0.104	11	1.0	3	1.59	1.38	1.43	1.71	0.057	15.3	23.4	14.8	0.12			7.8	
13-23	0.25			0.9	9	1.58		1.40	1.93	0.116	23.0	30.4	19.3	0.16		7.9	8.2	9.3
23-31	0.16			0.9	6	1.48		1.22	1.92	0.160	26.8	41.1	20.6	0.25		8.2	8.3	9.6
31-43	0.09			0.9	8	1.52		1.32	1.84	0.116	24.2	34.4	21.8	0.17		8.3	8.4	9.6
43-62	0.08			1.0	8	1.60		1.37	1.96	0.126	22.7	32.8	21.4	0.16		8.1	8.4	9.6
62-76	0.01			1.6	tr(s)								14.0			7.7	8.3	9.2
76-88	0.02			1.9	2								14.5			7.6	8.2	8.9

Depth (In.)	Extractable bases 5B1a: 6N3a Ca	6O3a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum	5A1a NH_4OAc	Water extract from saturated paste 8A1: Ca	Mg	6P1a Na	6Q1a K		CO_3	HCO_3	Cl	6L1a SO_4	8A1a Electrical conductivity
	meq/100 g								meq/liter									mmho/cm
0-6	19.9	7.1	0.5	0.8	28.3			22.8										
6-13	18.6	8.0	1.2	0.6	28.4			23.2										
13-23	10.8	13.7	5.7	0.6	30.8			25.4			12.5	0.1					3.0	1.39
23-31	5.0	15.7	10.4	0.6	31.7			25.8			15.8	0.1					3.3	1.66
31-43	4.3	15.9	12.9	0.6	33.7			27.9			19.2	0.1					3.1	2.02
43-62	6.9	15.9	11.4	0.6	34.8			29.2			23.3	0.1					3.0	2.65
62-76	10.9	9.5	5.8	0.4	26.6	1.2	27.8	23.5			26.5	0.1					1.7	3.48
76-88	16.4	9.1	3.1	0.4	29.0			25.0			13.9	0.2					-	2.60

Depth (In.)	8A Water at Saturation Pct.	5D2 Exchangeable Na Pct.		Gypsum Pct.	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-6					0.67	0.04	0.42
6-13					0.69	0.03	0.44
13-23	75.8	19			0.55	0.02	0.42
23-31	104.6	34			0.53	0.02	0.42
31-43	114.0	38			0.54	0.02	0.42
43-62	98.4	31			0.58	0.02	0.42
62-76	46.9	20			0.85	0.06	0.51
76-88	49.6	10			0.81	0.06	0.47

a. 25-50% Fe-Mn. 0-5% carbonate.
b. 5-25% carbonate.
c. 7.0 kg/m² to 60 inches. (Method 6A).
d. Calculated to include volume but not weight of > 2mm. material (Method 3B2).

USDA-SCS HYATTSVILLE MD 1964

Soil Classification: Entic Chromustert; fine, mixed, isohyperthermic
Soil type: Series not designated
Soil Nos.: S64VI-18-2
Location: St. Croix, Virgin Islands, 0.3 mile west on farm road along north side of Lower Love and 400 feet north of farm road.
Vegetation and Use: Cultivated; used for sugar cane.
Slope and land form: Nearly level coastal plain.
Drainage and Permeability: Moderately well drained with slow runoff; slow permeability.
Parent Material: Fine textured sediments derived from the residuum of volcanic and limestone rocks.
Elevation: 140 feet.
Rainfall: 40-45 inches.
Samples collected by: R. B. Grossman and W. E. McKinzie, September 22, 1964.
Described by: W. E. McKinzie.

Horizon and Lincoln Lab. Number	
Ap 20063	0 to 6 inches, very dark grayish brown (2.5Y 3.5/2) clay; moderate medium granular structure; friable, sticky and plastic; common roots; strong effervescence; clear smooth boundary.
A12 20064	6 to 13 inches, dark grayish brown (2.5Y 4/2) clay; weak fine and medium subangular blocky structure (few small angular peds); very firm, sticky and plastic; few fine angular volcanic rock fragments; few fine black nodules, few worm casts 1-2 mm. in diameter; strong effervescence; clear wavy boundary.
A3 20065	13 to 23 inches, light olive brown (2.5Y 5/4) clay; weak medium subangular blocky structure with a rhombic form and having pressure faces; very firm, sticky and plastic; few angular volcanic fragments, few fine black nodules less than 2 mm., very few roots; strong effervescence; clear wavy boundary.
C1 20066	23 to 31 inches, light olive brown (2.5Y 5/4) clay; medium to coarse, intersecting, angular or wedge shaped peds with numerous slickensides and pressure faces; very firm, sticky and plastic; few fine limestone fragments; few angular volcanic fragments, few fine black nodules; strong effervescence with small blotches of secondary lime; clear wavy boundary.
C2 20067	31 to 43 inches, light olive brown (2.5Y 5/4) clay; medium to coarse,intersecting,angular or wedge shaped peds with numerous slickensides and pressure faces; very firm, sticky and plastic; few fine limestone fragments; strong effervescence; clear wavy boundary.
C3ca 20068	43 to 62 inches,light olive brown (2.5Y 5/4) clay with common medium distinct yellowish brown (10YR 5/6) mottles; medium and coarse angular and wedge shaped peds with pressure faces and slickensides (less numerous than in horizon above); very firm, sticky and plastic; few black nodules 1mm. in size, few limestone concretions; violent effervescence with numerous blotches of secondary lime; abrupt wavy boundary.
IIB2b 20069	62 to 76 inches, strong brown (7.5YR 5/8) with seams of black (5Y 2/2) gravelly clay loam; very weak subangular blocky structure with thin patchy clay films; firm, slightly plastic; few angular volcanic fragments, few black nodules 1-2 mm.; slightly calcareous: clear wavy boundary.
IIIBtb 20070	76 to 88 inches, strong brown (7.5YR 5/8) clay loam; weak medium subangular blocky structure with thin dark olive (5Y 3/3) discontinuous clay films; friable, nonsticky and plastic; few black nodules; matrix noncalcareous with very few limestone blotches.

Notes: Samples taken for the Bureau of Public Roads. Colors given are for the moist soil. Ap and A12 horizons are near field capacity. Underlying horizons are below the wilting point. Soil temperature at 20 inches, 82°F.

Mineralogy (Methods 7A1, 7A2, 7B1).

Fraction	Mont.	Chlorite	Kaolinite	Mica (Biotite)	Epidote (group)	Quartz	Feldspar
A3 horizon							
Clay	s to m	s to m	s to m	s			
Coarse silt				tr	m	tr to s	m
Very fine sand						m	a
IIB2b horizon							
Clay	s	tr	s	m			
Coarse silt				s	s		
Very fine sand				tr to s		s	d

Amounts: X-ray diffraction and optical: s = small, m = moderate, tr = trace, a = abundant, d = dominant.

NOTES

1. Mineralogy is mixed.
2. The mica and kaolinite clays are fairly well crystallized. The montmorillonite is somewhat disordered and the amount may be underestimated, especially in the IIB2b horizon.
3. The IIB2b clay contains small amounts of interstratified chlorite-mica and amphibole (hornblende). The A3 clay contains a very small amount of interstratified minerals including montmorillonite, chlorite and mica. Aluminum interlayer "islands" are likely present.
4. The A3 coarse silt contains accessory plant phytoliths.
5. The A3 very fine sand contains a moderate amount of hornblende. The IIB2b very fine sand contains a small amount of hornblende; the mica is altered biotite.

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Paleustollic Chromustert; fine, mixed, isohyperthermic

SOIL Fe´clay SOIL Nos. S61PR-14-1 LOCATION Iajas Valley, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14823-14827 December 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	3A1a Non-Carbonate Clay		Coarse fragments 2A2 > 2 (<19) Pct	2 - 19	19 - 76
		Pct. of < 2 mm														Pct	Pct of < 76 mm	
0-7	Ap	19.2	31.0	49.8	1.8	1.6	1.6	5.9	8.3	6.8	24.2	19.0	10.9	50		6		
7-17	AC	15.3a	30.9	53.8	1.0	1.4	1.3	4.6	7.0	9.8	21.1	19.8	8.3	52		4		
17-28	C1cs	11.7a	32.8	55.5	0.5	0.9	0.9	3.3	6.1	13.1	19.7	21.4	5.6	54		tr		
28-42	C2	12.6a	33.0	54.4	0.8	1.1	0.9	3.3	6.5	13.3	19.7	22.0	6.1	51		tr		
42-56	C3	20.7a	30.2	49.1	2.2	2.6	2.0	6.1	7.8	6.4	23.8	17.9	12.9	47		13		

Depth (in.)	6A1a Organic carbon	6B1a Nitrogen	C/N	6C2a Ext. Iron as Fe	Carbonate as $CaCO_3$: 6E1c <2mm.	3A1a <0.002 mm.	Bulk density: 4A1a Field-State	4A1c 30-cm.	4A1b Air-Dry	4D1 COLE	Water content: 4B4 Field-State	4B3 30-cm.	4B1b 1/3-Bar	4B2 15-Bar	4C1 1/3-to 15-Bar	pH: 8C1b Saturated Paste	8C1a 1:5	8C1a 1:10
	Pct.	Pct		Pct.	Pct.	Pct.	g/cc	g/cc	g/cc		Pct	Pct	Pct.	Pct.	in./in.			
0-7	2.09	0.192	11	2.2	2	-							31.1	19.6		7.5	8.4	8.4
7-17	0.76	0.066	12	1.7	7	2	1.63	1.32	1.87		19.3	34.6	33.6	21.8	0.16	8.0	8.7	9.0
17-28	0.28	0.025	11	1.4	7	2	1.48	1.32b	1.84	0.12	27.7	35.4	35.5	23.1	0.16	8.2	8.5	8.7
28-42	0.16			1.2	9	3								23.0		8.3	8.7	8.9
42-56	0.10			1.2	8	2	1.56	1.37c	1.88	0.11	24.6	32.1	28.9	21.4	0.10	8.3	8.8	9.0

Depth (in.)	Extractable bases 5B1a: Ca	6C2a Mg	6P2a Na	6Q2a K	Sum	Ext. Acidity	Cat. Exch. Cap.: 5A2a NaOAc	5A1a NH_4OAc	Water extract from saturated paste 8A1: Ca	Mg	6P1a Na	6Q1a K		6I1a CO_3	6J1a HCO_3	6K1a Cl	6L1a SO_4	8A1a Electrical conductivity
	meq/100 g								meq/liter									mmho/cm
0-7		11.3	2.2	1.0			39.2	35.5			7.9	0.2						1.4
7-17		18.0	14.3	0.6			36.8	33.6			52.0	0.1		-	3.0	41.4	19.2	5.6
17-28		21.9	24.6	0.8			35.8	32.1			138	0.2		-	1.4	80.1	128	14.9
28-42		21.8	23.1	0.8			35.1	32.1			124	0.2		-	1.2	73.0	99.9	13.5
42-56		19.3	21.9	0.8			32.7	30.7			101	0.1		-	1.4	64.5	58.8	10.6

Depth (in.)	8A Water at Saturation	5D1 Exchangeable Na		6F1a Gypsum	Ratios to Clay: 8D2 NH_4OAc	8D2 Ext.	8D1 15-Bar

a. Carbonate grains and shell fragments: 5-25 percent.
b. One clod.
c. 1.27 g/cc when calculated to include volume but not weight

Soil Classification: Palleustollic[1/] Chromustert; fine, mixed, isohyperthermic
Soil Type: Fe clay
Soil Nos.: S61PR-14-1
Location: Lajas Valley, Puerto Rico, 2.5 kilometers south of kilometer marker 11.7, Highway 117. 125 feet south of hedge, 50 feet east of big cerezo tree. Farm of Santos Lugo. Aerial photograph GS-LR-4-40. **Suroeste SCD.**
Vegetation and Use: Pasture, Pajon grass, paraguita grass, rayo or aroma bushes, other weeds.
Slope and Land Form: Nearly level, less than 2 percent slope, toward south on low depositional fan. 9 meters above sea level.
Drainage and Permeability: Moderately well to somewhat poorly drained, slow runoff, very slow permeability.
Parent Material: Alluvial or valley fill material from soils derived from acid volcanic and limestone rocks.
Collected by: R. B. Grossman and soil survey field party, March 14, 1961.
Described by: R. B. Grossman, March 14, 1961.

Horizon and Lincoln Lab. No.	
Ap 14823	0 to 7 inches. Dark reddish brown (5YR 3/2) clay; strong very coarse prismatic structure breaking to moderate medium to coarse angular blocky; very hard dry, firm moist, sticky and plastic wet; common fine roots; calcareous; clear to abrupt, wavy to irregular boundary.
AC 14824	7 to 17 inches. Dark reddish brown (5YR 3/2, tongues of 5YR 3/3) clay; massive wet, on drying strong very coarse prismatic structure breaking to weak coarse angular blocky; very hard dry, extremely firm moist, sticky and plastic wet; many pressure faces; trace of fine gravel and sand grains; common fine roots; strongly effervescent; some small lime aggregates; clear smooth boundary.
C1cs 14825	17 to 28 inches. Dark reddish brown (5YR 3/3) clay; massive wet, on drying weak medium angular blocky structure; common slickensides less than 3 inches; firm moist, slightly sticky and plastic wet; common gypsum crystals; few fine roots; trace of fine gravel and sand-size grains; strongly effervescent; clear smooth boundary.
C2 14826	28 to 42 inches. Dark reddish gray (5YR 4/2) clay; massive, on drying breaks to weak fine angular blocky structure; few to common slickensides and pressure faces; firm moist, slightly sticky and plastic wet; a few gypsum crystals; few fine roots; five percent fine gravel; no clay films; strongly effervescent; arbitrary boundary.
C3 14827	42 to 56 inches. Dark reddish gray (5YR 4/2) clay; massive, on drying breaks to weak fine angular blocky structure; few slickensides; common pressure faces; no clay films; firm moist, slightly sticky and plastic wet; no roots; no pores; no salt crystals; 10 percent fine gravel of subangular volcanic fragments; strongly effervescent.

Remarks: Colors given are for moist soil. Ap and AC horizons estimated at below field capacity, C horizons at field capacity when sampled. Cracks in soil to 17 inches when sampled.

Mineralogy (Methods 7A1, 7A2): AC horizon. The clay is dominated by a complex of interstratified 2:1 layer silicates, mostly vermiculite and mica with small chlorite and montmorillonite components. A small amount of kaolinite is present.

1/ Subgroup classification based on columnar structure observed in a nearby pedon under drier conditions than when this pedon was sampled.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Paleustollic Chromustert; fine, mixed, isohyperthermic

SOIL Pe clay SOIL Nos. S61PR-14-2 LOCATION Lajas Valley, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14828-14834 December 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Total: Sand (2-0 05) a	Total: Silt (0 05-0 002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0 5)	Sand: Medium (0 5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0 1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0 02)	(2-0.1)	3A1a Non-Carbonate Clay		Coarse fragments: 2A2 > 2 (<19) Pct.	Coarse fragments: 2 - 19 (Pct. of < 76 mm)	Coarse fragments: 19 -76 (Pct. of < 76 mm)
		Pct of < 2 mm																
0-2	A11	18.6	29.8	51.6	1.9	2.4	1.8	5.4	7.1	10.2	19.6	20.6	11.5	46		tr		
2-5	A12	15.3	27.1	57.6	1.6	2.6	1.8	4.3	5.0	7.8	19.3	15.3	10.3	47		tr		
5-9	AC	12.4	27.8	59.8	1.0	1.6	1.2	3.9	4.7	7.6	20.2	14.6	7.7	45		tr		
9-15	C1	11.1	30.1	58.8	0.7	1.2	1.2	3.5	4.5	8.9	21.2	15.5	6.6	45		tr		
15-28	C2	8.7	29.3	62.0	0.3	0.8	0.9	2.8	3.9	7.9	21.4	13.5	4.8	48		tr		
28-43	C3	8.3	28.6	63.1	0.3	0.8	0.8	2.6	3.8	7.5	21.1	12.9	4.5	51		tr		
43-57	C4	8.6	28.8	62.6	0.7	0.9	0.8	2.4	3.8	7.5	21.3	12.8	4.8	52		tr		

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$: 6E1c <2mm. Pct.	Carbonate as $CaCO_3$: 3A1a <0.002 mm. Pct.	Bulk density: 4A1a Field-State g/cc	Bulk density: 4A1c 30-cm.	Bulk density: 4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct	Water content: 4B3 30-cm. Pct.	4B1b 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in./in.	pH: 8C1b Saturated Paste	pH: 8C1a (1:5)	pH: 8C1a (1:10)
0-2	2.28	0.202	11	1.0	19	6								20.4		7.7	8.2	8.4
2-5	1.31	0.120	11	0.9	23	11							34.2	22.9		7.9	8.5	8.9
5-9	0.69	0.061	11	0.8	30	15	1.50	1.34	1.76	0.10	23.5	32.7	32.4	21.2	0.15	7.9	8.5	8.8
9-15	0.44	0.037	12	0.8	28	14	1.50	1.34	1.78	0.10	23.7	33.3	31.1	21.8	0.12	8.0	8.3	8.5
15-28	0.27	0.021		0.7	28	14							34.1	24.9		8.1	8.5	8.8
28-43	0.18			0.7	26	12	1.40	1.29	1.80	0.12	30.8	36.5	34.9	24.6	0.13	8.3	8.7	8.9
43-57	0.16			0.8	23	11								25.0		8.3	8.6	8.9

Soil Classification: Paleustollic[1] Chromustert; fine,[2] mixed,[3] isohyperthermic
Soil Type: Fé clay
Soil Nos.: S61PR-14-2
Location: Lajas Valley, Puerto Rico. Land Authority farm at Fraternidad, 275 feet east of Cristales drainage ditch, 250 feet south of road on old railroad bed. Aerial photograph GS-LR-4-42. Suroeste SCD.
Vegetation and Use: Pasture, Pajon grass, Paraguita grass, cacti, weeds, Rayo trees.
Slope and Land Form: Nearly level (1 percent) slope toward south on low depositional fan. 7 meters above sea level.
Drainage and Permeability: Moderately well drained, slow runoff, slow permeability.
Parent Material: Alluvial or valley-fill material from soils derived from volcanic and limestone rocks.
Collected by: R. B. Grossman and soil survey field party, March 14, 1961.
Described by: L. H. Rivera.

Horizon and Lincoln Lab. No.	
A11 14828	0 to 2 inches. Dark reddish brown (5YR 3/2) clay; moderate medium granular structure; friable, sticky, plastic; many fine roots; many fine sand-size lime aggregates; highly calcareous; clear smooth boundary.
A12 14829	2 to 5 inches. Dark reddish brown (5YR 3/2) clay; moderate medium prismatic structure breaking to moderate coarse angular blocky; firm, plastic; sticky; common fine roots; many fine sand-size lime aggregates; highly calcareous; clear wavy boundary.
AC 14830	5 to 9 inches. Dark reddish gray (5YR 4/2) clay; massive wet; moderate medium prismatic structure breaking to weak medium angular blocky upon drying; firm, slightly sticky, plastic; few fine roots; few fine slickensides; common pressure faces; many fine sand-size lime aggregates; highly calcareous; clear wavy boundary.
C1 14831	9 to 15 inches. Dark reddish brown and dark reddish gray (5YR 3/2 and 4/2) clay; massive wet, upon drying breaks to weak fine angular blocky structure; friable, slightly sticky, plastic; few roots; common small slickensides and pressure faces; common filaments of fine sand-size crystals (salt?); highly calcareous; clear wavy boundary.
C2cs 14832	15 to 28 inches. Dark reddish brown (5YR 3/2) and dark reddish gray (5YR 4/2) clay; massive, breaks to weak fine subangular blocky structure; friable, slightly plastic, slightly sticky; common fine gypsum crystals; few fine roots; few slickensides; highly calcareous; gradual smooth boundary.
C3 14833	28 to 43 inches. Dark reddish gray (5YR 4/2) clay; massive, breaks to weak fine angular blocky structure; friable, plastic, slightly sticky; few roots; common slickensides less than 3 inches in width; few gypsum crystals; highly calcareous; arbitrary boundary.
C4 14834	43 to 57 inches. Dark reddish gray (5YR 4/2) clay; massive, breaking to moderate fine angular blocky structure; friable, plastic, slightly sticky; few roots; many slickensides less than 3 inches; few gypsum crystals; few fine flat sand-size crystals and shell fragments; few soft black aggregates; highly calcareous.

Remarks: Colors given are for moist soil. When sampled, A11 and A12 were below field capacity; remainder of profile about field capacity.

1/ Subgroup classification based on columnar structure observed in a nearby pedon under drier conditions than when this pedon was sampled.

2/ Family texture based on noncarbonate clay; would be very fine if carbonate clay were included.

3/ Family mineralogy based on X-ray data for Fé, S61PR-14-1.

SOIL CLASSIFICATION: Udic Chromustert; fine, mixed, isohyperthermic

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Cartagena clay SOIL No. 857PR-14-5 LOCATION Surroeste SCN Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 7403-7409 November 1966
General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05) a	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)			Coarse fragments: 2A2 ≥ 2 (<19) Pct.	2 – 19	19 – 76
		Pct. of < 2 mm															Pct. of < 76 mm	
0-7	Ap	8.6	27.5	63.9	0.9	1.2	0.7	2.4	3.4	7.1	20.4	12.1	5.2			2		
7-17	A12	16.1	25.3	58.6	5.9	3.0	1.3	2.7	3.2	6.8	18.5	11.6	12.9			2		
17-26	C1	15.4	25.9	58.7	4.7	3.6	1.4	2.7	3.0	6.2	19.7	10.8	12.4			1		
26-38	C2	13.7	27.5	58.8	4.3	3.1	1.1	2.3	2.9	6.5	21.0	10.8	10.8			tr		
38-50	C3	9.8	25.2	65.0	2.3	1.9	0.9	2.0	2.7	6.8	18.4	10.7	7.1			tr		
50-60	C4	7.0	27.5	65.5	1.2	1.0	0.5	1.6	2.7	6.7	20.8	10.4	4.3			tr		
60-72+	C5	8.6	28.1	63.3	1.0	1.0	0.6	2.3	3.7	8.1	20.0	13.3	4.9			tr		

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	6E1a Carbonate as $CaCO_3$ Pct		Bulk density g/cc	g/cc	g/cc		Water content Pct.	Pct	4B2 15-Bar Pct.			pH 8C1a 1:5	1:1
0-7	1.84	0.175	11	2.1	1								25.0				7.5
7-17	0.56	0.051	11	1.9	9								24.6				8.0
17-26	0.48	0.038	13	1.8	12								25.4				8.3
26-38	0.42			1.8	10								26.0				8.1
38-50	0.35			1.9	15								27.2				8.2
50-60	0.14			1.8	10								27.0			9.2	
60-72+	0.06			2.1	5								24.8			9.3	

Depth (In.)	Extractable bases 5B1a: Ca	6Q2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. Sum Cations	5A1a NH_4OAc	Water extract from saturated paste 8A1: Ca	Mg	6P1a Na	6Q1a K		CO_3	HCO_3	Cl	SO_4	8A1a Electrical conductivity
	meq/100 g								meq/liter									mmho/cm
0-7		14.4	1.2	1.2		2.5		52.4			2.6	0.1						1.0
7-17		16.8	4.4	0.7		-		45.8			6.0	-						0.9
17-26		20.8	8.0	0.6		-		45.0			10.2	-						1.2
26-38		20.7	11.4	0.6		-		42.8			13.1	-						1.9
38-50		24.5	15.0	0.7		-		44.1			15.8	-						2.3
50-60		22.7	16.6	0.7		-		42.6			13.4	-						1.8
60-72+		20.0	17.0	0.7		-		41.1			11.8	-						1.6

Depth (In.)	8A Water at Saturation Pct	5D2 Exchangeable Na Pct.		6F1a Gypsum Pct.	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-7	93.3	2		-	0.82	0.03	0.39
7-17	87.2	8		-	0.78	0.03	0.42
17-26	104	16		-	0.77	0.03	0.43
26-38	113	23		-	0.73	0.03	0.44
38-50	127	29		-	0.68	0.03	0.42
50-60	145	34		-	0.65	0.03	0.41
60-72+	158	37		-	0.65	0.03	0.39

a. Earthy nodules: 25-50 percent; carbonate grains: < 5 percent.

See introductory part of this SSIR for discussion of several of the determinations.

Soil Classification: Udic Chromustert; fine, mixed, isohyperthermic
Soil Type: Cartagena clay
Soil Nos.: 857PR-14-5
Location: 1 1/8 mile south of Highway No. 117 and 1 5/8 mile east of Highway No. 116 on photo GS-LR-4-34 - 100 feet southeast of intersection of farm roads.
Area: Puerto Rico, Lajas Valley, Suroeste Soil Conservation District.
Climate: Semiarid - annual precipitation 30 to 40 inches a year.
Slope: 0 to 1 percent.
Relief: Smooth (tendency to Gilgai microrelief).
Drainage: Somewhat poorly drained.
Vegetation: Native grasses (has been in sugar cane).
Erosion: None to slight.
Root Distribution: Abundant to 26 inches.
Collected by: L. T. Alexander, C. J. Koch, R. E. Gierbolini, J. Juarez, Jr., and J. E. Trigo, September 6, 1957.
Described by: C. J. Koch.

Horizon and Lincoln Lab. No.	
Ap 7403	0 to 7 inches. Very dark brown (10YR 2/2) clay; moderate medium granular structure; sticky, plastic; smooth abrupt boundary.
A12 7404	7 to 17 inches. Very dark brown (10YR 2/2) clay; massive when wet; slickenside faces present; very sticky, plastic; gradual wavy boundary.
C1 7405	17 to 26 inches. Dark reddish brown (5YR 3/2) clay; massive when wet; slickenside faces present; very sticky, plastic; clear wavy boundary.
C2 7406	26 to 38 inches. Very dark grayish brown (10YR 3/2) clay; massive when wet; slickenside faces present; sticky, plastic; few small rounded fragments; clear wavy boundary.
C3 7407	38 to 50 inches. Brown to dark brown (7.5YR 4/2) clay; massive when wet; sticky, plastic; few lime specks; arbitrary boundary.
C4 7408	50 to 60 inches. Same as C1.
C5 7409	60 to 72 inches plus. Same as C1.

Remarks: Deep cracks develop in this pedon during dry periods with many of them extending as deep as 48 inches. Colors given are for moist soil unless otherwise stated.

Mineralogy (Methods 7A1, 7A2), C2 horizon. The clay is principally a complex of minerals involving vermiculite, montmorillonite, possibly also chlorite, and mica. The principal mineral displays some expansion properties upon solvation with glycerol, but evidence of true montmorillonite is lacking. A small amount of kaolinite is present.

U. S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Udic Chromustert; fine, mixed, isohyperthermic

SOIL Cartagena clay SOIL Nos. S57PR-14-8 LOCATION Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 7419-7425 December 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1															
		Total			Sand					Silt					Coarse fragments		
		Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Very coarse (2–1)	Coarse (1–0 5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	0.05–0.02	Int. III (0.02–0 002)	Int. II (0.2–0.02)	(2–0 1)			2A2 > 2 (<19) Pct.	2 – 19	19 –76
		Pct of < 2 mm														Pct. of < 76 mm		
0-7	Ap	7.5	32.7	59.8	0.4	0.6	0.4	2.1	4.0	8.4	24.3	13.9	3.5			tr		
7-15	A12	8.0	33.5	58.5	0.6	0.7	0.5	2.1	4.1	9.5	24.0	15.0	3.9			1		
15-22	C1	10.0	33.0	57.0	0.6	1.0	0.8	2.9	4.7	9.9	23.1	16.5	5.3			2		
22-30	C2	11.2	27.1	61.7	1.3	1.6	0.9	2.7	4.7	9.1	18.0	15.6	6.5			2		
30-46	C3	9.3	31.3	59.4	1.0	1.5	0.9	2.2	3.7	8.9	22.4	14.0	5.6			5		
46-60	C4	9.5	28.4	62.1	2.1	1.5	0.8	1.9	3.2	7.8	20.6	12.2	6.3			5		

Soil Classification: Udic Chromustert; fine, mixed,[1/] isohyperthermic
Soil Type: Cartagena clay
Soil Nos.: S57PR-14-8
Location: 5/8 mile south of Highway No. 117 and 1½ miles east of junction of old railroad and Highway No. 116 in northwest corner of farm road intersection. Photo GS-LR-6-82.
Area: Puerto Rico, Lajas Valley, Suroeste Soil Conservation District.
Slope: 1 to 2 percent. Climate: Semiarid. Annual precipitation 30 to 40 inches.
Relief: Smooth.
Drainage: Moderately well drained.
Crop: Sugar cane.
Erosion: None to slight.
Root Distribution: Abundant to 30 inches.
Soil Temperature: 26.5 degrees C. at 55 inches.
Collected by: L. T. Alexander, C. J. Koch, Juan Juarez, Jr., and J. E. Trigo.
Described by: C. J. Koch, September 9, 1957.

Horizon and Lincoln Lab. No.	
Ap 7419	0 to 7 inches. Very dark grayish brown (10YR 3/2) clay; tendency to weak fine angular blocky, although there is some platiness due to compaction; slightly sticky and plastic; clear boundary; pH 6.6; neutral.
A12 7420	7 to 15 inches. Very dark grayish brown (10YR 3/2) clay with moderate medium angular blocky structure; slightly sticky and plastic; few fine gravel; slight slickenside activity; arbitrary boundary; pH 6.9; neutral.
C1 7421	15 to 22 inches. Very dark gray (10YR 3/1) clay with moderate fine angular blocky structure; moderately sticky and plastic; few fine gravel - some appear to be waterworn; numerous fine pores; strong slickenside activity with polished pressure faces; clear wavy boundary; pH 7.3; neutral.
C2 7422	22 to 30 inches. Black (10YR 2/1) clay with weak coarse angular blocky structure; slightly sticky and plastic; few gravel; some slickenside faces; clear wavy boundary with some pockets 6 inches deep - part of the laboratory sample came from pockets at 36 inches; pH 7.6; mildly alkaline.
C3 7423	36 to 46 inches. Dark grayish brown (10YR 4/2) clay with weak coarse angular blocky structure; sticky and plastic; numerous fine rounded gravel; few patchy clay skins; a portion of the laboratory sample came from pockets occurring at 30 inches; arbitrary boundary; pH 8.1; moderately alkaline.
C4 7424	46 to 60 inches. Brown to dark brown (10YR 4/3) clay; massive structure with slight tendency to weak coarse angular blocky; sticky and plastic; few fine rounded rhyolite gravel; calcareous; abrupt irregular boundary; pH 8.4; moderately alkaline.
C5 7425	60 to 65 inches plus. This layer is either decomposed rock or a dense stone line. There is a clay matrix much like the horizon above; pH 8.8; strongly alkaline.

Remarks: Colors given are for moist soil unless otherwise stated.

1/ **Family mineralogy based on mineralogy of Cartagena, S57PR-14-5. The apparent exchange capacity of the clay in the two pedons is similar.**

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Udic Chromustert; very fine, montmorillonitic, isohyperthermic

SOIL Fraternidad clay SOIL Nos. S61PR-14-9 LOCATION Lajas Valley, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB Nos. 14856-14861 December 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0 05)	Total: Silt (0.05–0 002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0 5)	Sand: Medium (0.5–0.25)	Sand: Fine (0 25–0.1)	Sand: Very fine (0.1–0 05)	Silt: 0 05–0 02	Silt: Int. III (0.02–0.002)	Silt: Int II (0 2–0.02)	(2–0.1)			Coarse fragments: 2A2 > 2 (<19) Pct.	2 – 19	19 – 76
		Pct. of < 2 mm														Pct.	Pct of < 76mm	
0-7	Ap	17.7	30.7	51.6	1.8	2.4	1.9	5.1	6.5	11.5	19.2	21.0	11.2			tr		
7-14	A12	16.7	28.3	55.0	2.0	2.3	1.7	4.5	6.2	10.7	17.6	19.5	10.5			tr		
14-23	A13	13.6	24.8	61.6	1.7	1.8	1.3	3.7	5.1	8.9	15.9	16.2	8.5			tr		
23-34	C1	12.4	24.6	63.0	1.0	1.6	1.2	3.5	5.1	9.3	15.3	16.5	7.3			tr		
34-51	C2	13.3a	28.5	58.2	1.0	1.5	1.2	3.8	5.8	10.8	17.7	19.0	7.5			tr		
51-60	C3	15.1a	27.6	57.3	1.5	1.5	1.4	4.5	6.2	10.6	17.0	19.6	8.9			tr		

Depth (In)	6A1a Organic carbon b Pct	6B1a Nitrogen Pct.	C/N		6E2a 6E1c Carbonate as $CaCO_3$ Pct.	6C2a Ext. Iron as Fe Pct.	Bulk density: 4A1a Field-State g/cc	4A1c 30-cm. g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct	4B3 30-cm Pct.	4B1b 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in/in.	pH		8C1a (1.1) H_2O

Soil Classification: Udic Chromustert; very fine, montmorillonitic, isohyperthermic
Soil Type: Fraternidad clay
Soil Nos.: 861PR-14-9
Location: Lajas Valley, Puerto Rico, On Lajas Experiment Station, 690 feet north and 150 feet east of junction of roads to poultry barns and to Lajas railroad station, east of Experiment Station headquarters. Aerial photograph GS-LR-6-86. Suroeste Soil Conservation District.
Vegetation and Use: Idle, weeds on old cultivated field.
Slope and Land Form: Nearly level (1 percent slope) at top of low convex alluvial fan above valley floor.
Drainage and Permeability: Moderately well drained, moderately slow permeability, slow to medium rate of runoff.
Parent Material: Alluvial or valley-fill sediments derived from volcanic and limestone rocks.
Collected by: R. B. Grossman, W. E. McKinzie, O. R. Carter, L. H. Rivera, March 21, 1961.

Described by: O. R. Carter.

Horizon and Lincoln Lab. No.	
Ap 14856	0 to 7 inches. Very dark grayish brown (10YR 3/2) clay; weak medium granular structure; firm, slightly sticky, plastic; many fine roots; common fine volcanic fragments; medium acid; clear smooth boundary.
A12 14857	7 to 14 inches. Very dark grayish brown (10YR 3/2) and 20 percent dark brown (10YR 3/3) clay; massive wet, upon drying breaks to weak medium and coarse angular blocky with many pressure faces; slickensides one inch wide; firm, sticky, plastic; few fine roots; common fine brown volcanic fragments, few up to 1 inch across; medium acid; clear wavy boundary.
A13 14858	14 to 23 inches. Dark brown (10YR 3/3) clay with tongues and pockets of very dark grayish brown (10YR 3/2) clay; massive wet, upon drying breaks to weak medium and coarse angular blocky with pressure faces and slickensides 6 inches in width and less; firm, sticky, plastic; common fine volcanic pebbles, common fine black aggregates; calcareous; gradual wavy boundary.
C1 14859	23 to 34 inches. Dark yellowish brown (10YR 4/4) clay with tongues and pockets of very dark grayish brown (10YR 3/2) clay; massive wet, upon drying breaks to weak medium and coarse angular blocky with pressure faces; slickensides 6 inches in width and less; firm, sticky, plastic; common fine black aggregates; calcareous; clear wavy boundary.
C2 14860	34 to 51 inches. Dark yellowish brown (10YR 4/4) clay; massive wet, upon drying breaks to weak coarse subangular blocky bounded by very dark brown (10YR 2/2) pressure faces in wedge shape; slickensides from 1 to 12 inches wide, 30 degrees to horizontal; very firm, sticky, plastic; common fine black concretions or aggregates; mildly alkaline except for common calcareous seams; clear wavy boundary.
C3 14861	51 to 60 inches. Dark yellowish brown (10YR 4/4) clay, appears to contain less clay than above horizons; massive wet, upon drying breaks to weak fine angular blocky bounded by very dark brown (10YR 2/2) pressure faces; many slickensides less than 1 inch; friable, slightly sticky, slightly plastic; slightly calcareous.

Remarks: Colors given are for moist soil. When sampled, A11, A12, A13, estimated to be below field capacity; C horizons at field capacity. Prominent cracks extend down to 23 inches.

Mineralogy (Methods 7A1, 7A2): C1 horizon. Fairly well ordered montmorillonite dominates the clay. A small amount of kaolinite is present.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Chromudic Pellustert; fine, mixed, isohyperthermic

SOIL Aguirre clay SOIL Nos. S57PR-14-3 LOCATION Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. No. 7392-7398 November 1966

[redacted]

General Methods: 1A, 1H1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05) a	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int II (0.2-0.02)	(2-0.1)			Coarse fragments 2A2: > 2 (<19) Pct.	2 - 19	19-76
		Pct. of < 2 mm															Pct. of < 76 mm	
0-9	Ap	6.1	24.4	69.5	1.0	1.0	0.5	1.3	2.3	6.5	17.9	9.6	3.8			2		
9-18	C1	18.3	24.7	57.0	8.3	3.1	1.1	2.5	3.3	7.3	17.4	12.1	15.0			5		
18-27	C2	15.5	26.9	57.6	3.9	3.3	1.5	3.0	3.8	8.1	18.8	13.7	11.7			3		
27-35	C3	12.2	28.2	59.6	3.0	2.2	1.0	2.4	3.6	8.1	20.1	13.2	8.6			2		
35-48	C4	9.3	29.9	60.8	1.0	1.4	1.0	2.5	3.4	6.8	23.1	11.7	5.9			1		
48-60	C5	6.7	29.4	63.9	0.7	1.2	0.8	1.6	2.4	6.5	22.9	9.9	4.3			tr		
60-72+	C6	7.0	28.1	64.9	1.3	1.1	0.6	1.5	2.5	6.2	21.9	9.7	4.5			tr		

Depth (In.)	6A1a Organic carbon Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	6E1a Carbonate as $CaCO_3$ Pct		Bulk density g/cc	Bulk density g/cc	Bulk density g/cc		Water content Pct.	Water content Pct.	4B2 15-Bar Pct.				pH 8C1a (1:1)
0-9	1.76	0.173	10	2.1	1								28.0				7.6
9-18	0.68	0.054	13	2.3	9								24.8				7.9
18-27	0.44	0.035	13	2.3	9								25.0				7.9
27-35	0.40			2.1	14								25.4				7.9
35-48	0.24			1.9	9								26.1				7.8
48-60	0.11			2.3	7								27.0				7.9
60-72+	0.07			2.1	8								27.8				7.9

Depth (In.)	Extractable bases 5B1a: Ca	6G2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. Sum Cations	5A1a NH_4OAc	Water extract from saturated paste 8A1: Ca	Mg	6P1a Na	6Q1a K	CO_3	HCO_3	Cl	SO_4	8A1a Electrical conductivity
	meq/100 g								meq/liter								mmho/cm
0-9		23.6	4.1	0.9		2.1		58.8			5.8	0.1					1.1
9-18		23.0	9.5	0.6		-		47.2			21.4	0.1					3.0
18-27		27.5	13.8	0.5		-		47.2			50.6	0.1					8.4
27-35		31.5	15.4	0.6		-		47.4			52.2	0.1					8.4
35-48		33.3	17.8	0.6		-		47.2			58.4	0.2					9.4
48-60		34.3	20.8	0.7		-		46.6			53.4	0.1					7.8
60-72+		33.3	21.4	0.8		-		47.8			44.0	0.1					5.8

Depth (In.)	8A Water at Saturation Pct	5D2 Exchangeable Na Pct.		6F1a Gypsum Pct.	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-9	102	6		-	0.85	0.03	0.40
9-18	94.9	16		-	0.83	0.04	0.44
18-27	90.8	19		-	0.82	0.04	0.43
27-35	102	21		-	0.80	0.04	0.43
35-48	103	25		-	0.78	0.03	0.43
48-60	117	31		-	0.73	0.04	0.42

a. Earthy nodules: 25-50 percent; carbonate grains: < 5 percent.

See introductory part of this SSIR for discussion of several

Soil Classification: Chromudic Pellustert; fine, mixed, isohyperthermic
Soil Type: Aguirre clay
Soil Nos.: S57PR-14-3
Location: 100 yards east of Highway No. 106 at kilometer marker 9.6. 50 feet south of farm road.
Area: Puerto Rico, Lajas Valley, Suroeste Soil Conservation District.
Climate: Semiarid - annual precipitation 30 to 40 inches a year.
Slope: 0 to 1 percent.
Relief: Smooth.
Drainage: Somewhat poorly drained.
Vegetation: Native grasses - previously cultivated to sugar cane.
Erosion: None to slight.
Root Distribution: Abundant in Ap. Few down to 27 inches.
Soil Temperature: 28 degrees C. at 55 inches.
Collected by: L. T. Alexander, C. J. Koch, J. A. Bonnet, R. E. Gierbolini, J. Juarez, Jr., and J. E. Trigo, September 6, 1957.
Described by: C. J. Koch.

Horizon and Lincoln Lab. No.	
Ap 7392	0 to 9 inches. Black (10YR 2/1) clay; weak medium granular structure; very sticky, plastic; soil subject to severe surface cracking; smooth clear boundary.
C1 7393	9 to 18 inches. Very dark brown (10YR 2/2) clay; massive when wet; slickenside faces are evident; very sticky, plastic; this horizon appears to be more compact, probably because of tillage; few volcanic fragments; gradual wavy boundary.
C2 7394	18 to 27 inches. Very dark gray (10YR 3/1) clay; massive when wet; slickenside faces are evident; very sticky, plastic; few volcanic fragments; gradual wavy boundary.
C3 7395	27 to 35 inches. Very dark brown (10YR 2/2) clay; massive when wet; slickenside faces are evident; very sticky, plastic; common medium lime splotches; clear wavy boundary.
C4 7396	35 to 48 inches. Dark brown (7.5YR 3/2) clay; massive when wet; slickenside faces are evident; very sticky, plastic; most cracks extend to this depth; arbitrary boundary.
C5 7397	48 to 60 inches. Dark brown (10YR 3/3) clay; massive when wet; very sticky, plastic; occasional cracks to this depth with some slickenside faces; few medium lime splotches; common fine black concretions; gradual wavy boundary.
C6 7398	60 to 72 inches plus. Dark grayish brown (10YR 4/2) clay; massive; very sticky, plastic; common lime concretions and black concretions.

Remarks: Colors given are for the moist soil.

Mineralogy (Methods 7A1, 7A2), C2 horizon. The clay is principally a complex of minerals involving vermiculite, montmorillonite, possibly also chlorite, and mica. The principal mineral displays some expansion properties upon solvation with glycerol, but evidence of true montmorillonite is lacking. A small amount of kaolinite is present.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Chromudic Pellustert; fine, montmorillonitic, isohyperthermic

SOIL: Santa Isabel clay — SOIL Nos.: S57PR-14-7 — LOCATION: Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska — LAB. Nos.: 7412-7418 — November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int II (0.2–0.02)	(2–0.1)			Coarse fragments: 2A2 > 2 (<19) Pct.	2 – 19	19 – 76
		Pct of < 2 mm															Pct of < 76 mm	
0-9	Ap	9.6a	38.0	52.4	0.8	1.1	1.0	2.8	3.9	10.2	27.8	15.9	5.7			tr		
9-17	A12	11.9b	37.9	50.2	0.5	1.4	1.4	3.8	4.8	10.2	27.7	17.4	7.1			tr		
17-25	AC	10.2b	35.2	54.6	0.4	0.9	0.9	3.0	5.0	10.2	25.0	17.2	5.2			tr		
25-34	C1	23.1b	31.9	45.0	2.9	3.8	2.2	6.4	7.8	10.7	21.2	22.5	15.3			tr		
34-41	C2	15.2b	31.0	53.8	1.2	1.6	1.3	5.0	6.1	9.7	21.3	19.1	9.1			tr		
41-49	C3	5.3b	29.3	65.4	0.5	0.4	0.4	1.5	2.5	6.8	22.5	10.3	2.8			tr		
49-60+	C4	6.2b	32.5	61.3	0.9	0.7	0.4	1.5	2.7	7.6	24.9	11.3	3.5			tr		

Depth (In.)	6A1a Organic carbon	6B1a Nitrogen	C/N	6C2a Ext. Iron as Fe	6E2a 6E1a Carbonate as $CaCO_3$		Bulk density				Water content		4B2 15-Bar				pH 8C1a	
	Pct.	Pct		Pct.	Pct		g/cc	g/cc	g/cc		Pct	Pct.	Pct.				1:5	1:1
0-9	2.04	0.185	11	3.4	-(a)								24.6					6.8
9-17	1.52	0.152	10	3.2	2								24.6					7.4
17-25	1.67	0.151	11	2.9	1								26.5					7.4
25-34	0.85			2.7	12								23.9					7.6
34-41	0.90			2.6	2								26.9					7.6
41-49	1.19			2.1	5								31.2				8.3	
49-60+	0.64			1.9	19								28.1					7.8

Depth (In.)	Extractable bases 5B1a: Ca	6Q2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: Sum Cations	5A1a NH_4OAc	Ca	Mg	6F1a Na	6Q1a K		CO_3	HCO_3	Cl	SO_4	8A1a Electrical conductivity
	meq/100 g								Water extract from saturated paste 8A1: meq/liter									mmho/cm
0-9		13.3	0.3	0.6		7.2		53.3			0.5	0.1						0.6
9-17		12.3	0.3	0.6		4.2		51.5			0.7	-						0.7
17-25		14.5	0.5	0.6		3.8		56.1			1.1	-						0.6
25-34		15.2	0.8	0.5		3.4		51.8			1.6	-						0.7
34-41		19.4	1.3	0.6		3.0		58.7			2.3	-						0.8
41-49		24.1	1.6	0.6		-		60.2			2.6	-						0.8
49-60+		23.0	1.7	0.5		-		49.3			2.8	-						0.7

Depth (In.)	8A Water at Saturation	5D2 Exchangeable Na		6F1a Gypsum	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
	Pct.	Pct.		Pct			
0-9	79.8			-	1.02	0.06	0.47
9-17	82.1			-	1.03	0.06	0.49
17-25	88.9			-	1.03	0.05	0.49
25-34	76.9	1		-	1.15	0.06	0.53
34-41	92.4	1		-	1.09	0.05	0.50
41-49	115	2		-	0.92	0.03	0.48
49-60+	96.8	1		-	0.80	0.03	0.46

a. Earthy nodules: 25-50 percent (1-0.05 mm.).
b. Fe-Mn nodules: 25-50 percent; carbonate grains: < 5 percent (1-0.05 mm.).

See introductory part of this SSIR for discussion of several of the determinations.

USDA SCS-HYATTSVILLE MD 1964

Soil Classification: Chromudic Pellustert; fine, montmorillonitic, isohyperthermic
Soil Type: Santa Isabel clay
Soil Nos.: S57PR-14-7
Location: One-half mile east of Highway No. 116 and one-eighth mile south of old railroad tracks - 50 feet south of field road and 100 feet east of irrigation lateral. Photo GS-LR-6-84.
Area: Puerto Rico, Lajas Valley, Suroeste Soil Conservation District.
Climate: Semiarid - annual precipitation 30 to 40 inches a year.
Slope: 1 to 2 percent.
Relief: Smooth.
Drainage: Moderately well drained.
Crop: Sugar cane.
Erosion: Slight.
[redacted]

Ground Water: Saturated soil was found below 60 inches. Water table estimated at 66 to 72 inches.
Soil Temperature: 27 degrees C. at 50 inches.
Collected by: L. T. Alexander, C. J. Koch, J. Juarez, Jr., and J. E. Trigo, September 9, 1957.
Described by: C. J. Koch.

Horizon and Lincoln Lab. No.	
Ap 7412	0 to 9 inches. Very dark gray (10YR 3/1) clay; weak fine granular structure; slightly sticky, plastic; many fine pores; neutral; clear wavy boundary.
A12 7413	9 to 17 inches. Very dark grayish brown (10YR 3/2) clay; moderate medium blocky structure; slightly sticky, plastic; few fine pores; pressure faces on most ped faces; neutral; gradual wavy boundary.
AC 7414	17 to 25 inches. Very dark gray and black (10YR 3/1 and 2/1) clay; moderate fine blocky structure; slightly sticky, plastic; many fine pores; few fine waterworn gravel; mildly alkaline; clear wavy boundary.
C1 7415	25 to 34 inches. Very dark grayish brown (10YR 3/2) clay with weak medium blocky structure; slightly sticky, plastic; many fine waterworn gravel; highly polished slickenside faces; mildly alkaline; clear wavy boundary.
C2 7416	34 to 41 inches. Very dark gray (10YR 3/1) with some pockets of very dark grayish brown (10YR 3/2) from overlying horizon, clay; weak medium blocky structure; slightly sticky, plastic; few waterworn gravel; prominent slickenside faces; mildly alkaline; arbitrary boundary.
C3 7417	41 to 49 inches. Very dark gray (10YR 3/1) clay; weak medium blocky structure; slightly sticky, plastic; prominent slickenside faces; mildly alkaline; clear boundary.
C4 7418	49 to 60 inches plus. Very dark grayish brown (10YR 3/2) clay with weak medium blocky structure; slightly sticky, plastic; few spots of lime; has appearance of clay skins but may be pressure faces; mildly alkaline.

Remarks: Santa Isabel soils occur on level or nearly level concave alluvial fans. This pedon shows very pronounced slickenside faces, which are highly polished and show striations of movement. This condition has probably restricted the development of more distinct soil structure. The Santa Isabel soils in low positions may have concentrations of salt or sodium. Soil colors are for moist conditions unless otherwise stated.

Mineralogy (Methods 7A1, 7A2), C1 horizon. The clay consists of abundant montmorillonite and a small to moderate amount of vermiculite. The minerals appear rather well crystallized.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Tropaquept; fine, mixed, acid, isohyperthermic

SOIL: Maunabo clay SOIL Nos. S63PR-12-5 LOCATION: Este SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska LAB. Nos. 19080-19085 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	<0.0002	<0.074	Coarse fragments 2A2 > 2 (<19) Pct.	2 – 19	19 – 76
		Pct. of < 2 mm															Pct. of < 76mm	
0-4	Ap	21.5	32.8	45.7	1.2	3.0	2.8	7.8	6.7	7.1	25.7	18.5	14.8		82.5	tr		
4-10	A12	20.2	32.1	47.7	0.8	2.6	2.5	7.4	6.9	7.0	25.1	18.5	13.3		83.9	tr		
10-15	B1g	18.2	32.9	48.9	0.7	1.6	1.9	7.0	7.0	6.9	26.0	18.3	11.2		86.0	-		
15-22	B2g	19.9	32.9	47.2	0.2	1.1	1.9	8.4	8.3	7.9	25.0	21.5	11.6	19.0	87.1	-		
22-39	B3g	25.0	38.2	36.8	0.1	0.9	2.3	10.3	11.4	11.9	26.3	29.7	13.6		82.1	-		
39-48	IICg	78.8	10.3	10.9	1.8	6.6	20.6	42.8	7.0	3.3	7.0	25.3	71.8		24.5	tr		

Depth (In.)	6A1a Organic carbon a Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.	Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in./in.	pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-4	2.44	0.187	13	1.3		1.15	1.35	1.49	0.032	42.2	28.0	20.7	0.10	3.5	4.3
4-10	1.64	0.159	10	1.3		1.27	1.40	1.59	0.044	34.8	27.0	20.6	0.09	3.9	4.8
10-15	1.38	0.142	10	1.2		1.23	1.35	1.52	0.040	36.2	27.9	20.8	0.10	3.7	4.7
15-22	0.89	0.097	9	1.0		1.34	1.48	1.68	0.044	32.7	25.0	20.7	0.06	4.5	5.3
22-39	0.35	0.042	8	1.5		1.31	1.41	1.57	0.036	34.8	27.6	17.4	0.14	4.5	5.2
39-48	0.11			0.1								5.2		4.3	5.0

Depth (In.)	Extractable bases: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	6I2a NH_4OAc Ext. SO_4	Base saturation: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g											
0-4	7.6	1.7	0.4	0.3	10.0	18.3	28.3	19.4	2.9	0.3	35	52
4-10	10.5	2.2	0.6	0.1	13.4	13.1	26.5	18.2	0.7	0.3	51	74
10-15	9.5	2.6	1.1	0.1	13.3	13.4	26.7	18.6	0.9	0.9	50	72
15-22	9.7	3.8	1.6	0.1	15.2	8.4	23.6	17.0	-	0.8	64	89
22-39	7.2	3.7	0.9	0.2	12.0	6.4	18.4	13.3	0.2	0.4	65	90
39-48	2.4	1.7	0.3	0.1	4.5	3.1	7.6	5.2	0.2	0.1	59	87

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-4	0.42	0.03	0.45
4-10	0.38	0.03	0.43
10-15	0.38	0.02	0.43
15-22	0.36	0.02	0.44
22-39	0.36	0.04	0.47
39-48	0.48	0.01	0.48

a. 14 kg/m² to 39 inches (Method 6A).

Soil Classification: Typic Tropaquept; fine, mixed, acid, isohyperthermic
Soil type: Maunabo clay.
Soil Nos.: S63PR-12-5.
Location: Este SCD, Puerto Rico, 5.0 kilometers northeast from town of Yabucoa, 1,500 feet northeast from intersection of highways 905 and 3. Photo GS-LR-9-19.

Drainage and permeability: Poorly drained, slow runoff, slow permeability.
Parent material: Fine textured sediments derived from plutonic rocks.
Samples collected by and date: W.E. McKinzie, R.B. Grossman and R.A. Boccheciamp on September 17, 1963.
Profile described by: R.A. Boccheciamp.

Horizon and Lincoln Lab. Number	
Ap 19080	0 to 4 inches, light brownish gray (10YR 6/2) clay with few fine faint strong brown (7.5YR 5/6) mottles; massive; very firm, slightly sticky, plastic; common fine roots; few fine quartz grains; few fine black grains; strongly acid; gradual smooth boundary. Field moisture 45.2 percent.
A12 19081	4 to 10 inches, grayish brown (10YR 5/2) clay with common medium distinct strong brown (7.5YR 5/6) mottles; massive; very firm, slightly sticky, plastic; red coatings on old root channels; common fine roots; few fine pores; few fine black grains; strongly acid; gradual smooth boundary. Field moisture 39.4 percent.
B1g 19082	10 to 15 inches, gray (5Y 5/1) clay with common medium distinct yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; very firm, slightly sticky, plastic; dark and red coatings along root channels; common fine roots; few fine quartz grains; few fine black grains; strongly acid; gradual smooth boundary. Field moisture 42.2 percent.
B2g 19083	15 to 22 inches, light gray (5Y 6/1) clay with common medium distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; very firm, slightly sticky, plastic; dark coatings along root channels; few fine roots; common fine pores; few fine quartz grains; strongly acid; gradual smooth boundary. Field moisture 41.3 percent.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Aeric Tropaquept; fine, mixed, nonacid, isohyperthermic

SOIL Josefa clay loam SOIL Nos. S63PR-12-4 LOCATION Este SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19033-19039 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in)	Horizon	Size class and particle diameter (mm)												3A1				
		Total			Sand					Silt						Coarse fragments		
		Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	0.05–0.02	Int III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	<0.0002	<0.074	2A2 > 2 (<19) Pct.	2 - 19	19 - 76
		Pct. of < 2 mm															Pct. of < 76mm	
0-9	Ap	40.0	32.6	27.4	3.1	5.9	4.4	13.3	13.3	12.3	20.3	33.8	26.7		68.0	tr		
9-15	B21	38.3a	35.7	26.0	1.0	3.1	3.1	13.9	17.2	14.5	21.2	40.7	21.1		72.2	tr		
15-25	B22	19.0a	49.7	31.3	-	0.6	1.0	3.8	13.6	16.4	33.3	32.7	5.4		90.3	-		
25-34	B23	13.6a	54.5	31.9	0.1	0.4	0.8	2.3	10.0	16.7	37.8	28.3	3.6		93.7	-		
34-40	IIC1g	25.0a	37.6	37.4	0.1	0.9	1.6	9.5	12.9	12.0	25.6	31.7	12.1		82.7	-		
40-59	IIIC2	54.9b	29.8	15.3	0.7	1.8	3.3	23.4	25.7	13.3	16.5	55.5	29.2		59.4	tr		

Soil Classification: Aeric Tropaquept; fine,[1] mixed, nonacid, isohyperthermic
Soil type: Josefa **clay loam**
Soil Nos.: S63PR-12-4.
Location: Este SCD, Puerto Rico, 1.5 miles east from town of Yabucoa, 6.8 miles south of Humacao, 1.2 miles southeast of Central Roig, 30 feet east of the intersection of farm roads. Photo GS-LR-9-07.
Vegetation and use: Cultivated, planted to sugar cane.
Slope and land form: Nearly level (0 to 2 percent) on the Guayanés River flood plain. This surface is at somewhat higher elevation than Maunabo **S63PR-12-5. The pedons S63PR-12-3 and Mayo** S63PR-12-1 occur on the associated uplands.
Drainage and permeability: Somewhat poorly drained, slow runoff and slow permeability.
Parent materials: Fine to medium textured stratified sediments derived from plutonic rocks.
Samples collected by and date: W.E. McKinzie, R.B. Grossman and R.A. Boccheciamp on September 17, 1963.
Profile described by: W.E. McKinzie.

Horizon and Lincoln Lab. Number	
Ap 19033	0 to 9 inches, dark brown (10YR 3/3) silty clay; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic, common fine roots; few fine black concretions; few fine quartz grains; few worm casts; strongly acid; abrupt smooth boundary. Field moisture 31.2 percent.
B21 19034	9 to 15 inches, dark brown (10YR 4/3) silty clay loam with many fine distinct reddish brown (5YR 4/4) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few thin patchy clay films; small pieces fail semiplastically upon slight pressure between fingers 2/; common fine roots; few fine black concretions; few fine yellowish platy grains; few small krotovinas; very strongly acid; clear smooth boundary. Field moisture 30.2 percent.
B22 19035	15 to 25 inches, grayish brown (10YR 5/2) silty clay loam with many medium distinct yellowish brown (10YR 5/6) and few fine distinct reddish brown (5YR 4/4) mottles; weak coarse subangular blocky structure; firm, slightly plastic, slightly sticky; thin discontinuous clay films; small pieces fail semiplastically upon slight pressure between fingers 2/; few fine roots; common fine pores; organic stains along old roots channels; few fine yellow platy grains; very strongly acid; clear smooth boundary. Field moisture 37.2 percent.
B23 19036	25 to 34 inches, mixed grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) silty clay with few fine distinct dark reddish brown (5YR 3/4) mottles; weak medium and coarse subangular blocky structure; firm, slightly sticky, slightly plastic; thin discontinuous clay films; few fine roots; common fine pores; few fine black concretions; few fine platy yellow grains; organic stains along old root channels; very strongly acid; abrupt smooth boundary. Field moisture 41.8 percent.
IIC1g 19037	34 to 40 inches, gray (5Y 5/1) clay with thin lenses of coarse sand with many medium distinct reddish brown (5YR 4/4) mottles; weak coarse subangular blocky structure; very firm, slightly sticky, plastic; few fine roots; few fine pores; organic stains along old root channels; very strongly acid; abrupt smooth boundary.
IIIC2 19038	40 to 59 inches, grayish brown (2.5Y 5/2) very fine sandy loam with many coarse distinct strong brown (7.5YR 5/6) and few fine distinct reddish brown (5YR 3/4) mottles; massive; very friable, nonsticky, nonplastic; few fine roots; common fine yellow platy grains; very strongly acid; abrupt smooth boundary.
IV C3g 19039	59 to 70 inches, greenish gray (5BG 6/1) clay with common medium distinct strong brown (7.5YR 5/8) mottles; massive with few pressure faces; very firm, sticky, plastic; few fine roots; very strongly acid; clear wavy boundary.
VC4	70 inches plus, coarse-textured naterials.

Remarks: Ap, B22, and IIIC2 horizons sampled for the Bureau of Public Roads. Colors given are for the moist soil. Reaction determined by Soiltex. Water table at 66 inches at time of sampling.

1/ Family texture based on clay percentage estimated as 2.5 times the 15-bar water content.

2/ See introductory part of the Soil Survey Investigations Report for an explanation of this and similar terms that are designed to describe the failure of the material in its natural state of organization.

SOIL CLASSIFICATION: Typic Dystropept; clayey, oxidic, isohyperthermic

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL *Anones clay SOIL Nos. S61PR-8-5 LOCATION Oeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16799-16802 November 1966
General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	3A1c Water-Disp. Clay <0.002		Coarse fragments: 2A2 > 2 (<19) Pct.	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-6	Ap	19.7a	40.1	40.2	2.8	2.5	1.7	4.8	7.9	13.1	27.0	24.2	11.8			tr		
6-13	B	21.9a	40.1	38.0	3.2	2.4	1.5	5.2	9.6	13.5	26.6	26.8	12.3	19		tr		
13-27	C1	43.8	41.9	14.3	0.4	2.3	3.6	18.6	18.9	17.3	24.6	49.4	24.9			tr		
27-40	C2	52.8	39.6	7.6	1.3	4.8	5.8	22.3	18.6	18.6	21.0	52.0	34.2			tr		

Depth (In.)	6A1a Organic carbon Pct.	6H1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct		Bulk density: 4A1a Field-State g/cc	4A1c 30-cm. g/cc	4A1b Air-Dry g/cc	4D1 COLE b	Water content: 4B4 Field-State Pct.	4B3 30-cm. Pct.	4H1b 1/3-Bar Pct.	4B2 15-Bar Pct.		pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-6	2.28	0.194	12	10.2			1.20	1.27	1.39	0.052	32.4c	27.9	32.3	22.7		3.5	4.2
6-13	1.35	0.119	11	9.7			1.11		1.30	0.056	35.0d		30.0	22.9		3.7	4.6
13-27	0.26	0.028	9	7.2										18.5		3.7	4.5
27-40	0.05			7.9										17.3		3.7	4.6

Depth (In.)	Extractable bases: 6N2b Ca	6Q2b Mg	6P2a Na	5B1a 6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		5A3b Bases Plus Al me/100g Clay					Base saturation: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																
0-6	1.6	0.7	tr	0.3	2.6	23.8	26.4	18.7	8.6		27.9					10	14
6-13	3.0	0.7	tr	0.1	3.8	19.0	22.8	16.6	6.9		28.2					17	23
13-27	1.9	1.4	tr	0.2	3.5	19.8	23.3	16.9	10.9		31 e					15	21
27-40	tr	0.8	0.1	0.2	1.1	20.4	21.5	17.0	12.6		32 e					5	6

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-6	0.46	0.25	0.56
6-13	0.44	0.26	0.60
13-27	1.18	0.50	1.29
27-40	2.24	1.04	2.28

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Earthy nodules: 25-50 percent (2-0.5 mm.).
b. Field state.
c. Field-determined value: 37.3 percent.
d. Field-determined value: 37.0 percent.
e. Clay percentage is estimated (15-bar water percentage x 2.5).

USDA SCS HYATTSVILLE, MD 1964

Soil Classification: Typic Dystropept; clayey[1], oxidic, isohyperthermic
Soil Type: *Anones clay
Soil Nos.: S61PR-8-5
Location: Oeste Soil Conservation District, Puerto Rico - 3.0 kilometer from kilometer marker 19.4, Highway 105, on dirt road, 50 feet west of road. Photo No. GS-LR-3-208.
Vegetation and Use: Merker (Elephant) grass.
Slope and Land Form: Steep (50 percent) east-facing sideslope leading to a stream, about 50 feet from interfluve summit.
Drainage and Permeability: Well drained, rapid runoff and medium internal drainage. Permeability is moderate.
Parent Material: Residuum or very local colluvium from volcanic rocks, supposedly high in manganese.
Collected by: R. B. Grossman, W. E. McKinzie, O. R. Carter, Luis H. Rivera, December 19, 1961.
Described by: L. H. Rivera, December 19, 1961.

Horizon and Lincoln Lab. No.	
Ap 16799	0 to 6 inches. Reddish gray (10R 5/1) dry color, dusky red (2.5YR 3/2) moist, clay loam; weak fine granular structure; firm moist, nonsticky and slightly plastic when wet; many fine roots; clear smooth boundary.
B 16800	6 to 13 inches. Reddish gray (10R 5/1) dry color, dusky red (2.5YR 3/2) moist, silty clay loam; weak medium subangular blocky structure breaking into moderate fine subangular blocky structure; thin patchy clay films on ped surfaces and root channels; firm moist, nonsticky and slightly plastic when wet; many fine roots; very fine pores; fails semiplastically,[2] gradual wavy boundary.
C1 16801	13 to 27 inches. Weak red (10R 4/2) loam; 50 percent of horizon consists of saprolite; massive; very friable moist, nonsticky and nonplastic when wet; common fine roots; gradual wavy boundary.
C2 16802	27 to 40 inches. Saprolite (original rock structure visible); rock easily broken with fingers - bluish gray in color.

Remarks: The Ap, B and C2 horizons were sampled for the Bureau of Public Roads. Colors given are for moist soil unless otherwise stated. Soil was near field capacity when sampled.

Mineralogy, Micromorphology (Methods 7B1, 4E1). Coarse and very coarse sands of the solum largely consist of reddish brown, iron-bearing nodules; finer sand largely whitish soapy-looking grains, rounded by abrasion during the particle-size analysis. Quartz is rare. The whitish grains have low interference colors and may be feldspar altered to kaolinite. A trace of identifiable ferromagnesian minerals is present. Thin section observations indicate no clay films.

1/ Family texture based on clay percentage estimated as 2.5 times the 15-bar water content.

2/ Two terms are used in the descriptions to describe the rate of failure of natural fabric: fails abruptly and fails semiplastically. To fail abruptly means that no plasticity is observed prior to failure. Stress builds up as the piece of soil is squeezed and dissipates quickly as the piece of soil breaks apart into numerous fragments or peds due to failure along natural planes of weakness. In semiplastic failure, deformation is readily observed prior to rupture.

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Dystropept; coarse-loamy, mixed, isohyperthermic

SOIL Mayo sandy loam SOIL Nos. S63PR-12-1 LOCATION Este SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19086-19091 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth	Horizon	Size class and particle diameter (mm) 3A1														Coarse fragments 2A2	
		Total			Sand					Silt							
		Sand	Silt	Clay	Very coarse	Coarse	Medium	Fine	Very fine		Int. III	Int. II				3B2 > 2	3B1 > 2

Soil Classification: Typic Dystropept; coarse-loamy, mixed, isohyperthermic
Soil type: Mayo **sandy loam**
Soil Nos.: S63PR-12-1
Location: Este SCD, Puerto Rico, 2.6 miles north from town of Yabucoa, 1.2 miles north northwest from intersection of highways 905 and 3. Photo number GS-LR-9-19
Vegetation and use: Cultivated, planted to sugar cane.
Slope and land form: **10 percent. Alluvial fan inset below pediment slope on which pedon S63PR-12-3 is located.**
Drainage and permeability: Well drained, medium runoff and rapid permeability.
Parent material: Moderately coarse textured alluvial fan sediments derived from plutonic rocks.
Samples collected by and date: W. E. McKinzie, R. B. Grossman and R. A. Boccheciamp on September 16, 1963.
Profile described by: W. E. McKinzie.

Horizon and Lincoln Lab. Number	
Ap 19086	0 to 8 inches, very dark brown (10YR 2/2) loam; moderate medium granular structure; soft, very friable, nonsticky, nonplastic; strongly acid; clear smooth boundary. Field moisture 22.2 percent.
AC 19087	8 to 18 inches, dark brown (10YR 3/3) sandy loam; massive, soft, very friable, nonsticky, nonplastic; common fine quartz grains; common fine partially weathered feldspar grains; common fine black concretions, strongly acid; clear smooth boundary. Field moisture 17.1 percent.
C1 19088	18 to 27 inches, brown to dark brown (10YR 4/3) sandy loam; massive; soft, very friable, nonsticky, nonplastic; many fine quartz grains; common fine quartz; common fine partially weathered feldspar grains; few fine black concretions; strongly acid; gradual smooth boundary. Field moisture 16.2 percent.
IIC2 19089	27 to 34 inches, pale brown (10YR 6/3) loamy sand; massive; loose, nonsticky, nonplastic; few fine shiny flakes; many fine dark grains attracted strongly by magnet; strongly acid; abrupt smooth boundary. Field moisture 15.2 percent.
IIIC3 19090	34 to 44 inches, pale brown (10YR 6/3) stratified loamy sand and sandy loam; massive; loose, nonsticky, nonplastic; many fine quartz grains; few fine dark grains; common fine partially weathered feldspar grains; strongly acid; abrupt smooth boundary.
IVC4 19091	44 to 60 inches, brown (10YR 5/3) loam; massive; very friable, nonsticky; slightly plastic; many fine quartz grains; common fine black grains; common fine partially weathered feldspar grains; few fine black shiny and flaky grains; strongly acid.

Remarks: Ap, AC IIC2 horizons sampled for the Bureau of Public Roads. Colors given are for the moist soil. Reaction determined by Soiltex. Soil at about field capacity when sampled.

Mineralogy (Methods 7A1, 7A2): C1 horizon. The clay is nearly X-ray amorphous. There is a hint of kaolinite and of a 14Å mineral.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Dystropept; loamy, mixed, isohyperthermic, shallow

SOIL Pandura sandy clay loam SOIL Nos. S61PR-13-3 LOCATION Sudeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16880-16884 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1														Coarse fragments		
		Total			Sand					Silt								
		Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	(0.05–0.02)	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)			2A2 > 2 (<19) Pct.	2 – 19	19 – 76
		Pct. of < 2 mm															Pct. of < 76mm	
0-3	Ap	50.9	28.3	20.8	0.8	6.6	8.5	19.7	15.3	12.9	15.4	40.1	35.6			tr		
3-7	B2	50.3	28.1	21.6	1.1	7.1	8.4	19.0	14.7	12.4	15.7	38.7	35.6			tr		
7-15	C1	54.0	31.6	14.4	1.4	8.8	8.7	20.9	14.2	10.0	21.6	36.5	39.8			tr		
15-23	C2	58.6	31.0	10.4	1.7	10.4	9.2	22.4	14.9	10.9	20.1	39.0	43.7			tr		
23-35	C3	66.4	29.2	4.4	1.8	11.2	9.8	25.7	17.9	11.4	17.8	44.9	48.5			tr		

Soil Classification: Typic Dystropept; loamy, mixed, isohyperthermic, shallow
Soil Type: Pandura sandy clay loam

Soil Nos.: S61PR-13-3
Location: Sudeste Soil Conservation District, Puerto Rico, 150 feet northeast kilometer marker 23.93, Highway No. 181.
Vegetation and Use: Cerrillo grass, tortuga grass, ferns; used as permanent pasture.
Slope and Land Form: 40 percent. Southwest aspect. Located in the steeply dissected uplands.
Drainage and Permeability: Well drained, runoff medium to rapid. Permeability moderately rapid.
Parent Material: Residuum or very local sideslope colluvium from plutonic rocks.
Collected by: R. B. Grossman, W. E. McKinzie, R. Boccheciamp, J. Juarez, December 13, 1961.
Described by: R. Boccheciamp, December 13, 1961.

Horizon and Lincoln Lab. No.	
Ap 16880	0 to 3 inches. Dark brown (10YR 3/3) sandy clay loam; weak fine granular; friable when moist, slightly sticky and plastic when wet; very strongly acid; many roots; many worm casts; clear smooth boundary.
B2 16881	3 to 7 inches. Dark grayish brown (10YR 4/2) sandy clay loam; weak medium subangular blocky; friable when moist, slightly sticky and slightly plastic when wet; very strongly acid; thin patchy clay films on peds; many worm casts; many roots; many dark-colored highly weathered minerals; gradual smooth boundary.
C1 16882	7 to 15 inches. Light olive brown (2.5Y 5/4) sandy clay loam; massive; friable when moist, nonsticky and nonplastic when wet; very strongly acid; few roots; gradual wavy boundary.
C2 16883	15 to 23 inches. Light olive brown (2.5Y 5/4) sandy loam; massive; friable when moist, nonsticky and nonplastic when wet; very strongly acid; few roots; gradual wavy boundary.
C3 16884	23 to 35 inches. Highly weathered intrusive volcanic rock.

Remarks: Many quartz grains mixed throughout the profile. The B2 and C1 horizons have saprolite mixed throughout as a result of worm activity. Colors shown are for the moist soil.

Mineralogy (Method 7B1). The sands are rich in dark minerals. Ferruginous nodules are scarce; angular quartz occurs in modest percentages. Earthy aggregates are not abundant, even in the lower solum. The very fine sand of the upper four horizons consists of about 40 percent feldspar, 30 percent hornblende, plus smaller percentages of quartz, altered biotite(?), opaques, and coated grains. The hornblende is fairly fresh looking except for ragged ends; feldspar shows more alteration than the hornblende in the upper solum. The decrease in alteration with depth is greater for feldspar than for hornblende.

(Method 7A). C1 horizon. The clay contains a moderate to abundant amount of poorly ordered kaolinite or halloysite and a small amount of poorly ordered montmorillonite. Differential thermal analysis yielded 20 percent kaolinite in the < 2 mm. material and 60 percent kaolinite (plus halloysite) in the clay.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Eutropept; clayey, mixed, isohyperthermic

SOIL *Morado silty clay loam SOIL Nos. S61PR-8-2 LOCATION Oeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16862-16865 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth	Horizon	Size class and particle diameter (mm) 3A1															
		Total			Sand					Silt					Coarse fragments		
		Sand	Silt	Clay	Very coarse	Coarse	Medium	Fine	Very fine		Int III	Int. II			2A2 ≥ 2	2 - 19	19 - 76

Soil Classification: Typic Eutropept; clayey[1], mixed, isohyperthermic
Soil Type: *Morado silty clay loam
Soil Nos.: S61PR-8-2
Location: Oeste Soil Conservation District, Mayaguez, Puerto Rico, kilometer marker 3.85 on Highway 406, 500 meters on dirt road, 100 feet north of road. Photo No. GS-LR-3-86.
Vegetation and Use: Pigeonpeas (gandures) with undergrowth of native pasture and weeds.
Slope and Land Form: 55 percent. West aspect. Located in the uplands.
Drainage and Permeability: Well drained with rapid runoff and medium internal drainage. Permeability is moderate.
Parent Material: Residuum or very local colluvium from volcanic rocks.
Collected by: R. B. Grossman, W. E. McKinzie, O. R. Carter, R. E. Gierbolini, December 6, 1961.
Described by: L. H. Rivera, December 6, 1961.

Horizon and Lincoln Lab. No.	
Ap 16862	0 to 7 inches. Dark reddish gray (10R 4/1) silty clay with weak fine subangular blocky structure; friable when moist, slightly sticky and plastic when wet; common fine roots; fails semiplastically,[2] clear smooth boundary.
C1 16863	7 to 17 inches. Dark reddish gray (5YR 4/2) with few fine faint mottles of weak red, yellowish red, reddish brown clay with massive structure which breaks into weak fine granular structure; friable when moist, slightly sticky and plastic when wet; common fine roots; fails semiplastically; gradual wavy boundary.
C2 16864	17 to 24 inches. Variegated brown dark brown (7.5YR 4/2) dark reddish gray (5YR 4/2) and dark gray (5YR 4/1) silty clay loam with massive structure; friable when moist, slightly sticky and plastic when wet; few fine roots; clear wavy boundary.
C3 16865	24 to 33 inches. Variegated brown dark brown (7.5YR 4/2) dark reddish gray (5YR 4/2) and dark gray (5YR 4/1) silty clay loam with massive structure; friable when moist, nonsticky and slightly plastic when wet; no roots.

Remarks: Colors given are for moist soil. Soil was at field capacity when sampled. The C2 and C3 horizons are weathered parent rock.

Mineralogy (Method 7B1). The sands consist largely of altered minerals. Most grains are either white or purplish red. Some discrete feldspar grains with rhomb-shaped form are present. But for the most part, the mineral species is not identifiable, and in many instances the sand particles are composites of smaller grains. The very fine sand consists mainly of somewhat coated unidentified grains with lesser percentages of opaques and feldspar, and with a trace of pyroxene. Quartz is scarce. Some of the coated grains may be altered pyroxene. Interference colors of the altered feldspar are commonly yellow rather than white. Differences with depth are not large. Percentages of identified feldspar and of ferromagnesian minerals are higher than in *Anones S61PR-8-5; the percentage of pyroxene is less than in Mucara S61PR-14-11. Clay is very poorly ordered. Small amounts of kaolinite and mica are present. Considerable amorphous material is indicated.

1/ Family texture based on clay percentage estimated as 2.5 times the 15-bar water content.

2/ Two terms are used in the descriptions to describe the rate of failure of natural fabric: fails abruptly and fails semiplastically. To fail abruptly means that no plasticity is observed prior to failure. Stress builds up as the piece of soil is squeezed and dissipates quickly as the piece of soil breaks apart into numerous fragments or peds due to failure along natural planes of weakness. In semiplastic failure, deformation is readily observed prior to rupture.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Eutropept; clayey, montmorillonitic, isohyperthermic, shallow

SOIL Series not designated SOIL Nos. S58PR-4-9 LOCATION Cibuco SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 9826-9830 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1: Total: Sand (2–0.05) a	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	3A1c Water-Disp. Clay <0.002		Coarse fragments: 2A2 > 2 (<19) Pct.	2 – 19	19 – 76
		Pct. of < 2 mm															Pct. of < 76mm	
0-6	Ap	26.9	41.8	31.3	7.5	7.2	2.9	4.9	4.4	9.6	32.2	16.7	22.5			5		
6-10	A12	24.7	42.8	32.5	5.0	4.9	2.8	5.9	6.1	9.6	33.2	19.1	18.6	21		4		
10-16	B	20.6	42.9	36.5	4.0	4.6	2.0	4.6	5.4	10.4	32.5	18.6	15.2			tr		
16-20	C1	28.7	42.3	29.0	9.8	6.6	2.3	4.6	5.4	10.5	31.8	18.7	23.3			1		
20-28	C2	40.3	39.4	20.3	13.1	9.7	3.4	7.2	6.9	11.8	27.6	23.1	33.4			tr		

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	6E2a Carbonate as $CaCO_3$ Pct.	Bulk density g/cc	Bulk density g/cc	4A1h Oven-Dry g/cc	Water content Pct.	Water content Pct.	4B2 15-Bar Pct.	pH	pH	8C1a (1:1)
0-6	2.68	0.223	12	3.9				1.41			21.0			6.0
6-10	0.96	0.097	10	2.9				1.31			21.5			6.3
10-16	0.50	0.049	10	2.5	-(s)			1.28			25.1			6.5
16-20	0.34	0.028		1.7	-(s)			1.49			20.6			6.7
20-28	0.12			1.1	-(s)			1.7			15.3			6.9

Soil Classification: Typic Eutropept; clayey,[1] montmorillonitic, isohyperthermic, shallow
Soil Type: Series not designated
Soil Nos: S58PR-4-9
Location: Cibuco Soil Conservation District, Puerto Rico. Approximately 1,000 feet across head of drainage way west of pedon S58PR-4-8. In fresh road cut on north side of road. Approximately 1,040 feet west of Highway No. 813 and 80 feet south of road junction to house. Aerial photo GS-LR-5-53.
Elevation: 650 meters.
Precipitation: 90 inches plus or minus.
Vegetation and Use: Unimproved pasture.
Slope and Land Form: 30 percent with east aspect.
Drainage and Permeability: Well drained. Moderate permeability.
Parent Material: Volcanic rocks of andesitic to basaltic composition.
Collected by: L. T. Alexander, F. Llavat-Cristy, R. E. Gierbolini, J. Juarez, K. W. Flach, L. H. Rivera and T. U. Yager, November 7, 1958.
Described by: T. U. Yager.

Horizon and Lincoln Lab. No.

Ap 9826 — 0 to 6 inches. Very dark grayish brown (2.5Y 3/2) to dark grayish brown (2.5Y 4/2) gritty clay; moderate medium prismatic structure breaking to strong fine granular; firm, slightly sticky, slightly plastic; angular fragments of weathered parent rock make up 10 to 15 percent of this horizon; clear smooth boundary.

A12 9827 — 6 to 10 inches. Very dark grayish brown (2.5Y 3/2) to dark grayish brown (2.5Y 4/2) gritty clay; moderate medium prismatic structure breaking to weak medium subangular blocky; consistence similar to Ap; thin patchy clay films; clear smooth boundary.

B 9828 — 10 to 16 inches. Gray (5Y 5/1) to olive gray (5Y 5/2) gritty clay; weak medium subangular blocky structure; evidence of rock texture is weakly expressed; firm, slightly sticky, slightly plastic; thin patchy clay films; gradual wavy boundary.

C1 9829 — 16 to 20 inches. Olive gray (5Y 5/2) gritty clay; massive; very highly weathered rock; slightly sticky, slightly plastic; clear wavy boundary.

C2 9830 — 20 to 28 inches. Olive (5Y 5/3) gritty clay; massive; loose; slightly sticky, slightly plastic; evidence of rock texture pronounced; fragments of parent rock, up to as much as 30 percent of the mass in local areas, may be separated from this very highly weathered material.

R — 28 to 39 inches. Partially weathered rock; may be dug out by spade with difficulty.

Remarks: Colors given are for moist soil. Soil sampled at 1/2 field capacity during rain. Gray colors in B and C1 horizons reflect the parent rock and not impeded drainage. Moderate erosion.

Mineralogy (Method 7A).

Interpretation of X-ray and Differential Thermal Analysis Patterns of the Clay Fraction

Horizon	Depth Inches	Kaolinite[a] %	Vermiculite	Montmorillonite[b]
Ap	0-6	--	--	xxx
B	10-16	--	--	xxxx
C2	20-28	--	--	xxxx

a. Percentages estimated from differential thermal analysis.
b. Expands to only 15.4Å upon solvation.
Legend: x = detected; xx = moderate; xxx = abundant; xxxx = dominant.

1/ Family texture based on clay percentage estimated as 2.5 times the 15-bar water content.

Soil Classification: Typic[1] Eutropept; clayey,[2] mixed,[3] isohyperthermic, shallow
Soil Type: Series not designated
Soil Nos.: S61PR-4-2
Location: Cibuco Soil Conservation District, Puerto Rico; 80 feet west of marker K8 H9, Highway 152. Barranquitas Soil Study Area.
Elevation: 610 to 615 meters.
Slope: 20 percent to north and 10 to 15 percent to west.
Vegetation and Land Use: Brushy road bank; previously cultivated.
Parent Material: Designated by Briggs as "basaltic-andesite flow breccia". (Briggs, R. P. Laterization in East-Central Puerto Rico. Trans. Second Caribbean Geol. Cong. 103-109. 1959.)
Collected and Described by: R. B. Grossman, March 12, 1961.

Horizon and Lincoln Lab. No.	
Ap1 14885	0 to 1 inch. Dark reddish brown (5YR 3.5/4) silty clay; moderate medium and coarse granular; friable; sticky and plastic; overlay of slope wash plus some Ap2.
Ap2	1 to 6 inches. Brown (10YR 4/3) clay loam with [illegible]

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SOIL CLASSIFICATION: Typic Eutropept; clayey, mixed, isohyperthermic, shallow

SOIL Series not designated SOIL Nos. S61PR-4-3 LOCATION Cibuco SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14893-14896 December 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: (0.05–0.02)	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	3A1c Water Disp. Clay <0.002		Coarse fragments 2A2 > 2 (<19) Pct.	2–19 (Pct of < 76mm)	19–76 (Pct of < 76mm)
		Pct of < 2 mm																
7-13	A12 or A1	29.2	42.3	28.5	6.1	7.5	4.0	6.5	5.1	9.4	32.9	17.8	24.1			tr		
13-21	B2	35.2	36.1	28.7	4.8	9.8	5.3	8.7	6.6	6.9	29.2	18.0	28.6	24		tr		
21-33	D1	51.9	23.8	24.3	2.4	10.3	9.4	19.0	10.8	7.3	16.5	27.9	41.1			70		
33-48	D2																	

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N		Carbonate as $CaCO_3$ Pct.	6C2a Ext. Iron as Fe Pct.	Bulk density g/cc	g/cc	g/cc		Water content Pct	Pct.	4B2 15-Bar Pct.			pH 8C1c (1:1) N KCl	8C1a (1:1) H_2O
7-13	1.72	0.172	10			4.3							19.9			4.2	5.3
13-21	0.57	0.065	9			3.7							23.1			3.8	5.2
21-33	0.40	0.032	13			2.7							20.3			3.6	5.4
33-48																	

Depth (In.)	Extractable bases 5B1a: 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		5A3b Bases Plus Al me/100g Clay				8D3 Ca/Mg		Base saturation 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct
	meq/100 g																	
7-13	11.8	14.9	0.2	0.4	27.3	15.5	42.8	32.5	0.5		56 a				0.8		64	84
13-21	16.5	25.8	0.3	0.3	42.9	14.4	57.3	45.0	1.8		77 a				0.6		75	95
21-33	18.4	31.1	0.4	0.2	50.1	10.5	60.6	55.6	1.5		101 a				0.6		83	90
33-48																		

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water		
7-13	1.14	0.15	0.70		
13-21	1.57	0.13	0.80		
21-33	2.29	0.11	0.84		
33-48					

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Clay percentage estimated (15-bar water percentage x 2.5).

Soil Classification: Typic[1] Eutropept; clayey,[2] mixed, isohyperthermic, shallow
Soil Type: Series not designated
Soil Nos.: S61PR-4-3
Location: Cibuco Soil Conservation District, Puerto Rico; 30 feet east of K8 H9, Highway 152. Barranquitas Soil Study Area.
Elevation: 610 to 615 meters.
Slope: 20 percent to north.
Vegetation and Land Use: Brushy road cut; field upslope in pasture.
Parent Material: Probably a sandstone of similar mineralogical composition to the basaltic-andesite flow breccia

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SOIL CLASSIFICATION: Typic Eutropept; loamy, mixed, isohyperthermic, shallow

SOIL Series not designated SOIL Nos. 863PR-12-3 LOCATION Este SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19092-19095 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0 05)	Total: Silt (0.05–0 002)	Total: Clay (< 0 002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0 5)	Sand: Medium (0 5–0 25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0 1–0.05)	Silt: (0 05–0.02)	Silt: Int. III (0 02–0.002)	Int. II (0.2–0 02)	(2–0 1)	<0.0002	<0.074	Coarse fragments 2A2: 3B2 > 2 Vol. Pct.	3B1 > 2 Pct.	> 2 (<19) Pct.
		Pct. of < 2 mm																
0-5	Ap	73.0	18.2	8.8	17.5	17.6	9.2	17.6	11.1	8.2	10.0	29.1	61.9		33.0	4	7	7
5-12	B	81.2	12.9	5.9	26.4	24.3	9.3	13.7	7.5	6.2	6.7	20.7	73.7		23.0	8	10	10
12-28	C1	83.0	12.6	4.4	24.6	25.1	10.7	14.8	7.8	5.8	6.8	21.1	75.2	1.7	21.3		12	12
28+	C2 a																	

Soil Classification: Typic Eutropept; loamy, mixed, isohyperthermic, shallow

Soil type: **Series not designated**

Soil Nos.: S63PR-12-3

Location: Este SCD, Puerto Rico, 2.7 miles north from town of Yabucoa, 1.25 miles north northwest from intersection of highways 905 and 3. Photo GS-LR-9-19.

Vegetation and Use: Native grasses and weeds, used as pasture.

Slope and land form: **35 percent. South aspect. Backslope of a pediment surface. The landscape consists of steep sideslopes and narrow (100-foot wide) interfluves. 150 yards above the site of**

Drainage and permeability: Well drained, medium runoff, rapid permeability.

Parent material: Residuum of weathered plutonic rocks.

Samples collected by and date: W. E. McKinzie, R. B. Grossman and R. A. Boccheciamp on September 17, 1963.

Profile described by: R. A. Boccheciamp.

Horizon and Lincoln Lab. Number	
Ap 19092	0 to 5 inches, dark brown (10YR 4/3) loam; weak fine granular structure; soft, very friable, nonsticky, slightly plastic; common fine roots; few fine black grains; common fine quartz grains; very strongly acid; abrupt wavy boundary. Field moisture 20.6 percent.
B 19093	5 to 12 inches, pale brown (10YR 6/3 crushed) sandy loam; massive; very friable, nonsticky, nonplastic; few fine roots; common fine quartz grains; few fine black grains; common fine weathered feldspar grains, grains give soil a mottled appearance of gray, white and yellowish brown; very strongly acid; gradual wavy boundary. Field moisture 10.7 percent.
C1 19094	12 to 28 inches light yellowish brown (10YR 6/4, crushed) coarse loamy sand; massive; very friable, nonsticky, nonplastic; few fine yellow flakes; many fine quartz grains; few fine black grains; mottled appearance due to color of grains; fracture plains in parent rock are visible, strongly acid; gradual boundary. Field moisture 9.8 percent.
C2 19095	28 inches plus weathered granitic rock that can be penetrated with auger.

Remarks: Colors given are for the moist soil. Reaction determined by Soiltex. Profile considered at field capacity when sampled.

Mineralogy (Methods 7A1, 7A2): C1 horizon. It contains very small amounts of interstratified minerals, involving mica and chlorite. The clay is nearly X-ray amorphous.

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SOIL CLASSIFICATION: Lithic Eutropept; clayey, montmorillonitic, isohyperthermic

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 9814-9816 November 1966
General Methods: 1A, 1B1a, 2A1, 2B

Soil Classification: Lithic Eutropept; clayey,[1] montmorillonitic, isohyperthermic
Soil Type: Series not designated
Soil Nos.: 958PR-4-7
Location: Cibuco Soil Conservation District, Puerto Rico. 20 meters northeast of kilometer marker 21.6 along Highway No. 165. Aerial photo GS-LR-3-26.
Elevation: 300 meters. Slope and Land Form: 52 percent west-facing sideslope of low mountain.
Precipitation: 80 inches plus or minus.
Vegetation and Use: Unimproved native pasture for past 30 plus years. Moderate erosion.
Drainage and Permeability: Well drained. Moderate permeability.
Parent Material: Residuum or local colluvium derived from volcanic rocks of andesitic or basaltic composition.
Collected by: L. T. Alexander, F. Llavat-Cristy, R. E. Gierbolini, J. Juarez, K. W. Flach, L. H. Rivera and T. U. Yager, November 6, 1958.
Described by: T. U. Yager.

Horizon and Lincoln Lab. No.	
A1 9814	0 to 6 inches. Very dark brown (10YR 2/2) silty clay; weak coarse prismatic structure breaking to moderate fine subangular blocky and strong fine granular; firm, slightly sticky, slightly plastic; fine gravel-size fragments of highly weathered andesite or basalt rocks and black concretions make up 10 to 20 percent of this horizon; clear wavy boundary.
B 9815	6 to 12 inches. Dark yellowish brown (10YR 3/4) gravelly silty clay; very weak coarse prismatic structure breaking to weak medium subangular blocky; consistence similar to that of A1; percentage of fragments increases to 20 to 30 percent. Common black concretions increasing in frequency with depth; few fine strong brown (7.5YR 5/6) mottles with a crushed color of reddish brown (2.5YR 5/4); abrupt wavy boundary.
C 9816	12 to 16 inches plus. Dominantly dark yellowish brown (10YR 3/4) very highly weathered tuffaceous rock with many black coatings and few reddish brown (2.5YR 5/4) mottles; massive or weak coarse platy structure as a result of the parent rock cleavage; may be dug into with a spade with moderate resistance; horizontal faces of a group of aggregates tend to parallel or dip slightly more than ground surface.

Remarks: Colors given are for moist soil. Soil sampled at 1/4 to 1/2 field capacity. Roots abundant in A horizon.

1/ Family texture based on clay percentage estimated as 2.5 times the 15-bar water content.

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SOIL CLASSIFICATION: Vertic Eutropept; clayey over loamy, mixed, isohyperthermic

SOIL *Curabo clay SOIL Nos. S63PR-16-1 LOCATION Turabo SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19005-19011 January 1967
General Methods: 1A, 1B1b, 2A1, 2B

Depth (In)	Horizon	Size class and particle diameter (mm) 3A1														Coarse fragments		
		Total			Sand					Silt								
		Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	0.05–0.02	Int III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	<0.0002	<0.074	2A2 > 2 (<19) Pct	2 – 19	19 – 76
		Pct. of < 2 mm															Pct. of < 76mm	
0-7	Ap	16.5a	36.5	47.0	2.1	4.3	2.3	3.6	4.2	9.9	26.6	16.2	12.3		86.4	tr		
7-12	A12	7.4a	27.7	64.9	0.8	1.4	1.0	2.0	2.2	7.6	20.1	11.0	5.2		94.1	tr		
12-21	C1	7.4a	28.9	63.7	0.7	0.9	0.9	2.1	2.8	6.9	22.0	11.0	4.6		94.5	tr		
21-29	C2	12.3	33.7	54.0	1.4	1.8	1.4	3.6	4.1	8.1	25.6	14.4	8.2		90.4	tr		
29-39	IIC3	41.4	31.8	26.8	9.0	8.8	5.4	10.4	7.8	10.0	21.8	23.6	33.6		63.2	tr		
39-48	IIIC4	58.4	21.6	20.0	9.1	14.8	11.9	15.6	7.0	7.3	14.3	21.6	51.4		45.5	10		
48-62	IVC5	33.3	33.8	32.9	5.4	6.3	4.0	8.9	8.7	10.7	23.1	24.7	24.6		72.1	9		

Depth	6A1a Organic	6B1a Nitrogen	C/N	6C2a Ext. Tmor	6E2a Carbonate		Bulk density 4A1a	4A1d	4A1b	4D1	Water content 4B4	4B1c	4B2	4C1		pH	8C1c	8C1a

Soil Classification: Vertic Eutropept; clayey over loamy, mixed, isohyperthermic
Soil type: *Gurabo clay
Soil Nos.: S63PR-16-1
Location: Turabo SCD, Puerto Rico, 5 kilometers west of the town of Gurabo, 200 yards north of kilometer marker 5.6 on highway 30, on Gurabo Experiment Station. Photo No. GS-IR-15-72.
Vegetation and use: Pangola grass, used as pasture.
Slope and land form: **3 to 5 percent alluvial fan. Gilgai microrelief is evident.**

Drainage and permeability: Somewhat poorly drained, medium runoff, slow permeability.
Parent materials: Alluvial fan sediments derived from volcanic rocks.
Samples collected by and date: R.B. Grossman, W.E. McKinzie, J. Juarez, and L.H. Rivera on September 30, 1963.
Profile described by: L.H. Rivera.

Horizon and Lincoln Lab. Number	
Ap 19005	0 to 7 inches, very dark grayish brown (10YR 3/2) clay with common fine faint reddish brown (5YR 4/4) mottles; weak fine granular structure; very hard, firm, slightly sticky, plastic; common fine black grains; few fine rock fragments; common fine roots; slightly acid; clear smooth boundary. Field moisture 38.3 percent.
A12 19006	7 to 12 inches, dark brown (10YR 3/3) clay with common fine distinct yellowish brown (10YR 5/6), few fine faint gray (10YR 5/1) common fine distinct greenish gray (5GY 5/1) mottles; weak medium angular blocky structure with few pressure faces; firm, slightly sticky, plastic; common fine black grains; common fine roots; few fine rock fragments; slightly acid; clear wavy boundary. Field moisture 44.9 percent.
C1 19007	12 to 21 inches, grayish brown (10YR 5/2) clay with common medium distinct greenish gray (5GY 6/1) and common fine faint gray (10YR 5/1) mottles; weak coarse angular blocky structure with many pressure faces and slickensides; firm, slightly sticky, plastic; few fine black grains; common fine roots; few fine rock fragments; slightly acid; gradual wavy boundary. Field moisture 37.1 percent.
C2 19008	21 to 29 inches, mixed dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) clay; weak medium and coarse angular blocky structure with common pressure faces and slickensides; firm, slightly sticky, plastic; few fine black grains; few fine rock fragments; few fine roots; slightly acid; clear wavy boundary. Field moisture 31.0 percent.
IIC3 19009	29 to 39 inches, mixed colors of the weathered rock fragments, rubbed color brown (10YR 5/3) clay loam; massive with common pressure faces; friable, slightly sticky, slightly plastic; few fine black grains; many sand-size volcanic grains; many weathered and partially weathered volcanic rock fragments; slightly acid; gradual wavy boundary.
IIIC4 19010	39 to 48 inches, mixed colors of the weathered rock fragments, rubbed color brown (10YR 5/3) sandy loam; friable, nonsticky, nonplastic; few fine black grains; slightly acid; gradual wavy boundary.
IVC5 19011	48 to 62 inches, mixed color of the weathered rock fragments, rubbed color yellowish brown (10YR 5/4) gravelly clay loam; weak coarse subangular blocky structure with pressure faces; friable, slightly sticky, slightly plastic; slightly acid; gradual wavy boundary.
VC6	62 to 70 inches plus, coarse-textured partially weathered volcanic rock fragments.

Remarks: Ap, C2, IVC5 horizons sampled for the Bureau of Public Roads. Colors given are for the moist soil. First three horizons above field capacity, fourth and fifth horizons at field capacity; gravelly horizons below field capacity when sampled. Reaction was determined by Soiltex. Field has been in pasture for a long time. Five years ago, field was plowed and planted to Pangola grass. Last year 14-4-10 fertilizer was applied at a rate of 400 pounds per acre.

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SOIL CLASSIFICATION: Vertic Eutropept; clayey, montmorillonitic, isohyperthermic, shallow

SOIL Mucara clay SOIL Nos. S61PR-14-11 LOCATION Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16859-16861 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1														Coarse fragments		
		Total			Sand					Silt								
		Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	(0.05–0.02)	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)			2A2 > 2 (<19) Pct.	2 – 19	19 – 76
		Pct of < 2 mm														Pct. of < 76mm		
0-6	Ap	23.2	36.0	40.8	1.8	2.5	2.7	8.1	8.1	11.0	25.0	24.2	15.1			21		
6-12	B2	21.4	34.8	43.8	1.0	1.8	2.4	7.8	8.4	10.1	24.7	23.6	13.0			34		
12-20	C																	

Soil Classification: Vertic[1]/Eutropept; clayey, montmorillonitic, isohyperthermic, shallow
Soil Type: Mucara clay
Soil Nos.: S61PR-14-11
Location: Suroeste Soil Conservation District, Puerto Rico, 100 feet north of new Highway 2, at a point 2.5 kilometers east of bridge over the Rosario River. Photo No. GS-LR-18-161.
Vegetation and Use: Sour grass, cerrillos grass and other native pastures and weeds.
Slope and Land Form: 30 percent. West aspect. On a sideslope in the uplands on the north side of the Guanajibo River valley.
Drainage and Permeability: Moderately well drained, medium runoff and medium internal drainage. Permeability is moderately slow.
Parent Material: Residuum or very local colluvium from volcanic rocks.
Collected by: R. B. Grossman, W. E. McKinzie, L. H. Rivera, December 20, 1961.
Described by: L. H. Rivera, December 20, 1961.

Horizon and
Lincoln
Lab. No.

0 to 6 inches. Very dark grayish brown (10YR 3/2) clay with few fine faint dark grayish green (5BG 4/1)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Lithic Ustropept; loamy, mixed, isohyperthermic

SOIL Series not designated SOIL Nos. S57PR-14-6 LOCATION Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 7410-7411 December 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)			Coarse fragments 2A2: > 2 (<19) Pct.	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-6	A11	59.2	11.3	29.5	2.6	6.2	10.4	31.4	8.6	3.2	8.1	28.2	50.6			1		
6-15	A12	55.8	9.8	34.4	3.8	5.9	8.2	29.0	8.9	3.2	6.6	27.5	46.9			2		

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	6E1a Carbonate as $CaCO_3$ Pct.		Bulk density g/cc	g/cc	g/cc		Water content Pct	Pct.	4B2 15-Bar Pct.			pH		8C1a (1:1)
0-6	4.30	0.407	11	3.0	2								12.9					7.6
6-15	1.86	0.206	9	3.8	14								11.7					7.6

Depth (In.)	Extractable bases 5B1a: Ca	6Q2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: Sum Cations	5A1a NH_4OAc								Base saturation Pct.	Pct.
	meq/100 g																
0-6		4.6	0.3	1.4		-		23.5									
6-15		2.8	0.2	0.8		0.8		19.5									

Depth (In.)	6F1a Gypsum Pct.		Ratios to Clay 8I1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-6	-		0.80	0.10	0.44
6-15	-		0.57	0.11	0.34

Soil Classification: Lithic Ustropept; loamy, mixed, isohyperthermic
Soil Type: Series not designated.
Soil Nos.: S57PR-14-6
Location: One-half mile northeast of Punta Molina on Caribbean Coast. Photo GS-LR-10-154.
Area: Suroeste Soil Conservation District, Puerto Rico.
Climate: Semiarid. Annual precipitation approximately 25 inches with frequent droughty periods.
Slope: 7 percent.
Relief: Undulating or gently rolling.
Drainage: Well drained to excessive.
Vegetation: Wire grass, cactus, small desert-type shrubs.
Erosion: Moderate to severe.
Collected by: L. T. Alexander and J. E. Trigo.
Described by: C. J. Koch, September 7, 1957.

Horizon and Lincoln Lab. No.	
A11 7410	0 to 6 inches. Dusky red (10R 3/4) loam (has the feel of a loam, but mechanical analysis probably will place it in the clay-textural class); moderate very fine granular structure; very friable, nonsticky and nonplastic when wet; few very small limestone gravel; clear boundary; pH 7.3.
A12 7411	6 to 15 inches. Dark red (10R 3/6) loam (see note above) with weak medium to fine granular structure; very friable; nonsticky and nonplastic when wet; few limestone gravel; very irregular boundary to underlying rock; pH 7.3.
	15 inches plus. Parent rock. Hard limestone.

Remarks: The colors given are for moist soil unless otherwise stated.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Vertic Ustropept; fine over loamy-skeletal, mixed, isohyperthermic

SOIL Series not designated SOIL Nos. S57PR-14-11 LOCATION Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 7437-7441 December 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)			Coarse fragments: 2A2 > 2 (<19) Pct	2 – 19	19 – 76
		Pct. of < 2 mm															Pct. of < 76 mm	
0-6	Ap	26.4	24.4	49.2	1.7	6.1	4.8	8.1	5.7	7.4	17.0	17.3	20.[illegible]			tr		
6-11	C1	23.1	26.2	50.7	1.6	4.8	4.0	7.2	5.5	6.6	19.6	15.9	17.6			tr		
11-19	C2	23.9	26.3	49.8	2.6	4.5	3.7	7.6	5.5	6.0	20.3	15.7	18.4			tr		
19-28	IIC3	41.8	27.3	30.9	7.9	9.3	6.2	11.4	7.0	6.7	20.6	19.5	34.8			47		
28-38	IIIC4	31.3	43.9	24.8	4.4	7.1	4.6	9.4	5.8	5.5	38.4	16.2	25.5			60		

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	6E1a Carbonate as $CaCO_3$ Pct		Bulk density g/cc	g/cc	g/cc		Water content Pct.	Pct	4B2 15-Bar Pct.				pH 8C1a (1.1)
0-6	2.01	0.249	8	2.6	4								20.7				7.7
6-11	0.79	0.099	8	1.9	13								20.1				8.1
11-19	0.49	0.068	7	2.4	12								21.1				8.0
19-28	0.18			2.1	18								14.9				8.2
28-38	0.06			1.6	11								12.2				8.4

Depth (In.)	Extractable bases 5B1a: Ca	6Q2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. Sum Cations	5A1a NH_4OAc	Water extract from saturated paste 8A1: Ca	Mg	6P1a Na	6Q1a K		CO_3	HCO_3	Cl	SO_4	8A1a Electrical conductivity
	meq/100 g								meq/liter									mmho/cm
0-6		5.8	1.2	1.1		-		44.1			3.4	0.2						0.9
6-11		5.8	4.2	0.6		-		37.8			7.9	0.1						1.2
11-19		8.0	9.6	0.6		-		36.3			23.5	0.1						3.4
19-28		5.5	13.8	0.5		-		30.7			59.8	0.2						7.6
28-38		5.2	16.2	0.5		-		30.1			92.0	0.3						11.2

Depth (In.)	8A Water at Saturation Pct.	5D2 Exchangeable Na Pct		6F1a Gypsum Pct.	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-6	71.2	2		-	0.90	0.05	0.42
6-11	68.6	10		-	0.75	0.04	0.40
11-19	81.9	21		-	0.73	0.05	0.42
19-28	59.7	33		-	0.99	0.07	0.48
28-38	47.2	40		0.7	1.21	0.06	0.49

Soil Classification: Vertic Ustropept; fine over loamy-skeletal, mixed, isohyperthermic
Soil Type: Series not designated
Soil Nos.: S57PR-14-11
Location: 200 feet south of Highway No. 116 and 1/4 mile east of headquarters of Irizarry farm. Photo GS-LR-10-51.
Area: Puerto Rico, Lajas Valley, Suroeste Soil Conservation District.
Climate: Semiarid. Precipitation 25 to 30 inches a year.
Slope: 5 percent.
Relief: Smooth.
Drainage: Somewhat poorly drained.

Collected by: L. T. Alexander, C. J. Koch, Juan Juarez, Jr., and J. E. Trigo.
Described by: C. J. Koch, September 10, 1957.

Horizon and Lincoln Lab. No.	
Ap 7437	0 to 6 inches. Very dark grayish brown (10YR 3/2) clay with moderate medium angular blocky structure; sticky, plastic; few stones of various shapes and sizes; moderately alkaline; abrupt wavy boundary.
C1 7438	6 to 11 inches. Dark yellowish brown (10YR 3/4) clay; moderate coarse angular blocky structure; very sticky, plastic; few pressure faces; few stones having clay coatings; strongly alkaline; clear smooth boundary.
C2 7439	11 to 19 inches. Dark yellowish brown (10YR 4/4) clay; strong coarse blocky structure; sticky, plastic; many pressure faces; some evidence of slickenside activity; many volcanic fragments; common fine lime specks; strongly alkaline; abrupt wavy boundary.
IIC3 7440	19 to 28 inches. This horizon is 75 percent gravel of mixed sizes and shapes; clay matrix; massive; extremely hard and compact; calcareous; gradual boundary; appears to be a stone line.
IIIC4 7441	28 to 38 inches. Dark reddish brown (5YR 3/2) coarse sandy loam; massive; hard; calcareous; many fine greenish blue crystals.

Remarks: This soil occurs on gentle alluvial fans. Colors given are for moist soil unless otherwise stated.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Rendoll; coarse-loamy, carbonatic, isohyperthermic

SOIL Series not designated SOIL Nos. S58PR-4-6 LOCATION Cibuco SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 9811-9813 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Soil Classification: Typic Rendoll; coarse-loamy, carbonatic, isohyperthermic
Soil Type: Series not designated
Soil Nos.: S58PR-4-6
Location: Cibuco Soil Conservation District, Puerto Rico. Approximately 100 meters north of a road 0.5 mile west of kilometer marker 1.3 on Highway No. 165.
Elevation: 90 meters.
Precipitation: 80 inches.
Vegetation and Use: Unimproved pasture and brush. Avocado tree nearby.
Slope and Land Form: 20 percent with south aspect. Footslope below a limestone hill.

Drainage and Permeability: Well drained. Moderate permeability.
Parent Material: Residuum or local colluvium from limestone.
Collected by: L. T. Alexander, F. Llavat-Cristy, R. E. Gierbolini, J. Juarez, K. W. Flach, L. H. Rivera and T. U. Yager, November 6, 1958.
Described by: T. U. Yager.

Horizon and Lincoln Lab. No.	
Ap 9811	0 to 6 inches. Very dark grayish brown (10YR 3/2) clay; weak fine subangular blocky breaking to moderate fine granular structure; friable, slightly sticky, plastic; common fine and medium very pale brown (10YR 7/4) soft concretions of lime; violent effervescence with dilute HCl; clear smooth boundary. 1/
B 9812	6 to 9 inches. Very pale brown (10YR 7/4) clay loam; massive; friable, slightly sticky, slightly plastic; white soft fragments of lime common; semihardened lime-cemented lenses make up 10 percent of the horizon; tongues of the Ap amounting to 15 plus or minus percent of the soil mass extend into this horizon; violent effervescence; clear smooth boundary.
C 9813	9 to 23 inches. Very pale brown (10YR 7/4) clay loam; massive; friable, slightly sticky; many white soft fragments of lime; violent effervescence with dilute HCl.

Remarks: Colors given are for moist soil. Soil sampled at 1/2 field capacity. The material below 23 inches is firmer than in the C horizon. Moderate erosion.

1/ Later examination showed a thin zone of highly contrasting colors of dark red and grayish brown between this and the subjacent horizon.

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Eutropeptic Rendoll; fine-loamy, carbonatic, isohyperthermic

SOIL Colinas clay SOIL Nos. S58PR-4-5 LOCATION Cibuco SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 9808-9810 November 1966
General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05) a	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Silt: Int. II (0.2-0.02)	(2-0.1)			Coarse fragments: 2A2 > 2 (<19)	2-19	19-76
		Pct. of < 2 mm														Pct.	Pct. of < 76mm	
0-10	Ap	37.1	18.2	44.7	4.8	10.0	7.1	10.3	4.9	5.1	13.1	14.5	32.2			1		
10-17	B	39.3	40.8	19.9	4.8	8.0	5.4	11.2	9.9	9.3	31.5	25.3	29.4			tr		
17-33+	C	41.1	40.8	18.1	3.0	8.6	7.4	13.9	8.2	9.4	31.4	24.7	32.9			tr		

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$: 6E1a < 2mm. Pct.	6E1c < 0.002 mm. Pct.	Bulk density: g/cc	g/cc	4A1h Oven-Dry g/cc	Water content: Pct	Pct.	4B2 15-Bar Pct.	pH		8C1a (1:1)
0-10	3.90	0.407	10	2.9	15				1.34			21.0			7.5
10-17	0.42	0.047	9	0.9	72	2			1.4			9.2			7.9
17-33+	0.25	0.027	9	0.8	78	6			1.13			7.3			8.0

Depth (In.)	Extractable bases 5B1a: Ca	Mg	6P2a Na	6Q2a K	Sum	Ext. Acidity	Cat. Exch. Cap: Sum Cations	5A1a NH_4OAc	Base saturation	
	meq/100 g								Pct	Pct.
0-10			0.1	0.2				36.8		
10-17			0.1	0.2				12.6		
17-33+			0.1	0.3				8.8		

Depth (In.)	Ratios to Clay 8H1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-10	0.82	0.06	0.47
10-17	0.63	0.05	0.46
17-33+	0.49	0.04	0.40

a. Carbonate grains: 25-50 percent; earthy nodules: < 5 percent.

SCS-SCS HYATTSVILLE, MD 1964

Soil Classification: Eutropeptic Rendoll; fine-loamy, carbonatic, isohyperthermic
Soil Type: Colinas clay
Soil Nos.: S58PR-4-5
Location: Cibuco Soil Conservation District, Puerto Rico. 50 feet north of road at kilometer marker 0.1, road No. 823. Aerial photo GS-LR-1-47.
Elevation: 130 meters.
Precipitation: 80 inches plus or minus.
Vegetation and Use: Unimproved native pasture.
Slope and Land Form: 35 percent with a south aspect. Footslope below a limestone hill.

Drainage and Permeability: Well drained. Moderate permeability.
Parent Material: Residuum or local colluvium from the basal Lares(?) formation.
Collected by: L. T. Alexander, F. Llavat-Cristy, R. E. Gierbolini, J. Juarez, K. W. Flach, L. H. Rivera and T. U. Yager, November 6, 1958.
Described by: T. U. Yager.

Horizon and Lincoln Lab. No.	
Ap 9808	0 to 10 inches. Very dark brown (10YR 2/2) clay; weak coarse subangular blocky structure breaking to moderate fine and medium granular; firm, slightly sticky, plastic; few light yellowish brown (10YR 6/4) inclusions of B; few coarse lime fragments and angular gravel; strong effervescence with dilute HCl; clear smooth boundary.
B 9809	10 to 17 inches. Dark yellowish brown (10YR 4/4) gravelly clay; very weak, medium subangular blocky structure breaking to medium and fine granular; firm, slightly plastic; contains 25 percent fine and coarse lime fragments with a tendency towards partial case hardening; tongues amounting to approximately 10 percent of Ap extend into this horizon; few scattered shells; violent effervescence with dilute HCl; gradual smooth boundary.
C 9810	17 to 33 inches plus. Very pale brown (10YR 7/4) and light yellowish brown (10YR 6/4) clay loam; massive; friable, nonsticky, nonplastic; few fine to coarse white soft fragments of lime.

Remarks: Colors given are for moist soil. Soil sampled at 1/2 to 3/4 field capacity. Clinic [illegible]

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Aquic Fluventic Hapludoll; clayey, mixed, isohyperthermic

SOIL: Toa silty clay loam SOIL Nos. S63PR-8-1 LOCATION: Oeste SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska LAB. Nos. 19096-19100 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	<0.0002	<0.074	Coarse fragments: 2A2 > 2 (<19) Pct.	2 - 19	19 - 76
		Pct. of < 2 mm															Pct. of < 76mm	
0-7	Ap	15.1a	54.1	30.8	0.5	0.7	0.5	2.8	10.6	20.3	33.8	33.1	4.5		92.7	tr		
7-16	B21	16.5a	54.0	29.5	0.5	0.6	0.5	2.9	12.0	20.5	33.5	34.8	4.5		92.3	tr		
16-23	B22	17.0a	52.3	30.7	0.1	0.4	0.4	3.1	13.0	20.9	31.4	36.4	4.0	6.8	92.3	tr		
23-37	C1	16.9	53.1	30.0	-	tr	0.1	3.7	13.1	21.5	31.6	37.9	3.8		92.0	tr		
37-60	C2	22.5	49.3	28.2	tr	0.1	0.3	5.9	16.2	18.6	30.7	39.7	6.3		88.2	-		

Depth (In.)	6A1a Organic carbon (b) Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	6E2a Carbonate as $CaCO_3$ Pct.	Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in./in.	pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-7	1.90	0.158	12	3.3		1.37	1.41	1.51	0.024	29.8	27.8	18.0	0.14	3.9	4.9
7-16	0.98	0.095	10	3.3		1.56	1.54	1.65	0.024	23.2	24.4	17.6	0.10	4.9	6.0
16-23	0.89	0.078	11	3.3		1.34	1.36	1.48	0.028	29.6	28.2	18.7	0.13	5.1	6.2
23-37	0.39	0.047	8	3.3	-(s)	1.42	1.43	1.51	0.017	25.3	24.7	18.8	0.08	5.2	6.3
37-60	0.28			3.7	-(s)		1.4c					18.7		5.1	6.3

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	6I2a NH_4OAc Ext. SO_4	Base saturation: 5C3 Sum Cations	5C1 NH_4OAc
	meq/100 g										Pct.	Pct.
0-7	11.8	5.7	0.1	1.0	18.6	15.4	34.0	23.7	0.5	0.4	55	78
7-16	16.3	7.7	0.2	0.4	24.6	10.2	34.8	24.1		0.3	71	102
16-23	17.7	7.9	0.2	0.4	26.2	8.4	34.6	24.7		0.3	76	106
23-37	17.7	7.8	0.2	0.4	26.1	6.8	32.9	21.0		0.3	79	124
37-60	15.5	8.3	0.2	0.5	24.5	6.7	31.2	20.6		0.2	79	119

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-7	0.77	0.11	0.58
7-16	0.82	0.11	0.60
16-23	0.80	0.11	0.61
23-37	0.70	0.11	0.63
37-60	0.73	0.13	0.66

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Earthy nodules: 25-50 percent (2-0.25 mm.).

b. 15 kg/m² to 60 inches (Method 6A).

c. Estimated.

USDA SCS HYATTSVILLE, MD 1961

Soil Classification: Aquic Fluventic Hapludoll; clayey,[1] mixed, isohyperthermic
Soil type: Toa silty clay loam.
Soil Nos.: S63PR-8-1
Location: Oeste SCD, Puerto Rico, 10 miles north of the city of Mayaguez in the Añasco River valley, 650 meters on dirt road west of kilometer marker 146.1 on highway 2 and 75 feet south of dirt road.
Vegetation and use: Cultivated, planted to sugar cane.
Slope and land form: **2 percent. Site is on a natural levee near the course of the Añasco River.**

Drainage and permeability: Moderately well drained, medium runoff, moderate permeability.
Parent material: Moderately fine textured sediments derived from basic volcanic rocks.
Samples collected by and date: R. B. Grossman, L. H. Rivera and R. E. Gierbolini on September 23, 1963.
Profile described by: R. E. Gierbolini.

Horizon and Lincoln Lab. Number	
Ap 19096	0 to 7 inches, dark brown (10YR 3/3) silty clay loam; weak medium granular structure; friable, slightly sticky, slightly plastic; common fine roots; few fine volcanic fragments; medium acid; clear smooth boundary.
B21 19097	7 to 16 inches, dark brown (10YR 3/3) silty clay loam; weak fine and medium subangular blocky structure with thin patchy clay films on faces and root channels; firm, slightly sticky, slightly plastic; common fine roots; few fine pores; few fine black nodules; few fine volcanic fragments; medium acid; clear smooth boundary.
B22 19098	16 to 23 inches, dark yellowish brown (10YR 3/4) with few fine faint dark brown (7.5YR 4/4) mottles; silty clay loam; weak medium subangular blocky structure with thin patchy clay films on faces and root channels; firm, slightly sticky, slightly plastic; few fine roots; common fine pores; few fine black concretions; slightly acid; clear smooth boundary.
C1 19099	23 to 37 inches, brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common fine and few medium pores; very few fine black concretions; slightly acid; clear smooth boundary.
C2 19100	37 to 60 inches, auger sample, brown (10YR 4/3) clay loam; massive; friable, slightly sticky, slightly plastic; very few fine black concretions; slightly acid.

Remarks: Colors given are for moist soil. Soil was above field capacity when sampled. Water table at 36 inches. Seepage due to heavy rains the night before. Reaction determined by Soiltex. In sugar cane for a very long time. Scattered pottery fragments were found at 20 inches and 33 inches. Several of those fragments at 20 inches have scribed bands.

Mineralogy (Methods 7A1, 7A2, 7B1): B22 horizon. The clay contains small amounts of kaolinite and/or halloysite, mica, and interstratified mica minerals. The minerals are rather poorly ordered. The very fine sand contains feldspar, quartz, weathered mica, pyroxene, amphibole, and plant phytoliths, listed in approximate order of abundance.

1/ Family texture based on clay percentage estimated as 2.5 times the 15-bar water content.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Aquic Fluventic Hapludoll; clayey, mixed, isohyperthermic

SOIL: Toa clay loam SOIL Nos.: S63PR-14-1 LOCATION: Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska LAB. Nos.: 19101-19105 January 1967

General Methods: 1A, 1H1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.0002	<0.074	Coarse fragments 2A2: > 2 (<19) Pct.	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-8	Ap	33.0	39.7	27.3	0.2	1.6	5.9	15.8	9.5	11.8	27.9	29.9	23.5		72.7	tr		
8-17	IIA12	29.1	41.1	29.8	0.1	1.5	5.3	13.8	8.4	12.4	28.7	28.2	20.7		76.0	tr		
17-29	IIB21	9.4	52.4	38.2	0.1	0.1	0.1	1.2	7.9	17.4	35.0	26.2	1.5		96.8	-		
29-43	IIB22	8.7	49.5	41.8	tr	-	tr	0.9	7.8	15.7	33.8	24.3	0.9		97.3	-		
43-64	IIIC1	11.8	48.1	40.1	0.1	0.1	0.3	2.0	9.3	15.0	33.1	25.9	2.5		94.9	-		

Depth (In.)	6A1a Organic carbon a Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	6E2a Carbonate as $CaCO_3$ Pct.	Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in./in.	pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-8	1.40	0.118	12	3.7		1.26	1.30	1.39	0.020	33.7	28.5	17.7	0.14	5.3	6.5
8-17	1.63	0.122	13	3.5	-(s)	1.31	1.37	1.48	0.024	34.5	28.9	18.1	0.15	5.4	6.6
17-29	1.23	0.106	12	4.1	-(s)	1.36	1.38	1.52	0.032	31.7	29.5	18.5	0.15	5.6	6.8
29-43	0.69	0.081	9	4.3	-(s)	1.23	1.27	1.44	0.044	39.2	33.4	24.4	0.11	5.7	6.9
43-64	0.47	0.057	8	4.3	-(s)		1.3b					24.8		5.8	7.0

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	6I2a NH_4OAc Ext. SO_4	Base saturation: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g											
0-8	11.7	16.0	0.1	0.2	28.0	7.8	35.8	26.3		0.3	78	106
8-17	12.7	17.4	0.1	0.2	30.4	8.0	38.4	27.0		0.3	79	113
17-29	11.0	20.8	0.1	0.2	32.1	7.4	39.5	26.6		0.2	81	121
29-43	7.9	24.1	0.2	0.3	32.5	6.3	38.8	27.2		0.2	84	119
43-64	7.2	26.0	0.2	0.3	33.7	5.8	39.5	30.0		0.2	85	112

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-8	0.96	0.14	0.65
8-17	0.91	0.12	0.61
17-29	0.70	0.11	0.48
29-43	0.65	0.10	0.58
43-64	0.75	0.11	0.62

Underlining indicates that the non-clay probably has strong clay-like properties.

a. 20 kg/m² to 60 inches (Method 6A).

b. Estimated.

Soil Classification: Aquic Fluventic Hapludoll; clayey,[1] mixed, isohyperthermic
Soil type: Toa clay loam.
Soil Nos.: S63PR-14-1.
Location: Suroeste SCD, Puerto Rico, 9.0 kilometers west northwest of town of San Germán, 700 meters on dirt road south of kilometer marker 2.5 on highway 345, 200 meters east of dirt road.
Vegetation and use: Cultivated, planted to sugarcane.
Slope and land form: Nearly level alluvial fan (2 percent slope gradient) on the flood plain of the Rosario River. Site is on a natural levee near the course of the river.
Drainage and permeability: Moderately well drained, medium runoff, moderate permeability.
Parent material: Moderately fine textured sediments derived from basic volcanic rocks.
Samples collected by and date: R.B. Grossman, W.E. McKinzie, L.H. Rivera, G. Acevedo and R.E. Gierbolini on September 25, 1963.
Profile described by: L.H. Rivera.

Horizon and Lincoln Lab Number	
Ap 19101	0 to 8 inches, dark brown (10YR 3/3) clay loam; weak fine granular structure; friable, slightly sticky, slightly plastic; common fine roots; many fine sand grains; few fine volcanic fragments; strongly acid; clear smooth boundary.
IIA12 19102	8 to 17 inches, dark brown (10YR 3/3) silty clay loam; weak medium subangular blocky breaking to weak fine granular structure; friable, slightly sticky, slightly plastic; few fine roots; common fine black nodules; neutral; clear smooth boundary.
IIB21 19103	17 to 29 inches, dark yellowish brown (10YR 3/4) with few fine distinct dark brown (7.5YR 4/4) mottles; silty clay loam; weak medium and coarse subangular blocky breaking to weak fine subangular blocky structure with thin patchy clay films; friable, slightly sticky, slightly plastic; few fine roots; few fine pores; common fine black nodules; mildly alkaline; clear smooth boundary.
IIB22 19104	29 to 43 inches, dark brown (10YR 4/3) with few fine distinct reddish brown (5YR 5/3) mottles; silty clay loam; weak medium subangular blocky structure with thin patchy clay films and thin coatings in root channels; friable, slightly sticky, slightly plastic; few fine roots; few fine pores; few fine charcoal pieces; mildly alkaline; clear smooth boundary. Pottery and brick fragments found at the top of this horizon.
IIIC1 19105	43 to 64 inches, dark yellowish brown (10YR 4/4) with few fine faint yellowish brown (10YR 5/6) and few fine faint light gray (10YR 7/1) mottles; clay loam; massive; friable, slightly sticky, slightly plastic; few fine black nodules; mildly alkaline.

Remarks: Colors given are for moist soil. Soil was above field capacity when sampled. Water table at 36 inches. Seepage due to heavy rains the day before. Reaction determined by Soiltex. In sugar cane for a very long time. Pottery fragments or brick were found at 29 inches.

Mineralogy (Method 7B1): IIB21 horizon. The very fine sand contains a mixture of feldspar, quartz, weathered mica, pyroxene, amphibole, and plant phytoliths in approximate order of abundance.

1/ Family texture based on clay percentage estimated as 2.5 times the 15-bar water content.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Argiustoll; fine, mixed, isohyperthermic

SOIL Glynn clay loam SOIL Nos. S64VI-18-1 LOCATION Virgin Islands

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 20071-20078 November 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	Clay: 3A1a Carbonate	Clay: Noncarbonate	Coarse fragments 2A2: 3B2 > 2 Vol. Pct.	3B1 > 2 Pct.	2–19 Pct. of < 19
		Pct. of < 2 mm																
0-10	Ap	32.8	38.9	28.3	4.1a	5.0a	3.8a	9.7a	10.2a	15.0	23.9	31.2	22.6	tr.	28	4	8	8
10-15	A12	29.1	37.6	33.3	3.4a	4.4a	3.4a	8.9a	9.0a	14.5	23.1	28.9	20.1	tr.	33	3	6	6
15-26	B21t	16.1	31.7	52.2	1.0	1.8	1.5	5.0	6.8	11.5	20.2	21.5	9.3	-	52	4	8	8
26-37	B22t	35.0	26.3	38.7	1.3	2.2	3.1	13.0	15.4	14.2	12.1	38.1	19.6	-	31		4	4
37-50	B3	32.9	31.0	36.1	4.2	5.1	3.6	9.6	10.4	13.3	17.7	29.7	22.5	-	36		4	4
50-59	IIB21cab	23.8	34.4	41.8	1.3b	2.6b	2.5a	8.3a	9.1a	10.3	24.1	24.8	14.7	1	41		3	3
59-68	IIB22cab	23.1	39.7	37.2	1.4b	3.2b	3.1a	7.3a	8.1a	13.4	26.3	25.9	15.0	tr.	37		5	5
68-80	IIIB23b	54.4	22.6	23.0	5.8b	13.8b	10.1b	15.5b	9.2b	8.7	13.9	26.3	45.2	-	23	7	12	12

Depth (In.)	6A1a Organic carbon c Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	6E1b 6E2a Carbonate as $CaCO_3$ Pct.	Bulk density: 4A1d 1/3-Bar d g/cc	4A1d 1/3-Bar g/cc	4A1b Air Dry g/cc	4D1 COLE	Water content: Pct.	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in. per in.	pH (1:1) N KCl	8C1a (1:1) H_2O
0-10	1.18	0.115	10	1.2	6	1.33	1.39	1.55	0.031		21.8	11.9	0.13		7.7
10-15	0.87	0.102	9	1.4	7	1.38	1.43	1.59	0.034		21.2	13.7	0.11		7.7
15-26	0.47	0.061	8	2.2	1	1.28	1.34	1.78	0.097		31.1	21.2	0.12		7.5
26-37	0.20			1.9	tr(s)		1.60	1.80	0.040		20.2	14.3	0.09		7.7
37-50	0.08			1.7	tr(s)		1.66	2.00	0.064		20.4	14.1	0.10		7.6
50-59	0.08			1.7	6		1.58	1.98	0.078		23.1	14.8	0.13		7.8
59-68	0.06			1.8	6		1.64	1.91	0.052		20.0	14.6	0.09		7.8
68-80	0.04			1.7	1	1.43	1.54e	1.60e	0.013		13.7e	9.7	0.06		8.0

Depth (In.)	Extractable bases 5B1a: 6N3a Ca	6O3a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum	5A1a NH_4OAc	Base saturation: 5C3 Sum	5C1 NH_4OAc
	meq/100 g								Pct.	Pct
0-10	23.3	1.2	0.2	0.4	25.1			20.7		121
10-15	25.2	1.8	0.2	0.4	27.6			22.9		121
15-26	35.7	3.9	0.3	0.6	40.5			34.6		117
26-37	26.7	4.8	0.3	0.4	32.2	3.7	35.9	28.8	90	112
37-50	18.0	7.8	0.3	0.5	26.6	3.0	29.6	22.8	90	117
50-59	18.1	9.1	0.4	0.5	28.1			23.0		122
59-68	18.7	9.2	0.5	0.4	28.8			23.8		121
68-80	13.2	5.0	0.4	0.3	18.9			17.4		

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-10	0.73	0.04	0.42
10-15	0.69	0.04	0.41
15-26	0.66	0.04	0.41
26-37	0.74	0.05	0.37
37-50	0.63	0.05	0.39
50-59	0.55	0.04	0.35
59-68	0.64	0.05	0.39
68-80	0.76	0.07	0.42

a. 5-25% carbonate.
b. 0-5% carbonate.
c. 8.8 kg/m² to 60 inches. (Method 6A).
d. Calculated to include volume but not weight of > 2-mm. material (Method 3B2).
e. One clod.

USDA-SCS HYATTSVILLE MD 1966

Soil Classification: Typic Argiustoll; fine, mixed, isohyperthermic
Soil type: Glynn clay loam.
Soil Nos.: S64VI-18-1
Location: St. Croix, Virgin Islands, 300 feet south of church (the southwest corner of Grove Place) to a light pole, sample site 60 feet west and 30 feet north of the light pole.
Vegetation and Use: Cultivated; used for sugar cane.
Slope and land form: 3 percent south-facing alluvial fan.
Drainage and permeability: Well drained, medium runoff and moderate permeability.
Parent Material: Fine textured sediments derived from the residuum of volcanic rocks.
Elevation: 160 feet.
Rainfall: 40-45 inches.
Samples collected by: R. B. Grossman and W. E. McKinzie, September 21, 1964.
Described by: W. E. McKinzie.

Horizon and Lincoln Lab. Number	
Ap 20071	0 to 10 inches, dark brown (10YR 3/3) clay loam; moderate medium granular; very hard, friable, slightly sticky, slightly plastic; calcareous; clear smooth boundary.
A12 20072	10 to 15 inches, dark brown (10YR 3.5/3) heavy clay loam; weak medium subangular blocky structure; firm, slightly sticky, plastic; few sand grains, few worm casts less than 2mm. in diameter; calcareous; clear smooth boundary.
B21t 20073	15 to 26 inches reddish brown (5YR 4/4) clay; moderate medium subangular blocky structure with patchy clay films on vertical and horizontal peds; very firm, slightly sticky, plastic; few dark brown worm casts, common sand grains; calcareous; clear smooth boundary.
B22t 20074	26 to 37 inches, dark brown (7.5YR 4/4) clay; weak medium and coarse subangular blocky structure with thin patchy clay films on vertical and horizontal ped surfaces; very firm moist, slightly sticky, plastic; common sand grains, few fine black nodules, dark organic coatings along root channels; neutral; clear smooth boundary.
B3 20075	37 to 50 inches, yellowish brown (10YR 5/4) light clay; weak coarse subangular blocky structure, with few patch clay films on vertical cleavage planes; firm, slightly sticky, plastic; many fine black nodules, many sand grains; neutral; abrupt smooth boundary.
IIB21cab 20076	50 to 59 inches, strong brown (7.5YR 5/8) clay; weak coarse subangular blocky structure with thin discontinuous yellowish brown (10YR 5/4) coatings on horizontal and vertical peds; firm, slightly sticky, plastic; large blotches of secondary lime, many fine soft dark brown nodules and mottles; violent effervescence; gradual smooth boundary.
IIB22cab 20077	59 to 68 inches, yellowish red (5YR 5/6) clay loam; weak coarse subangular blocky structure with thin discontinuous yellowish brown (10YR 5/4) coatings on vertical peds and root channels; friable, slightly sticky, slightly plastic; many fine dark brown soft nodules and mottles, lime blotches larger than in horizon above; violent effervescence; gradual smooth boundary.
IIIB23b 20078	68 to 80 inches, yellowish red (5YR 5/8) clay loam; massive with clay bridging between sand grains; friable; many fine dark brown nodules, many sand grains; weak effervescence.

Notes: The Ap, B21t and IIB21cab horizons sampled for the Bureau of Public Roads. The Ap and A12 horizons are near field capacity; remaining horizons are below the wilting point. A thin discontinuous stone line occurs between the B21t and the B22t. Soil temperature at 20 inches, 82°F. Colors given are for the moist soil.

B22t horizon

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Argiustoll; fine, mixed, isohyperthermic

SOIL Series not designated SOIL Nos. 857PR-14-4 LOCATION Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 7399-7402 November 1966

General Methods: 1A, 1H1a, 2A1, 2B

Depth	Horizon	Size class and particle diameter (mm)															
		Total			Sand					Silt		3A1		3A1c		Coarse fragments		
		Sand	Silt	Clay	Very	Coarse	Medium	Fine	Very fine		Int. III	Int II (0.2–0.02)	(2–0.1)	Water Diam.		2A2 > 2	2 – 19	19 – 76

Soil Classification: Typic Argiustoll; fine, mixed, isohyperthermic
Soil Type: Series not designated
Soil Nos.: S57PR-14-4
Location: 50 yards south of Highway No. 116 at kilometer marker 11.1.
Area: Puerto Rico, Lajas Valley, Suroeste Soil Conservation District.
Climate: Semiarid - annual precipitation 30 to 40 inches a year.
Slope: 1 to 2 percent.
Relief: Smooth.
Drainage: Moderately well drained.
Vegetation: Native grasses.
Erosion: None to slight.
Root Distribution: Abundant to 15 inches.
Soil Temperature: 29 degrees C. at 16 inches.
Collected by: L. T. Alexander, C. J. Koch, J. A. Bonnet, R. E. Gierbolini, J. Juarez, Jr., and J. E. Trigo, September 6, 1957.
Described by: C. J. Koch.

Horizon and Lincoln Lab. No.	
A11 7399	0 to 4 inches. Dark reddish brown (5YR 3/2) clay; moderate medium granular structure; friable, slightly plastic; smooth clear boundary.
A12 7400	4 to 7 inches. Dark reddish brown (5YR 3/2) clay; moderate medium granular structure; friable, slightly plastic; few small rounded gravel; smooth clear boundary.
B2 7401	7 to 15 inches. Dark brown (10YR 3/3) clay; moderate medium subangular blocky structure; sticky, plastic; thin patchy clay films are common; irregular abrupt boundary.
C 7402	15 to 25 inches plus. Brown to dark brown (10YR 4/3) gravelly clay; massive; this layer consists of highly weathered andesitic tuff with some fragments of hard tuff remaining.

Remarks: Jacana clay occurs on gentle footslopes. It is a shallow soil, generally ranging from 12 to 18 inches of soil over weathered andesitic tuff. Colors given are for moist soil unless otherwise stated.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Lithic Argiustoll; clayey, mixed, isohyperthermic

SOIL *Cramer gravelly clay loam SOIL Nos. S64VI-18-6 LOCATION Virgin Islands

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 20050-20053 November 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1												3A1b		Coarse fragments 2A2		
		Total			Sand					Silt								
		Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	0.05–0.02	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	<0.0002		3B2 > 2 Vol. Pct.	3B1 > 2 Pct.	2-19 Pct. of < 19
		Pct. of < 2 mm												>				
0-9	A1	28.3	34.5	37.2	6.9	5.5	3.0	5.7	7.2	9.9	24.6	20.5	21.1			44	63	53
9-14	B1	23.2	31.3	45.5	4.5	4.8	2.2	4.9	6.8	9.0	22.3	18.9	16.4	27.2		31	46	37
14-20	B2t	21.2	21.0	57.8	6.2	5.2	2.1	3.4	4.3	5.9	15.1	12.2	16.9			22	38	38
20-32	R&B	34.1	26.7	39.2	8.3	7.9	3.4	6.9	7.6	9.1	17.6	20.9	26.5			63	78	78

Soil Classification: Lithic Argiustoll; clayey, mixed, isohyperthermic
Soil type: *Cramer gravelly clay loam.
Soil Nos.: S64VI-18-6
Location : St. Croix, Virgin Islands, 1.8 miles northwest of Annaly and Scenic Drive intersection and 100 feet to the right of the road, and 1.3 miles northeast on the Scenic Drive from the rock quarry located on the northwest corner of St. Croix.
Vegetation and Use: Native brush and trees; presently used as pasture.
Slope and land form: On a 50 percent south-facing convex slope in the steeply dissected uplands.
Drainage and permeability: Well drained, rapid runoff and moderate permeability.
Parent Material: Residuum or very local colluvium from basic volcanic rocks (Caledonia Formation).
Elevation: 500-600 feet.
Rainfall: 50 inches.
Samples collected by: R. B. Grossman and W. E. McKinzie, September 23, 1964.
Described by: W. E. McKinzie.

Horizon and Lincoln Lab. Number	
A1 20050	0 to 9 inches, dark reddish brown (5YR 3/3) gravelly clay loam; moderate medium granular structure; slightly hard, friable, nonsticky and slightly plastic; many roots; 30 percent of soil material consists of angular volcanic rock fragments 1/4 to 2 inches in diameter; clear smooth boundary.
B1 20051	9 to 14 inches, dark red (2.5YR 3/6) gravelly clay; weak medium subangular blocky breaking to moderate medium granular structure; firm, slightly sticky and slightly plastic; common roots, 30 percent of horizon consists of angular volcanic rock fragments 1/4 to 2 inches in diameter; clear smooth boundary.
B2t 20052	14 to 20 inches, dark reddish brown (2.5YR 3/4) clay; moderate fine and medium subangular blocky structure, with a few pressure faces; very firm, sticky and plastic; few roots; numerous volcanic rock fragments 1/4 to 2 inches in diameter; abrupt wavy boundary.
R&B 20053	20 to 32 inches, this horizon consists of partially weathered (difficult to dig with spade) greenish gray mudstone with dark reddish brown (2.5YR 3/4) granular clay occurring between the fracture planes and in small pockets. Red clay occupies 15 to 20 percent of the horizon.
R	32 inches +, bedded volcanic mudstone with red staining along a few of the fracture planes.

Notes: The A1, B2t and R&B horizons sampled for the Bureau of Public Roads. Fifteen percent of the A1 horizon consists of material greater than 3/4 inches; in the B1 10 percent is greater than 3/4 inches. Colors given are for the moist soil. Soil temperature at 20 inches, 79°F. The A1 horizon is at 75 percent of field capacity and the remaining horizons below the wilting point.

Mineralogy (Methods 7A, 7B1)
B1 horizon

Fraction	Mont.	Mica	Kaolinite	Interstratified Chl-Mica	Quartz	Feldspar
Fine clay	?	m	m	m		
Clay		m	m, 25%	m		
Fine silt		s		s	m to a	m to a
Coarse silt					m to a	m to a
Very fine sand		tr			<5%	d

Amounts: X-ray diffraction and optical: m = moderate, s = small, a = abundant, d = dominant.
Differential thermal analysis: kaolinite percentages rounded to nearest 5 percent.

NOTES

1. Mineralogy is mixed.
2. Montmorillonite (possibly an interstratified montmorillonite mineral) in the fine clay is very poorly ordered and it is difficult to estimate the amount. The other clay minerals are well crystallized.
3. An 8.2Å peak in the fine silt may be a third order peak of an interstratified mica-chlorite-like mineral. The mineral is stable at 300 degrees C., disrupted at 400 degrees C. and collapsed at 500 degrees C. The mineral has regularly alternating layers.
4. Feldspar fragments in the very fine sand are weathered. The mica is weathered.
5. Zoisite is an important accessory mineral in the coarse silt. Fewer weathered grains than in very fine sand.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Lithic Argiustoll; clayey, mixed, isohyperthermic

SOIL *Cramer gravelly clay loam SOIL Nos. S64VI-18-9 LOCATION Virgin Islands

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 20054-20057 November 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: (0.05-0.02)	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	3A1b < 0.0002		Coarse fragments 2A2: 3B2 > 2 Vol. Pct.	3B1 > 2 Pct.	2-19 Pct. of > 19
		Pct. of < 2 mm												>				
0-4	Ap	37.5	29.1	33.4	8.5	7.6	4.9	9.7	6.8	8.2	20.9	20.4	30.7			25	43	38
4-10	A3	33.8	29.5	36.7	5.6	6.4	4.9	9.8	7.1	8.8	20.7	21.4	26.7	22.7		30	50	40
10-14	B2t	19.2	24.4	56.4	3.5	4.2	2.5	4.8	4.2	5.4	19.0	12.4	15.0			8	16	16
14-18	B3	18.8	23.0	58.2	3.4	3.9	2.3	4.7	4.5	6.8	16.2	14.1	14.3			11	21	21

Depth (In.)	6A1a Organic carbon a Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	6E2a Carbonate as $CaCO_3$ Pct.		Bulk density: 4A1d 1/3-Bar b g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: Pct.	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in. per in.		pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-4	2.99	0.305	10	2.2	-(s)		0.88	1.17	1.26	0.020		25.5	14.2	0.10		6.4	7.2
4-10	1.90	0.186	10	2.5			0.81	1.17c					14.5			5.6	6.5
10-14	0.78	0.101	8	3.2	-(s)		1.18	1.29	1.64	0.078		33.9	21.2	0.15		5.0	6.4
14-18	0.42	0.064	7	2.6			1.14	1.29	1.69	0.085		34.3	22.2	0.14		5.0	6.4

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum	5A1a NH_4OAc		6L2a SO_4 NH_4OAc Ext.						Base saturation: 5C3 Sum	5C1 NH_4OAc
	meq/100 g									>						Pct	Pct.
0-4	20.8	7.9	0.3	0.8	29.8	4.4	34.2	26.0		0.1						87	115
4-10	19.2	8.0	0.5	0.4	28.1	6.4	34.5	26.0								81	108
10-14	21.6	12.4	1.8	0.6	36.4	7.2	43.6	33.2		0.1						83	110
14-18	21.5	12.8	2.5	0.6	37.4	6.7	44.1	34.6								85	108

Ratios to Clay 8D1

a. 6.4 kg/m² to 18 inches. (Method 6A)

Soil Classification: Lithic Argiustoll; clayey, mixed, isohyperthermic
Soil type: *Cramer gravelly clay loam.
Soil Nos.: S64VI-18-9.
Location: St. Croix, Virgin Islands, I mile south of Centerline Road on the entrance road to Cotton Valley. (300 feet southwest of house or 0.2 mile south of dam).
Vegetation and use: Native grasses and shrubs; being subdivided for a housing development.
Slope and Land form: On a 30 percent convex west-facing slope in an area of steeply dissected uplands.
Drainage and permeability: Well drained, medium runoff and moderate permeability.
Parent Material: **Residuum or very local colluvium from basic volcanic rock.**
Elevation: 150 feet.
Rainfall: 30 inches.
Samples collected by: R. B. Grossman and W. E. McKinzie, September 25, 1964.
Described by: W. E. McKinzie.

Horizon and Lincoln Lab. Number	
Ap 20054	0 to 4 inches, dark brown (7.5YR 3/2) gravelly clay loam; moderate medium granular structure; slightly hard, friable, slightly sticky and plastic; many roots; 30 percent of horizon consists of angular volcanic rock fragments from 1/4 to 2 inches in diameter; clear smooth boundary.
A3 20055	4 to 10 inches, dark reddish brown (5YR 3/2) gravelly clay loam; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many roots, 40 percent of horizon consists of angular volcanic rock fragments ranging from 1/4 to 2 inches in size; clear smooth boundary.
B2t 20056	10 to 14 inches, reddish brown (5YR 4/4) clay; moderate coarse subangular blocky structure with dark reddish brown 5YR 3/4 thin discontinuous clay films; very hard, firm, slightly sticky and plastic; dominant vertical cleavage, numerous pressure faces and no evidence of slickensides; few roots, common angular volcanic fragments ranging from 1/4 to 2 inches in diameter; clear smooth boundary.
B3 20057	14 to 18 inches, strong brown (7.5YR 5/6) gravelly clay; weak medium subangular blocky structure with thin patchy dark reddish brown (5YR 3/4) clay films; very hard, firm, slightly sticky and slightly plastic; few roots, 50 percent of horizon consisting of saprolite and rock fragments; clear wavy boundary.
R 20185	18 inches plus, silicified bedded volcanic siltstone or mudstone; rock fragments stained red.

Notes: Five percent of the Ap and 10 percent of the A3 horizon consists of material greater than 3/4 inches. Colors given are for the moist soil. The Ap is at 75 percent of field capacity and the remaining horizons are below the wilting point.

Mineralogy (Methods 7A1, 7A2, 7B1).
A3 horizon

Fraction	Mont.	Mica	Kaolinite	Interstratified Mont-Mica	Interstratified Chl-Mica	Quartz	Feldspar
Clay	s	a	s	s	s		
Fine silt		s			s	m	m
Coarse silt		s				m	m
Very fine sand		tr				5%	80%

Amounts: X-ray diffraction: s = small, tr = trace, a = abundant, m = moderate.
Optical: percentage rounded to nearest 5 percent.

NOTES

1. Mineralogy is mixed.
2. Very poorly ordered montmorillonite in the fine clay makes it difficult to estimate the amount. This mineral may contribute to the high apparent exchange capacity of the clay.
3. The fine silt contains a small amount of hornblende.
4. The coarse silt includes 20 to 25 percent epidote-group minerals, mostly zoisite; some volcanic glass and pyroxene. The mica, both biotite and muscovite, is weathered.
5. The very fine sands include 10 percent opaques with accessory hornblende and epidote (group).

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Lithic Argiustoll; clayey, mixed, isohyperthermic

SOIL Series not designated SOIL Nos. S61PR-14-7 LOCATION Lajas Valley, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14851-14853 December 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1																
		Total			Sand					Silt						Coarse fragments		
		Sand (2–0 05)	Silt (0.05–0.002)	Clay (< 0 002)	Very coarse (2–1)	Coarse (1–0 5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	0 05–0.02	Int. III (0.02–0 002)	Int. II (0.2–0.02)	(2–0.1)	3A1c Water Disp. Clay <0.002		2A2 > 2 (<19) Pct.	2 - 19	19 – 76
		← Pct. of < 2 mm →												→			← Pct. of < 76mm →	
0-5	A11	21.8	28.3	49.9	2.8	4.2	3.2	6.7	4.9	7.4	20.9	15.9	16.9			20		
5-11	B	15.8	21.1	63.1	1.7	2.9	2.2	4.9	4.1	5.8	15.3	12.6	11.7	32		12		
11-17	C	42.6a	25.5	31.9	2.3	8.2	8.4	14.2	9.5	10.3	15.2	27.2	33.1			13		

Soil Classification: Lithic Argiustoll; clayey, mixed, isohyperthermic
Soil Type: Series not designated
Soil Nos.: 861PR-14-7
Location: Lajas Valley, Puerto Rico, 0.8 mile northwest of junction of old railroad bed and Highway 101, at kilometer marker 3.3 in Boqueron. Farm of Juan Carlo, 45 feet north of old railroad bed. Aerial photograph GS-IR-6-94. Suroeste Soil Conservation District.
Vegetation and Use: Pajon, other grasses. Used for pasture.
Slope and Land Form: Sloping (8 percent) on a northwest-facing sideslope of low hill.
Drainage and Permeability: Well drained. Runoff rapid. Permeability moderate.
Parent Material: Volcanic rocks of andesitic or basaltic composition.
Collected by: R. B. Grossman, W. E. McKinzie, O. R. Carter, J. E. Trigo, March 20, 1961.
Described by: W. E. McKinzie.

Horizon and Lincoln Lab. No.	
A11 14851	0 to 5 inches. Very dark brown (10YR 2/2) clay; weak coarse subangular blocky structure breaking to weak fine granular; very hard, firm, slightly sticky, slightly plastic; few volcanic fragments of pebble and cobble size; many roots; slightly acid; clear wavy boundary.
B 14852	5 to 11 inches. Dark brown (7.5YR 3/2) clay; weak coarse subangular blocky structure breaking to weak fine granular with pressure faces; no clay films; hard, firm, slightly sticky, slightly plastic; many sand-size and 2-to 5-mm. volcanic fragments; many roots not restricted to ped surfaces; slightly acid; gradual wavy boundary.
C 14853	11 to 17 inches. 40 percent grayish brown (2.5Y 5/2), 40 percent light brownish gray (2.5Y 6/2) and 10 percent light yellowish brown (2.5Y 6/4) saprolite with 10 percent dark brown (7.5YR 3/2) clay occurring in seams and pockets; massive; hard, firm, slightly sticky, nonplastic; on wetting saprolite can be broken between fingers; grades into hard volcanic rock; mildly alkaline.
R	17 to 20 inches plus. Hard volcanic rock, difficult to dig with a spade.

Remarks: Colors given are for moist soil. Soil estimated to be at wilting point when sampled.

Mineralogy (Methods 7A1, 7A2) B horizon. The clay is dominated by a complex of interstratified 2:1 layer silicates, mostly vermiculite and mica with small chlorite and montmorillonite components. A small amount of kaolinite is present.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Udic Argiustoll; fine-loamy, mixed, isohyperthermic

SOIL Parasol clay loam SOIL Nos. S64VI-18-3 LOCATION Virgin Islands

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 20091-20098 November 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: (0.05–0.002)	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)			Coarse fragments 2A2: 3B2 > 2 Vol. Pct.	3B1 > 2 Pct.	2-19 Pct. of < 19
		Pct. of < 2 mm																
0-7	Ap	43.5	24.6	31.9	4.7	7.9	6.3	14.2	10.4	11.2	13.4	29.8	33.1				2	2
7-13	A12	44.7	23.8	31.5	8.0	9.4	5.8	12.3	9.2	11.1	12.7	27.5	35.5				3	3
13-19	B2t	42.1	19.9	38.0	6.9	9.3	5.8	11.9	8.2	7.7	12.2	22.7	33.9				5	5
19-24	B2t	48.8	22.0	29.2	9.5	12.5	6.8	11.6	8.4	8.8	13.2	23.7	40.4			3	6	6
24-40	B3	51.6	24.1	24.3	9.9	13.5	7.8	12.4	8.0	9.3	14.8	24.0	43.6			4	6	6
40-52	C1	64.2	23.0	12.8	10.8	18.2	9.5	15.8	9.9	9.6	13.4	28.2	54.3				5	5
52-62	C2	64.8	21.9	13.3	12.7	17.1	9.6	15.8	9.6	9.1	12.8	27.4	55.2				2	2
62-80	IIC3	77.4	12.8	9.8	26.5	23.2	8.4	12.9	6.4	5.3	7.5	18.4	71.0				31	31

Depth (in.)	6A1a Organic carbon a Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	6E2a Carbonate as $CaCO_3$ Pct.	Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar b g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in. per in.		pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-7	1.76	0.159	11	1.6		1.49		1.44	1.68	0.052	20.6	22.6	14.3	0.12		4.2	5.3
7-13	1.42	0.130	11	1.4		1.46		1.43	1.66	0.052	23.4	23.4	14.0	0.13		4.7	6.0
13-19	0.78	0.072	11	1.9	-(s)	1.42		1.37	1.67	0.068	26.1	27.4	17.8	0.13		4.7	6.5
19-24	0.50	0.058	9	1.3	-(s)	1.46	1.37	1.42	1.62	0.043	23.1	24.6	15.3	0.13		4.7	6.5
24-40	0.26			1.2	-(s)	1.56	1.47	1.52	1.68	0.034	17.9	20.9	13.5	0.10		4.8	7.0
40-52	0.11			1.3	-(s)	1.62		1.52	1.63	0.024	7.9	16.5	9.8	0.10		4.7	7.0
52-62	0.12			0.9	tr(s)								9.4				7.3
62-80	0.06			1.2	tr(s)								9.2				7.4

Soil Classification: Udic Argiustoll; fine-loamy, mixed, isohyperthermic
Soil type: Parasol clay loam.
Soil Nos.: S64VI-18-3.
Location: St. Croix, Virgin Islands, 1.3 miles north of hard-surfaced road on the road to River and 100 feet south and 75 feet west of gate.
Vegetation and use: Cultivated; used for sugar cane.
Slope and land form: On the 10 percent west-facing foot slope of an alluvial fan.
Drainage and permeability: Well drained, medium runoff and moderate permeability.
Parent Material: Moderately fine to fine textured sediments derived from residuum of intrusive rocks (Gabbro).
Elevation: 260 feet.
Rainfall: 45 to 50 inches.
Samples collected by: R. B. Grossman and W. E. McKinzie, September 22, 1964.
Profile described by: W. E. McKinzie.

Horizon and Lincoln Lab. Number	
Ap 20091	0 to 7 inches, very dark brown (10YR 2/2) clay loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; many sand grains; few roots; neutral; clear smooth boundary.
A12 20092	7 to 13 inches, very dark brown (10YR 2/2) clay loam; weak medium subangular blocky breaking to moderate medium granular structure; friable, slightly sticky, slightly plastic; many sand grains, few roots; neutral; clear smooth boundary.
B2t 20093 (13 to 19 inches) 20094 (19 to 24 inches)	13 to 24 inches, brown (10YR 4/3) clay; moderate medium subangular blocky structure; hard, firm, slightly sticky, plastic; thin discontinuous dark brown (10YR 3/3) clay films on peds and in root channels; many dark brown worm casts 1-2 mm. in diameter, few roots, many sand grains; neutral, gradual smooth boundary.
B3 20095	24 to 40 inches, dark yellowish brown (10YR 4/4) clay loam; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; thin discontinuous very dark grayish brown (10YR 3/2) coatings on vertical ped surfaces and in root channels; very few roots, many sand grains, many old root channels with very dark brown organic coatings; neutral; gradual smooth boundary.
C1 20096	40 to 52 inches, brown (10YR 4/3) (saprolite) loam; massive; friable, nonsticky, nonplastic; with a few thin patchy clay films; few feldspar crystals; neutral; gradual smooth boundary.
C2 1/ 20097	52 to 62 inches, brown (10YR 4/3) (saprolite) sandy loam; massive; very friable, nonsticky, nonplastic; few partially weathered feldspar crystals; neutral; gradual smooth boundary.
IIC3 1/ 20098	62 to 80 inches, brown (10YR 5/3) (saprolite) loamy sand; massive; neutral.

Notes: Ap, B2 and B3 horizons sampled for the Bureau of Public Roads. Colors given are for the moist soil. B2t horizon split for sampling as upper section appeared to contain more clay. The Ap and A12 horizons are near field capacity, B2t horizon is approximately 50 percent of field capacity and the B3 and C horizons are below the wilting point. Soil temperature at 20 inches, 82°F.

1/ Samples taken by auger.

Mineralogy (Methods 7A1, 7A2, 7B1).

Fraction	Mont.	Mica	Kaolinite	Vermiculite	Interstratified Minerals	Feldspar	Quartz	Hornblende
A12 horizon								
Clay	s	m to a	s		s(mi-mont)			s
Fine silt						m	s	s
Coarse silt		20%				50%	tr	5 to 10%
Very fine sand		<5%				70%		10%
B2t horizon, 20094								
Clay	s	s to m			s(mi-mont)			
Fine silt	s			a to d		s	tr	
Coarse silt	tr to s	70%		m?		10%	tr	10%
Very fine sand		30%				50%		>5%
C2 horizon								
Clay	d							
Fine silt	a			s	s(chl-?)			
Coarse silt	m	60%				20%, s		s
Very fine sand	s	65%				25%		tr to s

Amounts: X-ray diffraction: s = small, m = moderate, a = abundant, d = dominant, tr = trace.
Optical: percentage rounded to nearest 5 percent.

NOTES

A12 horizon The fine silt contains a small amount of interstratified 2:1 layer silicate minerals including montmorillonite and mica. The coarse silts include accessory epidote and glass or plant phytoliths (optical observations). The very fine sands contain accessory mica, glass, pyroxene and opaques.

B2t horizon The clays are well crystallized. Hint of an interstratified chlorite mineral. The vermiculite mineral in the fine and coarse silts becomes very disordered after heat treatment. Chlorite interlayers are probable. The very fine sand contains accessory pyroxene, apatite and opaques. Most of the feldspar are altered and many are difficult to identify positively.

C2 horizon Two subspecies of montmorillonite clay are suggested by twin peaks at 11.9Å and 10.0Å when the sample is heated to 300 degrees C. A small amount of an interstratified chlorite is present in the silt and clay. The coarse silt has 5 to 10 percent apatite and accessory pyroxene and opaques. The very fine sands include accessory apatite and opaques.

Special caution is needed in interpreting the mineralogy at this time. The mineral identified as biotite by optical means appears to be a combination of vermiculite and montmorillonite on the X-ray patterns. In the coarser fractions the mineral becomes disordered when heated.

SOIL CLASSIFICATION: Udic Argiustoll; fine-loamy, mixed, isohyperthermic

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1																
		Total			Sand					Silt						Coarse fragments		
		Sand (2-0.05)	Silt (0 05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0 1)	Very fine (0 1-0 05)	0 05-0.02	Int. III (0 02-0.002)	Int. II (0.2-0 02)	(2-0.1)	<0.0002	<0.074	2A2 > 2 (<19) Pct.	2 - 19	19-76
		← Pct. of < 2 mm →															← Pct. of < 76mm →	
0-8	Ap	43.7	36.3	20.0	4.1	6.9	5.9	12.7	14.1	16.3	20.0	38.2	29.6		65.2	4		
8-13	B1	44.0	35.0	21.0	3.6	7.6	6.6	13.4	12.8	15.3	19.7	35.9	31.2		64.0	4		
13-22	B2t	38.7	23.9	37.4	2.8	4.3	4.8	15.2	11.6	10.8	13.1	31.6	27.1		68.0	2		
22-27	B3	58.4	17.8	23.8	3.9	7.5	9.5	24.9	12.6	7.9	9.9	34.2	45.8		48.2	4		
27-39	C1	59.8	20.0	20.2	1.2	4.8	9.1	29.2	15.5	8.6	11.4	40.9	44.3		48.2	tr		
39-46	IIC2	39.3	34.2	26.5	0.3	1.3	2.7	16.3	18.7	15.6	18.6	45.5	20.6		72.0	tr		
46-81	IIIC3	57.8	25.3	16.9	1.9	4.3	6.9	27.1	17.6	11.2	14.1	45.2	40.2		51.9	1		

Soil Classification: Udic Argiustoll; fine loamy[1/] mixed, isohyperthermic
Soil type: **Series not designated**
Soil Nos.: S63PR-13-2
Location: Sudeste SCD, Puerto Rico, 2.7 kilometers northeast from town of Arroyo, 0.35 miles north and 400 feet east of kilometer 132.1 on highway 3.
Vegetation and land use: Cultivated, planted to sugarcane.
Slope and land form: Gently sloping (2 percent) alluvial fan or terrace.
Drainage and permeability: Well drained, medium runoff, moderate permeability.
Parent material: Alluvial fan sediments derived from volcanic rocks.
Samples collected by and date: W. E. McKinzie and R. A. Boccheciamp on October 10, 1962.
Profile described by: W. E. McKinzie.

Horizon and Lincoln Lab. Number	
Ap 19073	0 to 8 inches, dark reddish brown (5YR 3/3) loam; weak fine granular structure; friable, nonsticky, nonplastic; common fine roots; strongly acid; clear wavy boundary.
B1 19074	8 to 13 inches dark reddish brown (5YR 3/2) clay loam; weak medium subangular blocky structure breaking to weak fine granular; friable, slightly sticky, slightly plastic; common fine roots, few fine pores; organic staining on ped surfaces; strongly acid; clear wavy boundary.
B2t 19075	13 to 22 inches red (2.5YR 4/6) clay; moderate medium and coarse subangular blocky structure with thin discontinuous reddish brown (5YR 4/3) clay films on peds, clay and organic coatings also present in root channels and pores; very firm, slightly sticky, plastic; common fine roots; strongly acid; clear wavy boundary.
B3 19076	22 to 27 inches yellowish red (5YR 4/6) clay loam; weak coarse subangular blocky structure with thin patchy reddish brown (5YR 4/3) clay films on peds and in root channels; friable, slightly sticky, slightly plastic; few fine roots, common fine sand grains and few fine and medium rounded pebbles; strongly acid; clear smooth boundary.
C1 19077	27 to 39 inches reddish brown (5YR 4/4) sandy clay loam; massive, very friable, nonsticky, nonplastic; common fine pores, few fine roots, organic coatings along root channels; strongly acid; abrupt smooth boundary.
IIC2 19078	39 to 46 inches yellowish red (5YR 4/6) clay; massive; very firm; slightly sticky, plastic; few fine roots; strongly acid; clear smooth boundary.
IIIC3 19079	46 to 81 inches reddish brown (5YR 4/4) sandy loam; massive; very friable, nonsticky, nonplastic, strongly acid.
IVC4	81 to 105 inches coarse sand.
VC5	105 to 108 inches gravel.
VIC6	108 to 122 inches sand.

Remarks: Colors given are for the moist soil. Wavy boundary between Ap and B1 horizons is a result of cultivation. Reaction determined by Soiltex.

1/ Family texture is fine if the B3 horizon is excluded from the argillic horizon.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Haplustoll; fine, mixed, isohyperthermic

SOIL Series not designated SOIL Nos. S61PR-14-5 LOCATION Lajas Valley, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14843-14848 December 1966

General Methods: 1A. 1B1b. 2A1. 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1												3A1c		Coarse fragments		
		Total			Sand					Silt						2A2		
		Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	0.05–0.02	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	Water-Disp. Clay <0.002		> 2 (<19) Pct.	2 - 19	19 - 76
		Pct. of < 2 mm															Pct. of < 76mm	
0-6	Ap	16.4	29.7	53.9	1.3	1.9	1.8	5.6	5.8	10.9	18.8	19.9	10.6			tr		
6-12	A12	13.8	25.4	60.8	1.3	1.7	1.5	4.3	5.0	8.8	16.6	16.3	8.8			tr		
12-18	B2	20.0	35.2	44.8	1.4	2.7	2.4	6.1	7.4	12.1	23.1	22.9	12.6	23		tr		
18-26	B3	36.2	37.4	26.4	2.8	4.8	4.2	11.5	12.9	15.3	22.1	35.0	23.3			13		
26-38	C1	55.7	33.0	11.3	5.3	9.3	6.1	16.1	18.9	14.7	18.3	43.2	36.8			tr		
38-46	C2	64.3	27.7	8.0	5.4	12.8	8.8	19.3	18.0	14.9	12.8	43.6	46.3			tr		

Soil Classification: Typic Haplustoll; fine,[1] mixed,[2] isohyperthermic
Soil Type: Series not designated
Soil Nos.: S61PR-14-5
Location: Lajas Valley, Puerto Rico, Highway 117, 160 feet west and 100 feet north of kilometer marker 7.4. Aerial photograph GS-LR-6-80. Suroeste Soil Conservation District.
Vegetation and Use: Cultivated, planted to sugar cane for last 40 years.
Slope and Land Form: 10 percent with southeast aspect; footslope position.
Drainage and Permeability: Moderately well drained, runoff medium, permeability slow.
Parent Material: Local alluvium or colluvium from volcanic rocks. Lower part developed in residuum.
Collected by: R. B. Grossman. W. E. McKinzie. L. H. Rivera. S. J. Greer. J. E. Brunet, March 18, 1961.

Described by: W. E. McKinzie.

Horizon and Lincoln Lab. No.	
Ap 14843	0 to 6 inches. Very dark gray (5YR 3/1) clay; weak fine granular structure; very hard, very firm, sticky, plastic; many fine roots; slightly acid; clear smooth boundary.
A12 14844	6 to 12 inches. Dark reddish brown (5YR 3/2) clay with seams and pockets less than one inch in diameter of very dark gray (5YR 3/1) clay; massive when wet, upon drying breaks to weak medium and coarse subangular blocky and weak fine granular structure; very hard, very firm, sticky, plastic; many roots, not restricted to surface of peds; slightly acid; clear smooth boundary.
B2 14845	12 to 18 inches. Dark reddish brown (5YR 3/2 to 4/2) silty clay; massive when wet, upon drying breaks to weak medium and coarse angular blocky and weak fine granular structure; hard, firm, sticky, plastic; many pressure faces; common sand-size yellowish brown pebbles of saprolite; neutral; gradual smooth boundary.
B3 14846	18 to 26 inches. Dark reddish gray (5YR 4/2) clay with 20 to 30 percent sand-size saprolite; massive in place, breaks to weak fine granular structure; hard, firm, sticky, plastic; surface of soil peds slightly darker than interior, possible discontinuous clay films; neutral; gradual wavy boundary.
C1 14847	26 to 38 inches. 80 percent saprolite, 20 percent dark reddish gray (5YR 4/2) silty clay occurring in seams and pockets; massive; slightly hard, friable, slightly sticky, slightly plastic; saprolite has some spherical structure of 2-to 4-inch diameter, outside color dark reddish brown (2.5YR 3/4), inside color pale red (2.5YR 6/2); neutral; gradual wavy boundary.
C2 14848	38 to 46 inches. Coarse bedded volcanic-flow conglomerate, partly weathered, breaks with difficulty between fingers when dry, friable; mildly alkaline.

Remarks: Colors given are for moist soil. At sampling, soil was estimated to be below field capacity.
Fertilizer and herbicide applications:

1958-1959:
1,000 pounds of ammonium sulfate per acre, weed killers Karmex and 2-4D.

1959-1960:
1,000 pounds of 14-4-10 per acre.

1960-1961:
1,000 pounds of 14-4-10 per acre.

A one-half inch diameter calcium carbonate seam present in the C horizon on one side of the pit was not included in the sample.
This pedon was sampled as Jacana.

[1] Family particle-size class based on clay percentage estimated as 2.5 times the 15-bar water content.

[2] Family mineralogy based on X-ray diffraction data for Jacana, S61PR-14-4.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Haplustoll; loamy, mixed, isohyperthermic, shallow

SOIL Series not designated SOIL Nos. S64VI-18-5 LOCATION Virgin Islands

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 20058-20062 November 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth	Horizon	Size class and particle diameter (mm) 3A1														Coarse fragments 2A2		
		Total			Sand					Silt								
		Sand	Silt	Clay	Very coarse	Coarse	Medium	Fine	Very fine		Int. III	Int. II				3B2 > 2	3B1 > 2	2-19 Pct.

Soil Classification: Typic Haplustoll; loamy, mixed, isohyperthermic, shallow
Soil type: **Series not designated**
Soil Nos.: S64VI-18-5
Location: St. Croix, Virgin Islands, 1.75 miles west and 50 feet northeast of intersection (Fountain-Lavallee and the Scenic-Drive).
Vegetation and Use: Native grasses; presently used for pasture.
Slope and land form: On 30 percent southwest-facing convex slope in the dissected **uplands.**
Drainage and Permeability: Well drained, medium runoff and moderate permeability.
Parent Material: Residuum **or very local colluvium from volcanic rocks.**
Elevation: 750 feet.
Rainfall: 50 inches
Samples collected by: R. B. Grossman and W. E. McKinzie, September 23, 1964.
Described by: W. E. McKinzie.

Horizon and Lincoln Lab. Number	
Ap 20058	0 to 6 inches, very dark grayish brown (10YR 3/2) clay loam; weak fine subangular blocky to moderate medium granular; friable, slightly sticky and slightly plastic; many fine roots, few small volcanic fragments; neutral; clear smooth boundary.
B1 20059	6 to 10 inches, dark brown (10YR 3/3) clay loam; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; many fine roots, few small volcanic fragments; neutral; clear smooth boundary.
B2 20060	10 to 14 inches, dark brown (10YR 4/3) light silty clay; moderate fine medium subangular blocky structure with thin very dark grayish brown (10YR 3/2) clay films; nonsticky and slightly plastic; neutral; clear smooth boundary.

SOIL CLASSIFICATION: Lithic Haplustoll; clayey mixed isohyperthermic

SOIL Descalabrado clay SOIL Nos. S61PR-14-8 LOCATION Lajas Valley, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14854-14855 December 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1														Coarse fragments		
		Total			Sand					Silt								
		Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	(0.05–0.02)	Int III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)			2A2 > 2 (<19) Pct.	2 – 19	19 – 76
		Pct. of < 2 mm														Pct. of < 76mm		
0-5	A	18.3	37.4	44.3	3.5	4.0	2.3	4.4	4.1	7.9	29.5	14.3	14.2			27		
5-10	B	18.7	37.1	44.2	4.3	3.8	1.8	4.6	4.2	6.9	30.2	13.8	14.5			28		

Soil Classification: Lithic Haplustoll; clayey, mixed, isohyperthermic
Soil Type: Descalabrado clay
Soil Nos.: 861PR-14-8
Location: Lajas Valley, Puerto Rico, 0.3 mile north of Highway 117, kilometer marker 8.5, 300 feet northwest of secondary road, 275 feet southeast of main irrigation canal. Aerial photograph GS-LR-6-80. Suroeste SCD.
Vegetation and Use: Pajon, other grasses and weeds. Used for pasture.
Slope and Land Form: Strongly sloping (15 percent) on southwest-facing sideslope of a low hill.
Drainage and Permeability: Well drained. Runoff rapid. Permeability moderate.
Parent Material: Stratified volcanic mudstones and volcanic flows of andesitic or basaltic composition.
Collected by: R. B. Grossman, W. E. McKinzie, O. R. Carter, J. E. Trigo, March 20, 1961.
Described by: R. B. Grossman.

Horizon and Lincoln Lab. No.	
A 14854	0 to 5 inches. Dark brown (10YR 3/3) gravelly clay loam; moderate fine subangular blocky breaking to moderate medium granular structure; slightly hard, friable, slightly sticky, slightly plastic; few to common fine roots; neutral; clear smooth boundary.
B 14855	5 to 10 inches. Dark brown (7.5YR 3/2) gravelly clay and fine gravel in a 50:50 ratio; gravel is massive, pockets of soil appear to be weak fine subangular blocky; slightly hard, firm, slightly sticky, slightly plastic; few roots; neutral; calcareous in spots; wavy irregular boundary.
C	10 to 18 inches. Mixed volcanic, mudstone and limestone rock with pockets of clayey material similar to that of the B and occasional seams of secondary carbonates. Below this horizon there is hard volcanic rock which is difficult to dig with a spade.
R	18 inches plus. Hard volcanic rock that cannot be broken easily with a spade.

Remarks: Colors given are for moist soil. Soil was estimated to be near wilting point when sampled.

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Lithic Haplustoll; loamy, mixed, isohyperthermic

SOIL Series not designated SOIL Nos. S61PR-14-6 LOCATION Lajas Valley, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. NO. 14840-14850 December 1966

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)			Coarse fragments: 2A2 > 2 (<19) Pct.	2 – 19	19 – 76
		Pct. of < 2 mm															Pct. of < 76mm	
0-5	A	25.4	38.3	36.3	2.4	4.1	3.6	8.2	7.1	13.1	25.2	24.7	18.3			24		
5-12	B	56.0	30.1	13.9	6.3	13.2	8.9	15.5	12.1	12.6	17.5	33.1	43.9			tr		

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct	C/N		6E2a Carbonate as $CaCO_3$ Pct.	6C2a Ext. Iron as Fe Pct.	Bulk density g/cc	g/cc	g/cc		Water content Pct.	4B1b 1/3-Bar Pct.	4B2 15-Bar Pct			pH		8C1a (1:1) H_2O
0-5	2.59	0.206	13		-(s)	2.7						27.6	17.0					6.4
5-12	0.57	0.037	15		-(s)	1.6							10.4					7.2

Depth (In.)	Extractable bases 5B1a: 6N2b Ca	6Q2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc						8D3 Ca/Mg		Base saturation: 5C3 Sum Cations	5C1 NH_4OAc
	meq/100 g															Pct.	Pct.
0-5	27.1	9.6	0.2	0.4	37.3	6.3	43.6	34.5						2.8		86	108
5-12	22.6	6.7	0.4	0.2	29.9	2.2	32.1	27.7						3.4		93	108

Soil Classification: Lithic Haplustoll; loamy, mixed, isohyperthermic
Soil Type: Series not designated
Soil Nos.: S61PR-14-6
Location: Lajas Valley, Puerto Rico, 275 feet north of country road, 0.3 mile east of Highway 4, kilometer marker 13.1, 132 feet north of cement marker A.F.F. No. 38 on edge of main irrigation canal. Suroeste SCD.
Vegetation and Use: Pajon and other grasses, used for pasture.
Slope and Land Form: Sloping (10 percent) toward southwest, convex sideslope of low hill.
Drainage and Permeability: Well drained, runoff rapid, internal drainage moderate.
Parent Material: Volcanic rocks of andesitic or basaltic composition.
Collected by: R. B. Grossman, W. E. McKinzie, O. R. Carter, J. E. Trigo, March 20, 1961.
Described by: O. R. Carter.

Horizon and
Lincoln
Lab. No.

A 0 to 5 inches. Very dark brown (10YR 2/2) clay loam; moderate fine granular structure; slightly hard, [illegible] pebbles; neutral; clear wavy boundary.

B 14850 5 to 12 inches. Dark grayish brown (10YR 4/2) and grayish brown (2.5Y 5/2) weathered rock with very dark grayish brown (10YR 3/2) clay on seams and in pockets (about 15 percent by volume); massive with cleavage planes; slightly hard, friable, nonsticky, nonplastic; saprolite can be broken easily with fingers; neutral; grades gradually on a wavy line into hard rock.

R 12 to 15 inches plus. Hard volcanic rock that cannot be broken easily with a spade.

Remarks: Colors given are for moist soil. Soil was moist when sampled.
Mineralogy (Method 7A).
A horizon

Fraction	Montmorillonite	Mica	Kaolinite	Chlorite	Interstratifed Mont-?	Quartz	Feldspar
Clay	tr	s to m	tr, 20		?		
Fine silt		tr	tr	tr		s	m
Coarse silt						s	m
Very fine sand		s					a to d

Amounts: X-ray diffraction and optical: tr = trace, s = small, m = moderate, a = abundant, d = dominant.
Differential thermal analysis: kaolinite percentages rounded to the nearest 5 percent.

NOTES

1. Mineralogy is mixed.
2. Clays are poorly crystallized. The presence of amorphous colloids is suggested.
3. The montmorillonite and possible interstratified mineral are very poorly ordered, but may contribute to the high apparent exchange capacity of the clay.
4. DTA estimates of kaolinite and montmorillonite diverge. An endothermic doublet at 129 and 212 degrees C. suggests more than a trace of montmorillonite. The one hydroxyl endotherm at 550 degrees C. may include a high-iron montmorillonite component, although the endotherm shape suggests a poorly ordered kaolinite. The kaolinite percentage is a maximum.
5. The fine silt contains very small amounts of various interstratified minerals.
6. The coarse silt contains a small to moderate amount of epidote-group minerals.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Udic Haplustoll; loamy-skeletal, mixed, isohyperthermic

SOIL Series not designated SOIL Nos. 357PR-14-10 LOCATION Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 7430-7436 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth	Horizon	Size class and particle diameter (mm) 3A1															
		Total			Sand					Silt					Coarse fragments		
		Sand	Silt	Clay	Very	Coarse	Medium	Fine	Very fine		Int. III	Int. II (0.2–0.02)	(2–0.1)	3A1c Water	2A2 >2	2–19	19–76

Soil Classification: Udic Haplustoll; loamy-skeletal, mixed, isohyperthermic
Soil Type: Series not designated
Soil Nos.: S57PR-14-10
Location: 1 3/4 miles west of Highway No. 116 along Highway No. 305. 3/4 mile south of Highway No. 305. Photo GS-LR-10-45.
Area: Puerto Rico, Lajas Valley, Suroeste Soil Conservation District.
Climate: Semiarid - precipitation 25 to 30 inches a year.
Slope: 5 to o percent.
Relief: Slightly undulating.
Drainage: Moderately well drained.
Vegetation: Native grasses.
Erosion: Moderate.
Root Distribution: Abundant to 22 inches.
Collected by: L. T. Alexander, C. J. Koch, J. Juarez, Jr., and J. E. Trigo, September 10, 1957.
Described by: C. J. Koch.

Horizon and Lincoln Lab. No.	
Ap	0 to 6 inches. Very dark grayish brown (10YR 3/2) gravelly clay loam with weak fine angular blocky
B 7431	6 to 15 inches. Dark brown (10YR 3/3) gravelly heavy clay loam; moderate fine angular blocky structure; friable, slightly sticky, plastic; patchy clay skins on peds; many volcanic fragments of various shapes and sizes. These fragments appear to be a stone line at the lower depth of this horizon; neutral; clear smooth boundary.
IIC1 7432	15 to 22 inches. Brown to dark brown (10YR 4/3) gravelly sandy clay loam; moderate coarse angular blocky structure with a tendency to prismatic; many fine volcanic fragments; many fine pores; there appears to be a stone line at the bottom of this layer; neutral; clear smooth boundary.
IIC2 7433	22 to 29 inches. Same as above except the structure is massive, the reaction is mildly alkaline and there appears to have been a thin organic layer in this horizon before it was buried.
IIIC3 7434	29 to 40 inches. This layer is 90 percent volcanic fragments in all shapes and sizes. The matrix is sandy clay loam.
IVC4 7435	40 to 50 inches. Dark reddish brown (5YR 3/3) dry) clay loam; massive; slightly hard; fragments of old soft charcoal were found in this and the next horizon - carbon dates would be of interest; clear smooth boundary.
IVC5 7436	50 to 58 inches plus. Dark reddish brown (5YR 3/4) clay loam; massive; slightly hard; numerous fine pores.

Remarks: Colors given are for moist soil unless otherwise stated.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Vertic Haplustoll; fine, mixed, isohyperthermic

SOIL Jacana clay SOIL Nos. 861PR-14-4 LOCATION Lajas Valley, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14838-14842 December 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1															
		Total			Sand					Silt					Coarse fragments		
		Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	0.05–0.02	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)		2A2 > 2 (<19) Pct	2 – 19	19 – 76
		Pct. of < 2 mm														Pct of < 76mm	
0-6	Ap	19.8a	32.6	47.6	2.0	2.6	2.2	6.1	6.9	12.0	20.6	22.5	12.9		tr		
6-13	A12	14.5a	28.6	56.9	1.6	2.1	1.5	4.1	5.2	9.3	19.3	17.0	9.3		tr		

Soil Classification: Vertic Haplustoll; fine, mixed, isohyperthermic
Soil Type: Jacana clay
Soil Nos.: S61PR-14-4
Location: Lajas Valley, Puerto Rico, Highway 117, 60 feet east of kilometer marker 1.7 and 35 feet south of fence along highway. Aerial photograph GS-LR-6-84. Suroeste Soil Conservation District.
Vegetation and Use: Cultivated - corn and beans for last 6 months; before this, native pasture and weeds.
Slope and Land Form: Gently sloping (3 percent) to south; on lower convex footslope.

Drainage and Permeability: Moderately well drained. Runoff medium. Slow permeability.
Parent Material: Local colluvium or alluvium derived from volcanic rocks. Lower part developed from residuum.
Collected by: R. B. Grossman, W. E. McKinzie, S. J. Greer, J. E. Brunet, March 18, 1961.
Described by: W. E. McKinzie.

Horizon and Lincoln Lab. No.	
Ap 14838	0 to 6 inches. Very dark brown (10YR 2/2) clay; weak fine granular structure; hard, friable, slightly sticky, plastic; medium acid; abrupt smooth boundary.
A12 14839	6 to 13 inches. Very dark brown (10YR 2/2) clay; massive when wet, weak coarse blocky structure breaking to weak fine granular upon drying; hard, very firm, slightly sticky, plastic; no clay films; small slickensides less than one inch in width; medium acid; clear smooth boundary.
B 14840	13 to 21 inches. Dark brown (7.5YR 3/2) and very dark brown (10YR 2/2) in an 80:20 ratio, clay; massive when wet; weak coarse blocky structure breaking to weak fine granular when dry; hard, very firm, plastic, slightly sticky; many pressure faces and 1- to 3-inch wide slickensides; neutral; clear wavy boundary.
C1 14841	21 to 28 inches. 80 percent saprolite of volcanic flow that doesn't break down on wetting, with 20 percent dark brown (7.5YR 3/2) clay in pockets and seams; massive, breaks along lines of cleavage; clay portion is slightly sticky, plastic; neutral; gradual wavy boundary.
C2 14842	28 to 38 inches. Coarse bedded volcanic-flow conglomerate with dark brown (7.5YR 3/2) clay in seams; hard and massive; some green particles less than 5 mm. in diameter; neutral.

Remarks: Colors given are for moist soil. Fine saprolite and volcanic pebbles scattered throughout profile. Soil was estimated to be slightly below field capacity when sampled.

Mineralogy (Methods 7A1, 7A2): B horizon. The clay is a complex of interstratified 2:1 layer silicates, including components of vermiculite, mica, montmorillonite, and chlorite in approximate decreasing order of abundance. A very small amount of kaolinite is present.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Petrocalcic Paleustoll; clayey, mixed, isohyperthermic, shallow

SOIL Hesselberg clay SOIL Nos. S64VI-18-4 LOCATION Virgin Islands

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 20079-20083 November 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int II (0.2–0.02)	(2–0.1)	Clay: 3A1a Carbonate	Clay: Non-Carbonate	Coarse fragments 2A2: 3B2 > 2 Vol. Pct.	3B1 > 2 Pct.	2-19 Pct. of < 19
		Pct. of < 2 mm																
0-7	Ap	7.0	22.6	70.4	0.6a	1.3a	0.9a	1.9a	2.3a	5.6	17.0	9.0	4.7	-	70		3	3
7-12	B1	7.7	34.7	57.6	0.7a	1.3a	1.1a	2.1a	2.5a	5.9	28.8	9.6	5.2	-	58	3	7	7
12-17	B2	5.7	27.1	67.2	0.3	1.1a	0.8a	1.7a	1.8a	6.3	20.8	9.1	3.9	-	67		4	4
17-18	Ccam1																	
18-24	Ccam2																	

Depth (In.)	6A1a Organic carbon b Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	6E1b Carbonate as $CaCO_3$ Pct		Bulk density 4A1d 1/3-Bar c g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content Pct	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in. per in.		pH		8C1a (1:1)
0-7	3.99	0.355	11	1.4	2			0.99	1.23	0.078		43.2	30.8	0.12				7.4
7-12	2.81	0.240	12	1.5	2		1.01	1.04	1.30	0.076		42.5	29.7	0.13				7.4
12-17	1.21	0.127	10	1.9	1			1.05	1.44	0.111		47.7	32.8	0.16				7.6
17-18	0.30	0.033	9		89													
18-24	0.30				91													

Depth (In.)	Extractable bases 5B1a: 6N3a Ca	6O3a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap: 5A3a Sum	5A1a NH_4OAc	Base saturation: 5C3 Sum	5C1 NH_4OAc
	meq/100 g								Pct.	Pct.
0-7	46.6	4.2	0.4	2.2	53.4	5.9	59.3	46.1	90	116
7-12	46.2	4.1	0.4	1.5	52.2	5.2	57.4	41.7	91	125
12-17	44.8	4.5	0.6	1.5	51.4			42.8		120
17-18										
18-24										

Depth (In.)	Ratios to Clay: NH_4OAc CEC	Ext. Iron	8D1 15-Bar Water
0-7	0.65	0.02	0.44
7-12	0.72	0.03	0.52
12-17	0.64	0.03	0.49
17-18			
18-24			

a. 0-5% carbonate.
b. 12 kg/m² to 17 inches. (Method 6A).
c. Calculated to include volume but not weight of > 2 mm. material (Method 3B2).

Soil Classification: Petrocalcic Paleustoll; clayey, mixed, isohyperthermic, shallow
Soil type: Hesselberg clay
Soil Nos.: S64VI-18-4
Location: St. Croix, Virgin Islands, 0.7 mile west of the south entrance to the Airport and 470 feet south on secondary road, and 50 feet west of road.
Vegetation and use: Native grasses and shrubs; presently used as pasture.
Slope and land form: Nearly level coastal plain.
Drainage and permeability: Well drained, very little runoff and moderate permeability.
Parent Material: Residuum or local colluvium from limestone.
Elevation: 40 feet.
Rainfall: 35 inches.
Samples collected by: R. B. Grossman, and W. E. McKinzie, September 23, 1964.
Described by: W. E. McKinzie.

Horizon and Lincoln Lab. Number	
Ap 20079	0 to 7 inches, dark reddish brown (5YR 3/3) silty clay; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many roots; few limestone fragments; calcareous, mildly alkaline; clear smooth boundary.
B1	7 to 12 inches, dark reddish brown (5YR 3/3) silty clay; moderate fine subangular blocky structure; friable, slightly sticky, plastic; many fine roots; few limestone fragments; calcareous, mildly alkaline; clear smooth boundary.
20080	slightly sticky, plastic; many fine roots; calcareous, few limestone fragments, mildly alkaline; clear smooth boundary.
B2 20081	12 to 17 inches, dark red (2.5YR 3/6) clay; weak medium prismatic breaking to moderate fine and medium subangular blocky structure; friable, slightly sticky, plastic; common fine roots; few limestone fragments, few dark reddish brown (5YR 3/3) worm casts; calcareous with mycelial lime, mildly alkaline; abrupt wavy boundary.
Ccam1 20082	17 to 18 inches, hard white limestone with light red (2.5YR 6/6) bands.
Ccam2 20083	18 to 24 inches plus, white hard limestone.

Notes: The Ap, B2 and a composite sample of the Ccam1 and Ccam2 horizons sampled for the Bureau of Public Roads. Colors given are for the moist soil. The Ap horizon is near field capacity, B1 approximately 50 percent of field capacity and the B2 is below the wilting point.

Mineralogy (Methods 7A1, 7A2, 7B1).
B1 horizon

Fraction	Mont.	Mica	Kaolinite	Quartz	Feldspar	Epidote

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Aeric Tropaqualf; fine-loamy, mixed, isohyperthermic

SOIL Candelero sandy loam SOIL Nos. 863PR-12-8 LOCATION Este SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18936-18944 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0 05)	Total: Silt (0 05-0 002)	Total: Clay (< 0 002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.0002	<0.074	Coarse fragments 2A2 > 2 (<19) Pct.	2 - 19	19 - 76
		Pct. of < 2 mm														Pct.	Pct of < 76mm	
0-7	Ap	70.1	16.4	13.5	12.9	17.4	9.5	18.6	11.7	9.4	7.0	31.9	58.4		36.1	tr		
7-11	B1	51.5	15.8	32.7	7.7	12.1	7.1	14.6	10.0	8.3	7.5	26.6	41.5		54.0	tr		
11-15	B21tg	48.9	14.2	36.9	6.9	12.0	7.0	13.9	9.1	6.1	8.1	22.9	39.8	26.5	55.0	tr		
15-24	B22tg	54.0	14.8	31.2	9.1	13.7	7.5	14.3	9.4	6.8	8.0	23.9	44.6		50.0	tr		
24-34	B23tg	56.9	14.3	28.8	9.5	14.9	8.2	14.7	9.6	7.0	7.3	24.7	47.3		47.4	tr		
34-50	B31	69.1	11.2	19.7	17.7	18.3	8.6	15.9	8.6	5.8	5.4	22.8	60.5	15.5	34.9	tr		
50-64	B32	65.5	14.4	20.1	14.3	17.9	8.7	15.1	9.5	6.9	7.5	24.5	56.0		39.1	tr		
64-90	C1	72.0	12.5	15.5	11.5	18.0	11.8	19.6	11.1	7.2	5.3	28.6	60.9		33.2	tr		
90-115	C2	65.6	13.2	21.2	11.6	18.6	10.2	16.3	8.9	6.3	6.9	23.7	56.7		38.4	tr		

Depth (In.)	6A1a Organic carbon a Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct		Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct	4C1 1/3-to 15-Bar in./in.		pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-7	0.64	0.052	12	1.2			1.66	1.67	1.68	0.003	17.2	12.8	5.8	0.12		3.8	4.2
7-11	0.31	0.043	7	1.4			1.41	1.54	1.70	0.032	28.0	19.3	12.3	0.11		3.5	4.3
11-15	0.20			1.1			1.43	1.54	1.80	0.052	28.1	21.3	13.2	0.12		3.6	4.6
15-24	0.11			1.0			1.60	1.62	1.90	0.056	22.0	20.4	11.1	0.15		4.8	5.5
24-34	0.04			0.8				1.7b					8.3			5.3	6.2
34-50	0.01			0.6			1.92	1.84	1.95	0.020	9.9	12.4	7.6	0.09		5.2	6.5
50-64	0.01			0.5				1.8b					8.1			5.3	6.5
64-90	-			0.5									6.1			5.8	6.7
90-115	-			0.8									9.0			5.6	6.7

Depth (In.)	Extractable bases 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	5B1a Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	6L2a NH_4OAc-Ext. SO_4		5A3b Bases Plus Al me/100g Clay				Base saturation 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																
0-7	-	0.2	tr	0.1	0.3	12.0	12.3	6.1	2.3	0.8		19.3				2	5
7-11	1.8	0.6	0.1	0.1	2.6	13.4	16.0	10.6	5.4	1.8		24.5				16	25
11-15	5.3	2.1	0.2	0.2	7.8	11.5	19.3	12.5	2.8	1.6		28.7				40	62
15-24	7.9	4.4	0.2	0.3	12.8	4.4	17.2	13.6		0.5		41.0				74	94
24-34	7.4	5.7	0.2	0.3	13.6	3.7	17.3	13.7		0.1		47.2				79	99

Soil Classification: Aeric Tropequalf; fine-loamy, mixed, isohyperthermic
Soil type: Candelero sandy loam
Soil Nos.: S63PR-12-8
Location: Este SCD, Puerto Rico, 5.4 kilometers north from town of Yabucoa, 1.5 kilometers north of intersection of highways 905 and 3. Photo GS-LR-9-19.
Vegetation and use: Used for production of sugar cane.
Slope and land form: **8 percent. Alluvial fan leading down to flood plain.**

Drainage and permeability: Somewhat poorly drained, with medium runoff and slow permeability.
Parent materials: Sediments derived from plutonic rocks.
Samples collected by and date: W.E. McKinzie, R.B. Grossman, R.A. Boccheciamp on September 18, 1963.
Profile described by: R.A. Boccheciamp.

Horizon and Lincoln Lab. Number	
Ap 18936	0 to 7 inches, dark grayish brown (10YR 4/2) loam; weak fine granular structure; very friable, nonsticky, nonplastic; few fine roots; few fine black grains; few concretions, 2 to 3 milimeters in diameter; extremely acid; clear smooth boundary.
B1 18937	7 to 11 inches, gray (10YR 6/1) light clay with many medium distinct yellowish brown (10YR 5/8) and dark red mottles; weak coarse subangular blocky structure; very firm, slightly sticky, plastic; thin discontinuous gray clay films on ped surfaces; few fine roots; black coatings on root channels; common fine quartz grains; extremely acid; clear smooth boundary.
B21tg 18938	11 to 15 inches, gray (10YR 6/1) clay with many medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very firm, slightly sticky, plastic; thin discontinuous gray clay films on ped surfaces, few fine roots; dark coatings on root channels; common fine quartz grains; few fine black grains; many weathered feldspar and ferromagnesian grains; very strongly acid; gradual smooth boundary.
B22tg 18939	15 to 24 inches, greenish gray (5GY 6/1) clay with common medium distinct brownish yellow (10YR 6/6) and few fine distinct reddish brown (5YR 4/3) mottles; weak coarse subangular blocky structure; very firm, slightly sticky, plastic; thin discontinuous greenish gray clay films on ped surfaces; few fine roots; dark coatings on root channels; many fine quartz grains; few fine black grains; many weathered feldspar and ferromagnesian grains; strongly acid; gradual smooth boundary.
B23tg 18940	24 to 34 inches, light greenish gray (5GY 7/1) light clay with common fine distinct greenish gray (5BG 6/1), common medium distinct yellowish brown (10YR 5/8) and common medium distinct [illegible] slightly plastic; thin discontiuous clay films on vertical ped faces; many fine quartz grains; few fine black grains; many weathered feldspar and ferromagnesian grains; slightly acid; clear smooth boundary.
B31 18941	34 to 50 inches, dark yellowish brown (10YR 4/4) sandy clay loam with common medium distinct yellowish brown (10YR 5/6) and greenish gray (5GY 6/1) mottles; massive; friable, slightly sticky, nonplastic; many fine quartz grains; many weathered feldspar grains; common fine black grains; slightly acid.
B32	50 to 64 inches, same as above, split for sampling.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Aeric Tropaqualf; fine, mixed, isohyperthermic

SOIL Cayagua sandy loam SOIL Nos. S61PR-12-3 LOCATION Esta SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16803-16809 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth	Horizon	Size class and particle diameter (mm) 3A1											3A1c				
		Total			Sand					Silt					Coarse fragments		
		Sand	Silt	Clay	Very coarse	Coarse	Medium	Fine	Very fine		Int III	Int. II		Water-Disp. Clay	2A2 > 2	2 - 19	19-76

Soil Classification: Aeric Tropaqualf; fine, mixed, isohyperthermic
Soil Type: Cayagua sandy loam
Soil Nos.: S61PR-12-3
Location: Este Soil Conservation District, Puerto Rico, 450 feet west of kilometer marker 0.7, Highway No. 450 (75 feet west of fence).
Vegetation and Use: Morning-glory, zorrograss, carpetgrass, native legumes, used for pasture.
Slope and Land Form: Moderately sloping (7 percent) southwest convex slope.
Drainage and Permeability: Somewhat poorly drained with medium runoff. Permeability is moderate.
Parent Material: Residuum from plutonic rock.
Sampled by: Robert B. Grossman, William McKinzie, Rafael Boccheciamp, Juan Juarez, December 12, 1961.
Described by: William McKinzie and Rafael Boccheciamp, December 12, 1961.

Horizon and Lincoln Lab. No.	
Ap 16803	0 to 4 inches. Dark grayish brown (10YR 4/2) sandy loam; weak fine granular; very friable moist, nonsticky and nonplastic when wet; few medium iron concretions between Ap and B21t horizons; many roots; abrupt smooth boundary.
B21t 16804	4 to 10 inches. Light brownish gray (10YR 6/2) clay with many coarse distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; very firm when moist, slightly sticky and plastic when wet; patchy clay films on peds and root channels; common roots; clear wavy boundary.
B22t 16805	10 to 20 inches. Light brownish gray (10YR 6/2) clay with many coarse distinct strong brown (7.5YR 5/6) and few fine distinct red (2.5YR 5/6) mottles; weak coarse blocky structure; firm when moist, slightly sticky and plastic when wet; patchy clay films on peds and root channels; few roots; clear wavy boundary.
B3 16806	20 to 27 inches. Sixty percent yellowish red (5YR 5/6) sandy loam; friable when moist, nonsticky and nonplastic when wet; 40 percent light gray (10YR 7/1) clay; friable moist, nonsticky and plastic when wet; massive; very few roots; gradual wavy boundary.
C1 16807	27 to 36 inches. Sixty percent yellowish red (5YR 4/6) sandy loam by volume; nonsticky and nonplastic when wet; 40 percent light gray (10YR 7/1) clay and quartz seams; friable when moist, nonsticky and slightly plastic when wet; massive; gradual wavy boundary.
C2 16808	36 to 100 inches. Yellowish red (5YR 4/6) and reddish yellow (7.5YR 6/6) sandy loam; massive; very friable when moist; nonsticky and nonplastic when wet. Sample from 80 to 100 inches taken with auger.
Ap2 16809	2 to 4 inches. Lower 2 inches of Ap. More sandy and richer in iron concretions than upper half.

Remarks: Soil colors are for the moist soil.

Mineralogy, Micromorphology (Methods 7B1, 4E1). Angular clear quartz and white to cream-colored altered feldspar(?), predominate with some metallic black grains. In the very fine sand, quartz and feldspar are about equal, with an increase in feldspar relative to quartz with depth. Some of the feldspar grains are readily identifiable with alteration restricted to frayed edges; many, however, are altered beyond clear-cut identification. Feldspar alteration does not change with depth. Hornblende and epidote occur in trace percentages; both increase in the bottom horizon. In thin section, the clay of the B2t shows strong orientation and there are occasional clay films.

Differential thermal analysis (Method 7A3) indicated the following percentages of kaolinite:
32 - Beltsville Laboratory
35) - Lincoln Laboratory (less than 10 percent gibbsite is present)
55)

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SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Aeric Tropaqualf; fine, mixed, isohyperthermic

SOIL: Vega Baja silty clay loam SOIL Nos. S61PR-9-1 LOCATION: Rio Piedras Experiment Station, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska LAB. Nos. 16892-16898 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Silt: Int. II (0.2–0.02)	Silt: (2–0.1)			Coarse fragments 2A2: > 2 (<19) Pct.	2 – 19	19 – 76
		Pct. of < 2 mm															Pct. of < 76mm	
0-7	Ap	15.7a	43.8	40.5	1.6	3.5	2.1	3.8	4.7	11.7	32.1	18.7	11.0			tr		
7-12	A12	14.8a	43.2	42.0	1.8	3.3	1.9	3.3	4.5	10.7	32.5	17.2	10.3			tr		
12-17	B21t	11.0b	40.6	48.4	1.0	2.6	1.6	2.4	3.4	11.6	29.0	16.5	7.6			tr		
17-32	B22t	7.1b	39.7	53.2	0.4	0.6	0.5	1.6	4.0	10.0	29.7	15.2	3.1			tr		
32-50	B3	19.1b	42.9	38.0	0.4	1.1	1.8	6.5	9.3	13.5	29.4	27.2	9.8			tr		
50-55	C1	5.9b	44.9	49.2	-	0.4	0.5	1.3	3.7	10.1	34.8	14.7	2.2			tr		
55-60	C2	6.6	52.4	41.0	-	0.1	0.3	1.4	4.8	12.7	39.7	18.5	1.8			tr		

Depth (In.)	6A1a Organic carbon c Pct	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct		Bulk density: 4A1a Field-State g/cc	4A1c 30-cm. g/cc	4A1b Air-Dry g/cc	4D1 COLE e	Water content: 4B4 Field-State Pct.	4B3 30-cm. Pct.	4B1b 1/3-Bar Pct.	4B2 15-Bar Pct.			pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-7	1.48	0.156	9	5.9			1.20	1.32	1.48	0.073	40.7f	30.3	32.1	21.7			4.0	4.6
7-12	1.19	0.135	9	6.5			1.26	1.32	1.46	0.052	34.7	29.2	31.2	21.5			4.1	5.1
12-17	0.54	0.061	9	4.9			1.29	1.32	1.45	0.040	33.6g	29.9	30.6	22.9			3.5	4.8
17-32	0.32	0.039	8	5.2			1.28	1.34	1.58	0.073	35.2h		34.9	25.0			3.4	4.8
32-50	0.10			5.7			1.36	1.36	1.52	0.040	30.8i	30.4	30.2	22.2			3.7	5.1
50-55	0.09			4.8										23.2			4.1	5.6
55-60	0.06			5.2										22.9			4.3	5.8

Depth (In.)	Extractable bases 5B1a: 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		5A3b Bases Plus Al me/100g Clay					Base saturation: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct
	meq/100 g																
0-7	9.4	3.0	0.3	0.1	12.8	16.2	29.0	20.7	0.5		32.8					44	62

Soil Classification: Aeric Tropaqualf; fine, mixed, isohyperthermic
Soil Type: Vega Baja silty clay loam
Soil Nos.: S61PR-9-1
Location: Rio Piedras Experiment Station, Puerto Rico, 200 feet northwest on road to Foods Laboratory and 200 feet northeast of the entrance to the Experiment Station (Section north of highway), San Juan SCD.
Vegetation and Use: Merker grass and being used as pasture.
Slope and Land Form: Nearly level (1 percent) coastal plain.
Drainage and Permeability: Somewhat poorly drained, surface drainage slow. Slowly permeable.
Parent Material: Old coastal alluvium.

Collected by: I. L. Martin, J. Juarez, R. B. Grossman, W. E. McKinzie, October 11, 1961.
Described by: W. E. McKinzie, October 11, 1961.

Horizon and Lincoln Lab. No.	
Ap 16892	0 to 7 inches. Dark brown (10YR 4/3) silty clay loam; weak fine granular structure; firm when moist, slightly sticky and slightly plastic when wet; strongly acid; few fine manganese and iron concretions; many roots; gradual wavy boundary.
A12 16893	7 to 12 inches. Yellowish brown (10YR 5/8) and dark grayish brown (10YR 4/2) silty clay loam; weak fine granular; firm when moist, slightly sticky and plastic when wet; strongly acid; few fine manganese concretions; many roots; abrupt wavy boundary.
B21t 16894	12 to 17 inches. Dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/8) clay; weak coarse subangular blocky structure; common fine distinct yellowish brown mottles; firm when moist, slightly sticky and slightly plastic when wet; strongly acid; few fine manganese concretions; black coatings on soil peds and in root channels; abrupt wavy boundary.
B22t 16895	17 to 32 inches. Strong brown (7.5YR 5/8) and gray (5Y 6/1) clay; weak medium subangular blocky structure; firm when moist, slightly sticky and plastic when wet; strongly acid; seams between peds and root channels filled with gray clay; few fine iron and manganese concretions; gradual wavy boundary.
B3 16896	32 to 50 inches. Brownish yellow (10YR 6/8) and light gray (N 7/) clay with pockets of yellowish brown clay loam materials; weak coarse subangular blocky; slightly sticky and slightly plastic when wet; strongly acid; few peds and fracture planes coated with manganese; root channels and worm burrows filled with clay; abrupt wavy boundary.
C1 16897	50 to 55 inches. Light gray (N 7/) mottled with strong brown (7.5YR 5/8) clay; massive; sticky and plastic when wet; strongly acid; few roots; abrupt wavy boundary.
C2 16898	55 to 60 inches. Light gray (N 7/) and strong brown (7.5YR 5/8) clay; massive; sticky and plastic when wet.

Mineralogy, Micromorphology (Methods 7B1, 4E1). A prominent feature is the abundant dark nodules in the upper solum. The very fine sand consists, in decreasing order of abundance, of opaques and coated grains, quartz-feldspar intergrowths with the feldspar highly altered, quartz with mottled interference color, discrete quartz grains, and feldspar grains ranging from somewhat altered to feldspar pseudomorphs composed of clay minerals. A few weathered epidote occur. Plant opal is common in the A horizons. In thin section, the B22t shows some clay films and strong orientation of the clayey matrix.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Tropudalf; fine, mixed, isohyperthermic

SOIL Machete loam SOIL Nos. S63PR-13-1 LOCATION Sudeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19067-19072 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth	Horizon	Size class and particle diameter (mm)																
		Total			Sand					Silt		3A1				Coarse fragments		
		Sand	Silt	Clay	Very coarse	Coarse	Medium	Fine	Very fine		Int. III	Int. II				2A2 > 2	2 – 19	19 – 76

Soil Classification: Typic Tropudalf; fine, mixed, isohyperthermic
Soil type: Machete loam.
Soil Nos.: S63PR-13-1.
Location: Sudeste SCD, Puerto Rico, 3.3 kilometers north of town of Arroyo, 1200 feet east of kilometer 1.4, highway 753 to iron stake and 50 feet east and 20 feet north.
Vegetation and use: Cultivated, planted to sugarcane.
Slope and land form: Gently sloping (2 percent) alluvial fan or terrace.
Drainage and permeability: Well drained, medium runoff, moderate permeability.
Parent material: Alluvial fan sediments derived from volcanic rocks.
Samples collected by and date: W.E. McKinzie and R.A. Boccheciamp on October 10, 1962.
Profile described by: W.E. McKinzie.

Horizon and Lincoln Lab. Number	
Ap 19067	0 to 7 inches reddish brown (5YR 4/3) loam; weak fine granular structure, very friable, nonsticky, nonplastic; many fine roots; strongly acid; gradual smooth boundary.
A12 19068	7 to 14 inches, dark reddish brown (5YR 3/3) loam; weak fine granular structure, very friable, nonsticky, nonplastic; common fine roots, common fine sand grains; strongly acid; clear smooth boundary.
B21t 19069	14 to 19 inches, reddish brown (5YR 4/4) clay loam; weak medium subangular blocky structure with few thin patchy clay films; friable, slightly sticky, plastic; few fine black concretions, many fine sand grains; strongly acid; clear smooth boundary.
B22t 19070	19 to 28 inches, reddish brown (5YR 4/4) clay; moderate medium subangular blocky structure with thin discontinuous clay films on peds and in root channels; firm, slightly sticky, plastic; common fine black concretions, many fine sand grains; few fine weathered rock fragments, few fine rounded pebbles; strongly acid; clear smooth boundary.
B23t 19071	28 to 40 inches, yellowish red (5YR 4/6) clay; weak medium and coarse subangular blocky structure with thin patchy clay films in peds and in root channels; firm, slightly sticky, plastic; common fine black concretions, few rounded pebbles, few weathered rock fragments; strongly acid; abrupt smooth boundary.
B3 19072	40 to 60 inches, reddish brown (5YR 4/4) silty clay loam; moderate medium blocky structure with very few thin patchy clay films; firm, slightly sticky, plastic; few fine black concretions; strongly acid, gradual smooth boundary.
C1	60 inches plus reddish brown (5YR 4/4) cobbly sandy clay loam; massive; strongly acid.

Remarks: Thin clay lens at 57 inches. Colors given are for the moist soil. Reaction determined by Soiltex.

Mineralogy (Method 7A): B22t horizon. The clays are rather poorly organized. Moderate amounts of kaolinite and/or halloysite, small amounts of mica and montmorillonite are present. An interstratified chlorite-mica is present in a small amount. A broad peak near 8.1Å may be a hydrated halloysite. Small to moderate amounts of well-crystallized quartz and feldspar are present. A small amount of true chlorite, probably high in iron, is present. The diffraction patterns are similar to those of the Cramer soils sampled in the Virgin Islands, S64VI-18-6 and S64VI-18-9.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: **Ultic Tropudalf**; very fine, mixed, isohyperthermic

SOIL **Series not designated** SOIL Nos. S61PR-4-1 LOCATION Cibuco SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14874-14884 December 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: (0.05–0.02)	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	3A1c Water Disp. Clay <0.002		Coarse fragments 2A2 > 2 (<19) Pct.	2 - 19	19 - 76
		Pct. of < 2 mm															Pct. of < 76mm	
0-6	Ap	18.1	26.5	55.4	2.4	2.8	2.2	5.7	5.0	6.6	19.9	14.8	13.1			tr		
6-17	B21	6.8	23.5	69.7	0.4	0.6	0.7	2.5	2.6	4.3	19.2	8.4	4.2	36		tr		
17-34	B22	10.3	28.6	61.1	0.1	0.5	1.0	4.6	4.1	6.3	22.3	13.2	6.2	14		tr		
34-60	C1	22.5	34.4	43.1	1.8	2.7	2.5	7.5	8.0	9.0	25.4	21.4	14.5			tr		
60-90	C2	42.4	33.4	24.2	1.5	6.9	7.1	16.1	10.8	9.8	23.6	29.2	31.6			-		
114-138	C4	44.2	39.0	16.8	1.6	5.5	5.9	16.9	14.3	13.4	25.6	37.4	29.9			5		
150-174	C5	44.9	35.9	19.2	7.5	10.6	5.0	11.0	10.8	11.8	24.1	29.0	34.1			tr		
204	D1																	
222	D2																	
222	D3																	
150-174	a																	

Soil Classification: Ultic Tropudalf; very fine, mixed, isohyperthermic
Soil Type: **Series not designated**
Soil Nos.: S61PR-4-1
Location: Cibuco Soil Conservation District, Puerto Rico. **Barranquitas Soil** Study Area; 16 feet east of kilometer marker K8 H8, Highway 152. The Ap through C3 horizons were taken straight downward. The C4 was offset 8 feet to left (as facing profile); the C5 horizon 3 feet to the right; the D1 8½ feet to right; the D2 16 feet to right and the D3 30 feet to right, **same section as studied by Briggs.** 1/
Elevation: 610 to 615 meters.
Vegetation and Land Use: Idle road bank; previously cultivated.
Parent Material: Designated by Briggs as "basaltic-andesite flow breccia".
Collected and Described by: R. B. Grossman, W. E. McKinzie and G. D. Smith, March 11, 1961.

Horizon and
Lincoln
Lab. No.

Ap
14874 — 0 to 6 inches. Dark reddish brown (5YR 3.5/2 moist) and brown (7.5YR 5/4 dry) clay; massive and moderate coarse granular; massive parts break down to coarse granules; hard; many coarse pores; much worm activity; a few smooth macrosurfaces perhaps from pressure orientation by worms; abrupt boundary.

B21
14875 — 6 to 17 inches. Red (2.5YR 4/6) ped interiors and reddish brown (2.5YR 4/4) ped surfaces with few fine distinct reddish yellow mottles that show some association with the macrosurfaces and pore walls; clay; where moist, moderate to strong medium coarse blocky and where dry along surface of cut, strong medium and fine blocky; very firm; fails semiplastically; 2/ distinct broken clay films and numerous pressure surfaces; sand-size black aggregates common; some light-colored, sand-size grains; few interped pores; roots common; gradual boundary.

B22
14876 — 17 to 34 inches. Red (2.5YR 4/6) clay with reddish brown (2.5YR 4/4) macrosurfaces and with few fine distinct yellowish brown mottles; moderate to weak coarse blocky; firm; fails semiplastically; few distinct clay films; common pressure surfaces; occasional slickenside; few black sand-size aggregates; few fine pores; 5 to 10 percent saprolitic material ranging from sand-size to 1/2-inch diameter; clear wavy boundary.

C1
14877 — 34 to 60 inches. Red (2.5YR 4/6) and reddish yellow (5YR and 7.5YR 6/6 to 6/8) about equal with many reddish brown (2.5YR 4/5) vertical surfaces; silty clay; moderate coarse prismatic with prisms at about 30 degrees to vertical; clay films on vertical surfaces; cleavage planes appear largely controlled by original rock structure.

C2
14878 — 60 to 90 inches. Saprolite. Reddish yellow (5YR and 7.5YR 6/6 to 6/8) with 30 percent reddish brown (2.5YR 4/4) along macrosurfaces and as parts about 1/2 inch in diameter; silty clay; firm; slickenside surfaces at 30 degrees to vertical; clay films common on vertical surfaces but sparse considering the whole soil mass; clay films commonly have pustular surface.

C3 — 90 to 114 inches. Transition from C2 to C4. Bottom is about the top of Briggs' zone C.

C4
14879 — 114 to 138 inches. Saprolite. Reddish yellow (5YR and 7.5YR 6/6 to 6/8) with about 20 percent reddish brown (2.5YR 4/4) as apparently disconnected parts about 1/2 inch in diameter and as coatings on macrosurfaces; silty clay loam; very firm; many soft white bodies about 1 mm. across; black (2.5YR 2/0) Fe-Mn(?) concentrations common on macrosurfaces; few clay films on macrosurfaces; presence of the small white bodies and the black coatings are the principal differences from the C2.

C5
14880 — 150 to 174 inches. Similar to C4 with a more greenish cast; veins of light olive gray (5Y 6/2); obtained a sample of the veins as well as the bulk sample.

D1
14881 — 204 inches. At base of Briggs' C zone. Saprolitic rock that when saturated can be broken in the hands only with difficulty; numerous black coatings on macrosurfaces; interiors of saprolitic rock fragments have numerous whitish bodies as described in the C4 horizon; some reddish brown (2.5YR 4/4) clay on fracture surfaces.

D2
14882 — 222 inches. Weathered lava with prominent rock structure; much greenish material; surfaces of fractures black; several epidote-rich veins and light-colored quartz veins (designated as such by Briggs).

D3
14883 — 222 inches. Unweathered rock.

14884 — Veins from C5 horizon.

1/ Briggs, R. P., Laterization in East-Central Puerto Rico. Trans. Second Caribbean Geol. Cong. 103-119. 1959.

2/ Two terms are used in the descriptions to describe the rate of failure of natural fabric: fails abruptly and fails semiplastically. To fail abruptly means that no plasticity is observed prior to failure. Stress builds up as the piece of soil is squeezed and dissipates quickly as the piece of soil breaks apart into numerous fragments or peds due to failure along natural planes of weakness. In semiplastic failure, deformation is readily observed prior to rupture.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Ultic Tropudalf; very fine, kaolinitic, isohyperthermic

SOIL Series not designated SOIL Nos. S63PR-8-4 LOCATION Oeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18999-19003 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1														Coarse fragments		
		Total			Sand					Silt								
		Sand (2-0 05)	Silt (0.05-0.002)	Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)	0.05-0 02	Int III (0.02-0.002)	Int. II (0.2-0.02)	(2-0 1)	<0.0002	<0.074	2A2 > 2 (<19) Pct.	2 - 19	19 - 76
		Pct. of < 2 mm															Pct. of < 76mm	
0-6	Ap	5.4b	29.0	65.6	0.2	0.3	0.3	1.7	2.9	5.5	23.5	9.6	2.5		96.6	tr		
6-12	B21t	8.1b	26.5	65.4	0.7	0.7	0.7	2.5	3.5	4.6	21.9	9.8	4.6		94.0	tr		
12-19	B22t	4.1c	27.3	68.6	-	0.2	0.2	1.3	2.4	3.4	23.9	6.7	1.7	13.5	97.5	-		
19-34	B23t	3.4c	26.0	70.6	0.1	0.2	0.2	1.0	1.9	3.2	22.8	5.8	1.5		97.9	-		
42-48+	C1 a																	

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.		Bulk density g/cc	g/cc	g/cc		Water content Pct	Pct.	4B2 15-Bar Pct			pH 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-6	3.00	0.286	10	5.7									29.5			4.9	5.6
6-12	1.38	0.148	9	5.3									28.5			4.8	5.4
12-19	0.68	0.085	8	5.3									29.0			4.5	5.1
19-34	0.65	0.063	10	5.7									30.3			4.3	5.0
42-48+																	

Soil Classification: Ultic Tropudalf; very fine, kaolinitic, isohyperthermic
Soil type: Series not designated
Soil Nos.: S63PR-8-4
Location: Oeste SCD, Puerto Rico; 4.5 kilometers north from town of Añasco, 900 meters north of intersection of Highways 2 and 110, 150 feet east of highway. This location is 100 feet south of **pedon** S63PR-8-3 and is a satellite site taken with the intent of noting differences in soil characteristics related to differences in stability of geomorphic position.
Vegetation and use: Old coffee plantation with an overstory of shade trees consisting of guamá, guava, Moca, Bucaré, all leguminous trees.
Slope and land form: **30 percent sideslope in dissected upland. The site is steeper and probably less stable than that of pedon S63PR-8-3.**

Drainage and permeability: Well drained, with medium runoff. Permeability is moderate.
Parent materials: **Residuum or very local sideslope colluvium from basic volcanic rocks.**
Samples collected by and date: R.B. Grossman, W.E. McKinzie, L.H. Rivera, G. Acevedo, and R.E. Gierbolini on September 25, 1963.
Profile described by: R.E. Gierbolini

Horizon and Lincoln Lab. Number	
Ap 18999	0 to 6 inches, reddish brown (5YR 5/4) clay; weak fine granular structure; firm, slightly sticky, slightly plastic; common fine roots; very strongly acid; clear smooth boundary.
B21t 19000	6 to 12 inches, reddish brown (5YR 4/3) clay; weak medium subangular blocky structure, firm, slightly sticky, slightly plastic; thin patchy clay films; common fine roots; very strongly acid; clear smooth boundary.
B22t 19001	12 to 19 inches, red (2.5YR 4/6) clay with yellow streaks that follow path of old roots; moderate medium subangular blocky breaking to weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; thin discontinuous clay films; small pieces fail semiplastically upon slight pressure between fingers 1/; common fine roots; few fine pores; very strongly acid; gradual smooth boundary.
B23t 19002	19 to 34 inches, red (2.5YR 4/6) clay; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; thin discontinuous clay films; small pieces fail semiplastically upon slight pressure between fingers 1/; few fine roots; common fine pores; very strongly acid; gradual smooth boundary.
B3	34 to 42 inches, red (2.5YR 4/6) clay with few fine yellow mottles of the saprolite; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; thin patchy clay films; small pieces fail semiplastically upon slight pressure between fingers 1/; few fine roots; common fine pores; very strongly acid; gradual smooth boundary.
C1 19003	42 to 48 inches plus, saprolite, highly weathered volcanic rock with variegated colors; clay; massive; friable, slightly sticky, slightly plastic; few partially weathered rock fragments 1 to 2 inches in diameter.

1/ - See introductory part of the Soil Survey Investigations Report for an explanation of this and similar terms that are designed to describe the failure of the material in its natural state of organization.

Remarks: This profile is on a steeper side slope below ridge top where **pedon** S63PR-8-3 was sampled. Selected horizons taken for laboratory determinations to compare with **pedon** on more stable surface on ridge top. Soil was above field capacity when sampled. Colors given are for the moist soil. Reaction determined by Soiltex. This site has been in coffee under shade for more than 20 years.

Mineralogy (Method 7A): B22t horizon. The clay contains primarily a poorly organized kaolinite, possibly a halloysite. Small amounts of mica and an interstratified mica mineral, probably a chlorite, are present. Kaolinite contents of the clay by differential thermal analysis are: 43 percent - Beltsville Laboratory
50 percent - Lincoln Laboratory.
55 percent

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Haplustalf; clayey-skeletal, mixed, isohyperthermic

SOIL: Amelia sandy clay loam — SOIL Nos.: S57PR-14-9 — LOCATION: Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska — LAB. Nos.: 7426-7429 — November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05) a	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int II (0.2-0.02)	(2-0.1)	3A1c Water Disp. Clay		Coarse fragments 2A2 > 2 (<19) Pct	2 - 19	19-76
		Pct. of < 2 mm														Pct. of < 76 mm		
0-7	A1	52.0	25.9	22.1	8.9	11.4	6.2	14.2	11.3	11.4	14.5	30.6	40.7			5		
7-15	B1	60.9	18.4	20.7	29.0	11.4	4.5	9.0	7.0	7.5	10.9	19.5	53.9	14		56		
15-24	B2t	37.2	19.2	43.6	15.9	7.6	3.2	5.9	4.6	7.0	12.2	14.8	32.6			76		
24-30+	C1	44.4	19.5	36.1	17.3	9.5	4.5	7.3	5.8	7.2	12.3	16.9	38.6			75		

Depth (In.)	6A1a Organic Carbon Pct	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	6E1a Carbonate as $CaCO_3$ Pct		Bulk density g/cc	g/cc	g/cc		Water content Pct	Pct.	4B2 15-Bar Pct.		Base Sat. 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.		pH 8C1a (1:1)
0-7	1.65	0.167	10	2.3									9.2		55	73		5.4
7-15	1.47	0.125	12	2.8									9.8		53	70		5.8
15-24	0.43	0.047	9	3.7									18.2		72	88		6.5
24-30+	0.22			2.4	7								14.6					7.4

Depth (In.)	Extractable bases 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	5B1a Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH_4OAc	Ca	Mg	Water extract from saturated paste 6F1a Na	6Q1a K		CO_3	HCO_3	8A1 Cl	SO_4	8A1a Electrical conductivity
	meq/100 g								meq/liter									mmho/cm
0-7	4.7	3.2	0.1	0.9	8.9	7.3	16.2	12.2			0.9	1.0						1.0
7-15	5.1	3.3	0.2	0.2	8.8	7.8	16.6	12.5			1.2	0.1						0.5
15-24	5.0	13.4	2.3	0.4	21.1	8.3	29.4	24.1										
24-30+		12.2	3.3	0.3		3.7		19.9										

Depth (In.)	8A Water at Saturation Pct.	5D2 Exchangeable Na Pct		6F1a Gypsum Pct	Ratios to Clay 8D1 NH_4OAc CEC	Ext. Iron	15-Bar Water
0-7	44.7	1		-	0.55	0.10	0.42
7-15	43.7	1		-	0.60	0.14	0.47
15-24				-	0.55	0.08	0.42
24-30+				-	0.55	0.07	0.40

a. Earthy nodules: 25-50 percent.

See introductory part of this SSIR for discussion of several

Soil Classification: Typic Haplustalf; clayey-skeletal, mixed, isohyperthermic
Soil Type: Amelia sandy clay loam
Soil Nos.: S57PR-14-9
Location: 1/2 mile west of Highway No. 116 along Highway No. 305 to Mayaguez. 100 yards west of dairy shed and 100 feet south of Highway No. 305. Photo GS-LR-4-30.
Area: Puerto Rico, Lajas Valley, Suroeste Soil Conservation District.
Climate: Semiarid - precipitation 25 to 30 inches a year.
Slope: 3 percent.
Relief: Smooth to slightly undulating.
Drainage: Moderately well drained.
Vegetation: Native grasses.
Erosion: None to slight.
Root Distribution: Numerous fine roots to 15 inches.
Collected by: L. T. Alexander, C. J. Koch, J. Juarez, Jr., and J. E. Trigo, September 10, 1957.
Described by: C. J. Koch.

Horizon and Lincoln Lab. No.	
A1 7426	0 to 7 inches. Dark brown (7.5YR 3/2) clay loam; weak medium granular structure; hard, friable, nonsticky, nonplastic; few fine angular volcanic fragments; very strongly acid; smooth clear boundary.
B1 7427	7 to 15 inches. Dark yellowish brown (10YR 3/4) gravelly sandy clay loam; weak medium granular structure; very hard, nonsticky, nonplastic; patchy clay skins; few fine angular volcanic fragments; many black concretions; common fine rounded iron concretions or iron-impregnated volcanic fragments; medium acid; clear irregular boundary.
B2t 7428	15 to 24 inches. Dark yellowish brown (10YR 4/4) gravelly clay with some spots of dark yellowish brown (10YR 3/4); massive; very hard, sticky, plastic; many angular volcanic fragments (50 to 75 percent of the soil mass); common black concretions; common fine iron concretions or iron-impregnated volcanic fragments; slightly acid; gradual boundary.
C1	24 to 30 inches plus. This horizon is similar to B2t except that it is extremely hard; has more than 75

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Lithic Haplustalf; clayey, mixed, isohyperthermic

SOIL: Guayama clay loam SOIL Nos. S61PR-14-3 LOCATION: Lajas Valley, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska LAB. Nos. 14835-14837 December 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: (0.05–0.02)	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)			Coarse fragments: 2A2 > 2 (<19) Pct.	2 – 19	19 – 76
		Pct of < 2 mm															Pct. of < 76mm	
0-5	A	40.1	21.4	38.5	18.1	10.9	3.4	4.2	3.5	7.1	14.3	12.7	36.6			18		
5-12	Bt	30.1	23.1	46.8	10.6	8.0	3.0	4.5	4.0	6.4	16.7	12.8	26.1			26		
12-21	C	44.9	21.9	33.2	17.9	13.3	4.6	5.4	3.7	7.4	14.5	13.7	41.2			29		

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N		6E2a Carbonate as $CaCO_3$ Pct.	6C2a Ext. Iron as Fe Pct.	Bulk density g/cc	g/cc	g/cc		Water content Pct.	Pct.	4B2 15-Bar Pct			pH	8C1a (1:1) H_2O
0-5	2.21	0.233	9		-(s)	3.6							16.9				7.0
5-12	1.05	0.115	9		-(s)	3.8							18.0				7.3
12-21	0.52	0.056	9		-(s)	3.3							16.8				7.5

Depth (In.)	Extractable bases 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	5B1a Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH_4OAc						8D3 Ca/Mg		Base saturation 5C3 Sum Cations	5C1 NH_4OAc
	meq/100 g															Pct	Pct
0-5	31.7	8.5	0.2	0.8	41.2	4.6	45.8	38.0						3.7		90	108
5-12	37.3	7.7	0.4	0.4	45.8	4.7	50.5	41.1						4.8		91	111
12-21	37.8	7.7	0.5	0.3	46.3	3.4	49.7	41.2						4.9		93	112

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-5	0.99	0.09	0.44
5-12	0.88	0.08	0.38
12-21	1.24	0.10	0.51

Soil Classification: Lithic Haplustalf; clayey, mixed, isohyperthermic
Soil Type: Guayama clay loam
Soil Nos.: S61PR-14-3
Location: Lajas Valley, Puerto Rico, 50 feet north of Km. 1.5, Highway 303. Photograph GS-LR-6-200. Suroeste SCD.
Vegetation and Use: Malva, Pajon, other grasses, and small cacti. Used for pasture.
Slope and Land Form: Strongly sloping (20 percent) toward south on a slightly concave sideslope of a ridge.
Drainage and Permeability: Well drained, rapid runoff, moderate internal drainage.
Parent Material: Very local colluvium and residuum from volcanic rocks.
Collected by: G. D. Smith, R. B. Grossman, W. E. McKinzie, O. R. Carter, L. H. Rivera, March 17, 1961.
Described by: W. E. McKinzie.

Horizon and Lincoln Lab. No.	
A 14835	0 to 5 inches. Dark reddish brown (5YR 3/4) clay loam; weak fine granular structure; soft, friable, slightly sticky, plastic; many fine roots; many fine subrounded volcanic fragments; neutral; clear smooth boundary.
Bt 14836	5 to 12 inches. Reddish brown (5YR 4/4) clay; moderate fine subangular blocky structure; soft, friable, sticky, plastic; common fine roots; common fine volcanic fragments; pebbles coated with clay; neutral; clear smooth boundary.
C 14837	12 to 21 inches. Yellowish red (5YR 4/6) clay loam; moderate fine subangular blocky structure; soft, firm, slightly sticky, plastic; few fine roots; many fine volcanic fragments; neutral; grades gradually and irregularly into weathered volcanic rock at depths of 10 to 24 inches.

Remarks: Underlying rock material not sampled. Colors given are for moist soil. Soil below field capacity when sampled. Depth to rock greater where sampled than for surrounding area. Some secondary or redeposited lime in rock cavities beneath the C horizon. Past history of field - pasture.

Mineralogy (Methods 7A1, 7A2): Bt horizon. The clay is dominated by a complex of interstratified 2:1 layer silicates, mostly vermiculite and mica with small chlorite and montmorillonite components. A small amount of kaolinite is present.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Udic Haplustalf; fine, mixed, isohyperthermic

SOIL *Dorothea clay loam SOIL Nos. S64VI-18-8 LOCATION Virgin Islands

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 20088-20090 November 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0 05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0 25-0 1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int III (0 02-0.002)	Int. II (0 2-0.02)	(2-0 1)			Coarse fragments 2A2: 3B1 > 2 Pct.	2-19 Pct. of Pct. < 19
		Pct. of < 2 mm															
0-6	A	29.7	32.3	38.0	2.3	3.8	3.9	9.9	9.8	11.7	20.6	27.6	19.9			6	6
6-11	B21t	29.8	30.9	39.3	2.4	4.5	4.2	9.6	9.1	11.0	19.9	25.8	20.7			4	4
11-19	B22t	27.0	26.1	46.9	2.0	3.6	3.8	9.3	8.3	9.8	16.3	23.7	18.7			3	3

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	6E2a Carbonate as $CaCO_3$ Pct.		Bulk density g/cc	g/cc	g/cc		Water content Pct.	Pct.	4B2 15-Bar Pct.			pH 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-6	3.68	0.312	12	4.1									19.0			4.9	6.1
6-11	1.70	0.155	11	4.1									17.9			4.5	6.1
11-19	0.77	0.077	10	5.0	-(s)								19.6			4.4	6.1

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum	5A1a NH_4OAc		6I2a SO_4 NH_4OAc Ext.						Base saturation 5C3 Sum	5C1 NH_4OAc
	meq/100 g															Pct.	Pct
0-6	17.4	12.2	0.7	0.5	30.8	11.7	42.5	29.1		0.2						72	106
6-11	15.9	13.2	0.8	0.2	30.1	10.1	40.2	30.1								75	100
11-19	17.8	16.6	1.1	0.3	35.8	9.1	44.9	31.0		tr.						80	115

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water		
0-6	0.76	0.11	0.50		
6-11	0.76	0.10	0.46		
11-19	0.66	0.11	0.42		

Soil Classification: Udic Haplustalf; fine, mixed, isohyperthermic
Soil type: *Dorothea clay loam.
Soil Nos.: S64VI-18-8.
Location: St.Thomas, Virgin Islands, approximately 1,000 feet west Liliendal Junction and 75 feet south of highway.
Vegetation and use: Idle land, covered by native brush.
Slope and Land form: 45 percent convex northwest-facing slope in the steeply dissected uplands.
Drainage and Permeability: Well drained with rapid runoff and moderate permeability.
Parent Material: Residuum or very local colluvium from basic volcanic rock.
Elevation: 400 to 500 feet.
Rainfall: 45 to 50 inches.
Samples collected by: R. B. Grossman and W. E. McKinzie, September 24, 1964.
Described by: W. E. McKinzie.

Horizon and Lincoln Lab. Number	
A 20088	0 to 6 inches, dark brown (10YR 4/3) clay loam; weak fine and medium subangular blocky breaking to moderate medium granular structure; friable, nonsticky and slightly plastic; many roots; clear smooth boundary.
B21t 20089	6 to 11 inches, yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure with thin discontinuous dark brown (10YR 4/3) coatings on vertical and horizontal peds; very firm, slightly sticky and plastic; few small pressure faces, roots common, few worm casts 1-2 mm. in diameter; clear smooth boundary.
B22t 20090	11 to 19 inches, yellowish brown (10YR 5/6) clay; moderate medium coarse subangular blocky structure with thin discontinuous brown (10YR 4/3) coatings; very firm, slightly sticky and plastic; few small pressure faces, few roots, few worm casts; clear smooth boundary.
B3	19 to 30 inches, strong brown (7.5YR 5/6) clay loam; weak medium coarse subangular blocky structure with thin patchy dark yellowish brown (10YR 4/4) clay films; friable, slightly sticky and slightly plastic; few roots, few black nodules, 25 to 30 percent saprolite; gradual smooth boundary.
C	30 inches plus, (saprolite) highly weathered volcanic rock with a few large unweathered volcanic boulders (breccia) mixed throughout the weathered material.

Notes: Colors given are for the moist soil.

Mineralogy (Methods 7A, 7B1)
B21t horizon

Fraction	Mont.	Mica	Kaolinite	Interstratified Mica-Mont.	Feldspar	Quartz
Clay	tr to s	m	m, 25%	s to m(?)		
Coarse silt					a	s
Very fine sand					a	s

Amounts: X-ray diffraction and optical: tr = trace, s = small, m = moderate, a = abundant.
Differential thermal analysis: kaolinite percentage rounded to nearest 5 percent.

NOTES

1. Mineralogy is mixed.
2. [illegible] ponents. The DTA pattern has a low temperature endothermic doublet suggestive of montmorillonite. One hydroxyl endotherm at 560 degrees C. looks kaolinitic rather than montmorillonitic. Amounts of kaolinite estimated by DTA and X-ray compare favorably, but the possibility of a high-iron montmorillonite is not ruled out.
3. The coarse silt and very fine sand contain accessory opaques and hornblende. Feldspars are mostly altered.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Paleustalf; fine, mixed, isohyperthermic

SOIL Series not designated SOIL Nos. S57PR-14-1 LOCATION Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 7382-7386 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05) a	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	3A1c Water-Disp. Clay		Coarse fragments: 2A2 > 2 (<19) Pct	2 - 19	19 - 76
		Pct. of < 2 mm															Pct. of < 76 mm	
0-9	Ap	35.6	40.0	24.4	5.6	7.2	3.6	9.0	10.2	16.6	23.4	32.3	25.4			4		
9-19	B21t	21.0b	24.0	55.0	2.9	4.6	2.9	5.3	5.3	8.6	15.4	16.8	15.7			4		
19-30	B22t	14.2b	28.5	57.3	1.9	2.0	1.4	3.6	5.3	9.9	18.6	17.5	8.9	32		1		
30-40	C1	11.5	28.2	60.3	1.1	1.2	0.9	3.0	5.3	10.2	18.0	17.5	6.2			1		
40-52+	C2cs															2		

Depth (In.)	6A1a Organic carbon	6B1a Nitrogen	C/N	6C2a Ext. Iron as Fe	6E2a Carbonate as $CaCO_3$		Bulk density				Water content		4B2 15-Bar		Base Sat. 5C3 Sum Cations	5C1 NH_4OAc		pH 8C1a (1:1)
	Pct	Pct.		Pct.	Pct		g/cc	g/cc	g/cc		Pct.	Pct.	Pct.		Pct.	Pct.		
0-9	1.57	0.143	11	3.2									12.1		50	64		4.7
9-19	0.50	0.079	6	4.3	tr(s)								21.8		96	128		7.7
19-30	0.22	0.037	6	5.1	tr(s)								22.6		94	130		7.7
30-40	0.11			3.8	-(s)								21.9		90	124		7.1
40-52+	0.05			5.9	-(s)								18.5					5.3

Depth (In.)	Extractable bases 5B1a: 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		Water extract from saturated paste 8A1: 6P1a Na	6Q1a K		CO_3	HCO_3	Cl	SO_4	8A1a Electrical conductivity
	meq/100 g										meq/liter							mmho/cm
0-9	10.2	2.5	0.2	0.4	13.3	13.1	26.4	20.8	0.2		1.2	0.3						1.6
9-19	22.7	5.1	2.2	0.3	30.3	1.2	31.5	23.6			5.6	-						1.2
19-30	18.9	6.4	5.0	0.4	30.7	2.1	32.8	23.6			15.6	-						2.6
30-40	18.2	8.6	7.7	0.4	34.9	3.7	38.6	28.1			23.5	0.1						3.7
40-52+		6.5	5.8	0.3		7.1		21.8	0.2		30.3	0.1						5.9

Depth (In.)	8A Water at Saturation Pct.	5D2 Exchangeable Na Pct.	5A3b Bases Plus Al me/100g clay	6F1a Gypsum Pct.	Ratios to Clay 8B: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-9	49.7	-	55.3	-	0.85	0.13	0.50
9-19	95.9	7		-	0.43	0.08	0.40
19-30	118	14		-	0.41	0.09	0.39
30-40	147	15		-	0.47	0.06	0.36
40-52+	130	9		9			

a. Earthy nodules: 25-50 percent.
b. Carbonate grains: < 5 percent.

See introductory part of this SSIR for discussion of several of the determinations.

USDA SCS HYATTSVILLE MD 1964

Soil Classification: Typic Paleustalf; fine, mixed, isohyperthermic
Soil Type: Series not designated
Soil Nos.: 857PR-14-1
Location: 30 yards north of Highway No. 306 at kilometer marker 4.
Area: Puerto Rico, Lajas Valley, Suroeste Soil Conservation District.
Climate: Semiarid - 30 to 40 inches of rainfall a year.
Slope: 2 percent.
Relief: Smooth.
Drainage: Moderately well drained.
Crop: Sugar cane.
Erosion: None to slight.
Root Distribution: Abundant in Ap. Few in B21t and B22t. Soil Temperature: 27.5 degrees C. at 40 inches.
Collected by: L. T. Alexander, C. J. Koch, J. A. Bonnet, R. B. Gierbolini, J. Juarez, Jr., and J. E. Trigo, September 5, 1957.
Described by: C. J. Koch.

Horizon and Lincoln Lab. No.	
Ap 7382	0 to 9 inches. Very dark grayish brown (10YR 3/2) loam; weak medium granular structure; friable; few small iron-impregnated volcanic fragments; smooth abrupt boundary.
B21t 7383	9 to 19 inches. Yellowish brown (10YR 5/6) clay with few medium faint mottles of yellowish red (5YR 5/8) and streaks of very dark grayish brown (10YR 3/2) from Ap; moderate medium subangular blocky structure; sticky and plastic; many iron-impregnated volcanic fragments; smooth clear boundary.
B22t 7384	19 to 30 inches. Red (2.5YR 4/8) clay with few medium faint mottlings of yellowish brown (10YR 5/8); moderate medium subangular blocky structure; sticky and plastic; clay skins on ped surfaces; many iron-impregnated volcanic fragments; smooth clear boundary.
C1 7385	30 to 40 inches. Red (2.5YR 4/8) clay with common medium prominent mottles of white (7.5YR 8/0) and yellowish brown (10YR 5/8); massive, sticky and plastic; irregular gradual boundary.
C2cs 7386	40 to 52 inches plus. Mottled strong brown (7.5YR 5/8) and white (7.5YR 8/0) clay; massive; sticky and plastic; zone of concentration of gypsum crystals. The high concentration of crystals is unusual, although adjacent areas of this soil appear to have disseminated gypsum.

Remarks: Pedon formed principally on sediments derived from volcanic rocks from the surrounding hills.

U. S. DEPARTMENT OF AGRICULTURE
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SOIL CLASSIFICATION: Oxic Plinthaquult; clayey, mixed, isohyperthermic

SOIL Sabana Seca clay SOIL Nos. S58PR-9-1 LOCATION San Juan SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 9831-9837 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth	Horizon	Size class and particle diameter (mm) 3A1											3A1c				
		Total			Sand					Silt			Water Disp.		Coarse fragments		
		Sand	Silt	Clay	Very coarse	Coarse	Medium	Fine	Very fine		Int III	Int II			2A2 > 2	2 - 19	19 - 76

Soil Classification: Oxic Plinthaquult; clayey, mixed, isohyperthermic
Soil Type: Sabana Seca clay
Soil Nos.: S58PR-9-1
Location: Municipio De Toa Baja, Barrio of Sabana Seca, San Juan Soil Conservation District, Puerto Rico. Longitude west 60 degrees, 10 minutes, 26 seconds; latitude north 18 degrees, 26 minutes, 0 seconds. 400 meters east of kilometer marker 8.5, Highway No. 866 or approximately 1.5 kilometers east by northeast of Sabana Seca schools. Aerial photo GS-LR-4-12.
Elevation: 3 meters.
Precipitation: 65 inches plus or minus.
Vegetation and Use: Sugar cane recently plowed under.
Slope and Land Form: Less than 1 percent. Smooth to slightly undulating. This field of 15 to 20 cuerdas has overall elevation differences of less than 1 meter.
Drainage and Permeability: Poorly drained. Very slowly permeable.

Parent Material: Coastal Plain clays.
Collected by: L. T. Alexander, K. W. Flach, L. H. Rivera, and T. U. Yager, November 8, 1958.
Described by: T. U. Yager.

Horizon and Lincoln Lab. No.	
Ap 9831	0 to 10 inches. Very dark grayish brown (10YR 3/2) clay; weak fine subangular blocky structure breaking to weak fine granular; firm, slightly sticky, plastic; abrupt smooth boundary.
B1 9832	10 to 13 inches. Dark grayish brown (2.5Y 4/2) clay with many medium and coarse prominent yellowish brown (10YR 5/6) mottles; (1:1 ratio of matrix to mottles); moderate fine subangular and angular blocky structure; firm, slightly sticky, very plastic; thin patchy clay films on peds (decreasing in abundance with increasing depth); dark gray (10YR 4/1) colorations in old root channels and cracks decrease with depth throughout lower horizon; inclusions of Ap horizon do not exceed 5 to 10 percent; clear wavy boundary.
B21g 9833	13 to 23 inches. Light gray (5Y 6/1) clay with many coarse prominent yellowish brown (10YR 5/6) and few fine prominent red (10R 4/6) mottles (1:1 ratio of matrix to mottles); very weak very coarse prismatic structure breaking to moderate medium subangular and angular blocky; very firm, slightly sticky, very plastic; thin patchy clay films on peds; gradual smooth boundary.
B22g 9834	23 to 36 inches. Light gray (5Y 6/1 to 7/1) clay with many fine to coarse prominent strong brown (7.5YR 5/6) and common medium and coarse prominent dark red (10R 3/6) mottles and perdigons and a few specks of red (7.5YR 4/6); very weak very coarse prismatic structure breaking to moderate medium subangular and angular blocky; very firm, slightly sticky, very plastic; mottles and perdigons nonsticky and nonplastic; clay films similar to B21g; gradual smooth boundary.
B23g 9835	36 to 48 inches. White (5Y 8/1 to 8/2) clay with many fine to coarse prominent dusky red (10R 3/4) and strong brown (7.5YR 5/6) mottles and perdigons; weak coarse prismatic breaking to weak medium subangular and angular blocky structure; consistence similar to that of B22g; thin patchy clay films in vertical and horizontal cleavage planes; clear smooth boundary.
B24g 9836	48 to 56 inches. White (5Y 8/1) clay with common (20 percent) coarse prominent dusky red (10R 3/4) and common (5 to 10 percent) fine to coarse strong brown (7.5YR 5/8) mottles and perdigons; weak coarse prismatic structure; consistence similar to that of B22g; thin patchy clay films in vertical planes; clear smooth boundary.
B25g 9837	56 to 70 inches plus. White (5Y 8/1) clay with many coarse prominent dusky red (10R 3/4) and dark red (7.5R 3/6) and few fine red (10R 4/8) and strong brown (7.5YR 5/8) mottles and perdigons (ratio of matrix to all mottling approximately 2:1); weak coarse prismatic structure; consistence similar to that of B22g; very few patchy clay films in vertical planes.

Remarks: Colors given are for moist soil. Soil sampled at 1/2 to 3/4 field capacity. B1 horizon has best developed structure and most pronounced clay films. Roots extend into B22g, but few are found in lower horizons. Perdigons found in B22g and all lower horizons, reaching maximum hardness and abundance in B24g; they are generally soft and appear dry even though below the water table, some offer moderate resistance to crushing. Free water collected in the lower few inches of the pit within 2 hours. Variety of colors make descriptions difficult. This site approximately 2.3 kilometers from the Atlantic Ocean.

Mineralogy (Method 7A3): B21g horizon. Differential thermal analyses indicate the following amounts of kaolinite:

42% - Beltsville Laboratory
45%, 58% - Lincoln Laboratory (about 10 percent gibbsite)

SOIL *Humatas clay SOIL Nos. S61PR-8-1 LOCATION Oeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16825-16833 November 1966
General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05) a	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: (0.05–0.02)	Silt: Int III (0.02–0.002)	Silt: Int. II (0.2–0.02)	(2–0.1)			Coarse fragments: 2A2 > 2 (<19) Pct.	2 – 19	19 – 76
		Pct of < 2 mm															Pct. of < 76mm	
0-4	Ap	6.0	29.4	64.6	1.3	1.1	0.6	1.3	1.7	4.4	25.0	6.9	4.3			tr		
4-9	B21t	2.5	28.1	69.4	-	0.1	0.2	0.7	1.5	3.8	24.3	5.8	1.0			tr		
9-15	B22t	2.7	34.4	62.9	-	tr	0.1	0.5	2.1	6.0	28.4	8.5	0.6			-		
15-25	B23t	6.1	46.3	47.6	-	0.1	0.1	0.9	5.0	9.9	36.4	15.6	1.1			-		
25-32	B3	10.7	50.7	38.6	0.1	0.2	0.2	2.1	8.1	12.6	38.1	22.2	2.6			-		
32-45	C1	15.3	51.0	33.7	0.2	0.4	0.4	3.2	11.1	13.5	37.5	27.2	4.2			-		
45-60	C2	18.1	50.3	31.6	0.2	0.9	0.8	4.3	11.9	12.9	37.4	28.1	6.2			-		
72-96	C3	21.1	51.9	27.0	3.6	2.2	1.5	4.8	9.0	13.2	38.7	25.4	12.1			6		
96-120	C4																	

Depth (In.)	6A1a Organic carbon b Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct		Bulk density: 4A1a Field-State g/cc	4A1c 30-cm. g/cc	4A1b Air-Dry g/cc	4D1 COLE d	Water content: 4B4 Field-State Pct.	4B3 30-cm. Pct.	4B1b 1/3-Bar Pct.	4B2 15-Bar Pct.		pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-4	4.90	0.430	11	8.1			0.89		1.10	0.073	63.3		47.5	32.1		3.9	4.6
4-9	2.00	0.211	9	8.4			1.06		1.42	0.10	49.8e		39.8	31.4		3.7	4.7
9-15	1.16	0.121	10	8.0			1.16		1.40	0.064	43.3		39.0	31.4		3.8	4.9
15-25	0.59	0.067	9	7.7			1.1c				f		36.7	30.1		3.8	5.0
25-32	0.36	0.049	7	7.3			1.09	1.17	1.24	0.044	47.0	41.0	40.7	28.6		3.8	4.9
32-45	0.31			7.3			1.04	1.09	1.14	0.032	48.9	43.4	39.6	28.0		3.7	4.8
45-60	0.25			6.9			1.04	1.10	1.16	0.036	48.9	46.4	40.0	23.5		3.7	4.8
72-96	0.10			8.1										24.3		3.7	4.7
96-120	0.06			8.7										24.7		3.7	4.9

Depth (In.)	Extractable bases 6N2b Ca	6O2b Mg	6P2a Na	5B1a 6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		5A3b Bases Plus Al me/100g Clay					Base saturation 5C3 Sum Cations	5C1 NH_4OAc
	meq/100 g															Pct.	Pct
0-4	2.4	1.5	0.1	0.4	4.4	31.5	35.9	24.7	4.0		13.0					12	18
4-9	2.8	0.7	tr	0.1	3.6	23.2	26.8	17.6	5.4		13.0					13	20
9-15	2.9	0.8	0.1	0.1	3.9	19.9	23.8	16.0	4.5		13.4					16	24
15-25	1.1	0.5	0.1	0.1	1.8	19.9	21.7	14.7	7.0		12 g					8	12
25-32	0.5	0.5	tr	0.2	1.2	21.3	22.5	15.4	9.1		14 g					5	8

Soil Classification: Typic Tropohumult; clayey, mixed,[1] isohyperthermic
Soil Type: *Humatas clay
Soil Nos.: S61PR-8-1
Location: Oeste Soil Conservation District, Mayaguez, Puerto Rico, on Highway 406, near kilometer marker 2.45, 200 meters on dirt road and 350 feet southwest of road. Photo No. GS-LR-3 140.
Vegetation and Use: Native pasture and weeds. Few orange trees.
Slope and Land Form: 27 percent. Southwest aspect. Sideslope in uplands.
Drainage and Permeability: Well drained, medium runoff, medium internal drainage. Permeability is moderate.
Parent Material: Residuum or very local colluvium from volcanic rocks.
Collected by: R. B. Grossman, W. E. McKinzie, O. R. Carter, L. H. Rivera, December 5, 1961.
Described by: W. E. McKinzie, December 5, 1961.

Horizon and Lincoln Lab. No.	
Ap 16825	0 to 4 inches. Brown to dark brown (7.5YR 4/4) with few fine faint reddish brown (5YR 4/4) mottles, clay loam; moderate fine granular structure; friable when moist, slightly sticky and slightly plastic when wet; many fine roots; few fine charcoal fragments; clear smooth boundary.
B21t 16826	4 to 9 inches. Yellowish red (5YR 5/6) clay with moderate fine subangular blocky structure; friable when moist, nonsticky and slightly plastic when wet; many fine roots; few fine pores; few fine black particles; fails semiplastically,[2] clear smooth boundary.
B22t 16827	9 to 15 inches. Red (2.5YR 5/8) clay with moderate medium to fine subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; many fine roots; few fine pores; thin patchy clay films; fails semiplastically; clear smooth boundary.
B23t	15 to 25 inches. Red (2.5YR 5/6) clay with weak fine subangular blocky structure; friable when moist, non-
	films; fails semiplastically; clear smooth boundary.
B3 16829	25 to 32 inches. Red (2.5YR 5/6) with common fine faint yellow mottles, clay; weak fine and medium subangular blocky structure; very friable when moist, nonsticky and slightly plastic when wet; few roots; many fine pores; fails abruptly; clear smooth boundary.
C1 16830	32 to 45 inches. Variegated brownish yellow (10YR 6/6) saprolite and red (2.5YR 5/6) clay; massive to very weak structure; very friable when moist, nonsticky and slightly plastic when wet; many fine pores; fails abruptly; clear smooth boundary.
C2 16831	45 to 60 inches. Variegated brownish yellow (10YR 6/6) and red (2.5YR 5/6) silty clay saprolite; massive structure; very friable when moist, nonsticky and slightly plastic when wet.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Tropohumult; clayey, mixed, isohyperthermic

SOIL *Humatas clay SOIL Nos. S61PR-8-4 LOCATION Oeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16834-16839 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

		Size class and particle diameter (mm) 3A1															
		Total			Sand					Silt					Coarse fragments		
Depth	Horizon	Sand	Silt	Clay	Very	Coarse	Medium	Fine	Very fine		Int. III	Int. II			2A2		

Soil Classification: Typic Tropohumult; clayey, mixed, isohyperthermic
Soil Type: *Humatas clay
Soil Nos.: S61PR-8-4
Location: Oeste Soil Conservation District, Puerto Rico, 300 meters beyond kilometer marker 5.4, Highway 349, on dirt road, 200 meters east of Rosario School. Photo GS-LR-11-46.
Vegetation and Use: Coffee under shade, undergrowth of native pasture, ferns, weeds.
Slope and Land Form: 55 percent. Southwest aspect. On a sideslope leading directly to a drainageway near the interfluve summit.
Drainage and Permeability: Well drained with medium runoff and medium internal drainage. Permeability is moderate.
Parent Material: Residuum or very local colluvium from volcanic rocks.
Collected by: R. B. Grossman, W. E. McKinzie, O. R. Carter, L. H. Rivera, W. Francia, J. E. Trigo, December 18, 1961.
Described by: W. E. McKinzie, December 18, 1961.

Horizon and
Lincoln
Lab. No.

Ap
16834 0 to 5 inches. Yellowish red (5YR 4/6) clay; weak fine and medium subangular blocky structure; firm when moist, slightly sticky and slightly plastic when wet; fails semiplastically,1/ many fine and medium roots; many fine wormholes and burrow casts; clear smooth boundary.

16835 slightly sticky and slightly plastic when wet; fails semiplastically; many fine roots; many fine pores; thin patchy clay films; gradual wavy boundary.

B22t
16836 14 to 22 inches. Yellowish red (5YR 4/8) clay; weak fine subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; fails semiplastically; common fine roots; many fine pores; pressure faces and thin patchy clay films; gradual smooth boundary.

B31
16837 22 to 33 inches. Red (2.5YR 4/8) clay; weak fine subangular blocky structure; friable when moist, nonsticky and slightly plastic when wet; fails abruptly; few fine roots; many fine pores; few thin patchy clay films; gradual wavy boundary.

B32
16838 33 to 45 inches. Red (2.5YR 4/6) with small amount of saprolite, clay; weak fine subangular blocky structure; friable when moist, nonsticky and slightly plastic when wet; fails abruptly; very few fine roots; many fine pores; few vertical clay lenses; gradual wavy boundary.

C1
16839 45 to 60 inches. Variegated colors of the saprolite, matrix is red (10R 4/6) with brownish yellow, very pale brown, very dark grayish brown specks, clay loam; massive structure; friable when moist; nonsticky and nonplastic when wet; fails abruptly; very few fine roots; many fine pores.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Tropohumult; clayey, mixed, isothermic

SOIL: Los Guineos clay loam — SOIL Nos. S61PR-13-2 — LOCATION: Sudeste SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska — LAB. Nos. 16852-16858 — November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Silt: Int. II (0.2-0.02)	(2-0.1)			Coarse fragments: 2A2 > 2 (<19) Pct	2-19 (Pct. of < 76mm)	19-76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-5	Ap	24.3	38.1	37.6	0.2	1.1	1.8	9.0	12.2	16.4	21.7	34.4	12.1			-		
5-15	B21t	21.5	33.4	45.1	0.3	0.8	1.8	8.0	10.6	14.3	19.1	30.2	10.9			-		
15-24	B22t	19.9	29.2	50.9	0.3	1.3	1.9	7.5	8.9	11.5	17.7	25.2	11.0			-		
24-34	B31t	13.3	26.9	59.8	0.3	0.9	1.3	5.2	5.6	8.7	18.2	17.5	7.7			-		
34-48	B32t	15.1	28.3	56.6	0.5	1.1	1.7	6.2	5.6	9.0	19.3	18.2	9.5			-		
34-48	B32t a	15.0	28.6	56.4	0.4	1.1	1.5	6.2	5.8	8.6	20.0	18.0	9.2			-		
34-48	B32t b	14.8	28.7	56.5	0.2	1.1	1.8	6.2	5.5	8.6	20.1	17.6	9.3			-		

Depth (In.)	6A1a Organic carbon Pct	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct		Bulk density g/cc	g/cc	g/cc		Water content Pct	Pct.	4B2 15-Bar Pct			pH	8C1c (1:1) N KCl	8C1a (1:1) H_2O

Soil Classification: Typic Tropohumult; clayey, mixed, isothermic
Soil Type: Los Guineos clay loam
Soil Nos.: S61PR-13-2
Location: Sudeste Soil Conservation District, Puerto Rico, 900 feet southeast school on Highway No. 179, 50 feet south of road (350 meters beyond kilometer marker 14.1).
Vegetation and Use: Native aluminum plant. Palm tree, ferns, carpetgrass. Land used for pasture.
Slope and Land Form: 35 percent slope. 50 feet beneath interfluve summit on a backslope that leads directly to major drainageway.
Parent Material: Residuum or very local colluvium from volcanic rocks.
Collected by: R. B. Grossman, W. E. McKinzie, R. A. Boccheciamp and J. Juarez, December 11, 1961.
Described by: R. A. Boccheciamp, December 11, 1961.

Horizon and Lincoln Lab. No.	
Ap 16852	0 to 5 inches. Brown (10YR 4/3) clay loam with common fine distinct yellowish brown mottles; weak fine granular structure; friable when moist, slightly sticky and slightly plastic when wet; few roots; very strongly acid; clear smooth boundary.
B21t 16853	5 to 15 inches. Yellowish brown (10YR 5/6) clay with few fine distinct yellowish red (5YR 5/8) mottles; moderate coarse subangular blocky structure with patchy clay films on ped surfaces and in root channels; very firm when moist, slightly sticky and slightly plastic when wet; very strongly acid; numerous worm casts; common roots; gradual smooth boundary.
B22t 16854	15 to 24 inches. Reddish yellow (7.5YR 6/8) clay; moderate coarse subangular blocky structure with thin continuous clay films on ped surfaces and patchy films in root channels; ped interiors have common medium

ly acid; gradual wavy boundary.

B31t 16855	24 to 34 inches. Red (2.5YR 4/6) and strong brown (7.5YR 5/8) clay; weak fine and medium subangular blocky structure with patchy clay films on vertical cleavage planes and on root channels; very firm when moist, slightly sticky and plastic when wet; very strongly acid; few roots; gradual wavy boundary.
B32t 16856	34 to 48 inches. Red (2.5YR 4/6) and reddish yellow (7.5YR 6/6) clay; weak fine and medium subangular blocky structure with few patchy clay films on vertical ped surfaces and in root channels; firm when moist, slightly sticky and plastic when wet; very strongly acid.

SOIL CLASSIFICATION: Typic Tropohumult; clayey, oxidic, isohyperthermic

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL Series not designated SOIL Nos. S61PR-10-1 LOCATION Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16810-16815 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

		Size class and particle diameter (mm)						
		Total	Sand	Silt		3A1	3A1b Water	Coarse fragments

Soil Classification: Typic Tropohumult; clayey, oxidic, isohyperthermic
Soil Type: Series not designated
Soil Nos.: S61PR-10-1
Location: Torrecillas Soil Conservation District, Puerto Rico. In the Barranquitas Soil Study Area, 450 feet east of S59PR-10-8 or approximately 495 feet east of field road and 470 feet south of house at kilometer marker 8.8, Highway 152.
Elevation: 575 plus or minus 5 meters.
Vegetation and Land Use: Native pasture.
Geomorphic Surface and Position: On the backslope leading down to the present drainage system. This would be the youngest extensive surface of the area. Occurs 50 feet below the break to a higher surface. The site occurs near the tip of a small triangular-shaped subsurface that points downslope. Below and to the south is a younger subsurface consisting of a triangular-shaped unit that points up the slope and merges into the backslope of the general surface. A slip scar occurs about 20 feet to the north; the slip scar is probably younger than either of the other two subsurfaces. These three subsurface elements are measured in tens of feet.
Slope: 30 percent to the east.
Parent Material: Chloritized greenish black basaltic andesite flow breccia.
Collected and Described by: Robert B. Grossman, December 10, 1961.

Horizon and Lincoln Lab. No.	
Ap 16810	0 to 6 inches. Brown (7.5YR 4/4) clay; moderate to weak fine subangular blocky; firm; slightly sticky and plastic; roots common; few pieces charcoal; abrupt smooth boundary.
B21t 16811	6 to 11 inches. Yellowish red (5YR 4/6) clay with common fine distinct strong brown and red mottles and with some brown ped surfaces; moderate medium blocky breaking to very fine blocky; fails semiplastically;1/ firm; slightly sticky and plastic; ped surfaces commonly more yellowish hued and lower in chroma than interiors; possibly a few weak clay films; peds quite dense with markedly fewer in-ped pores than in the lower solum; roots common; clear to gradual smooth boundary.
B22t 16812	11 to 19 inches. Red (2.5YR 4/6) clay with few medium distinct strong brown mottles and with some brown ped and pore surfaces; moderate to weak medium blocky breaking to fine and very fine; fails abruptly to semiplastically; firm; slightly sticky and plastic; common fine pores; possible few faint clay films; moisture films interfere with estimate of clay film abundance; roots common; gradual boundary.
B23t 16813	19 to 27 inches. Red (2.5YR 4/6) clay with a few of the larger ped surfaces yellowish red and with 5 to 10 percent saprolite; weak medium to fine blocky; fails abruptly; firm; slightly sticky and slightly plastic; many fine pores; possible thin clay films on pore walls; clay films are commonly brown and some have a "ropey" surface; few roots; gradual boundary.
B3 16814	27 to 37 inches. Reddish brown (2.5YR 4/3.5) silty clay with 20 percent saprolite; weak fine subangular to angular blocky; fails abruptly; firm; slightly sticky and slightly plastic; many fine pores; possible thin brown clay films on pore walls; very few roots; gradual wavy boundary.
C 16815	37 to 50 inches. Sixty percent dark reddish brown (2.5YR 3/4) silty clay loam; 40 percent saprolite - one side of pit shows rather distinct rock structure; weak medium subangular blocky; fails abruptly; firm to friable; slightly sticky and slightly plastic; many fine pores; possibly a few faint clay films on pore walls; very few roots.

Remarks: Moisture content increases toward surface. Moisture films occur. Soil described in the rain; consequently the description was hurried. No bulk density clods were taken because of the rain. The bulk density decreases considerably with depth. Extractable aluminum will be of particular interest. Compared to pedon S61PR-4-1, clay films are not as abundant and the structural units of the upper B are not as large.

Mineralogy, Micromorphology (Method 7B1, 4E1, 7A). About half reddish brown iron-bearing earthy nodules and half somewhat porous whitish earthy nodules; quartz essentially absent. The very fine sand consists largely of grains of an alteration product that has first order red interference color. Some quartz is present, and a few grains that may be kaolinite books. No ferromagnesian mineral observed. In thin section, the B2t shows clay films, and parts have moderately strong orientation of the matrix clay. The following data were obtained by differential thermal analysis (kaolinite) and by X-ray diffraction (Beltsville laboratory data).

Horizon	Whole Soil Powder				Iron-Free Clay		
	Kl	Q	Fl	G	Kl	Vm	Mt
	%				%		
Ap	28	XX		X	30	XX	
B21t	30	XX		XX	41	XX	
B22t	35	X		XX	40	X	
B23t	35	X	K	X	42	X	T
B3	36	X		X	30	T	X
C	32	X	K	X	35	T	XX

T	Trace	Kl	Kaolinite
X	Small	Q	Quartz
XX	Moderate	Fl	Feldspar
XXX	Abundant	G	Goethite
XXXX	Dominant	Vm	Vermiculite
		Mt	Montmorillonite

1/ Two terms are used in the descriptions to describe the rate of failure of natural fabric: fails abruptly and fails semiplastically. To fail abruptly means that no plasticity is observed prior to failure. Stress builds up as the piece of soil is squeezed and dissipates quickly as the piece of soil breaks apart into numerous fragments or peds due to failure along natural planes of weakness. In semiplastic failure, deformation is readily observed prior to rupture.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Aquic Tropohumult; clayey, mixed, isohyperthermic

SOIL Lares silty clay SOIL Nos. S63PR-8-2 LOCATION Oeste SGD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19040-19046 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1															
		Total			Sand					Silt					Coarse fragments		
		Sand (2–0 05)	Silt (0.05–0.002)	Clay (< 0.002)	Very coarse (2–1)	Coarse (1–0.5)	Medrum (0.5–0.25)	Fine (0 25–0.1)	Very fine (0 1–0.05)	0 05–0.02	Int. III (0.02–0.002)	Int. II (0.2–0 02)	(2–0.1)	<0.005	<0.074	2A2 > 2 (<19) Pct.	2 – 19	19 – 76
		Pct. of < 2 mm														Pct. of < 76mm	

Soil Classification: Aquic Tropohumult; clayey, mixed, isohyperthermic
Soil type: Lares silty clay.
Soil Nos.: S63PR-8-2.
Location: Oeste SCD, Puerto Rico, 1.8 kilometers northwest from town of Añasco, 300 feet southeast of kilometer marker 143.6 on new highway 2.
Vegetation and use: Sugar cane.
Slope and land form: 3 **percent. Either a terrace or an alluvial fan.**
Drainage and permeability: Moderately well drained, medium to slow runoff and moderate permeability.
Parent materials: Sediments derived from volcanic rocks.
Samples collected by and date: R.B. Grossman, W.E. McKinzie, L.H. Rivera and R.E. Gierbolini on September 24, 1963.
Profile described by: L.H. Rivera.

Horizon and Lincoln Lab. Number	
Ap 19040	0 to 9 inches, brown (10YR 4/3) silty clay; weak fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots; very strongly acid; clear smooth boundary.
B1 [illegible]	9 to 14 inches, mixed brown (10YR 5/3) and light yellowish brown (10YR 6/4) clay; weak medium [illegible]

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Orthoxic Tropohumult; clayey, mixed, isohyperthermic

SOIL *Aibonito clay SOIL Nos. S59PR-10-10 LOCATION Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 12869-12876 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In)	Horizon	Size class and particle diameter (mm) — Total: Sand (2–0.05) a	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	3A1c Water-Disp. Clay <0.002		Coarse fragments: 2A2 > 2 (<19) Pct.	2 – 19 (Pct. of < 76mm)	19 – 76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-7	Ap	4.1	47.1	48.8	0.6	0.6	0.4	1.0	1.5	5.3	41.8	7.4	2.6			tr		
7-11	B & A	2.8	36.6	60.6	0.5	0.4	0.2	0.8	0.9	3.5	33.1	4.9	1.9			tr		
11-22	B21t	2.6	24.4	73.0	0.5	0.5	0.2	0.5	0.9	2.4	22.0	3.6	1.7	47		tr		
22-32	B22t	2.5	28.7	68.8	0.5	0.4	0.2	0.5	0.9	2.1	26.6	3.3	1.6	49		tr		
32-43	B3	4.3	36.0	59.7	0.5	0.6	0.3	1.0	1.9	4.4	31.6	6.9	2.4			tr		
43-65	C1	6.8	38.8	54.4	1.4	1.0	0.5	1.5	2.4	5.2	33.6	8.5	4.4			tr		
65-104	C2	7.5	39.0	53.5	1.5	1.3	0.6	1.6	2.5	5.6	33.4	9.1	5.0			tr		
104-110	C2	7.9	43.0	49.1	1.0	1.3	0.7	2.0	2.9	7.0	36.0	11.1	5.0			tr		

Soil Classification: Orthoxic Tropohumult; clayey, mixed, isohyperthermic
Soil Type: *Aibonito clay
Soil Nos.: S59PR-10-10
Location: Kilometer marker 2.37, Highway 162, east road cut.
Vegetation: Native pasture of matojo, St. Augustine and grama amarga and few weeds.
Parent Material: Residuum or local colluvium derived from volcanic siltstones or sandstones.
Physiography and Slope: Low rounded hills with maximum elevation of about 640 meters; slope 25 percent to south.
Collected and Described by: R. A. Boccheciamp, K. W. Flach, R. E. Gierbolini, R. B. Grossman and T. U. Yager, December 17, 1959.

Horizon and Lincoln Lab. No.	
Ap 12869	0 to 7 inches. Dark grayish brown (10YR 4/2) silty clay loam or silty clay; moderate very fine and fine subangular blocky; friable, very hard, slightly sticky and plastic; no macro pores in peds; abrupt irregular boundary; the horizon extends in narrow tongues between peds into the B&A horizon; many roots.
B&A 12870	7 to 11 inches. Strong brown (7.5YR 5/6) clay with common fine and distinct yellowish red (5YR 4/6) mottles in the interiors of peds and dark brown to brown (10YR 4/3) ped faces; moderate medium prismatic breaking to weak to moderate coarse angular blocky; extremely firm, sticky and very plastic; common roots; blanched silt-rich areas occur on ped surfaces; gradual smooth boundary.
B21t 12871	11 to 22 inches. Clay; strong coarse prisms which break to moderate medium prisms which in turn break to weak coarse blocks; the surfaces of the coarse prisms are dark grayish brown to brown (10YR 4/2 to 4/3), those of the medium prisms are brown to dark brown (7.5YR 4/4 to 5/4), and those of the coarse blocks are yellowish brown (10YR 5/4); common fine and distinct yellowish red (5YR 4/6) mottles in the interior of peds; extremely firm, sticky and very plastic; no macro pores in peds; roots are restricted to ped faces; no slickensides; few sand-size grains, possibly chert; gradual wavy boundary.
B22t 12872	22 to 32 inches. Very similar to the superjacent horizon, but the texture may be slightly coarser; surfaces of the coarse blocks are yellowish brown (10YR 5/6); many medium and prominent reddish brown to red (2.5YR 4/5) mottles in the interior peds.
B3 12873	32 to 43 inches. Strong brown (7.5YR 5/6) clay with many medium and prominent yellowish brown (10YR 5/6) and red (2.5YR 4/6) mottles and few medium and prominent white (10YR 8/1) mottles; weak medium subangular blocky to blocky with some prism faces from the B22t extending into the upper part; very few roots; gradual wavy boundary.
C1 12874	43 to 65 inches. Mottled red (2.5YR 4/6) and strong brown (7.5YR 5/6) silty clay with common medium prominent white (10YR 8/1) streaks and mottles; massive; very firm, sticky and plastic; gradual boundary.
C2 12875	65 to 104 inches. Equal parts of yellowish red (5YR 5/6) and red (2.5YR 4/6) clay with about 5 percent white (5YR 8/1) mottles; extremely firm; the red material commonly is immediately next to the white mottles; evidence of rock structure present.
C2 12876	104 to 110 inches. Same as above. Split for sampling purposes.

Remarks: The color of the Ap horizon extends along ped faces throughout the B2 horizon and into the upper part of the B3 horizon. The ped faces in the B horizon seem to consist of illuvial material, but this material does not look like clay skins or slickensides; in the B horizon cracks between peds are at least 1/4-inch wide. The erosion at the site is slight, ground water deep, and the moisture content at sampling less than one-fourth field capacity.

Mineralogy (Method 7A).

Interpretation of X-ray and Differential Thermal Analysis Patterns of the Clay Fraction

Horizon	Depth Inches	Kaolinite[a] %	Vermiculite	Montmorillonite[b]
Ap	0-7	15	xx [c]	--
B21	11-22	20	xxx[c]	--
C1	43-65	15	xxx[c]	

a. Percentages estimated from differential thermal analysis.

[redacted]

c. Vermiculite?; K^+ and Mg^{++} saturated samples show 10Å peak; expands to diffuse 14Å after iron removal and ethylene-glycol solvation.

Legend: x = detected; xx = moderate; xxx = abundant; xxxx = dominant.

SOIL Cialitos clay SOIL Nos. S58PR-4-3 LOCATION Cibuco SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 9791-9799 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int II (0.2–0.02)	(2–0.1)	3A1c Water-Disp. Clay <0.002		Coarse fragments: 2A2 > 2 (<19) Pct.	2–19 (Pct. of < 76mm)	19–76 (Pct. of < 76mm)
		Pct of < 2 mm																
0-6	Ap	8.5a	19.1	72.4	0.3	0.6	0.8	3.8	3.0	3.1	16.0	8.5	5.5			-		
6-14	B1	3.4a	20.5	76.1	0.1	0.2	0.2	1.4	1.5	2.0	18.5	4.4	1.9	tr		-		
14-26	B21t	4.6a	27.6	67.8	-	-	0.2	2.0	2.4	2.6	25.0	6.4	2.2			-		
26-37	B22t	5.4a	35.6	59.0	-	0.1	0.3	2.6	2.4	3.0	32.6	7.1	3.0			-		
37-48	B23t	6.2a	34.1	59.7	-	0.1	0.3	3.0	2.8	3.6	30.5	8.4	3.4			-		
48-60	B3	7.7a	34.7	57.6	-	0.1	0.4	3.5	3.7	4.9	29.8	11.0	4.0			-		
60-71	C1	22.3b	39.6	38.1	1.6	2.8	2.7	7.7	7.5	8.8	30.8	20.9	14.8			-		
71-78+	C2	23.3b	41.8	34.9	0.4	1.3	2.5	9.7	9.4	9.2	32.6	24.5	13.9			-		
117-128	C3	23.3b	44.3	32.4	0.1	0.5	2.0	10.5	10.2	10.2	34.1	27.2	13.1			-		

Depth (In.)	6A1a Organic carbon Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.		Bulk density g/cc	g/cc	4A1h Oven-Dry g/cc		Water content Pct.	Pct.	4B2 15-Bar Pct.			pH 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-6	2.72	0.227	12	11.6					1.19				30.5			3.8	4.6
6-14	1.42	0.139	10	12.7					1.30				32.1			4.2	5.0
14-26	0.66	0.059	11	12.2					1.42				30.1			3.8	5.1

Soil Classification: Orthoxic Tropohumult: clayey, oxidic, isohyperthermic

Soil Type: Cialitos clay
Soil Nos.: S58PR-4-3
Location: Cibuco Soil Conservation District, Puerto Rico. 200 meters north of Dr. Jose Padin 2nd rural school unit. Aerial photo GS-LR-3-26.
Elevation: 480 meters.
Precipitation: 80 inches plus or minus.
Vegetation and Use: Unimproved pasture.
Slope and Land Form: 18 percent, southeast convex slope in mountainous topography.
Drainage and Permeability: Well drained, moderately permeable.
Parent Material: Residuum or local colluvium from volcanic rocks of andesitic or basaltic composition.
Collected by: L. T. Alexander, F. Llavat-Cristy, R. E. Gierbolini, J. Juarez, K. W. Flach, L. H. Rivera and T. U. Yager, November 4, 1958.
Described by: T. U. Yager.

Horizon and Lincoln Lab. No.	
Ap 9791	0 to 6 inches. Dark reddish brown (5YR 3/4) clay; strong fine and very fine granular structure; firm, slightly sticky, slightly plastic; abrupt smooth boundary.
B1 9792	6 to 14 inches. Dark red (2.5YR 3/6) clay; weak medium subangular blocky structure breaking to moderate [illegible]

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Orthoxic Tropohumult; clayey, oxidic, isohyperthermic

SOIL: Cialitos clay SOIL Nos. S58PR-4-8 LOCATION: Cibuco SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska LAB. Nos. 9817-9825 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05) a	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	3A1c Water-Disp. Clay <0.005		Coarse fragments: 2A2 > 2 (<19) Pct	2-19 (Pct. of < 76mm)	19-76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-10	Ap	2.5	26.1	71.4	0.2	0.3	0.3	0.6	1.1	2.9	23.2	4.4	1.4			-		
10-14	B11	2.6	23.8	73.6	0.4	0.4	0.2	0.6	1.0	2.6	21.2	4.0	1.6	43		-		
14-23	B12	2.1	26.7	71.2	0.3	0.2	0.1	0.6	0.9	2.5	24.2	3.8	1.2			-		
23-31	B21t	2.6	37.1	60.3	-	-	0.1	0.8	1.7	3.8	33.3	6.1	0.9			-		
31-43	B22t	5.6	43.0	51.4	0.1	0.2	0.3	1.9	3.1	5.2	37.8	9.6	2.5			-		
43-59	B23t	9.7	47.5	42.8	-	0.2	0.7	3.6	5.2	7.4	40.1	15.0	4.5			-		
59-72	B3	15.6	48.3	36.1	0.1	1.0	1.9	5.9	6.7	8.2	40.1	18.5	8.9			-		
72-86	C1	27.2	45.5	27.3	1.2	4.3	4.4	9.3	8.0	9.1	36.4	22.4	19.2			-		
86-90	C2	26.5	48.8	24.7	1.2	4.4	4.2	8.8	7.9	8.8	40.0	21.7	18.6			-		

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.	Bulk density g/cc	Bulk density g/cc	4A1h Oven-Dry g/cc	Water content Pct.	Water content Pct.	4B2 15-Bar Pct	pH 8C1c (1:1) N KCl	pH 8C1a (1:1) H_2O
0-10	3.45	0.313	11	8.8				1.05			31.7	3.5	4.5
10-14	1.56	0.150	10	9.0				1.26			32.6	3.6	4.8
14-23	0.88	0.085	10	10.9				1.26			32.8	3.7	4.9
23-31	0.60	0.056	11	11.3				1.44			30.1	3.7	4.8
31-43	0.48	0.046	10	11.5				1.42			28.2	3.6	4.8
43-59	0.38			10.9				1.30			27.2	3.7	4.7
59-72	0.32			10.4				1.26			24.6	3.7	4.7
72-86	0.26			9.6				1.16			22.0	3.7	4.8
86-90	0.22			10.4				1.12			19.5	3.7	4.7

Depth (In.)	Extractable bases 6N2b Ca	6O2b Mg	6P2a Na	5B1a 6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	5A3b Bases Bus Al me/100g Clay	Base saturation 5C3 Sum Cations Pct	5C1 NH_4OAc Pct.
	meq/100 g											
0-10	0.9	1.0	0.1	0.2	2.2	28.7	30.9	19.2	5.1	10.2	7	11
10-14	0.7	0.8	0.1	0.1	1.7	21.7	23.4	13.8	3.8	7.5	7	12
14-23	0.7	0.6	0.1	tr	1.4	19.2	20.6	13.2	3.6	7.0	7	11
23-31	0.5	0.8	0.1	tr	1.4	19.7	21.1	12.5	5.0	10.6	7	11
31-43	0.3	0.7	0.1	tr	1.1	17.1	18.2	11.8	5.3	12.5	6	9
43-59	0.3	0.4	0.1	tr	0.8	18.0	18.8	12.1	5.7	10 b	4	7
59-72	0.1	-	0.1	tr	0.2	17.1	17.3	12.1	6.0	10 b	1	2
72-86	0.1	1.2	0.1	0.1	1.5	15.1	16.6	10.9	5.7	13 b	9	14
86-90	0.1	0.8	0.1	0.1	1.1	15.9	17.0	11.1	6.2	15 b	6	10

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-10	0.27	0.12	0.44
10-14	0.19	0.12	0.44
14-23	0.19	0.15	0.46
23-31	0.21	0.19	0.50
31-43	0.23	0.22	0.55
43-59	0.28	0.25	0.64
59-72	0.34	0.29	0.68
72-86	0.40	0.35	0.81
86-90	0.45	0.42	0.79

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Earthy nodules: > 50 percent.

b. Clay percentage is estimated (15-bar water percentage x 2.5).

USDA SCS HYATTSVILLE, MD 1964

SOIL CLASSIFICATION: Orthoxic Tropohumult; clayey, oxidic,[1] isohyperthermic
Soil Type: Cialitos clay
Soil Nos.: S58PR-4-8
Location: Cibuco Soil Conservation District, Puerto Rico. 40 feet west of Highway No. 813 and 80 feet south of road junction to house. Aerial photo GS-LR-15-53.
Elevation: 650 meters.
Precipitation: 90 inches plus or minus.
Vegetation and Use: Unimproved pasture.
Slope and Land Form: 25 percent with a west aspect

Drainage and Permeability: Well drained, moderate permeability.
Parent Material: Residuum or local colluvium derived from volcanic rocks of andesitic or basaltic composition.
Collected by: L. T. Alexander, F. Llavat-Cristy, R. E. Gierbolini, J. Juarez, K. W. Flach, L. H. Rivera and T. U. Yager, November 7, 1958.
Described by: T. U. Yager.

Horizon and Lincoln Lab. No.	
Ap 9817	0 to 10 inches. Brown to dark brown (7.5YR 4/4) clay; weak medium subangular blocky structure breaking to moderate fine granular; firm, slightly sticky, slightly plastic; abrupt wavy boundary.
B11 9818	10 to 14 inches. Reddish brown (5YR 5/4) clay; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; clear smooth boundary.
B12 9819	14 to 23 inches. Yellowish red (5YR 4/6) clay; weak coarse prismatic structure breaking to moderate medium and fine subangular and angular blocky; firm, slightly sticky, slightly plastic; few medium distinct yellowish brown (10YR 5/5) mottles; thin and thick patchy clay films; clear smooth boundary.
B21t 9820	23 to 31 inches. Red (2.5YR 4/6) clay; strong medium and fine angular blocky structure; firm, slightly sticky, slightly plastic; thick continuous clay film around peds; gradual smooth boundary.
B22t 9821	31 to 43 inches. Similar to B21t except strong tendency for structure to become slightly subangular and clay films thick and patchy.
B23t 9822	43 to 59 inches. Red (2.5YR 4/6) clay; moderate fine subangular blocky structure; firm, slightly sticky, slightly plastic; thin and thick patchy clay films; gradual smooth boundary.
B3 9823	59 to 72 inches. Red (2.5YR 4/6) and yellowish red (5YR 4/6) clay containing a few small angular fragments of parent rock; weak medium and fine subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; clear smooth boundary.
C1 9824	72 to 86 inches. Yellowish red (5YR 4/6) and red (2.5YR 4/8) silty clay loam with very fine strong brown and reddish yellow (7.5YR 5/6 and 6/6) mottles; massive; shows some evidence of parent rock texture; friable, slightly sticky, slightly plastic; very few patchy clay films; gradual smooth boundary.
C2 9825	86 to 90 inches. Similar to C1 except that it has well defined rock texture and no clay films; few pores less than 1 mm. in size. Hard rock at 90 inches.

Remarks: Colors given are for moist soil. Soil sampled at 1/2 to 3/4 field capacity. Samples collected under a tent because of rain. Moderate erosion.

Mineralogy (Method 7A).

Interpretation of X-ray and Differential Thermal Analysis Patterns of the Clay Fraction

Horizon	Depth Inches	Kaolinite[a] %	Vermiculite	Montmorillonite[b]
Ap	0-10	40	xx[c]	--
B11	10-14	50	xx[c]	--
B22t	31-43	35	x [c]	--
C1	72-86	50	--	--
C2	86-90	25	--	--
	approx. 20 feet	35	--	--

a. Percentages estimated from differential thermal analysis.
b. Expands to only 15.4Å upon solvation.
c. Shows 14Å peak at room temperature but does not show 10Å peak after heating.
Legend: x = detected; xx = moderate; xxx = abundant; xxxx = dominant.

1/ Would fail to make oxidic family if the Ap is assumed to be part of the argillic horizon.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Orthoxic Tropohumult; clayey, kaolinitic, isohyperthermic

SOIL *Limones clay SOIL Nos. S63PR-12-2 LOCATION Este SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19047-19055 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Total Sand (2–0.05)	Total Silt (0.05–0.002)	Total Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	<0.0002	<0.074	Coarse fragments 2A2 > 2 (<19) Pct.	2–19	19–76
		Size class and particle diameter (mm) 3A1																
		Pct. of < 2 mm															Pct. of < 76mm	
0-5	Ap	38.7	14.7	46.6	1.6	13.3	9.8	10.5	3.5	2.8	11.9	10.9	35.2		63.1	tr		
5-9	B1	32.8	13.9	53.3	1.2	11.2	8.3	9.1	3.0	2.5	11.4	9.6	29.8		68.8	tr		
9-16	B21t	23.1	17.9	59.0	0.7	8.5	6.0	5.9	2.0	1.8	16.1	6.5	21.1	20.9	77.9	-		
16-26	B22t	18.6	27.1	54.3	0.7	7.1	4.4	4.5	1.9	2.8	24.3	6.8	16.7		82.4	-		
26-40	B3	18.3s	35.4	46.3	0.6	5.8	3.6	5.1	3.2	5.1	30.3	10.9	15.1		83.5	-		
40-54	C1	23.7s	38.5	37.8	1.1	7.0	4.6	6.8	4.2	5.3	33.2	13.0	19.5	5.7	78.7	-		
54-72	C2	27.6s	39.4	33.0	1.4	9.4	5.0	7.0	4.8	6.9	32.5	15.2	22.8		75.3	-		
72-96	C3	35.1s	43.1	21.8	1.5	12.1	6.3	9.1	6.1	7.3	35.8	18.0	29.0	5.9	68.5	-		
96-120	C4	37.3s	45.5	17.2	1.8	12.2	6.9	9.9	6.5	8.2	37.3	19.8	30.8		66.5	-		

Soil Classification: Orthoxic Tropohumult; clayey, kaolinitic, isohyperthermic
Soil type: *Limones **clay**
Soil Nos.: S63PR-12-2.
Location: Este SCD, Puerto Rico, 3 kilometers west of the town of Yabucoa, 100 feet north of kilometer [illegible]

Slope and land form: **35 percent. Site near the lateral axis of a 100-foot wide interfluve. Landscape consists of narrow, concordant interfluves with steep sideslopes.**

Drainage and permeability: Moderately well drained, rapid runoff and moderate permeability.
Parent material: Residuum from plutonic rocks.
Samples collected by and date: W.E. McKinzie, R.B. Grossman, R.A. Boccheciamp on September 16, 1963.
Profile described by: R.A. Boccheciamp.

Horizon and Lincoln Lab. Number	
Ap 19047	0 to 5 inches, dark yellowish brown (10YR 4/4) silty clay loam with few fine distinct strong brown (7.5YR 5/8) and olive gray (5Y 5/2) mottles; weak fine and medium subangular blocky structure; friable, **nonsticky**, plastic; red coatings along root channels; common fine roots; few fine quartz grains; strongly acid; clear smooth boundary. Field moisture 55.2 percent.
B1 19048	5 to 9 inches, dark yellowish brown (10YR 4/4) silty clay with few fine faint strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; friable, **nonsticky**, plastic; few thin patchy clay films; common fine roots; few fine quartz grains; few fine black grains; very strongly acid; clear smooth boundary. Field moisture 48.4 percent.
B21t 19049	9 to 16 inches, yellowish brown (10YR 5/6) clay with many medium distinct red (2.5YR 4/8) mottles; moderate medium and coarse subangular blocky structure; firm, slightly sticky, plastic; thin continuous yellowish brown clay films on ped faces and root channels; small pieces fail semiplastically upon slight pressure between fingers 1/; common fine roots; common fine quartz grains; few fine black concretions; very strongly acid; clear smooth boundary. Field moisture 48.2 percent.
B22t 19050	16 to 26 inches, yellowish red (5YR 5/6) clay; moderate medium and coarse subangular blocky structure; firm, slightly sticky, plastic; thin continuous strong brown clay films on ped faces, root and worm channels; small pieces fail semiplastically upon slight pressure between fingers 1/; common fine roots; common fine quartz grains; few fine black grains; very strongly acid; gradual smooth boundary. Field moisture 36.3 percent.
B3 19051	26 to 40 inches, yellowish red (5YR 4/8) clay; weak medium subangular blocky structure; friable, slightly sticky, plastic; thin patchy strong brown clay films on ped faces, and root channels; small pieces fail semiplastically upon slight pressure between fingers 1/; few fine roots; few

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Orthoxic Tropohumult; clayey, kaolinitic, isohyperthermic

SOIL *Limones clay SOIL Nos. S63PR-12-9 LOCATION Este SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19056-19058 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Soil Classification: Orthoxic Tropohumult; clayey, kaolinitic, isohyperthermic
Soil type: *Limones clay
Soil Nos.: S63PR-12-9
Location: This is a satellite site of *Limones clay S63PR-12-2 and is located about 50 yards east of it.
Vegetation and use: Pangola grass, used for pasture.
Slope and land form: 50 percent sideslope beneath the interfluve summit on which *Limones S63PR-12-2 is located.
Drainage and permeability: Moderately well drained, medium to rapid runoff, moderate permeability.
Parent material: Residuum or local colluvium from plutonic rocks.
Samples collected by and date: W. E. McKinzie, R. B. Grossman, and R. A. Boccheciamp, on September 19, 1963.
Profile described by: R. A. Boccheciamp.

Horizon and Lincoln Lab. Number	
Ap 19056	0 to 4 inches. Reddish brown (5YR 4/4) silty clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; many fine quartz grains; strongly acid; clear smooth boundary.
B21t 19057	4 to 13 inches. Red (2.5YR 4/8) clay with few fine faint dark red (2.5YR 3/6) and yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; thin patchy clay films; small pieces fail semiplastically upon slight pressure between fingers;1/ common fine roots; few fine white platy grains; few fine quartz grains; very strongly acid; clear smooth boundary.
B22t 19058	13 to 24 inches. Red (2.5YR 5/8) clay with few fine distinct dark red mottles; moderate medium subangular blocky structure; friable, nonsticky, plastic; very thin patchy clay films; small pieces fail semiplastically upon slight pressure between fingers; few fine roots; common fine quartz grains; few fine platy grains; common fine krotovinas filled with yellowish-brown soil; very strongly acid; clear smooth boundary.
B3	24 to 33 inches. Red (2.5YR 5/6) silty clay with common fine distinct dark red mottles; weak medium subangular blocky structure; friable, nonsticky, slightly plastic; few fine roots; common fine quartz grains; very strongly acid; gradual smooth boundary. About 10 percent saprolite.
C	33 inches plus. Variegated colors of the saprolite, red, dark red, yellowish brown, yellow, rubbed color red (2.5YR 5/8) silty clay; massive; friable, nonsticky, slightly plastic; many weathered feldspar grains; many fine dark grains; very strongly acid.

Remarks: Ap and B3 horizons sampled for the Bureau of Public Roads. Colors are for the moist soil. Reaction determined by Soiltex.

Mineralogy (Method 7A): B22t horizon. The horizon is dominated by a well-crystallized kaolinite comparable in amount to the B21t of *Limones S63PR-12-2. The clay contains a small amount of montmorillonite, a very small amount of quartz, and there is exhibited a small 6.2Å spacing that disappears upon heating to 300 degrees C. Differential thermal analysis indicates 55 percent kaolinite and possibly some gibbsite in the clay.

1/ See introductory part of the Soil Survey Investigations Report for an explanation of this and similar terms that are designed to describe the failure of the material in its natural state of organization.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Orthoxic Tropohumult; clayey, mixed, isohyperthermic

SOIL *Daguey clay SOIL Nos. S61PR-8-3 LOCATION Oeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16818-16823 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05) a	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Silt: Int. II (0.2–0.02)	(2–0.1)			Coarse fragments: 2A2 > 2 (<19) Pct.	2–19	19–76
		Pct. of < 2 mm															Pct of < 76mm	
0-6	Ap	5.9	33.1	61.0	-	0.2	0.6	2.5	2.4	3.3	29.8	7.3	3.5			tr		
6-13	B21t	2.9	28.6	68.5	-	0.1	0.3	1.3	1.2	2.0	26.6	4.0	1.7			tr		
13-19	B22t	1.6	26.8	71.6	-	0.1	0.2	0.6	0.7	1.1	25.7	2.2	0.9			tr		
19-32	B23t	2.5	32.4	65.1	-	tr	0.2	0.9	1.4	3.1	29.3	5.1	1.1			tr		
32-43	B3	4.4	39.4	56.2	-	0.1	0.3	1.7	2.3	4.1	35.3	7.5	2.1			tr		
43-60	C1	4.5	41.5	54.0	-	0.1	0.4	1.7	2.3	4.5	37.0	7.9	2.2			-		

Depth (In.)	6A1a Organic carbon b Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.		Bulk density: 4A1a Field-State g/cc	4A1c 30-cm. g/cc	4A1b Air-Dry g/cc	4D1 COLE e	Water content: 4B4 Field-State Pct.	4B3 30-cm. Pct.	4B1b 1/3-Bar Pct.	4B2 15-Bar Pct.		pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-6	3.75	0.327	11	6.9			1.06		1.33	0.078	43.8f		44.0	28.2		4.7	5.5
6-13	1.16	0.110	11	6.5			1.22		1.38	0.044	35.5		38.9	28.6		3.9	4.9
13-19	0.63	0.067	9	6.9			1.2 c				g		39.7	30.0		3.7	4.7
19-32	0.42	0.050	8	7.4			1.26d		1.38	0.032	34.8		40.1	30.1		3.6	4.6
32-43	0.29			6.7			1.2 c				h		39.6	28.0		3.6	4.6
43-60	0.22			6.7			1.24	1.24	1.31	0.017	35.8	40.4	40.0	27.8		3.6	4.6

Depth (In.)	Extractable bases: 6N2b Ca	6O2b Mg	6P2a Na	5B1a 6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		5A3b Bases Plus Al me/100g Clay					Base saturation: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																
0-6	5.7	4.2	0.1	1.8	11.8	14.1	25.9	19.9	0.2		19.7					46	59
6-13	2.6	2.2	0.1	1.6	6.5	13.1	19.6	13.5	1.4		11.5					33	48
13-19	1.3	1.3	0.1	0.9	3.6	15.5	19.1	14.1	4.6		11.5					19	26
19-32	0.8	1.4	0.1	0.4	2.7	17.2	19.9	14.5	7.5		15.7					14	19
32-43	0.8	1.3	0.1	0.2	2.4	17.0	19.4	14.4	9.0		20.3					12	17
43-60	0.6	1.1	0.1	0.2	2.0	18.7	20.7	14.2	10.0		22.2					10	14

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water		
0-6	0.33	0.11	0.46		
6-13	0.20	0.09	0.42		
13-19	0.20	0.10	0.42		
19-32	0.22	0.11	0.46		
32-43	0.26	0.12	0.50		
43-60	0.26	0.12	0.51		

a. Earthy nodules: > 50 percent.
b. 14 kg/m² to 60 inches (Method 6A).
c. Estimated.
d. Range in replicates is 0.12 g/cc.
e. Field state.
f. Field-determined value: 40.7 percent.
g. Field-determined value: 39.8 percent.
h. Field-determined value: 38.3 percent.

Soil Classification: Orthoxic Tropohumult; clayey, mixed, isohyperthermic
Soil Type: *Daguey clay
Soil Nos.: S61PR-8-3
Location: Oeste Soil Conservation District, Mayaguez, Puerto Rico, kilometer marker 11.0 on Highway 110, 400 meters east on dirt road, 100 feet south of road. Photo GS-LR-2-203.
Vegetation and Use: Native pasture and weeds.
Slope and Land Form: 18 percent. Northwest aspect. Dissected uplands.
Drainage and Permeability: Well drained with medium runoff and medium internal drainage. Permeability is moderate.
Parent Material: Residuum or very local colluvium from volcanic rocks.
Collected by: R. B. Grossman, W. E. McKinzie, O. R. Carter, Luis H. Rivera, R. R. Gierbolini, W. Francia, D. Compton and J. Trigo, December 18, 1961.
Described by: L. H. Rivera, December 18, 1961.

Horizon and Lincoln Lab. No.

Ap 16818 — 0 to 6 inches. Reddish brown (5YR 4/3) with common fine faint reddish brown (5YR 4/4) mottled clay with moderate fine and medium subangular blocky structure; friable when moist, nonsticky and slightly plastic when wet; many fine roots; abrupt smooth boundary.

B21t 16819 — 6 to 13 inches. Red (2.5YR 4/6) clay with moderate fine and medium subangular blocky structure; firm when moist, nonsticky and slightly plastic when wet; common fine roots; few fine pores; thin patchy clay films; fails semiplastically,1/ clear smooth boundary.

B22t 16820 — 13 to 19 inches. Red (2.5YR 4/6) interior of peds and weak red (2.5YR 5/2) exterior of peds, clay; moderate medium subangular blocky structure with thick patchy clay films on ped surfaces; firm when moist, slightly sticky and slightly plastic when wet; fails semiplastically; few fine roots; few fine pores; gradual smooth boundary.

B23t 16821 — 19 to 32 inches. Red (10R 4/6) clay; weak fine angular blocky structure; friable when moist and slightly sticky and slightly plastic when wet; fails abruptly; few fine pores; thin patchy clay films; few fine roots; gradual smooth boundary.

B3 16822 — 32 to 43 inches. Red (10R 4/6) with evidence of colors of the saprolite clay; weak fine angular blocky structure; very friable when moist, nonsticky and slightly plastic when wet; fails abruptly; few fine roots; very few thin clay films on vertical ped surfaces; gradual wavy boundary.

C1 16823 — 43 to 60 inches. Variegated colors of the saprolite, dominantly red (2.5YR 4/6), dark red (2.5YR 3/6), very pale brown (10YR 7/4) and yellowish brown (10YR 5/8); crushed color is red (10R 4/6); clay loam; massive; very friable when moist and nonsticky, nonplastic when wet; very few fine roots.

Remarks: The Ap, B22t, and C1 horizons were sampled for the Bureau of Public Roads. Colors given are for moist soil. Soils slightly below field capacity when sampled.

Micromorphology, Mineralogy (Methods 4E1, 7B1). Distinct illuviation cutans (B22t horizon) rest on a fabric that has very weak clay orientation. The following data were obtained by differential thermal analysis (kaolinite) and by X-ray diffraction (Beltsville laboratory data).

Horizon	Whole Soil Powder			Iron-Free Clay			
	Kl	Q	Fl	Kl	Vm	Mt	Mi
	%			%			
Ap	30	XXX	T	46	X		T
B21t	33	XXX		48	XX		T
B22t	35	XXX		45	X	X	X
B23t	38	XX		48	X	XX	X
B3	45	XX		51	X		XX
C1	38	X		47	X		XX

T	Trace	Kl	Kaolinite	Mi	Mica
X	Small	Q	Quartz		
XX	Moderate	Fl	Feldspar		
XXX	Abundant	G	Goethite		
XXXX	Dominant	Vm	Vermiculite		
		Mt	Montmorillonite		

1/ Two terms used in the descriptions to describe the rate of failure of natural fabric: fails abruptly and fails semiplastically. To fail abruptly means that no plasticity is observed prior to failure. Stress builds up as the piece of soil is squeezed and dissipates quickly as the piece of soil breaks apart into numerous fragments or peds due to failure along natural planes of weakness. In semiplastic failure, deformation is readily observed prior to rupture.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Orthoxic Tropohumult; clayey, mixed, isohyperthermic

SOIL *Daguey clay SOIL Nos. S61PR-8-6 LOCATION Oeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16840-16845 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: (0.05–0.002)	Silt: Int III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)			Coarse fragments: 2A2 > 2 (<19) Pct	2 – 19	19 – 76
		Pct of < 2 mm															Pct. of < 76mm	
0-6	Ap	2.1a	33.2	64.7	-	0.1	0.2	0.6	1.2	2.5	30.7	4.1	0.9			-		
6-14	B21t	1.9a	28.0	70.1	0.1	0.1	0.2	0.6	0.9	2.3	25.7	3.6	1.0			-		
14-26	B22t	1.7a	22.6	75.7	0.1	0.1	0.2	0.6	0.7	2.0	20.6	3.1	1.0			-		
26-40	B23t	4.5b	35.5	60.0	0.1	0.2	0.4	1.6	2.2	4.6	30.9	7.9	2.3			-		
40-52	B3	8.8b	47.7	43.5	0.2	0.5	0.8	3.1	4.2	7.6	40.1	13.9	4.6			-		
52-63	C1	9.0b	53.5	37.5	0.1	0.5	0.7	3.1	4.6	7.3	46.2	14.0	4.4			-		

Depth (In.)	6A1a Organic carbon c Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct		Bulk density: 4A1a Field State g/cc	4A1c 30-cm g/cc	4A1b Air-Dry g/cc	4D1 COLE e	Water content: 4B4 Field State Pct.	4B3 30-cm Pct.	4B1b 1/3-Bar Pct	4B2 15-Bar Pct.			pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-6	2.94	0.275	11	7.4			0.99		1.23	0.078	47.2f		43.2	30.0			3.5	4.1
6-14	1.27	0.122	10	8.0			1.20		1.40	0.052	39.4		39.8	31.6			3.6	4.4
14-26	0.90	0.110	8	8.4			1.2d				g		42.2	33.3			3.8	4.7
26-40	0.53	0.066	8	8.6			1.22		1.34	0.032	39.0		41.7	31.8			3.8	4.8
40-52	0.30			7.4			1.2d				h		40.6	26.0			3.8	4.8
52-63	0.25			6.7			1.20	1.23	1.29	0.024	38.0	37.9	40.9	22.2			3.7	4.7

Depth (In.)	Extractable bases 5B1a: 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		5A3b Bases Plus Al me/100g Clay					Base saturation: 5C3 Sum Cations Pct	5C1 NH_4OAc Pct
	meq/100 g																
0-6	1.0	0.6	tr	0.2	1.8	27.6	29.4	20.1	7.2		13.9					6	9
6-14	0.2	0.9	tr	0.1	1.2	21.2	22.4	14.3	6.1		10.4					5	8
14-26	0.1	0.8	0.1	0.1	1.1	19.2	20.3	12.7	5.0		8.1					5	9
26-40	tr	0.6	0.1	0.1	0.8	18.8	19.6	13.3	6.6		12.3					4	6
40-52	0.1	0.7	tr	0.1	0.9	16.9	17.8	12.6	7.4		13 i					5	7
52-63	-	0.6	0.1	0.1	0.8	15.7	16.5	10.8	7.3		14 i					5	7

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-6	0.31	0.11	0.46
6-14	0.20	0.11	0.45
14-26	0.17	0.11	0.44
26-40	0.22	0.14	0.53
40-52	0.29	0.17	0.60
52-63	0.29	0.18	0.59

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Earthy nodules: 5-25 percent (2-0.05 mm.).
b. Earthy nodules: > 50 percent (2-0.05 mm.).
c. 15 kg/m^2 to 60 inches (Method 6A).
d. Estimated.
e. Field state.
f. Field-determined value: 49.3 percent.
g. Field-determined value: 45.1 percent.
h. Field-determined value: 42.4 percent.
i. Clay percentage is estimated (15-bar water percentage x 2.5).

USDA SCS HYATTSVILLE MD 1964

Soil Classification: Orthoxic Tropohumult; clayey, mixed, isohyperthermic
Soil Type: * Daguey clay
Soil Nos.: S61PR-8-6
Location: Oeste Soil Conservation District, Puerto Rico, 2.45 kilometers on dirt road from kilometer marker 19.4, on Highway 105, Maricao to Larea, 50 feet east of road. Photo GS-LR-3-208.
Vegetation and Use: Coffee grown under shade.
Slope and Land Form: 35 percent. East aspect. On a sideslope leading to a drainageway.
Drainage and Permeability: Well drained with medium runoff and medium internal drainage. Permeability is moderate.
Parent Material: Residuum or very local colluvium from volcanic rocks.
Collected by: R. B. Grossman, W. E. McKinzie, O. R. Carter, L. H. Rivera, W. Francia, J. E. Trigo, D. A. Compton, December 19, 1961.
Described by: L. H. Rivera, December 19, 1961.

Horizon and Lincoln Lab. No.	
Ao	1/2 to 0 inch. Partially decomposed leaf mulch.
Ap 16840	0 to 6 inches. Dark red (2.5YR 3/6) clay; weak fine subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; many fine roots; many worm casts; clear smooth boundary.
B21t	6 to 14 inches. Red (2.5YR 4/6) clay; moderate medium subangular blocky structure; firm when moist.
B22t	14 to 26 inches. Red (2.5YR 4/6) clay; weak coarse subangular blocky structure; firm when moist, slightly

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Orthoxic Tropohumult; clayey, kaolinitic, isohyperthermic

SOIL: Series not designated SOIL Nos. S63PR-8-3 LOCATION: Oeste SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska LAB. Nos. 18989-18998 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: (0.05–0.02)	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	<0.005	<0.074	Coarse fragments: 2A2 > 2 (<19) Pct.	2–19	19–76
		Pct. of < 2 mm															Pct. of < 76mm	
0-7	Ap	10.1a	21.9	68.0	0.4	0.4	0.8	4.2	4.3	4.0	17.9	11.1	5.8		91.6	tr		
7-11	B21t	4.6a	19.1	76.3	tr	tr	0.3	1.7	2.6	2.7	16.4	6.5	2.0		96.4	-		
11-20	B22t	1.4a	19.0	79.6	-	-	-	0.5	0.9	2.3	16.7	3.6	0.5	16.2	99.2	-		
20-31	B23t	2.2b	31.4	66.4	-	-	-	0.6	1.6	3.5	27.9	5.6	0.6		98.9	-		
31-44	B3	3.4b	37.5	59.1	-	-	0.1	1.0	2.3	4.7	32.8	7.7	1.1		98.1	-		
44-56	C1	6.2b	42.1	51.7	-	0.1	0.3	1.9	3.9	6.0	36.1	11.3	2.3	8.2	96.4	-		
56-68	C2	7.2b	41.6	51.2	-	0.2	0.4	2.4	4.2	5.4	36.2	11.3	3.0		95.7	-		
68-92	C3	7.3b	44.2	48.5	-	0.1	0.5	2.4	4.3	6.2	38.0	12.2	3.0		95.6	-		
132-180	C4	6.0b	44.0	50.0	-	0.1	0.3	1.4	4.2	6.9	37.1	12.1	1.8	5.6	97.1	-		
216-264	C5	6.1b	48.0	45.9	-	0.2	0.4	1.5	4.0	6.9	41.1	12.0	2.1		96.9	-		

Depth (In.)	6A1a Organic carbon C Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.		Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct	4C1 1/3-to 15-Bar in./in.		pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-7	3.92	0.355	11	6.3			1.02	1.15	1.38	0.064	52.9	39.8	31.0	0.10		4.5	5.2
7-11	1.58	0.145	11	7.1			1.14	1.25	1.42	0.044	45.6	36.2	31.4	0.06		3.9	4.8
11-20	0.90	0.087	10	6.7			1.18	1.23	1.35	0.032	41.8	36.7	31.8	0.06		4.0	5.0
20-31	0.85	0.095	9	7.4			1.20	1.25	1.35	0.024	40.4	36.2	30.4	0.07		3.8	5.1
31-44	0.40	0.040	10	6.2			1.19	1.24	1.32	0.020	40.0	35.6	29.1	0.08		3.9	5.1
44-56	0.22			6.3			1.13	1.18	1.26	0.020	42.4	37.5	28.6	0.11		3.8	5.2
56-68	0.20			5.8			1.07	1.11	1.18	0.020	42.3	39.4	25.6	0.15		3.8	5.2
68-92	0.16			6.1									25.3			3.8	5.1
132-180	0.08			5.6									25.8			3.7	4.8
216-264	0.06			4.9									24.0			3.7	4.8

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	6L2a NH_4OAc Ext. SO_4		5A3b Bases Plus Al me/100g Clay				Base saturation: 5C3 Sum Cations Pct	5C1 NH_4OAc Pct
	meq/100 g																
0-7	8.9	4.3	0.1	0.3	13.6	22.3	35.9	23.0	0.2	-		20.3				38	59
7-11	3.5	2.7	0.1	0.1	6.4	18.0	24.4	14.5	1.1	-		9.8				26	44
11-20	3.1	2.1	0.1	0.1	5.4	14.6	20.0	12.7	1.4	0.2		8.5				27	43
20-31	3.5	2.1	0.2	0.1	5.9	13.9	19.8	13.5	2.7	0.3		13.0				30	44
31-44	4.0	2.0	0.2	0.1	6.3	13.2	19.5	13.0	3.0	0.6		15.7				32	48
44-56	4.5	2.0	0.2	0.1	6.8	13.9	20.7	14.4	4.2	1.2		21.3				33	47
56-68	3.9	1.8	0.2	0.1	6.0	14.0	20.0	14.1	4.4	1.4		20.3				30	43
68-92	2.9	1.5	0.2	0.1	4.7	14.2	18.9	13.7	5.7	1.9		21.4				25	34
132-180	0.4	1.1	0.1	0.1	1.7	18.1	19.8	12.8	8.1	2.7		19.6				9	13
216-264	0.5	1.2	0.1	0.2	2.0	17.1	19.1	12.7	8.4	1.9		22.7				10	16

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water		
0-7	0.34	0.09	0.46		
7-11	0.19	0.09	0.41		
11-20	0.16	0.08	0.40		
20-31	0.20	0.11	0.46		
31-44	0.22	0.10	0.49		
44-56	0.28	0.12	0.55		
56-68	0.28	0.11	0.50		
68-92	0.28	0.13	0.52		
132-180	0.26	0.11	0.52		
216-264	0.28	0.11	0.52		

a. Earthy nodules: > 50 percent (2-0.05 mm.).
b. Earthy nodules: 25-50 percent (2-0.05 mm.).
c. 17 kg/m² to 44 inches (Method 6A).

USDA SCS HYATTSVILLE MD 1984

Soil Classification: Orthoxic Tropohumult; clayey, kaolinitic, isohyperthermic
Soil type: Series not designated
Soil Nos.: S63PR-8-3
Location: Oeste SCD, Puerto Rico, 4.5 kilometers north from town of Añasco, 900 meters north of intersection of highways 2 and 110 and 150 feet east of the highway.
Vegetation and use: Old coffee plantation with an overstory of shade trees consisting of Guamá, Guava, Moca, Bucaré, all leguminous trees.
Slope and land form: **15 percent. On the lateral axis of backslope of a 50-yard wide interfluve near the less steeply sloping ridge top.**
Drainage and permeability: Well drained with medium runoff. Permeability is moderate.
Parent material: **Residuum or very local sideslope colluvium from basic volcanic rocks.**
Samples collected by and date: R.B. Grossman, W.E. McKinzie, L.H. Rivera, G. Acevedo, R.E. Gierbolini, on September 25, 1963.
Profile described by: R.E. Gierbolini.

Horizon and Lincoln Lab. Number	
Ap 18989	0 to 7 inches, dark brown (7.5YR 4/4) silty clay; weak fine granular structure; friable, slightly sticky, slightly plastic; common fine roots; very strongly acid; clear smooth boundary. Field moisture 51.9 percent.
B21t 18990	7 to 11 inches, red (2.5YR 4/6) clay with dark brown (7.5YR 4/4) coatings on ped surfaces; moderate medium subangular blocky structure; firm, slightly sticky, plastic; thin discontinuous clay films; small pieces fail semiplastically 1/; few fine black nodules; very strongly acid; clear smooth boundary. Field moisture 51.5 percent.
B22t 18991	11 to 20 inches, red (2.5YR 4/6) with yellow streaks that follow path of old rootlets, clay; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films

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SOIL CLASSIFICATION: Typic Tropudult; clayey, mixed, isohyperthermic

SOIL Series not designated SOIL Nos. S58PR-4-4 / S58(61)PR-4-4 LOCATION Cibuco SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 9800-9807 / 14862-14865 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Soil Classification: Typic Tropudult; clayey, mixed, isohyperthermic
Soil Type: Series not designated
Soil Nos.: S58PR-4-4
Location: Cibuco Soil Conservation District, Puerto Rico, on point of land 40 feet south of Highway No. 159 at kilometer marker 20.83. Aerial photo GS-LR-14-185.

Precipitation: 80 inches plus or minus.
Vegetation and Use: Unimproved pasture for the past 7 or 8 years, in plantains previously.
Slope and Land Form: 20 percent north-facing convex slope in mountainous topography.
Drainage and Permeability: Well drained, moderate permeability.
Parent Material: Residuum or local colluvium from early Tertiary volcanic conglomerate that contains rock fragments of greatly varying size.
Collected by: L. T. Alexander, F. Llavat-Cristy, R. E. Gierbolini, J. Juarez, K. W. Flach, L. H. Rivera, and T. U. Yager, November 5, 1958.
Described by: T. U. Yager.

Horizon and Lincoln Lab. No.	
Ap 9800	0 to 6 inches. Brown to dark brown (7.5YR 4/4) clay; moderate fine subangular blocky structure; firm, slightly sticky, slightly plastic; contains common, medium red (2.5YR 4/6) inclusions of possible B which have thin occasional clay films; abrupt wavy boundary.
B21t 9801	6 to 16 inches. Reddish brown (5YR 4/4) clay with fine yellowish brown (10YR 5/4) specks; strong medium and fine subangular blocky structure; thick continuous clay films around peds, interior of peds yellowish red (5YR 4/6); firm, slightly sticky, slightly plastic; clear smooth boundary.
B22t 9802	16 to 22 inches. Yellowish red (5YR 4/6) clay similar to B21t except structure tends to become fine angular blocky and the interior of the peds slightly more red; clear smooth boundary.
B23t 9803	22 to 30 inches. Red to yellowish red (2.5YR 4/6 to 5YR 4/6) clay with few fine yellowish brown (10YR 5/4) specks; moderate, medium subangular and fine angular blocky structure; firm, slightly sticky, slightly plastic; thin continuous and thick patchy clay films around peds; gradual smooth boundary.
B24t 9804	30 to 35 inches. Red (2.5YR 4/6) clay with few fine yellowish brown (10YR 5/4 to 5/6) specks; moderate medium and weak fine subangular blocky structure; firm, sticky; thick patchy and thin continuous clay films predominate along vertical cleavage planes; clear smooth boundary.
B3 9805	35 to 45 inches. Yellowish red to red (5YR 4/6 to 2.5YR 4/6) clay; weak medium subangular blocky structure; firm, sticky; thin very patchy clay films; parent rock texture apparent in most of soil mass results in yellowish brown (10YR 5/4 to 5/6) and common white spots; clear smooth boundary.
C1 9806	45 to 53 inches. Yellowish red (5YR 4/6) silty clay loam matrix with colors ranging from red (2.5YR 4/8) to yellowish brown (10YR 5/4) and light gray (10YR 7/1); massive; friable, slightly sticky, plas-

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Aquic Tropudult; clayey, mixed, isohyperthermic

SOIL *Corozal clay SOIL Nos. S58PR-4-1 LOCATION Cibuco SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 9775-9783 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth	Horizon	Size class and particle diameter (mm)															
		Total			Sand					Silt		3A1				Coarse fragments		
		Sand	Silt	Clay	Very coarse	Coarse	Medium	Fine	Very fine		Int. III	Int. II		3A1c Water-Disp.		2A2 > 2	2 - 19	19 - 76

Soil Classification: Aquic Tropudult; clayey, mixed, isohyperthermic
Soil Type: *Corozal clay
Soil Nos.: S58PR-4-1
Location: Cibuco Soil Conservation District, Puerto Rico. Corozal substation. 60 feet west of fence and approximately 0.2 mile west of main building. Photo GS-LR-14-185.
Elevation: 210 meters.
Precipitation: 80 inches plus or minus.
Vegetation and Use: Cultivated cropland; area was previously in pineapple for many years and is severely eroded.
Slope and Land Form: 5 percent southwest-facing convex slope in rolling area with deeply cut ravines.
Drainage and Permeability: Well drained, moderate permeability.
Parent Material: Pedisediment derived from early Tertiary volcanic conglomerate that contains sugangular to subrounded fragments from fine-gravel size to five feet across.
Collected by: L. T. Alexander, F. Llavat-Cristy, R. E. Gierbolini, J. Juarez, K. W. Flach, L. H. Rivera and T. U. Yager, November 3, 1958.
Described by: T. U. Yager.

Horizon and Lincoln Lab. No.	
Ap 9775	0 to 7 inches. Brown to dark brown (7.5YR 4/3) clay; weak fine subangular blocky structure; extremely hard; firm; thin patchy clay films on ped surfaces; abrupt smooth boundary.
B1 9776	7 to 12 inches. Brown (7.5YR 4/4) clay ped surfaces with yellowish red (5YR 4/6) clay interiors; strong medium subangular blocky structure; firm; thick continuous clay film around aggregates; clear smooth boundary.
B21t 9777	12 to 21 inches. Red (2.5YR 4/6) clay with occasional strong brown (7.5YR 5/6) streaks along root channels; moderate medium prismatic structure breaking to strong fine angular blocky; firm; thick continuous clay films around aggregates; clear wavy boundary.
B22t 9778	21 to 30 inches. Red (2.5YR 4/6) clay with strong brown (7.5YR 5/6) along root channels; strong medium subangular blocky structure breaking into strong fine angular blocky; firm; thick continuous clay films around aggregates; clear wavy boundary.
B31 9779	30 to 38 inches. Yellowish red (5YR 4/6) clay ped surfaces with red (2.5YR 4/6) clay interiors; strong fine angular blocky structure; firm; thick continuous clay films around aggregates; gradual irregular boundary.
B32 9780	38 to 47 inches. Yellowish red (5YR 4/6) clay tongues of B31 into red (2.5YR 4/6) clay; weak medium to fine subangular blocky structure; firm; thick large patches of clay films; gradual wavy boundary.
C1 9781	47 to 56 inches. Red (2.5YR 4/8) silty clay loam with common very fine white mottles; massive; firm; thick patchy clay films on a few aggregate faces; this horizon tends to retain some appearance (texture) of the parent rock; clear wavy boundary.
C2 [illegible]	56 to 67 inches plus. Red (2.5YR 4/8) rubbed color silty clay loam somewhat coarser than the C1; massive; [illegible]

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Oxic Tropudult; clayey, mixed, isohyperthermic

SOIL *Ingenio clay loam SOIL Nos. S63PR-12-6 LOCATION Este SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19012-19018 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.0002	<0.074	Coarse fragments 2A2 > 2 (<19) Pct.	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-7	Ap	35.3	29.4	35.3	0.5	11.2	9.0	10.1	4.5	5.4	24.0	14.7	30.8		67.2	tr		
7-15	B21t	21.4a	34.2	44.4	0.7	5.6	4.7	6.5	3.9	6.1	28.1	13.3	17.5		80.9	-		
15-31	B22t	21.1a	46.6	32.3	1.0	4.4	3.6	5.9	6.2	11.0	35.6	20.4	14.9	8.3	83.0	-		
31-40	B3	26.4a	50.2	23.4	1.4	6.0	4.5	7.1	7.4	13.0	37.2	24.3	19.0		78.5	-		
40-51	C1	30.1a	51.7	18.2	1.1	6.1	5.3	8.7	8.9	14.1	37.6	27.7	21.2	4.4	75.9	-		
51-76	C2	29.1	54.3	16.6	1.2	6.6	5.1	8.4	7.8	14.0	40.3	26.2	21.3		76.1	-		
76-110	C3	32.2	53.0	14.8	2.0	7.3	5.5	8.5	8.9	14.8	38.2	28.3	23.3		73.8	-		

Depth (In.)	6A1a Organic carbon b Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct	Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct	4C1 1/3-to 15-Bar in./in.	pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-7	2.08	0.177	12	3.2		1.21	1.36	1.45	0.020	38.7	25.8	18.8	0.10	4.3	4.8
7-15	0.78	0.076	10	2.6		1.25	1.38	1.48	0.024	36.6	27.5	22.8	0.06	3.7	4.6
15-31	0.34	0.036	9	4.9		1.29	1.32	1.38	0.014	29.1	26.9	17.6	0.12	3.7	4.6
31-40	0.25			4.7		1.25	1.25	1.29	0.010	27.0	27.7	14.5	0.17	3.8	4.7
40-51	0.17			4.7		1.14	1.14	1.17	0.010	30.3	29.1	11.7	0.20	3.8	4.7
51-76	0.10			4.3			1.1c					10.5		3.9	4.7
76-110	0.05			4.5								10.3		3.9	4.7

Depth (In.)	Extractable bases 6N2a Ca	6O2a Mg	6P2a Na	5B1a 6Q2a K	Sum (meq/100 g)	6H1a Ext. Acidity	Cat. Exch. Cap: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	6L2a NH_4OAc Ext. SO_4 >	5A3b Bases Plus Al me/100g Clay	Base saturation: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.
0-7	3.0	1.5	0.3	1.2	6.0	12.7	18.7	10.7	0.4	0.7	18.1	32	56
7-15	1.7	1.5	0.4	0.2	3.8	11.2	15.0	9.3	2.2	0.7	13.5	25	41
15-31	1.2	1.3	0.4	0.1	3.0	11.1	14.1	8.9	4.3	0.2	22.6	21	34
31-40	0.9	1.2	0.3	0.1	2.5	11.0	13.5	8.4	5.1	0.3	21 d	19	30
40-51	0.8	1.0	0.2	0.1	2.1	10.4	12.5	8.1	5.1	0.2	25 d	17	26
51-76	0.2	0.9	0.2	0.2	1.5	10.3	11.8	7.8	4.9	0.3	24 d	13	19
76-110	0.4	0.7	0.1	0.3	1.5	11.0	12.5	8.7	5.9	0.3	29 d	12	17

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-7	0.30	0.09	0.53
7-15	0.21	0.06	0.51
15-31	0.28	0.15	0.54
31-40	0.36	0.20	0.62
40-51	0.45	0.26	0.64
51-76	0.47	0.26	0.63
76-110	0.59	0.30	0.70

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Earthy nodules: 5-25 percent (0.25-0.05 mm.).
b. 11 kg/m^2 to 60 inches (Method 6A).
c. Estimated.
d. Clay percentage is estimated (15-bar water percentage x 2.5).

Soil Classification: Oxic Tropudult; clayey, mixed, isohyperthermic
Soil type: *Ingenio **clay loam**
Soil Nos.: S63PR-12-6
Location: Este SCD, Puerto Rico, 4.9 kilometers southwest from Humacao, 1.0 kilometers south southwest from Surillo school, Tejas ward. Photo GS-LR-13-105.
Vegetation and use: Pangola grass, used as pasture.
Slope and land form: **30 percent backslope of the second surface above the local drainage. The landscape consists of narrow interfluve summit remnants with steep sideslopes.**
Drainage and permeability: Well drained, medium runoff and moderate permeability.
Parent material: **Residuum or very local colluvium from plutonic rocks.**
Rainfall: About 80 inches a year.
Samples collected by and date: W.E. McKinzie, R.B. Grossman, and R.A. Boccheciamp on September 18, 1963.
Profile described by: W.E. McKinzie.

Horizon and Lincoln Lab. Number	
Ap 19012	0 to 7 inches, yellowish brown (10YR 5/4) silty clay loam with many medium distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine roots; common fine quartz grains; few fine black grains; very strongly acid; clear smooth boundary. Field moisture 41.7 percent.
B21t 19013	7 to 15 inches, red (2.5YR 5/6) silty clay; moderate medium and coarse prismatic structure with thin continuous yellowish red (5YR 4/8) coatings on vertical ped surfaces and thin discontinuous coatings on horizontal ped surfaces; friable, slightly sticky, plastic; small pieces fail semiplastically upon slight pressure between fingers 1/; common fine roots; common fine quartz grains; few fine black grains; few fine pores; few krotovinas 5 millimeters in diameter; very strongly acid; clear smooth boundary. Field moisture 42.4 percent.
B22t 19014	15 to 31 inches, red (2.5YR 4/6) clay; moderate medium and coarse subangular blocky structure with thin continuous reddish brown (2.5YR 5/4) coatings on vertical ped surfaces and thin discontinuous coatings on horizontal ped surfaces; friable, slightly sticky, slightly plastic; small pieces fail semiplastically upon slight pressure between fingers 1/; common fine roots; common fine quartz grains; few fine black grains; few krotovinas 2 to 5 millimeters in diameter; few fine pores; strongly acid; gradual smooth boundary. Field moisture 35.5 percent.
B3 19015	31 to 40 inches, red (2.5YR 4/6) silty clay; weak medium and coarse subangular blocky structure with thin discontinuous reddish brown (2.5YR 4/4) coatings on ped surfaces; very friable, non sticky, slightly plastic; small pieces fail abruptly upon slight pressure between fingers 1/; common fine roots; common fine quartz grains; few fine black grains; few krotovinas one inch in diameter with a thick clay coating; common fine pores; very strongly acid; clear smooth boundary. Field moisture 30.1 percent.
C1 19016	40 to 51 inches, variegated colors; dusky red, yellow and white; crushed color dark yellowish brown (10YR 4/4); silty clay loam; massive; very friable, nonsticky, nonplastic; common fine roots; common fine quartz grains; few fine pores; very strongly acid; gradual smooth boundary. Horizon consists of 50 percent saprolite.
C2 19017	51 to 76 inches, saprolite with variegated colors: dusky red, yellow, yellowish brown and white; silt loam; massive; very friable, nonsticky, nonplastic; many fine weathered feldspar grains; few dead roots with clay and organic coatings in root channels; very strongly acid; diffuse smooth boundary.
C3 19018	76 to 110 inches, saprolite with variegated colors: dusky red, yellow, yellowish brown and white; silt loam; massive; very friable, nonsticky, nonplastic; many fine feldspar grains; very strongly acid.

1/ - See introductory part of the Soil Survey Investigations Report for an explanation of this and similar terms that are designed to describe the failure of the material in its natural state of organization.

Remarks: Ap, B22t, C1 horizons sampled for the Bureau of Public Roads. Colors given are for the moist soil. Reaction determined by Soiltex. **Pedon S63PR-12-7 is a satellite pedon (see Introduction).**

Mineralogy (Method 7A): B22t and C1 horizons. The suite of minerals in the clay is similar for the two horizons studied: kaolinite in moderate to abundant amounts, mica in small amounts and very small amounts of interstratified mica minerals. The kaolinite in the B22t is considerably better crystallized than in the C1. The mineral in the C1 horizon may actually be a halloysite. The B22t contains 45 percent kaolinite in the clay by differential thermal analysis.

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SOIL CLASSIFICATION: Not designated

SOIL Series not designated SOIL Nos. S63PR-12-7 LOCATION Este SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19019 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1														Coarse fragments		
		Total			Sand					Silt								
		Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0 002)	Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0 1–0.05)	0.05–0 02	Int. III (0 02–0.002)	Int II (0.2–0.02)	(2–0.1)	<0.0002	<0.074	2A2 > 2 (<19) Pct.	2 - 19	19 - 76
		Pct. of < 2 mm															Pct. of < 76mm	
3-9	B2t	56.7	36.1	20.6	1.3	16.5	14.9	17.1	6.9	20.6	15.5	21.7	49.8	7.3	47.1	tr		

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.		Bulk density g/cc	g/cc	g/cc		Water content Pct.	Pct.	4B2 15-Bar Pct.			pH	8C1c (1:1) N KCl	8C1a (1:1) H_2O
3-9	0.30	0.042	7	3.7									10.9				3.9	4.6

Soil Classification: Not designated[1/]
Soil type: **Series not designated**
Soil Nos.: S63PR-12-7.
Location: This is a satellite site of ***Ingenio clay loam, S63PR-12-6, and is located 150 feet northeast** from it.
Vegetation and use: Pangola grass, used as pasture.
Slope and land form: This satellite site of ***Ingenio** clay loam (S63PR-12-6) was sampled with the aim of determining differences in morphology and soil characteristics, related to stability of geomorphic surfaces. This site is located on a **50-percent sideslope of the next surface beneath the sideslope on which S63PR-12-6 is located.**

Drainage and permeability: Well drained, rapid runoff and moderate permeability.
Parent material: **Residuum or very local colluvium from plutonic rocks.**
Rainfall: About 80 inches a year.
Samples collected by and date: W.E. McKinzie, R.B. Grossman and R.A. Boccheciamp on September 19, 1963.
Profile described by: R.A. Boccheciamp.

Horizon and Lincoln Lab. Number	
Ap	0 to 3 inches, yellowish brown (10YR 5/4) clay loam with few medium distinct red (2.5YR 4/6) mottles; weak medium subangular blocky structure; firm, slightly sticky, plastic; many fine roots; common fine quartz grains; common fine dark grains; few fine pores; strongly acid; clear wavy boundary.
B2t 19019	3 to 9 inches, red (2.5YR 4/6) clay loam; moderate medium subangular blocky structure; firm, slightly sticky, plastic; thin patchy clay films; small pieces fail abruptly upon slight pressure between fingers 2/; common fine roots; common fine quartz grains; few fine dark grains; few fine pores; strongly acid; clear smooth boundary.
B31	9 to 15 inches, red (2.5YR 4/6) clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; small pieces fail abruptly upon slight pressure between fingers; few thin patchy clay films; few fine roots; common fine pores; common fine quartz grains; common platy shiny grains; strongly acid; clear smooth boundary.
B32	15 to 40 inches, red (2.5YR 5/6) loam; massive; friable, slightly sticky, slightly plastic; common fine pores; common fine quartz grains; common shiny platy grains; strongly acid

[redacted]

determined by Soiltex. Selected B2t horizon, sampled to compare with *Ingenio clay loam, S63PR-12-6.

Mineralogy (Method 7A): B2t horizon. The clay contains moderate to abundant kaolinite, fairly well crystal-

[redacted]

lized, and a small amount of mica. Trace amounts of interstratified mica minerals are present. The clay

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SOIL CLASSIFICATION: Oxic Tropudult; fine-loamy, mixed, isohyperthermic

SOIL *Jagueyes sandy loam SOIL Nos. S63PR-12-10 LOCATION Este SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19020-19028 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Silt: Int II (0.2-0.02)	(2-0.1)	<0.0002	<0.074	Coarse fragments: 2A2 > 2 (<19) Pct.	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-8	Ap	73.7	9.7	16.6	5.2	18.8	18.8	25.0	5.9	3.4	6.3	20.0	67.8		29.0	tr		
8-14	A3	65.8	9.7	24.5	7.4	14.6	16.0	22.0	5.8	3.6	6.1	19.1	60.0		36.9	tr		
14-18	B1	58.1	9.9	32.0	11.7	13.5	12.3	16.2	4.4	3.2	6.7	14.6	53.7		44.0	3		
18-26	B21t	44.6	16.4	39.0	11.0	14.6	8.2	8.3	2.5	2.2	14.2	8.2	42.1	14.5	56.7	3		
26-37	B22t	44.9	24.4	30.7	13.7	15.3	6.6	6.3	3.0	3.4	21.0	9.3	41.9		56.7	3		
37-52	B3	45.1	26.1	28.8	10.8	16.0	6.9	7.2	4.2	3.9	22.2	11.6	40.9	9.1	57.2	3		
52-71	C1	45.8	30.0	24.2	6.9	13.6	10.1	10.5	4.7	4.9	25.1	14.0	41.1		56.9	2		
71-95	C2	51.3	33.8	14.9	3.2	12.2	14.7	14.9	6.3	7.0	26.8	19.3	45.0		52.4	tr		
95-120	C3	54.8	32.3	12.9	2.1	9.4	15.0	19.5	8.8	7.6	24.7	25.2	46.0	2.1	50.1	tr		

Depth (In.)	6A1a Organic carbon a Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.		Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in./in.		pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-8	1.43	0.114	13	0.6			1.41	1.46	1.47	0.003	21.7	13.3	6.9	0.09		4.1	4.7
8-14	0.24	0.045		0.9			1.69	1.72	1.73	0.003	16.0	12.2	10.1	0.04		4.0	4.5
14-18	0.22			1.0			1.64	1.65	1.68	0.007	18.2	15.6	12.9	0.04		3.7	4.6
18-26	0.16			1.7			1.58	1.60	1.66	0.014	22.0	19.8	17.4	0.04		3.5	4.5
26-37	0.08			1.4			1.72	1.73	1.77	0.007	17.4	16.2	14.8	0.02		3.5	4.5
37-52	0.06			1.3				1.66					13.5			3.6	4.5
52-71	0.06			0.9			1.54	1.55	1.58	0.007	21.9	18.7	11.7	0.11		3.6	4.5
71-95	0.04			0.8									7.4			3.7	4.5
95-120	0.01			0.5									6.6			3.9	4.6

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	6L2a NH_4OAc-Ext. SO_4	Total Analysis 7C2: CaO	K_2O	Fe	2-0.15 mm.: CaO	K_2O	Fe	Base saturation: 5C3 Sum Cations	5C1 NH_4OAc
	meq/100 g										Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct	Pct.
0-8	-	0.5	0.1	0.1	0.7	8.0	8.7	5.1	1.2	tr							8	14
8-14	0.2	0.5	tr	0.1	0.8	6.1	6.9	3.4	0.9	0.3							12	24
14-18	0.1	0.5	tr	0.1	0.7	6.6	7.3	4.0	1.7	0.6							10	18
18-26	0.1	0.8	0.1	0.1	1.1	11.0	12.1	6.8	5.2	0.8	0.014	1.0	2.7	0.007	0.05	0.15	9	16
26-37	-	0.5	tr	0.1	0.6	9.8	10.4	7.1	6.1	0.6							6	8
37-52	-	0.4	tr	0.1	0.5	8.6	9.1	6.5	6.4	0.5	0.008	1.2	2.5	0.007	0.05	0.44	5	8
52-71	-	0.5	tr	0.1	0.6	8.9	9.5	6.2	6.4	0.4							6	10
71-95	-	0.4	tr	0.2	0.6	7.2	7.8	5.7	6.3	0.2							8	11
95-120	-	0.5	tr	0.1	0.6	5.2	5.8	3.8	3.3	0.3	0.007	2.3	1.4	0.008	0.34	0.39	10	16

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water		5A3b Bases Plus Al me/100g Clay
0-8	0.31	0.04	0.42		11.4
8-14	0.14	0.04	0.41		6.9
14-18	0.13	0.03	0.40		7.5
18-26	0.17	0.04	0.45		16.2
26-37	0.23	0.05	0.48		21.8
37-52	0.23	0.05	0.47		24.0
52-71	0.26	0.04	0.48		28.9
71-95	0.38	0.05	0.50		46.3
95-120	0.29	0.04	0.51		30.2

a. 6.7 kg/m² to 60 inches (Method 6A).
b. Estimated.

USDA SCS HYATTSVILLE MD 1984

Soil Classification: Oxic Tropudult; fine-loamy, mixed, isohyperthermic
Soil type: *Jagueyes **sandy loam**
Soil Nos.: S63PR-12-10.
Location: Este SCD, Puerto Rico, 7.5 kilometers southwest from Humacao and 7.7 kilometers north from Yabucoa, 1480 feet west from road junction at Mr. Santiago's farm, Tejas ward, Yabucoa town. Photo GS-LR-13-103.
Vegetation and use: Cultivated crops: sweet potatoes, tanniers.
Slope and land form: **5 percent. On the saddle along the longitudinal axis of a 100-foot wide interfluve. This is the third surface above the local drainage.**
Drainage and permeability: Moderately well drained, medium runoff and moderate permeability.
Parent material: **Residuum or very local colluvium from plutonic rocks.**
Rainfall: About 80 inches a year.
Samples collected by and date: W.E. McKinzie, R.B. Grossman, R.A. Boccheciamp on September 19, 1963.
Profile described by : W.E.McKinzie.

Horizon and Lincoln Lab. Number	
Ap 19020	0 to 8 inches, dark grayish brown (2.5Y 4/2) loam; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common fine roots; very strongly acid; clear smooth boundary. Field moisture 24.4 percent.
A3 19021	8 to 14 inches, yellowish brown (10YR 5/6) clay loam; weak medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; common fine roots; few medium black concretions; common fine shiny grains; many fine quartz grains; very strongly acid; clear smooth boundary. Field moisture 18.7 percent.
B1 19022	14 to 18 inches, yellowish brown (10YR 5/8) clay with few fine faint strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) ped coatings; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films; small pieces fail semiplastically upon slight pressure between fingers 1/; common fine roots; few medium black concretions; common fine black grains; many fine quartz grains; very strongly acid; clear smooth boundary. Field moisture 16.0 percent.
B21t 19023	18 to 26 inches, yellow (10YR 7/6) clay with many fine distinct dark red (2.5YR 3/6), many medium distinct red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; thin continuous clay films; small pieces fail semiplastically-

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Oxic Tropudult; fine-loamy, mixed, isohyperthermic

SOIL *Jagueyes sandy clay loam SOIL Nos. S63PR-12-11 LOCATION Este SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 19029-19032 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05)	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: (0.05–0.02)	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	<0.0002	<0.074	Coarse fragments: 2A2 > 2 (<19) Pct.	2–19 (Pct. of < 76mm)	19–76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-7	A1	50.1	16.9	33.0	12.2	18.0	8.6	8.4	2.9	2.5	14.4	9.0	47.2		51.4	6		
7-13	B21t	41.5	19.9	38.6	13.1	14.8	5.8	5.4	2.4	2.8	17.1	7.7	39.1	11.0	59.8	4		
13-27	B22t	39.0	27.4	33.6	14.2	12.9	4.4	4.4	3.1	4.2	23.2	9.5	35.9		62.9	5		
27-44	B3	39.5	30.3	30.2	13.9	11.9	3.6	5.3	4.8	5.9	24.4	13.6	34.7		63.3	6		

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.		Bulk density g/cc	g/cc	g/cc		Water content Pct.	Pct.	4B2 15-Bar Pct.			pH 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-7	1.02	0.121	8	1.2									15.2			3.9	4.4
7-13	0.39	0.049	8	1.3									17.1			3.6	4.1
13-27	0.21			1.3									16.7			3.6	4.2
27-44	0.13			1.2									15.5			3.8	4.5

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	6L2a NH_4OAc-Ext. SO_4		5A3b Bases Plus Al me/100g Clay				Base saturation: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct
	meq/100 g																
0-7	0.4	0.8	0.1	0.1	1.4	7.8	9.2	5.7	1.4	tr		8.5				15	25
7-13	-	0.7	tr	0.1	0.8	9.3	10.1	4.6	2.3	0.4		8.0				8	17
13-27	-	0.7	tr	0.1	0.8	6.6	7.4	4.3	3.0	0.3		11.3				11	19
27-44	-	0.4	tr	0.1	0.5	7.1	7.6	4.3	2.9	0.3		11.3				7	12

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water		
0-7	0.17	0.04	0.46		
7-13	0.12	0.03	0.44		
13-27	0.13	0.04	0.50		
27-44	0.14	0.04	0.51		

Soil Classification: Oxic Tropudult; fine-loamy, mixed, isohyperthermic
Soil type: *Jagueyes **sandy clay loam**
Soil Nos. S63PR-12-11.
Location: Este SCD, Puerto Rico, this is a satellite site of*Jagueyes loam S63PR-12-10 and is located 100 feet northwest from it.
Vegetation and use: Native grasses and weeds, used as pasture.
Slope and land form: Steep back slope (40 percent) of the next surface below*Jagueyes S63PR-12-10. The immediate area consists of three principal geomorphic surfaces. The first above the drain has slopes of 50 percent and more; the next higher surface has slopes of 20 to 40 percent. This profile is located in this surface. The summit of the interfluve remnants form the third surface. *Jagueyes 12-10 is located in that third surface. The intent of sampling this soil is to determine differences in morphology and soil characteristics related to differences in the stability of the geomorphic surfaces.
Drainage and permeability: Moderately well drained, medium to rapid runoff, moderate permeability.
Parent material: **Residuum or very local sideslope colluvium from plutonic rocks.**
Rainfall: About 80 inches a year.
Samples collected by and date: W.E. McKinzie, R.B. Grossman, R.A. Boccheciamp on September 19, 1963.
Profile described by: R.A. Boccheciamp.

Horizon and Lincoln Lab. Number	
A1 19029	0 to 7 inches, brown (10YR 5/3) clay loam with few fine faint gray (5Y 6/1) mottles; weak fine granular structure; soft, friable, slightly sticky, slightly plastic; many fine roots; many fine quartz grains; strongly acid; clear smooth boundary.
B21t 19030	7 to 13 inches, reddish yellow (5YR 6/6) clay with yellowish brown (10YR 5/4) coatings; weak medium subangular blocky structure; friable, nonsticky, slightly plastic; thin patchy clay films; small pieces fail semiplastically upon slight pressure between fingers 1/; common fine roots; many quartz grains; strongly acid; clear smooth boundary.
B22t 19031	13 to 27 inches, light red (2.5YR 6/6) clay with light reddish brown (5YR 6/4) coatings; weak medium subangular blocky structure; firm, nonsticky, slightly plastic; thin patchy clay films; small pieces fail semiplastically upon slight pressure between fingers 1/; common fine roots; many quartz grains; strongly acid; clear smooth boundary.
B3 19032	27 to 44 inches, light red (2.5YR 6/8) clay; weak coarse subangular blocky structure; friable, nonsticky, slightly plastic; few fine roots; many quartz grains; strongly acid; clear smooth boundary. 10 percent of this horizon consists of saprolite.
C	44 to 56 inches, variegated colors of the saprolite; silty clay loam; massive; friable, nonsticky, slightly plastic; many weathered feldspar grains; strongly acid.

1/ - See introductory part of the Soil Survey Investigations Report for an explanation of this and similar terms that are designed to describe the failure of the material in its natural state of organization.

Remarks: A1, B22t and C horizons sampled for the Bureau of Public Roads. Colors given are for the moist soil. Reaction determined by Soiltex. Several checks for depth to saprolite were made in the area. This soil may be on the deep side, but not too much.

Clay Mineralogy (Method 7A): B21t horizon. The clay is dominated by a well crystallized kaolinite. A very small amount of mica; very small amounts of interstratified minerals are present. The clay mineralogy is similar to that of the B21t of *Jagueyes S63PR-12-10.

Sand Mineralogy (Method 7B1): B22t horizon. Very fine sand and total sand crushed to fine and very fine sand were examined. The total sand mount contains 10 percent weatherable grains (based on a count), mostly feldspar remnants, with a refractive index substantially below 1.550. The very fine sand contains about 50 percent weatherable grains, mostly highly weathered feldspar remnants(?) as described for the total sands, but also with substantial platy grains, most of which may be kaolinite. Magnetite(?) is a common accessory.

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Oxic Tropudult; clayey, oxidic, isohyperthermic

SOIL Series not designated SOIL Nos. S58PR-4-2 LOCATION Cibuco SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 9784-9790 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05) a	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int III (0.02–0.002)	Silt: Int. II (0.2–0.02)	(2–0.1)	3A1c Water-Disp. Clay <0.002		Coarse fragments: 2A2 > 2 (<19) Pct.	2 - 19 (Pct. of < 76mm)	19 - 76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-7	Ap	16.7	26.9	56.4	0.2	2.2	3.4	6.9	4.0	5.6	21.3	13.2	12.7			-		
7-17	B21t	18.1	36.9	45.0	-	1.3	2.8	8.8	5.2	6.9	30.0	17.1	12.9	tr		-		
17-28	B22t	17.1	43.5	39.4	0.2	1.8	2.7	7.0	5.4	8.7	34.8	18.1	11.7			-		
28-38	B31	18.2	42.3	39.5	0.3	2.6	3.3	6.4	5.6	8.6	33.7	17.7	12.6			-		
38-48	B32	16.8	43.9	39.3	0.3	3.2	3.3	5.4	4.6	8.0	35.9	15.5	12.2			-		
48-58	C1	19.2	47.9	32.9	0.4	3.3	3.4	6.2	5.9	8.9	39.0	18.2	13.3			tr		
58-72+	C2	19.9	47.5	32.6	0.3	2.3	3.2	7.4	6.7	8.9	38.6	19.8	13.2			-		

Depth (In.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct		Bulk density: g/cc	Bulk density: g/cc	4A1h Oven-Dry g/cc		Water content: Pct	Water content: Pct.	4B2 15-Bar Pct.			pH: 8C1c (1:1) N KCl	pH: 8C1a (1:1) H_2O

Soil Classification: Oxic Tropudult; clayey, oxidic, isohyperthermic
Soil Type: Series not designated
Soil Nos.: 858PR-4-2
Location: Cibuco Soil Conservation District, Puerto Rico. 100 meters southeast of Nicolas Rodriguez Padilla School (2nd Unit). Aerial Photo GS-LR-14-185.
Elevation: 240 meters.
Precipitation: 80 inches plus or minus.
Vegetation and Use: Cultivated - Yuca (casava).
Slope and Land Form: 8 percent east by northeast convex slope in mountainous topography.

Drainage and Permeability: Well drained, moderate permeability.
Parent Material: Residuum or local colluvium from early Tertiary volcanic conglomerate that contains rock fragments of greatly varying size.
Collected by: L. T. Alexander, F. Llavat-Cristy, R. E. Gierbolini, J. Juarez, K. W. Flach, L. H. Rivera and T. U. Yager, November 4, 1958.
Described by: T. U. Yager.

Horizon and
Lincoln
Lab. No.

[illegible] 0 to 7 inches. Reddish brown (5YR 4/4) clay; strong [illegible] fine granular structure; [illegible]

B21t
9785
7 to 17 inches. Red (2.5YR 4/6) clay; moderate medium and fine subangular blocky structure; firm; thin patchy clay films, few small (0.5 mm.) pores; gradual wavy boundary.

B22t
9786
17 to 28 inches. Red (2.5YR 4/6) clay, slightly more yellow than B21t; moderate medium and fine subangular blocky structure; firm; thin clay films and an occasional thick patchy one; gradual smooth boundary.

B31
9787
28 to 38 inches. Yellowish red (5YR 5/6) clay somewhat coarser than B22t; weak medium and fine subangular blocky structure; firm, slightly plastic, nonsticky; thin clay films and an occasional thick patchy one; some evidence of texture of parent material in isolated areas; gradual wavy boundary.

B32
9788
38 to 48 inches. Yellowish red (5YR 4/6) clay with fine spots of red (2.5YR 4/6) and light gray; weak coarse subangular blocky structure; friable, slightly plastic, nonsticky; occasional thin patchy clay films; shows evidence of the parent rock texture in 25 percent or more of an exposed face; clear wavy boundary.

C1
9789
48 to 58 inches. Yellowish red (5YR 4/6) silty clay loam; massive; friable, slightly sticky, nonplastic; tongues of B32 contain few thin clay films; shows evidence of the parent rock texture in 75 percent of an exposed face; gradual wavy boundary.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Oxic Tropudult; clayey, kaolinitic, isohyperthermic

SOIL Series not designated SOIL Nos. S61PR-12-1 LOCATION Este SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16848-16851 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1													Coarse fragments		
		Total			Sand					Silt					2A2		
		Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0.002)	Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0.25–0.1)	Very fine (0.1–0.05)	(0.05–0.02)	Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)		> 2 (<19) Pct.	2 - 19	19 - 76
		Pct. of < 2 mm													Pct. of < 76mm		

Soil Classification: Oxic Tropudult; clayey, kaolinitic, isohyperthermic
Soil Type: Series not designated
Soil Nos.: S61PR-12-1
Location: Este Soil Conservation District, Puerto Rico, 250 feet south of kilometer 9.1, Highway No. 182, 20 feet south of deep gully.
Vegetation and Use: Hicaco trees, cerrillo grass and used for pasture.
Slope and Land Form: 25 percent. Southeast aspect. There is one major land surface between the sample site and the present drainageway.
Drainage and Permeability: Moderately well drained to somewhat poor; runoff medium. Permeability is moderate.
Parent Material: Residuum or very local colluvium from plutonic rock.
Collected by: R. B. Grossman, W. E. McKinzie, R. Boccheciamp, J. Juarez, December 11, 1961.
Described by: W. E. McKinzie and R. Boccheciamp, December 11, 1961.

Horizon and Lincoln Lab. No.	
Ap 16848	0 to 8 inches. Yellowish brown (10YR 5/4) sandy clay loam; weak fine granular structure moist; friable when moist; very strongly acid; clear smooth boundary, horizon 4 to 12 inches thick.
B21t 16849	8 to 17 inches. Light yellowish brown (10YR 6/4) clay; color result of continuous clay films on soil peds; interior of soil peds yellowish brown (10YR 5/6); moderate coarse prismatic structure moist; firm when [illegible] roots; clear wavy boundary, horizon 6 to 12 inches thick.
B22t 16850	17 to 32 inches. Light yellowish brown (10YR 6/4) clay; color result of continuous clay films on soil peds; interior of peds yellowish brown (10YR 5/8) with common medium distinct red (2.5YR 4/6) mottles; moderate coarse subangular blocky structure moist; [illegible] strongly acid; clay films in pores and root channels; gradual wavy boundary, horizon 12 to 20 inches thick.
B23t 16851	32 to 43 inches. Red (2.5YR 4/6) clay; weak medium and coarse subangular blocky structure with patchy clay films on peds wet; [illegible]

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Plinthic Tropudult; clayey, mixed, isohyperthermic

SOIL Vega Alta silty clay loam SOIL Nos. S61PR-9-2 LOCATION Rio Piedras Experiment Station, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16886-16891 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: (0.05-0.02)	Silt: Int. III (0.02-0.002)	Silt: Int. II (0.2-0.02)	(2-0.1)			Coarse fragments: 2A2 > 2 (<19) Pct	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-8	Ap	22.4a	39.3	38.3	4.8	5.2	3.0	5.0	4.4	8.8	30.5	16.0	18.0			25		
8-14	B1	11.8a	34.0	54.2	1.7	2.0	1.6	3.3	3.2	7.6	26.4	12.7	8.6			16		
14-25	B21t	10.2a	27.0	62.8	1.2	1.3	1.1	3.2	3.4	6.6	20.4	12.0	6.8			tr		
25-36	B22t	17.4a	28.7	53.9	1.1	1.7	2.4	6.6	5.6	8.0	20.7	17.5	11.8			5		
36-52	B23t	26.1a	28.0	45.9	0.6	2.1	3.9	11.7	7.8	7.1	20.9	21.8	18.3			tr		
52-84	B24t	10.2b	37.0	52.8	1.4	1.4	1.3	3.1	3.0	4.1	32.9	9.0	7.2			9		

Depth (In.)	6A1a Organic carbon c Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct	Bulk density: 4A1a Field-State g/cc	4A1c 30-cm. g/cc	4A1b Air-Dry g/cc	4D1 COLE d	Water content: 4B4 Field-State Pct.	4B3 30-cm. Pct.	4B1b 1/3-Bar Pct.	4B2 15-Bar Pct.	pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-8	2.09	0.212	10	4.7		1.22	1.28	1.35	0.036	35.9e	25.4	30.4	18.4	4.8	5.4
8-14	0.49	0.083	6	5.8		1.30	1.32	1.44	0.036	32.5f	28.3	31.0	25.1	5.5	5.5
14-25	0.41	0.062	7	7.4		1.34	1.33	1.44	0.024	33.2g	32.8	36.0	27.8	3.6	5.2
25-36	0.23			7.8		1.35	1.34	1.46	0.028	33.5h	33.5	33.8	24.7	3.5	4.9
36-52	0.14			7.4									21.6	3.5	4.7
52-84	0.10			7.4									23.1	3.5	4.8

Depth (In.)	Extractable bases 5B1a: 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	5A3b Bases Plus Al me/100g Clay	Base saturation: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g								>			
0-8	7.4	1.2	0.2	tr	8.8	12.8	21.6	15.2	0.2	23.5	41	58
8-14	6.6	0.8	0.2	0.1	7.7	8.2	15.9	10.4		14.2	48	74
14-25	4.0	1.1	0.2	0.1	5.4	14.4	19.8	12.5	3.1	13.5	27	43
25-36	1.9	1.2	0.2	0.1	3.4	16.4	19.8	12.8	5.7	16.9	17	26
36-52	0.9	1.4	0.1	0.1	2.5	15.6	18.1	11.9	7.1	20.9	14	21
52-84	0.3	2.1	0.1	0.2	2.7	18.9	21.6	16.0	10.6	25.2	12	17

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-8	0.40	0.12	0.48
8-14	0.19	0.11	0.46
14-25	0.20	0.12	0.44
25-36	0.24	0.14	0.46
36-52	0.26	0.16	0.47
52-84	0.30	0.14	0.44

a. Earthy nodules: > 50 percent (2-0.5 mm.); 5-25 percent (0.5-0.05 mm.).
b. Earthy nodules: > 50 percent (2-0.05 mm.).
c. 7.9 kg/m^2 to 36 inches (Method 6A).
d. Field state.
e. Field-determined value: 33.9 percent.
f. Field-determined value: 35.0 percent.
g. Field-determined value: 38.2 percent.
h. Field-determined value: 35.6 percent.

USDA-SCS HYATTSVILLE MD 1964

Soil Classification: Plinthic Tropudult; clayey, mixed, isohyperthermic
Soil Type: Vega Alta silty clay loam
Soil Nos.: S61PR-9-2
Location: **San Juan SCD, Rio Piedras Experiment Station, Puerto Rico, 150 feet north radio station (50 feet south of trail).**
Vegetation and Use: Merker grass. Area has been in grass for several years.
Slope and Land Form: Nearly level - (1 percent) coastal terrace.
Drainage and Permeability: Well drained, surface runoff medium. Permeability moderate.
Parent Material: Old coastal alluvium.
Collected by: I. L. Martin, J. Juarez, R. B. Grossman, W. E. McKinzie, October 11, 1961.
Described by: W. E. McKinzie, October 11, 1961.

Horizon and Lincoln Lab. No.	
Ap 16886	0 to 8 inches. Dark yellowish brown (10YR 3/4) silty clay loam; moderate fine granular structure; friable when moist, slightly sticky and slightly plastic when wet; many fine manganese concretions; strongly acid; roots common; abrupt wavy boundary.
B1 16887	8 to 14 inches. Reddish yellow (7.5YR 6/8) and yellowish red (5YR 4/6) silty clay; weak medium and coarse subangular blocky breaking to moderate fine granular structure with a few thin patchy clay films on peds and in root channels; firm when moist, slightly sticky and slightly plastic when wet; strongly acid; many fine manganese concretions; few roots; clear wavy boundary.
B21t 16888	14 to 25 inches. Red (2.5YR 4/8) and strong brown (7.5YR 5/8) clay; moderate medium and coarse subangular blocky grading to weak coarse blocky structure with clay films on about 50 percent of ped surfaces; firm when moist, slightly sticky and slightly plastic when wet; strongly acid; few fine manganese concretions; few roots; gradual wavy boundary.
B22t 16889	25 to 36 inches. Red (2.5YR 4/8) mottled with brownish yellow (10YR 6/8) and red (2.5YR 4/8) clay with the red material being a clay loam; weak medium and coarse subangular blocky; firm when moist, nonsticky and nonplastic when wet; strongly acid; brownish yellow (10YR 6/6) clay films in root and worm channels; few fine quartz grains; gradual wavy boundary.
B23t 16890	36 to 52 inches. Red (10R 4/8) with strong brown (7.5YR 5/8) and light gray (5Y 7/1) clay with red materials being a clay loam; massive; friable when moist, nonsticky and nonplastic when wet; strongly acid; few thin manganese coatings; illuvial clay in pockets and in seams between cleavage planes; few roots; gradual wavy boundary.
B24t 16891	52 to 84 inches. Red (10R 4/8) mottled with brownish yellow (10YR 6/8) and light gray (5Y 7/1) clay; massive; friable when moist, nonsticky and nonplastic when wet; clay appears to be developing in place in lenses parallel to the surface; few tongues of manganese coatings; no roots.

Remarks: Colors given are for moist soil.

Mineralogy, Micromorphology (Methods 7B1, 4E1). Dark nodules in the coarse sand are common near the surface and decrease with depth. The bottom horizon contains a fair proportion of earthy-looking aggregates. The very fine sand consists mainly of opaques, coated grains, and quartz-feldspar intergrowths with the patches of feldspar largely altered to clay-size particles. There is a smaller percentage of discrete quartz grains and altered feldspar. Ferromagnesian minerals are very scarce. In thin section, the B21t shows distinct clay films and strong orientation of the clayey matrix.

Probably has over 10 percent weatherable material in the sand and silt of argillic horizon.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Tropustult; clayey, mixed, isohyperthermic

SOIL: Palmarejo loam SOIL Nos. S57PR-14-2 LOCATION: Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska LAB. Nos. 7387-7391 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05) a	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	3A1c Water Disp. Clay		Coarse fragments: 2A2 > 2 (<19) Pct.	2 – 19 (Pct. of < 76 mm)	19 – 76 (Pct. of < 76 mm)
		Pct. of < 2 mm																
0-9	Ap	41.2	37.6	21.2	3.1	7.3	6.3	13.4	11.1	16.4	21.2	34.9	30.1			2		
9-18	B21t	27.9	16.2	55.9	1.2	7.2	5.3	8.4	5.8	6.1	10.1	16.2	22.1			1		
18-30	B22t	31.2	22.3	46.5	3.0	7.1	5.0	9.1	7.0	7.0	15.3	18.8	24.2	33		2		
30-41	C1	40.3	27.7	32.0	6.4	10.9	6.0	9.8	7.2	5.5	22.2	17.9	33.1			8		
41-52+	C2	53.0	25.5	21.5	12.8	16.6	6.7	9.7	7.2	5.7	19.8	17.8	45.8			tr		

Depth (in.)	6A1a Organic carbon Pct.	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.		Bulk density g/cc	g/cc	g/cc		Water content Pct.	Pct.	4B2 15-Bar Pct.		Base Sat. 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.	pH 8C1c 1:1 (N KCl)	8C1a 1:1 (H_2O)
0-9	1.64	0.149	11	2.3									11.7		20	29	3.4	4.5
9-18	0.80	0.093	9	4.7									26.3		18	26	3.1	4.6
18-30	0.49	0.053	9	5.1									21.9		15	22	3.1	4.7
30-41	0.21			2.0									15.4		18	23	3.2	4.7
41-52+	0.11			3.8									11.7		21	26	3.3	4.8

Depth (in.)	Extractable bases 5B1a: 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		Water extract from saturated paste 8A1: 6F1a Na	6Q1a K		CO_3	HCO_3	Cl	SO_4	8A1a Electrical conductivity
	meq/100 g										meq/liter							mmho/cm
0-9	2.3	1.1	0.1	0.3	3.8	15.1	18.9	13.3	2.4		1.2	0.3						0.8
9-18	3.2	1.4	0.4	0.2	5.2	23.0	28.2	19.7	8.1		1.0	-						0.2
18-30	2.0	1.1	0.5	0.2	3.8	20.9	24.7	17.4	9.2		1.4	-						0.2
30-41	1.3	1.5	0.7	0.2	3.7	16.8	20.5	16.4	10.7		2.2	0.1						0.3
41-52+	1.1	1.8	0.6	0.2	3.7	13.9	17.6	14.5	8.8		2.8	0.1						0.5

Depth (in.)	8A Water at Saturation Pct.	5D2 Exchangeable Na Pct.	5A3b Bases Plus Al me/100g Clay	6F1a Gypsum Pct.	Ratios to Clay 8D1: NH_4OAc GEC	Ext. Iron	15-Bar Water
0-9	48.6		29.2	-	0.63	0.11	0.55
9-18	111	2	23.8	-	0.35	0.08	0.47
18-30	99.2	2	28.0	-	0.37	0.11	0.47
30-41	67.6	4	45.0	-	0.51	0.06	0.48
41-52+	45.2	3	58.1	-	0.67	0.18	0.54

a. Earthy nodules: 25-50 percent.

See introductory part of this SSIR for discussion of several of the determinations.

USDA SCS HYATTSVILLE, MD 1964

Soil Classification: Typic Tropustult; clayey, mixed, isohyperthermic
Soil Type: Palmarejo loam
Soil Nos.: 857PR-14-2
Location: 50 yards south of bridge No. 960+85 along main irrigation canal. Approximately 2 miles southwest of Sample 857PR-14-1. Area: Puerto Rico, Lajas Valley, Suroeste Soil Conservation District.
Climate: Semiarid - annual precipitation 30 to 40 inches a year.
Slope: 1 to 2 percent.
Relief: Smooth.
Drainage: Moderately well drained.
Crop: Sugar cane.
Erosion: None to slight.
Root Distribution: Abundant in Ap but old root channels evident down to B22t.
Soil Temperature: 27.5 degrees C. at 42 inches.
Collected by: L. T. Alexander, C. J. Koch, J. A. Bonnet, R. E. Gierbolini, J. Juarez, Jr., and J. E. Trigo, September 5, 1957.
Described by: C. J. Koch.

Horizon and Lincoln Lab. No.	
Ap 7387	0 to 9 inches. Dark brown (7.5YR 3/2) loam with weak medium granular structure; friable; few small iron-impregnated volcanic fragments; smooth abrupt boundary.
B21t 7388	9 to 18 inches. Yellowish brown (10YR 5/6) clay with distinct spots of dark brown (7.5YR 3/2) from Ap; moderate medium subangular blocky structure with tendency toward prismatic; slightly sticky; few small iron-impregnated volcanic fragments; clay skins are found on peds; clear smooth boundary.
B22t 7389	18 to 30 inches. Yellowish brown (10YR 5/8) clay with common medium distinct mottles of red (10R 4/8); moderate medium subangular blocky structure with tendency toward prismatic; clay skins present; sticky and plastic; clear smooth boundary.
C1 7390	30 to 41 inches. Mixed yellowish brown (10YR 5/8) and white (7.5YR 8/0) clay; massive, sticky and plastic; many iron-impregnated volcanic fragments, some may be indurated plinthite fragments; clear smooth boundary.
C2 7391	41 to 52 inches plus. Mixed white (7.5YR 8/0) and red (10R 4/8) clay; massive; sticky and plastic; many iron-impregnated volcanic fragments, some may be indurated plinthite fragments.

Remarks: The Palmarejo soils occur on gently sloping alluvial fans in the semiarid portion of southwestern Puerto Rico. They are derived principally from volcanic rocks in the surrounding hills.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Typic Acrorthox; clayey, oxidic, isohyperthermic

SOIL: Nipe clay — SOIL Nos. S57PR-8-1, S57(61)PR-8-1[a] — LOCATION: Oeste SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska — LAB. Nos. 7442-7448 (16867-16873)[a] — November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A2: Total: Sand (2-0.05) b	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	3A1c Water Disp. Clay		Coarse fragments: 2A2 > 2 (<19) Pct.	2-19	19-76
		Pct of < 2 mm														Pct. of < 76mm		
0-11	A1	9.2	36.3	54.5	1.5	2.0	0.9	2.3	2.5	6.7	29.6	10.6	6.7	22c		tr		
11-18	B1	7.4	34.9	57.7	2.9	1.5	0.6	1.1	1.3	7.1	27.8	9.0	6.1	33		tr		
18-28	B21	9.8	30.6	59.6	2.3	0.9	0.4	1.4	4.8	13.4	17.2	19.2	5.0	37		tr		
28-38	B22	23.3	21.0	55.7	2.5	1.8	1.1	6.0	11.9	9.4	11.6	25.9	11.4	2		tr		
38-48	B23	17.0	23.3	59.7	1.7	1.8	1.1	4.3	8.1	9.2	14.1	20.3	8.9	42		tr		
48-62	B24	19.2	27.2	53.6	4.0	3.3	1.4	3.5	7.0	10.2	17.0	19.5	12.2	32d		17		
62-70+	C1	17.1	45.3	37.6	8.8	4.0	1.0	1.4	1.9	10.1	35.2	12.8	15.2	34		tr		

Depth (In.)	6A1a Organic carbon e Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.		Bulk density: 4A1a Field-State g/cc	4A1c 30-cm. g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B3 30-cm. Pct.	4B1b 1/3-Bar Pct	4B2 15-Bar Pct.		pH: 8C1c 1:1 (N-KCl)	8C1a 1:1 (H_2O)
0-11	6.04	0.390	15	13.0			1.08	1.21	1.30	0.064f	43.2	29.9	35.4	26.5		4.3	5.1
11-18	2.04	0.131	16	12.9			1.18	1.27	1.32	0.040f	36.8	32.9	26.7	22.8		4.4	5.0
18-28	1.33			16.5			1.08	1.18	1.23	0.044f	41.5g	37.7	34.4	24.8		4.7	5.0
28-38	0.86			19.2			1.30	1.34	1.38	0.010	38.6h	37.4	35.7	25.9		5.7	5.2
38-48	0.72	0.048	15	23.1			1.36	1.38	1.42	0.010	37.1	36.6	31.6	26.4		6.1	5.5
48-62	0.56			25.7			1.33	1.36	1.38	0.003	38.0	37.8	29.8	24.5		6.4	5.7
62-70+	0.19			27.3			1.72	1.70	1.72	0.003	24.4	25.4	22.7	18.0		6.7	5.8

Depth (In.)	Extractable bases 5B1a: 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4 OAc	6G1d KCl-Ext. Al	5A3b Bases Plus Al me/100g Clay					Base saturation: 5C3 Sum Cations Pct	5C1 NH_4OAc Pct.
	meq/100 g															
0-11	1.3	1.4	0.1	0.1	2.9	31.9	34.8	25.4	1.4	7.9					8	11
11-18	0.1	-	-	-	0.1	21.4	21.5	12.1	0.9	1.7					tr	1
18-28	-	-	-	-	-	15.7	15.7	8.2							-	-
28-38	-	-	-	-	-	12.8	12.8	6.4							-	-
38-48	-	0.1	-	-	0.1	12.0	12.1	5.3	tr	0.2					1	2
48-62	-	-	-	-	-	12.8	12.8	3.8	tr	tr					-	-
62-70+		-	-	-	-	9.4	9.4	1.4	tr	tr					-	-

Depth (In.)	Ratios to Clay 8D1: NH_4 OAc CEC	Ext. Iron	15-Bar Water
0-11	0.47	0.24	0.49
11-18	0.21	0.22	0.40
18-28	0.14	0.28	0.42
28-38	0.11	0.34	0.46

a. Site resampled in 1961 for bulk density and moisture determinations.
b. Earthy nodules: > 50 percent.
c. 18 percent after sodium-sulfate pretreatment; 25 percent after potassium-sulfate pretreatment. (Stand overnight in one normal salt solution, wash free of excess salts.)
d. A trace after sodium-sulfate pretreatment; none after potassium-sulfate pretreatment.
e. 38 kg/m² to 60 inches (Method 6A).
f. Based on field-state bulk density.

Soil Classification: Typic Acrorthox; clayey, oxidic, isohyperthermic
Soil Type: Nipe clay
Soil Nos.: S57PR-8-1
Location: One-half mile west of kilometer marker 5.5 on Highway No. 349. On crest of hill under mango trees. Photo GS-LR-11-32.
Area: Puerto Rico, Oeste SCD, Las Mesas ridge.
Climate: Hot - humid. Precipitation 80 to 90 inches a year.
Slope: 2 to 3 percent.
Relief: The land surface at this site is planar.
Drainage: Well drained.
Vegetation: Native grasses and trees.
Erosion: Slight to moderate.
Soil Temperature: 25 degrees C. at 48 inches.

Collected by: L. T. Alexander, C. J. Koch, Juan Juarez, Jr., and J. E. Trigo, September 11, 1957.
Described by: C. J. Koch.

Horizon and
Lincoln
Lab. No.

A1
7442 — 0 to 11 inches. Dark reddish brown (2.5YR 2/4) clay; strong fine granular structure; friable; peds have shiny appearance, but do not have clay skins; very strongly acid; smooth abrupt boundary.

B1
7443 — 11 to 18 inches. Dark reddish brown (2.5YR 3/4) clay (has feel of clay loam); weak fine angular blocky structure; very friable, nonsticky, nonplastic; no clay skins; extremely acid; smooth clear boundary.

B21
7444 — 18 to 28 inches. Dark red (7.5R 3/8) clay; weak fine angular blocky structure; very friable, nonsticky, nonplastic; no clay skins; extremely acid; arbitrary boundary.

B22
7445 — 28 to 38 inches. Dusky red to dark red (7.5R 3/4 to 3/6) clay; massive; firm, nonsticky and nonplastic when wet; no clay skins; few small iron-coated gravel (probably serpentine); extremely acid; arbitrary boundary.

B23
7446 — 38 to 48 inches. Dusky red to dark red (7.5R 3/4 to 3/6) with streak of strong brown (7.5YR 5/6); clay; massive; friable, nonsticky, nonplastic; no clay skins; few iron-coated fragments; extremely acid; clear boundary.

B24
7447 — 48 to 62 inches. Dark red (7.5R 3/6) with streaks of strong brown (7.5YR 5/6) clay; massive; friable, non-[redacted]

C1
7448 — 62 to 70 inches plus. Dusky red (7.5R 3/4) clay; massive; very firm, nonsticky, nonplastic; no clay skins; medium acid.

Remarks: Site resampled in 1961 for bulk density and moisture determinations. Nipe is an Oxisol developed from serpentinite and occupies mesa-like hilltops in western Puerto Rico. It is a deeply weathered soil having all the characteristics of an old soil. This soil is limited in extent, but is important for the genetic processes it represents. The B2 horizon, when exposed, has a tendency to harden. Colors are for moist soils unless otherwise stated.

Mineralogy (Method 7A). Analyses on < 2-mm. material.

Horizon	Depth Inches	Kaolinite 1/ %	Gibbsite 1/ %	Goethite 2/	Quartz 2/
A1	0-11	5	25	x	xxx
B1	11-18	10	25	x	xxx
B21	18-28	20	30	xx	xx
B22	28-38	20	30	xx	x
B23	38-48	12	30	xx	x
C1	48-62	10	40	xx	-
C2	62-70+	3	60	xxx	-

1/ Differential thermal analyses.
2/ X-ray powder patterns.
Amounts estimated are: - = none detected; x = small; xx = moderate; xxx = abundant.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Eutrorthox; clayey, mixed, isohyperthermic

SOIL: Bayamón clay — SOIL Nos.: S63PR-7-1 — LOCATION: Norte SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska — LAB. Nos.: 18930-18935 — January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1: Total: Sand (2-0.05) a	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: (0.05-0.02)	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.0002	<0.074	Coarse fragments: 2A2 > 2 (<19) Pct.	2-19 (Pct. of < 76mm)	19-76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-8	Ap	19.2	7.7	73.1	-	1.4	6.2	9.8	1.8	1.6	6.1	7.3	17.4		81.8	-		
8-18	B21	12.3	6.5	81.2	0.1	1.0	3.5	6.3	1.4	1.1	5.4	5.2	10.9		88.3	-		
18-27	B22	9.3	5.2	85.5	0.3	0.7	2.7	4.7	0.9	1.7	3.5	4.5	8.4	42.3	91.1	-		
27-39	B23	5.8	4.7	89.5	0.1	0.3	1.8	3.1	0.5	0.1	4.6	1.9	5.3		94.4	-		
39-51	B3	3.1	6.3	90.6	-	0.2	0.9	1.6	0.4	-	6.3	1.1	2.7		97.1	-		
51+	R																	

Depth (In.)	6A1a Organic carbon b Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	6E1b 6E2a Carbonate as $CaCO_3$ Pct.		Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in/in.		pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-8	2.73	0.227	12	7.2			1.22	1.2c	1.42		35.1		26.7			4.9	5.6
8-18	0.94	0.145	6	8.3			1.25	1.3c	1.41		34.7		30.1			4.7	5.4
18-27	0.55	0.110	5	7.8			1.23	1.26	1.37	0.028	36.1	34.2	32.5	0.02		5.4	5.9
27-39	0.35			8.3			1.25	1.26	1.40	0.036	35.0	33.9	30.1	0.05		5.2	5.6
39-51	0.25			8.8			1.29	1.28	1.46	0.044	34.9	34.9	29.8	0.07		5.7	5.7
51+					98												

Depth (In.)	Extractable bases 5B1a: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	6L2a NH_4OAc Ext. SO_4		5A3b Bases Plus Al me/100g Clay				Base saturation: 5C3 Sum Cations Pct	5C1 NH_4OAc Pct.
	meq/100 g																
0-8	8.1	2.1	0.1	0.6	10.9	15.6	26.5	15.1		1.1		14.9				41	72
8-18	4.2	1.6	0.1	0.6	6.5	13.2	19.7	9.5	0.3	2.8		8.4				33	68
18-27	5.0	1.5	0.2	0.4	7.1	12.0	19.1	8.6	-	2.4		8.3				37	83
27-39	5.9	1.9	0.2	0.1	8.1	11.0	19.1	9.8		3.0		9.1				42	83
39-51	10.2	1.9	0.3	0.1	12.5	8.8	21.3	14.1		1.3		13.8				59	89
51+																	

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water		
0-8	0.21	0.10	0.37		
8-18	0.12	0.10	0.37		
18-27	0.10	0.09	0.38		
27-39	0.11	0.09	0.34		
39-51	0.16	0.10	0.33		
51+					

a. Earthy nodules: > 50 percent (2-0.5 mm.); 5-25 percent (0.5-0.05 mm.).
b. 14 kg/m² to 51 inches (Method 6A).
c. Estimated.

USDA SCS HYATTSVILLE MD 1964

Soil Classification: Tropentic Eutrorthox: clayey, mixed, isohyperthermic

Soil No.: S63PR-7-1
Location: Norte SCD, Puerto Rico; 2 kilometers northeast of Vega Alta, Puerto Rico; 1.7 kilometers north on Highway No. 694 (from kilometer 28.5 on Highway 2), left 0.8 kilometer, by dairy barn 0.2 kilometer. Photo number GS-IR-5-22.
Vegetation and use: Pangola grass, used for pasture.
Slope and land form: 3 percent. Terrace or alluvial fan immediately north of limestone hills.

Drainage and permeability: Well drained, medium runoff and medium internal drainage. Permeability is moderate.
Parent materials: Transported sediments derived from weathered limestone and quartzitic sand deposits.
Rainfall: About 80 inches a year.
Collected by and date: R.B. Grossman, W.E. McKinzie, J. Juarez, and L.H. Rivera on September 30, 1963.
Described by: L.H. Rivera.

Horizon and Lincoln Lab. Number	
Ap 18930	0 to 8 inches, dark reddish brown (5YR 3/4) clay; weak fine subangular blocky structure, slightly hard, firm, slightly sticky, slightly plastic; common fine roots; common sand size subrounded quartz grains; common fine black grains; pH 5.0; clear smooth boundary. Field moisture: 33.4 percent.
B21 18931	8 to 18 inches, dark red (2.5YR 3/6) moist, red (2.5YR 4/6) dry; clay; weak fine and medium subangular blocky breaking to moderate medium granular structure; friable, slightly sticky, slightly plastic; small pieces fail abruptly upon slight pressure between fingers 1/; common pressure surfaces and possible thin patchy clay films; common fine black grains; common fine quartz grains; common fine roots; common fine pores; pH 5.0; gradual smooth boundary. Field moisture, 60.7 percent.
B22 18932	18 to 27 inches, dark red (2.5YR 3/6) moist red (2.5YR 4/6) dry; clay; weak fine subangular blocky structure; friable slightly sticky, slightly plastic; small pieces fail abruptly upon slight pressure between fingers 1/; common pressure surfaces and possible thin patchy clay films; few fine black grains; common fine subrounded quartz grains; few fine roots; common fine pores; pH 5.0; gradual smooth boundary. Field moisture: 39.9 percent.
B23 18933	27 to 39 inches, red (2.5YR 4/6) clay; weak fine and medium subangular blocky breaking to moderate medium granular structure; friable, slightly sticky, slightly plastic; small pieces fail abruptly upon slight pressure between fingers 1/; common pressure surfaces and possible thin patchy clay films; common fine black grains; common sand-size subrounded quartz grains; few fine roots; common fine pores; pH 5.0; gradual smooth boundary. Field moisture: 38.6 percent.
B3 18934	39 to 51 inches, red (2.5YR 4/6) clay; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; small pieces fail semiplastically upon slight pressure between fingers 1/; common sand-size quartz grains; few fine black grains; pH 5.0; abrupt wavy boundary. Field moisture: 39.8 percent.
R 18935	51 inches plus. White hard limestone probably of the Aymamón formation.

1/ - See introductory part of the Soil Survey Investigations Report for an explanation of this and similar terms that are designed to describe the failure of the material in its natural state of organization.

Remarks: Ap, B22 and B3 horizons sampled for the Bureau of Public Roads. Colors given are for moist soil unless otherwise noted. Soil was about field capacity when sampled. Reaction determined by Soiltex.

Mineralogy (Method 7A): B22 horizon. The clay is principally kaolinite and halloysite with trace amounts of mica and chlorite. A very small amount of gibbsite may be present. The clay has rather poor crystalline quality. Differential thermal analysis indicates 45 percent kaolinite. Small amounts, about 10 percent or less, each of gibbsite and goethite are present.

R horizon (limestone). The limestone ground to very fine sand size and X-rayed proved to be almost entirely calcite. The samples taken from different portions of limestone proved in each case to be calcite even though of different crystal habit. A very small amount of quartz impurity was detected in one of the samples.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Eutrorthox; clayey, oxidic, isohyperthermic

SOIL Matanzas clay SOIL Nos. S61PR-6-2 LOCATION Noroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 14898-14900 December 1966

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1												3A1c		Coarse fragments		
		Total			Sand					Silt						2A2	2 – 19	19 – 76
		Sand (2–0.05)	Silt (0.05–0.002)	Clay (< 0 002)	Very coarse (2–1)	Coarse (1–0.5)	Medium (0.5–0.25)	Fine (0 25–0 1)	Very fine (0 1–0 05)	0 05–0.02	Int III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	Water-disp. Clay <0.002		> 2 (<19) Pct.	Pct. of < 76mm	
		Pct. of < 2 mm																
0-14	A1	12.2a	36.3	51.5	0.3	2.4	2.1	4.2	3.2	8.0	28.3	13.4	9.0			tr		
14-27	B21	3.8a	13.2	83.0	-	0.3	0.5	1.5	1.5	1.8	11.4	4.2	2.3	39		-		
27-39	B22	3.2b	9.8	87.0	-	0.1	0.6	1.2	1.3	1.5	8.3	3.5	1.9			-		

Soil Classification: Tropeptic Eutrorthox; clayey, oxidic, isohyperthermic
Soil Type: Matanzas clay
Soil Nos.: S61PR-6-2
Location: Noroeste Soil Conservation District, Puerto Rico. Road bank on south side of Highway 2, 50 steps east of kilometer marker 125.0.
Collected and Described by: R. B. Grossman, W. E. McKinzie, and G. D. Smith, March 15, 1961.

Horizon and Lincoln Lab. No.	
A1 14898	0 to 14 inches. Dark reddish brown (2.5YR 3/4) clay; moderate fine subangular blocky; firm to friable; fails abruptly;1/ some sand-size black aggregates; no clay films; pressure faces common; roots common.
B21 14899	14 to 27 inches. Dusky red (10R to 2.5YR 3/4) clay; weak medium subangular blocky breaking to moderate fine to very fine granular; friable to firm; slightly sticky to sticky and plastic; no clay films; weak pressure faces; very fine granules in micro channels; many medium pores; roots common; low bulk density.
B22 14900	27 to 39 inches. Dark red (2.5YR 3.5/6) silty clay; weak coarse subangular blocky breaking to moderate very fine granular; friable; slightly sticky to sticky; fails abruptly; clay films very scarce if present at all; few to common roots.

Remarks: Carbonate occurs at depths of from 12 inches to greater than 72 inches within a 100-foot stretch of road bank, with 36 inches the most common depth. Morphology of A1 similar to comparable depth in pedons S59PR-10-4 and S59PR-10-6 of Barranquitas Soil Study Area. B21 more sticky than Catalina of Barranquitas Soil Study Area. Fine granules in channels similar to those observed in pedons S59PR-10-4 and S59PR-10-6 of Barranquitas Soil Study Area.

1/ Two terms are used to describe the rate of failure of natural fabric: fails abruptly and fails semiplastically. To fail abruptly means that no plasticity is observed prior to failure. Stress builds up as the piece of soil is

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Eutrorthox; clayey, oxidic, isohyperthermic

SOIL Series not designated SOIL Nos. S57PR-8-2 LOCATION Oeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 7449-7455 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) Total: Sand (2–0.05) a	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: (0.05–0.02)	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	3A1c Water Disp. Clay		Coarse fragments: 2A2 > 2 (<19) Pct.	2 – 19	19 – 76
		Pct. of < 2 mm															Pct. of < 76mm	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]

Soil Classification: Tropeptic Eutrorthox; clayey, oxidic, isohyperthermic
Soil Type: Series not designated
Soil Nos.: S57PR-8-2
Location: 0.8 mile east of Highway No. 102 along road which passes headquarters of Pinio Morales Farm. Photo GS-IR-18-156.
Area: Puerto Rico, Oeste Soil Conservation District.
Climate: Hot - humid. Precipitation 80 to 90 inches a year.
Slope: 5 to 6 percent.
Relief: Gently undulating to rolling.
Drainage: Well drained.
Vegetation: Site located in turning strip adjacent to sugar cane field. Site has been disturbed and has no doubt had cane covering it.
Erosion: Slight to moderate.
Root Distribution: Numerous in entire profile, but seen most abundant where pH is above 6.0.
Soil Temperature: 26 degrees C. at 48 inches.
Collected by: L. T. Alexander, C. J. Koch, J. Juarez, Jr., and J. E. Trigo, September 12, 1957.
Described by: C. J. Koch.

Horizon and Lincoln Lab. No.	
Ap 7449	0 to 8 inches. Dark reddish brown (2.5YR 3/4) clay; moderate medium granular structure; friable, nonsticky, nonplastic; pronounced worm and insect activity; somewhat compacted by turning of farm machinery; extremely acid; smooth abrupt boundary.
B1 7450	8 to 14 inches. Dark red (2.5YR 3/6) clay; weak fine angular blocky structure; firm, nonsticky, nonplastic; somewhat compacted; pronounced worm activity; extremely acid; smooth clear boundary.
B21 7451	14 to 24 inches. Dusky red (10R 3/4) clay; weak coarse angular blocky structure; friable, nonsticky, nonplastic; many fine pores; extremely acid; arbitrary boundary.
B22 7452	24 to 35 inches. Dusky red (10R 3/4) clay; weak coarse angular blocky structure; very friable, nonsticky, nonplastic; many fine pores; slightly acid, arbitrary boundary.
B23 7453	35 to 45 inches. Dusky red (10R 3/4) clay; weak coarse angular blocky structure; very friable, nonsticky, nonplastic; many fine pores; some patches of C1 in this horizon; slightly acid; abrupt smooth boundary.
C1 7454	45 to 58 inches. Highly weathered parent material with few fragments of hard serpentine; color is predominantly dark reddish brown (2.5YR 3/4) with some spots of red (2.5YR 4/6); moderate medium angular blocky structure; firm; strongly acid; clear smooth boundary.
C2 7455	58 to 66 inches plus. Compact layer of highly disintegrated rock with some fragments of hard serpentine; colors include red, yellow, green and brown; structure appears much like original rock; medium acid.

Remarks: This pedon shows high percent base saturation which could be attributed to liming. Calcium is high and decreases with depth. Samples were taken near a sugar cane field while those from Nipe, S57PR-8-1, were taken in an abandoned field in native grasses and weeds. This pedon has weathered parent rock at 45 inches with evidence of original rock structure and an increase in extractable magnesium. This pedon has similar mineralogical composition to Nipe, S57PR-8-1, but the gibbsite contents are much lower and the kaolinite contents are higher. The pedon also contains quartz in the horizons near the surface and none in the C horizon. (See pedon of Nipe, S57PR-8-1, for mineralogical comparison.) Colors given are for moist soil unless otherwise stated.

SOIL CLASSIFICATION: Typic Haplorthox; clayey, oxidic, isohyperthermic

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL *Delicias clay SOIL Nos. S61PR-14-10 LOCATION Suroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 16874-16879 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0 05)	Total: Silt (0.05-0 002)	Total: Clay (< 0 002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0 25-0 1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0 002)	Int II (0.2-0 02)	(2-0 1)	3A1b Water-Disp. Clay <0.002		Coarse fragments 2A2 > 2 (<19) Pct.	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-6	Ap	37.4a	11.9	50.7	6.9	3.5	2.8	14.9	9.3	3.6	8.3	24.1	28.1	27.6		tr		
6-12	B21	32.3a	10.2	57.5	9.3	3.3	2.2	10.8	6.7	3.1	7.1	17.8	25.6	-		18		
12-22	B22	31.8a	17.6	50.6	9.1	3.3	1.9	10.4	7.1	4.5	13.1	19.4	24.7	-		22		
22-34	B23	27.8a	32.4	39.8	5.1	2.0	1.6	9.4	9.7	12.2	20.2	29.1	18.1	-		21		
34-45	B24	29.3b	29.6	41.1	5.4	2.1	1.6	8.7	11.5	13.1	16.5	31.2	17.8	-		15		
45-60	B25	30.4b	33.6	36.0	4.3	2.8	2.2	9.4	11.7	13.0	20.6	31.3	18.7	-		7		

Depth (In.)	6A1a Organic carbon c Pct.	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.		Bulk density 4A1a Field-State g/cc	4A1c 30-cm. g/cc	4A1b Air-Dry g/cc	4D1 COLE f	Water content 4B4 Field-State Pct	4B3 30-cm. Pct	4B2 15-Bar Pct			pH 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-6	2.68	0.212	13	9.8			1.38		1.51	0.032	29.0		20.4			5.0	5.8
6-12	1.01	0.110	9	10.9			1.24	1.22	1.28	0.010	32.6	30.3	22.3			4.3	5.1
12-22	0.43	0.069	6	11.8			1.16d	1.16d	1.20d	0.010	34.3	37.2	22.0			4.3	5.0
22-34	0.25	0.038	7	13.6			1.43	1.40	1.44	0.003	29.4	31.5	23.4			5.0	5.2
34-45	0.22			17.5			1.4e						26.8			5.1	5.6
45-60	0.18			25.3			1.36		1.38	0.003	34.8		28.1			5.6	5.5

Depth (In)	Extractable bases 5B1a: 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH_4OAc	6C1d KCl-Ext. Al		5A3b Bases Plus Al me/100g Clay					Base saturation 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.
	meq/100 g																

Soil Classification: Typic Haplorthox; clayey, oxidic, isohyperthermic
Soil Type: *Delicias clay
Soil Nos.: S61PR-14-10
Location: Suroeste Soil Conservation District, Puerto Rico, 0.5 kilometers south (on narrow road) from kilometer marker 5.6 on Puerto Rico Highway 311, 50 feet east of fence. Photo No. GS-LR-9-160.
Vegetation and Use: Guinea and molasses grasses. Other native pastures and weeds.
Slope and Land Form: 20 percent. North aspect. Located on a sideslope that leads to a drainageway.
Drainage and Permeability: Well drained with medium runoff and medium internal drainage. Permeability is moderately rapid.
Parent Material: Colluvium derived largely from ultrabasic rocks.
Collected by: R. B. Grossman, W. E. McKinzie, O. R. Carter, L. H. Rivera, D. A. Compton. J. E. Trigo, December 7, 1961.
Described by: W. E. McKinzie, December 7, 1961.

Horizon and Lincoln Lab. No.	
Ap 16874	0 to 6 inches. Dark reddish brown (2.5YR 3/4) clay; moderate medium granular structure; friable when moist, slightly sticky and plastic when wet; many fine roots; many medium and fine iron concretions; clear smooth boundary.
B21 16875	6 to 12 inches. Dark red (10R 3/6) clay; moderate medium granular structure; friable when moist, sticky and plastic when wet; common fine roots; many fine and medium iron concretions; clear smooth boundary.
B22 16876	12 to 22 inches. Dark red (10R 3/6) clay; weak medium subangular blocky structure which breaks into weak fine granular; friable when moist, nonsticky and slightly plastic when wet; common fine roots; many fine pores; common fine and medium iron concretions; gradual wavy boundary.
B23 16877	22 to 34 inches. Dark red (10YR 3/6) clay; weak fine angular blocky structure; firm when moist, nonsticky and nonplastic when wet; common fine roots; many fine and medium iron concretions; gradual wavy boundary.
B24 16878	34 to 45 inches. Dark red (2.5YR 3/6) clay; weak fine angular blocky structure; friable when moist, nonsticky and nonplastic when wet; few fine roots; common fine iron concretions; gradual wavy boundary.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic

SOIL: Catalina clay SOIL Nos. 859PR-10-7 LOCATION: Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska LAB. Nos. 12832-12845 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (in.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (<0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: (0.05-0.02)	Silt: Int III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	3A1c Water Disp. Clay <0.002		Coarse fragments: 2A2 >2 (<19) Pct	2-19	19-76
		Pct. of <2 mm															Pct of <76mm	
0-6	Ap	6.0b	18.2	75.8	0.5	0.9	0.7	1.7	2.2	4.3	13.9	7.5	3.8	34		tr		
6-14	B21	4.9b	13.0	82.1	0.3	0.8	0.6	1.4	1.8	3.6	9.4	6.2	3.1	tr		tr		
14-22	B22	4.2b	13.5	82.3	0.2	0.8	0.5	1.2	1.5	3.2	10.3	5.4	2.7			tr		
22-32	B23	4.9b	19.7	75.4	0.5	0.7	0.5	1.3	1.9	4.1	15.6	6.8	3.0			tr		
32-43	B24	6.4b	27.7	65.9	0.1	0.5	0.6	2.0	3.2	6.3	21.4	10.8	3.2			tr		
43-57	B25	6.6b	33.8	59.6	0.2	0.5	0.4	1.9	3.6	7.2	26.6	12.1	3.0			tr		
57-72	B26	10.5c	31.8	57.7	0.3	0.7	0.7	3.2	5.6	7.9	23.9	15.7	4.9			tr		
72-96	C1	8.9c	23.2	67.9	1.0	1.3	0.9	2.4	3.3	6.9	16.3	11.6	5.6			tr		
96-120	C2	4.9b	18.1	77.0	0.5	0.8	0.6	1.4	1.6	3.5	14.6	5.9	3.3			tr		
120-144	C3	6.9b	31.0	62.1	0.1	0.5	0.6	2.3	3.4	6.2	24.8	11.0	3.5			tr		
144-168	C4	12.9b	38.8	48.3	tr	0.5	1.1	4.9	6.4	8.3	30.5	17.6	6.5			tr		
194-228	C5	17.6d	53.8	28.6	0.1	0.4	1.1	6.9	9.1	11.8	42.0	25.2	8.5			tr		
240-252	C6	19.3d	54.4	26.3	0.3	0.7	1.1	6.7	10.5	13.6	40.8	28.5	8.8			tr		
0-6	Ap a	5.8b	19.0	75.2	0.3	0.7	0.7	1.7	2.4	4.6	14.4	8.0	3.4			tr		

Depth (in.)	6A1a Organic carbon e Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct	Bulk density: 4A1a Field-State g/cc	g/cc	4A1h Oven-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct	4B1b 1/3-Bar Pieces Pct	4B2 15-Bar Pct.			pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-6	3.84	0.324	12	10.5		1.04		1.33	0.087	45.8	38.9	30.9			4.3	5.1
6-14	1.25	0.144	9	10.6		1.00		1.33	0.10	44.4	41.2	32.3			4.2	4.8
14-22	0.86	0.110	8	12.6		1.13		1.33	0.056	43.5	40.0	32.4			4.2	4.9
22-32	0.56	0.076	7	13.2		1.26		1.39	0.032	38.5	35.4	32.1			4.0	5.0
32-43	0.42	0.054	8	13.2		1.28		1.42	0.036	38.6	37.2	30.5			3.9	5.0
43-57	0.23	0.030	8	12.6		1.39		1.48	0.020	33.5	34.5	28.5			3.8	5.0
57-72	0.17			12.2		1.36f		1.45f	0.020	34.1f		29.8			3.8	4.8
72-96	0.28			10.1								28.4			3.9	4.9
96-120	0.28			15.7								34.3			4.0	4.9
120-144	0.22			19.2								33.1			3.8	4.8
144-168	0.18			16.1								31.3			3.8	4.8
194-228	0.06			14.8								25.3			3.6	4.6
240-252	0.07			14.8								24.5			3.7	4.7
0-6	4.08	0.337	12	10.2								30.2			4.2	5.0

Depth (in.)	Extractable bases: 6N2b Ca	6O2b Mg	6P2a Na	5B1a 6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	5A3b Bases Plus Al me/100g Clay					Base saturation: 5C3 Sum Cations Pct	5C1 NH_4OAc Pct.
	meq/100 g															
0-6	5.8	1.0	0.1	0.3	7.2	21.9	29.1	16.2	0.3	9.9					25	44
6-14	1.5	0.4	tr	0.1	2.0	17.7	19.7	8.8	0.7	3.3					10	23
14-22	1.0	0.6	tr	0.1	1.7	14.6	16.3	7.7	0.7	2.9					10	22
22-32	0.4	0.6	tr	tr	1.0	14.1	15.1	7.7	1.3	3.1					7	13
32-43	0.1	0.5	tr	tr	0.6	14.4	15.0	8.4	2.2	4.2					4	7
43-57	tr	0.4	tr	0.1	0.5	15.1	15.6	8.9	3.4	6.5					3	6
57-72	tr	0.4	tr	0.1	0.5	14.9	15.4	8.4	3.3	6.6					3	6
72-96	0.4	0.4	0.1	0.1	1.0	13.6	14.6	6.8	1.7	4.0					7	15
96-120	0.6	0.4	0.1	tr	1.1	15.6	16.7	6.8	1.3	3.1					7	16
120-144	1.3	0.4	0.1	0.1	1.9	16.2	18.1	9.4	2.8	7.6					10	20
144-168	3.2	0.4	0.1	0.1	3.8	14.2	18.0	10.9	2.9	9 g					21	35
194-228	0.6	0.4	0.1	tr	1.1	17.5	18.6	12.8	8.4	15 g					6	8
240-252	0.9	0.3	0.1	tr	1.3	17.5	18.8	12.8	7.9	15 g					7	10
0-6	4.1	0.9	0.1	0.6	5.7	23.4	29.1	18.8	0.6	8.4					20	30

Depth (in.)	Ratios to Clay 8III: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-6	0.21	0.14	0.41
6-14	0.11	0.13	0.39
14-22	0.09	0.15	0.39
22-32	0.10	0.18	0.43
32-43	0.13	0.20	0.46
43-57	0.15	0.21	0.48
57-72	0.14	0.21	0.52
72-96	0.10	0.15	0.42
96-120	0.09	0.20	0.45
120-144	0.15	0.31	0.53
144-168	0.22	0.33	0.65
194-228	0.45	0.52	0.88
240-252	0.49	0.56	0.93
0-6	0.25	0.14	0.40

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Sampled along pit face several feet from first sample.
b. Earthy nodules: > 50 percent (2-0.05 mm.).
c. Earthy nodules: 25-50 percent (2-0.025 mm.); 5-25 percent (0.025-0.05mm.)
d. Earthy nodules: 5-25 percent (2-0.05 mm.).
e. 15 kg/m² to 60 inches (Method 6A).
f. One clod.
g. Clay percentage is estimated (15-bar water percentage x 2.5).

USDA SCS HYATTSVILLE MD 1964

Soil Classification: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic
Soil Type: Catalina clay
Soil Nos.: 859PR-10-7
Location: Torrecillas Soil Conservation District, Puerto Rico, Barranquitas Soil Study Area; 440 feet south of private road junction with main road; 285 feet east of 859PR-10-4; private road junction about 1/4 mile southeast of kilometer marker 9.7, Highway 152.
Elevation: 605 plus or minus 5 meters.
Vegetation and Land Use: Molassesgrass pasture.
Slope: 10 percent to south.
Parent Material: Chloritized greenish-black basaltic andesite flow breccia (personal communication from R. P. Briggs, USGS, to T. U. Yager).
Collected and Described by: R. A. Boccheciamp, K. W. Flach, R. E. Gierbolini, R. B. Grossman and T. U. Yager, December 15, 1959.

Horizon and Lincoln Lab. No.	
Ap 12832 12845	0 to 6 inches. Dark reddish brown (5YR 3/3 to 4/3) clay; weak fine subangular blocky; massive in parts; firm; slightly sticky and plastic; fails semiplastically;1/ few very fine pores and few medium and coarse pores; common sand-size aggregates; roots common; abrupt smooth boundary. Second LSL No. refers to an additional sample taken several feet away along the pit face; the data are given at the end of the regular sequence.
B21 12833	6 to 14 inches. Dark reddish brown (2.5YR 3/4) clay with surfaces of peds and macro-pores commonly reddish brown (2.5YR 4/3); moderate medium to fine subangular blocky; firm to friable, slightly sticky and plastic; fails abruptly; few coarse, few fine and common very fine pores; common sand-size aggregates; reflective or pressure surfaces abundant; probably no clay films; occasional piece of charcoal; few roots; clear smooth boundary.
B22 12834	14 to 22 inches. Dark red (2.5YR 3/6) clay with macro-pore and ped surfaces slightly lower in chroma and perhaps yellower in hue; medium fine blocky to subangular blocky; firm, slightly sticky and plastic; fails abruptly; few fine and common very fine pores; few sand-size aggregates; weak reflective or pressure surfaces common; few roots; clear smooth boundary.
B23 12835	22 to 32 inches. Dark red (2.5YR 3/6 to 4/6) clay; moderate to weak fine blocky; firm, slightly sticky to nonsticky and plastic; fails abruptly; few fine and many very fine pores; very few sand-size aggregates; moderate reflective or pressure surfaces common; striations on a few prominent structural planes; very few roots; gradual boundary.
B24 12836	32 to 43 inches. Red (2.5YR 4/6) silty clay; weak fine blocky; firm, slightly sticky to nonsticky and plastic; fails abruptly; few fine pores and many very fine pores; very few sand-size aggregates; occasional piece of saprolite of fine gravel size, breakable by hand; reflective or pressure surfaces common; very few roots; gradual boundary.
B25 12837	43 to 57 inches. Reddish brown (2.5YR 4/5) silty clay; weak fine blocky; firm, (firmer than superjacent horizon) slightly sticky to nonsticky and plastic; few fine pores and many very fine pores; [illegible]

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic

SOIL: Catalina clay SOIL Nos: S59PR-10-7 LOCATION: Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska LAB. Nos: 12832-12845 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1: Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int III (0.02-0.002)	Int II (0.2-0.02)	(2-0.1)	3A1c Water-Disp. Clay <0.002		Coarse fragments: 2A2 > 2 (<19) Pct.	2-19 (Pct of < 76mm)	19-76 (Pct of < 76mm)
		Pct of < 2 mm																
0-6	Ap	6.0b	18.2	75.8	0.5	0.9	0.7	1.7	2.2	4.3	13.9	7.5	3.8	34		tr		
6-14	B21	4.9b	13.0	82.1	0.3	0.8	0.6	1.4	1.8	3.6	9.4	6.2	3.1	tr		tr		
14-22	B22	4.2b	13.5	82.3	0.2	0.8	0.5	1.2	1.5	3.2	10.3	5.4	2.7			tr		
22-32	B23	4.9b	19.7	75.4	0.5	0.7	0.5	1.3	1.9	4.1	15.6	6.8	3.0			tr		
32-43	B24	6.4b	27.7	65.9	0.1	0.5	0.6	2.0	3.2	6.3	21.4	10.8	3.2			tr		
43-57	B25	6.6b	33.8	59.6	0.2	0.5	0.4	1.9	3.6	7.2	26.6	12.1	3.0			tr		
57-72	B26	10.5c	31.8	57.7	0.3	0.7	0.7	3.2	5.6	7.9	23.9	15.7	4.9			tr		
72-96	C1	8.9c	23.2	67.9	1.0	1.3	0.9	2.4	3.3	6.9	16.3	11.6	5.6			tr		
96-120	C2	4.9b	18.1	77.0	0.5	0.8	0.6	1.4	1.6	3.5	14.6	5.9	3.3			tr		
120-144	C3	6.9b	31.0	62.1	0.1	0.5	0.6	2.3	3.4	6.2	24.8	11.0	3.5			tr		
144-168	C4	12.9b	38.8	48.3	tr	0.5	1.1	4.9	6.4	8.3	30.5	17.6	6.5			tr		
194-228	C5	17.6d	53.8	28.6	0.1	0.4	1.1	6.9	9.1	11.8	42.0	25.2	8.5			tr		
240-252	C6	19.3d	54.4	26.3	0.3	0.7	1.1	6.7	10.5	13.6	40.8	28.5	8.8			tr		
0-6	Ap a	5.8b	19.0	75.2	0.3	0.7	0.7	1.7	2.4	4.6	14.4	8.0	3.4			tr		

Depth (In.)	6A1a Organic carbon e Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.		Bulk density: 4A1a Field-State g/cc	Bulk density: g/cc	Bulk density: 4A1h Oven-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct	Water content: 4B1b 1/3-Bar Pieces Pct	Water content: 4B2 15-Bar Pct.			pH: 8C1c (1:1) N KCl	pH: 8C1a (1:1) H_2O
0-6	3.84	0.324	12	10.5			1.04		1.33	0.087	45.8	38.9	30.9			4.3	5.1
6-14	1.25	0.144	9	10.6			1.00		1.33	0.10	44.4	41.2	32.3			4.2	4.8
14-22	0.86	0.110	8	12.6			1.13		1.33	0.056	43.5	40.0	32.4			4.2	4.9
22-32	0.56	0.076	7	13.2			1.26		1.39	0.032	38.5	35.4	32.1			4.0	5.0
32-43	0.42	0.054	8	13.2			1.28		1.42	0.036	38.6	37.2	30.5			3.9	5.0
43-57	0.23	0.030	8	12.6			1.39		1.48	0.020	33.5	34.5	28.5			3.8	5.0
57-72	0.17			12.2			1.36f		1.45f	0.020	34.1f		29.8			3.8	4.8
72-96	0.28			10.1									28.4			3.9	4.9
96-120	0.28			15.7									34.3			4.0	4.9
120-144	0.22			19.2									33.1			3.8	4.8
144-168	0.18			16.1									31.3			3.8	4.8
194-228	0.06			14.8									25.3			3.6	4.6
240-252	0.07			14.8									24.5			3.7	4.7
0-6	4.08	0.337	12	10.2									30.2			4.2	5.0

Depth (In.)	Extractable bases 6N2b Ca	6O2b Mg	6P2a Na	5B1a 6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		5A3b Bases Plus Al me/100g Clay					Base saturation 5C3 Sum Cations Pct	5C1 NH_4OAc Pct
	meq/100 g																
0-6	5.8	1.0	0.1	0.3	7.2	21.9	29.1	16.2	0.3		9.9					25	44
6-14	1.5	0.4	tr	0.1	2.0	17.7	19.7	8.8	0.7		3.3					10	23
14-22	1.0	0.6	tr	0.1	1.7	14.6	16.3	7.7	0.7		2.9					10	22
22-32	0.4	0.6	tr	tr	1.0	14.1	15.1	7.7	1.3		3.1					7	13
32-43	0.1	0.5	tr	tr	0.6	14.4	15.0	8.4	2.2		4.2					4	7
43-57	tr	0.4	tr	0.1	0.5	15.1	15.6	8.9	3.4		6.5					3	6
57-72	tr	0.4	tr	0.1	0.5	14.9	15.4	8.4	3.3		6.6					3	6
72-96	0.4	0.4	0.1	0.1	1.0	13.6	14.6	6.8	1.7		4.0					7	15
96-120	0.6	0.4	0.1	tr	1.1	15.6	16.7	6.8	1.3		3.1					7	16
120-144	1.3	0.4	0.1	0.1	1.9	16.2	18.1	9.4	2.8		7.6					10	20
144-168	3.2	0.4	0.1	0.1	3.8	14.2	18.0	10.9	2.9		9 g					21	35
194-228	0.6	0.4	0.1	tr	1.1	17.5	18.6	12.8	8.4		15 g					6	8
240-252	0.9	0.3	0.1	tr	1.3	17.5	18.8	12.8	7.9		15 g					7	10
0-6	4.1	0.9	0.1	0.6	5.7	23.4	29.1	18.8	0.6		8.4					20	30

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-6	0.21	0.14	0.41
6-14	0.11	0.13	0.39
14-22	0.09	0.15	0.39
22-32	0.10	0.18	0.43
32-43	0.13	0.20	0.46
43-57	0.15	0.21	0.48
57-72	0.14	0.21	0.52
72-96	0.10	0.15	0.42
96-120	0.09	0.20	0.45
120-144	0.15	0.31	0.53
144-168	0.22	0.33	0.65
194-228	0.45	0.52	0.88
240-252	0.49	0.56	0.93
0-6	0.25	0.14	0.40

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Sampled along pit face several feet from first sample.
b. Earthy nodules: > 50 percent (2-0.05 mm.).
c. Earthy nodules: 25-50 percent (2-0.025 mm.); 5-25 percent (0.025-0.05mm.)
d. Earthy nodules: 5-25 percent (2-0.05 mm.).
e. 15 kg/m^2 to 60 inches (Method 6A).
f. One clod.
g. Clay percentage is estimated (15-bar water percentage x 2.5).

USDA SCS HYATTSVILLE MD 1964

Soil Classification: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic
Soil Type: Catalina clay
Micromorphology (Method 4E1).

B22 horizon
The matrix is rather uniform with flecked and somewhat striated anisotropy. Crevice peripheries are somewhat opaque and show little anisotropism. The opacity may be due solely to a denser packing without preferred orientation. The boundaries toward the matrix are gradual. The cutans persist in the very thin parts of the slide where the matrix has been lost.

B23 horizon
The matrix is flecked, somewhat striated and weakly anisotropic and contains barely detectable blotches (see B26 horizon). Crevice peripheries are mostly stress cutans with a few strongly anisotropic illuviation cutans, mainly in small pores but also along crevice peripheries. Crevice peripheries are more opaque, probably caused by denser packing, but not more anisotropic than the matrix.

B24 horizon
The matrix is nearly isotropic with many small angular quartz grains. Somewhat indistinct blotches are present along with rather distinct stress cutans.

B26 horizon
The matrix is predominantly red (10R 4/6) and nearly isotropic with many small angular quartz grains and common blotches. The blotches range from red (10R 4/6) to yellowish brown (10YR 5/6); they are nearly isotropic to strongly anisotropic and are round and angular. Apparently some of the blotches are pore fillings, whereas the majority are pseudomorphs of feldspar and possibly ferromagnesian minerals. Crevice peripheries are commonly more opaque and more anisotropic than the matrix; they are probably compression and stress cutans. There are very few red, moderately anisotropic cutans which resemble illuviation cutans.

C6 horizon
Bands of colorless strongly anisotropic material alternate with opaque or nearly opaque bands which are red and yellow in incident light. The colorless material is mostly well developed, large kaolinite books. In the opaque bands, the yellow material is generally peripheral to the red material and is isotropic while the red material is very weakly anisotropic. In the red bands, the interference color is partly masked by the strong color.

Mineralogy (Method 7A).
Interpretations of X-ray and Differential Thermal Analyses of the Clay and Silt Fractions[a]

Horizon	Depth Inches	< 2μ fraction			2-50μ fraction		
		Vermiculite	Kaolinite %	Gibbsite %	Kaolinite %	Gibbsite %	Quartz
Ap	0-6	xx	30	5	20	—	ccc
B22	14-22	xx	25	5	20	—	ccc
B26	57-72	—	70	—	30	—	cc

a. Vermiculite: X-ray, oriented samples; (x = small, xx = moderate amounts). Quartz: X-ray, powder (unoriented); c = height unit of 3.35Å reflection. 7.2Å reflection (kaolinite) peak quite sharp in A, sharper in B22 and very diffuse in C. Kaolinite and gibbsite by DTA.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic

SOIL Catalina clay SOIL Nos. S59PR-10-8 S59(66)PR-10-8 LOCATION Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 12846-12856 †66L119-66L121 (field-moist) November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05) b	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	3A1c Water Disp. Clay <0.002		Coarse fragments: 2A2 > 2 (<19) Pct	2 – 19 (Pct. of < 76mm)	19 – 76 (Pct. of < 76mm)
		Pct of < 2 mm																
0-6	Ap	5.3	17.6	77.1	0.3	0.5	0.6	1.7	2.2	3.3	14.3	6.5	3.1	47		tr		
6-13	B21	6.0	17.2	76.8	0.1	0.6	0.7	2.0	2.6	3.6	13.6	7.4	3.4	tr		tr		
13-20	B22	3.1	13.0	83.9	0.1	0.2	0.3	1.0	1.5	1.4	11.6	3.5	1.6			-		
20-34	B23	1.9	14.9	83.2	tr	0.2	0.2	0.6	0.9	2.3	12.6	3.6	1.0			-		
34-46	B24	5.7	23.9	70.4	0.2	0.6	0.6	1.9	2.4	4.7	19.2	8.3	3.3			tr		
46-60	B25	11.6	35.7	52.7	0.3	1.2	1.3	4.3	4.5	7.4	28.3	14.4	7.1			tr		
60-72	C1	15.0	36.6	48.4	0.4	1.5	1.7	5.4	6.0	8.6	28.0	17.8	9.0			tr		
72-84	C2	17.7	36.2	46.1	0.7	2.3	2.5	6.2	6.0	8.0	28.2	17.6	11.7			-		
84-120	C3	9.6	46.2	44.2	0.1	0.6	0.8	3.3	4.8	7.8	38.4	14.7	4.8			tr		
120-132	C4	13.5	44.3	42.2	1.0	1.6	1.2	3.9	5.8	9.9	34.4	18.1	7.7			tr		
0-6	Ap a	6.3	19.9	73.8	0.3	0.7	0.8	2.1	2.4	2.3	17.6	5.9	3.9			tr		
	6A1a	6B1a		6C2a			Bulk density 4A1a		4A1b	4m	Water content 4B4	4B1b	4B2			pH	8C1c	8C1a

Soil Classification: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic
Soil Type: Catalina clay
Soil Nos.: S59PR-10-8
Location: Torrecillas Soil Conservation District, Puerto Rico, Barranquitas Soil Study Area; 45 feet east of field road and 470 feet south of house at kilometer marker 8.8, Highway 152; S59PR-10-9 is approximately 160 feet to the south.
Elevation: 585 plus or minus 5 meters.
Vegetation and Land Use: Native pasture.
Slope: 8 percent south slope, 300 feet above where the slope levels out.
Parent Material: Chloritized greenish-black basaltic andesite flow breccia (personal communication from R. P. Briggs, USGS, to T. U. Yager).
Collected and Described by: R. A. Bocheciamp, K. W. Flach, R. E. Gierbolini, R. B. Grossman and T. U. Yager, December 16, 1959.

Horizon and Lincoln Lab. No.	
Ap 12846 12856	0 to 6 inches. Dark reddish brown (5YR 3/3) clay with 10 percent colored reddish brown (2.5YR 4/4); massive in the upper part to weak fine granular in the lower part; friable, slightly sticky, plastic; many sand-size aggregates; abundant roots; abrupt smooth boundary. Second LSL No. refers to an additional sample taken several feet away along the pit face; the data are given at the end of the regular sequence.
B21 12847	6 to 13 inches. Dark reddish brown (2.5YR 3/4) clay; moderate medium to fine angular to subangular blocky; firm, slightly sticky and plastic; fails semiplastically to abruptly,1/ few fine and common very fine pores (less than in the B22); many soft black sand-size aggregates; roots common; clear boundary.
B22 12848	13 to 20 inches. Dark reddish brown (2.5YR 3/4) clay with some ped surfaces having slightly lower chroma; moderate to weak, medium to fine subangular to angular blocky; firm, slightly sticky, plastic; fails abruptly to semiplastically; few fine and common very fine pores; few sand-size aggregates; no reflective or pressure surfaces; roots common; clear wavy boundary.
B23 12849	20 to 34 inches. Reddish brown (2.5YR 4/5) clay with a few reddish brown (2.5YR 4/4) ped surfaces; weak fine angular to subangular blocky; firm, slightly sticky, plastic; fails abruptly; few fine and common very fine pores; very few sand-size aggregates; moderate reflective or pressure surfaces common with a few surfaces striated; possibly a few thin patchy clay films; very few roots; clear smooth boundary.
B24 12850	34 to 46 inches. Dark reddish brown (2.5YR 3/4 to 4/4) clay; weak fine angular blocky; firm, slightly sticky, plastic; fails abruptly; few fine and many very fine pores; very few sand-size aggregates; moderate reflective or pressure surfaces common with a few surfaces striated and possibly some thin patchy clay films; few roots; gradual boundary.
B25 12851	46 to 60 inches. Dark reddish brown (2.5YR 3/4) fine silty clay loam; weak fine angular blocky; firm, nonsticky, plastic; fails abruptly; few fine and common very fine pores; very few sand-size aggregates; moderate reflective or pressure surfaces common with a few surfaces striated and possibly some thin patchy clay films; very few roots; clear smooth boundary.
C1 12852	60 to 72 inches. Dark reddish brown (2.5YR 3/4) silty clay loam; weak fine angular blocky; firm, nonsticky, plastic; fails abruptly; many fine and common very fine pores; weak reflective or pressure surfaces common; possibly some thin patchy clay films; very few sand-size quartz grains; 2 percent saprolite; arbitrary boundary.
C2 12853	72 to 84 inches (6 to 7 feet). Dark reddish brown to dark red (2.5YR 3/4 to 3/6) silty clay loam; 25 percent saprolite; firm, nonsticky, plastic; arbitrary boundary.
C3 12854	84 to 120 inches (7 to 10 feet). 75 percent saprolite; dusky red (10R 3/4) and dark reddish brown (2.5YR 3/4) silty clay loam matrix with strong brown (7.5YR 5/8) and gray splotches; firm, nonsticky, plastic; arbitrary boundary.
C4 12855	120 to 132 inches (10 to 11 feet). Saprolite; dusky red (10R 3/4) to dark reddish brown (2.5YR 3/4) with dark gray (10YR 4/1) common and occasional splotches of strong brown (7.5YR 5/8) and white; silty clay loam; firm, nonsticky, plastic.

Remarks: A few pieces of charcoal occur in the Ap. Nearly all pores appear tubular. Few sand-size quartz crystals or angular grains, some up to 3 mm. across occur in the C2, C3 and C4 horizons. Apparently the auger cut a quartz vein.

1/ Two terms are used to describe the rate of failure of natural fabric: fails abruptly and fails semiplastically. To fail abruptly means that no plasticity is observed prior to failure. Stress builds up as the piece of soil is squeezed and dissipates quickly as the piece of soil breaks apart into numerous fragments or peds due to failure along natural planes of weakness. In semiplastic failure, deformation is readily observed prior to rupture.

Mineralogy (Method 7A).
Beltsville Laboratory: Interpretations of X-ray and Differential Thermal Analyses of the Clay and Silt Fractions

Horizon	Depth Inches	< 2μ fraction Vermiculite	Kaolinite %	Gibbsite %	2-50μ fraction Kaolinite %	Gibbsite %	Quartz
Ap	0-6	x	30	15	—	5	cc
C1	60-72	—	40	—	40	—	ccc

Notes: Vermiculite: X-ray, oriented samples; (x = small amount). Quartz: X-ray, powder (unoriented); c = height unit of 3.35Å reflection. 7.2Å reflection peak (kaolinite) very diffuse in Ap, sharper in C. Kaolinite and gibbsite by DTA.

Lincoln Laboratory: B22 horizon. Field-moist (Lab. No. 66L119) and air-dry (Lab. No. 12848) samples were compared. Kaolinite percentages by Differential Thermal Analyses are:

Air-dry (12848)	Field-moist (66L119)
35	40
40	50 (iron-free)
30	
50 (iron-free)	

Gibbsite content is considerably greater in the air-dry samples (25 to 50 percent gibbsite) than in the field-moist samples (10 percent gibbsite). Diffraction patterns show small amounts of goethite and vermiculite in addition to the kaolinite and gibbsite. All minerals are rather poorly ordered.

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic

SOIL *Comerio clay SOIL Nos S59PR-10-3 LOCATION Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 12788-12802 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (in)	Horizon	Sand (2 0 05)	Silt (0 05–0.002)	Clay (< 0 002)	Very coarse (2–1)	Coarse (1–0 5)	Medium (0.5–0.25)	Fine (0 25–0 1)	Very fine (0.1–0.05)	Silt 0 05–0.02	Silt Int. III (0 02–0 002)	Silt Int II (0 2–0 02)	(2–0 1)	3A1c Water-Disp. Clay <0.002		Coarse fragments 2A2 > 2 (<19) Pct	2 - 19	19 - 76
		Pct of < 2 mm															Pct of < /6mm	
0-6	Ap	2.4c	18.0	79.6	0.1	0.4	0.3	0.6	1.0	3.4	14.6	4.8	1.4	36		tr		
6-12	B21	2.4c	14.3	83.3	0.2	0.3	0.2	0.7	1.0	3.3	11.0	4.7	1.4			tr		
6-12a	B21	2.8c	13.6	83.6	0.3	0.4	0.3	0.7	1.1	3.5	10.1	5.0	1.7			-		
12-18	B22	1.8c	13.3	84.9	0.2	0.2	0.2	0.5	0.7	3.1	10.2	4.1	1.1			-		
18-25	B23	1.5c	14.7	83.8	-	0.2	0.2	0.4	0.7	1.6	13.1	2.5	0.8			-		
18-25a	B23	1.6d	14.5	83.9	-	0.3	0.2	0.4	0.7	3.0	11.5	3.9	0.9			-		
25-35	B24	2.3d	22.9	74.8	0.2	0.3	0.2	0.6	1.0	4.3	18.6	5.7	1.3			-		
35-45	B25	4.5d	26.6	68.9	0.2	0.7	0.5	1.2	1.9	4.6	22.0	7.2	2.6			-		
35-45a	B25	4.3d	26.7	69.0	0.2	0.7	0.5	1.2	1.7	4.3	22.4	6.7	2.6			-		
45-56	B26	7.5d	35.7	58.8	0.1	1.0	0.8	2.2	3.4	8.0	27.7	12.7	4.1			-		
56-84	C1	11.0d	40.4	48.6	0.2	1.2	1.1	3.2	2.3	10.0	30.4	17.2	5.7			-		
56-84a	C1	11.5d	41.1	47.4	0.3	1.5	1.2	2.4	5.1	9.3	31.8	16.4	5.4			-		
84-108	C2	12.6e	45.4	42.0	1.5	1.8	1.0	3.0	5.3	9.9	35.5	17.0	7.3			-		
120-144	C3	19.8e	45.4	34.8	0.6	2.2	2.0	6.3	8.7	12.0	33.4	24.6	11.1			-		
144-180	C4	22.2e	47.6	30.2	0.4	1.8	1.9	7.8	10.3	12.6	35.0	27.8	11.9			-		
180-216	C5	20.8e	49.6	29.6	0.6	2.0	1.9	7.0	9.3	12.0	37.6	25.7	11.5			-		
216-240	C6	20.3e	49.0	30.7	1.2	2.6	2.1	6.2	8.2	11.5	37.5	23.3	12.1			-		
240-246	C7	23.0e	48.6	28.4	1.4	2.7	2.2	7.2	9.5	11.9	36.7	25.8	13.5			-		
0-6	Ap b	3.4e	18.6	78.0	0.2	0.6	0.4	0.8	1.4	4.2	14.4	6.1	2.0			tr		

Depth (in)	6A1a Organic carbon f Pct	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct		Bulk density 4A1a Field-State g/cc	Bulk density g/cc	4A1h Oven-Dry g/cc	4B1 COLE	Water content 4B4 Field-State Pct	4B1b 1/3-Bar Pieces Pct	4B2 15-Bar Pieces Pct			pH 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-6	5.64	0.399	14	10.2			0.90		1.32	0.14	59.7	41.1	31.1			4.2	4.8
6-12	2.01	0.170	12	11.2			1.04		1.30	0.078	46.6	34.4	30.7			4.1	4.6
6-12a																	4.9
12-18	1.58	0.157	10	12.3			0.98		1.26	0.087	49.7		34.0			4.2	4.7
18-25	1.25	0.121	10	14.4			1.10		1.30	0.056	48.5	40.9	35.6			4.4	4.7
18-25a																	5.0
25-35	0.70	0.076	9	16.5			1.17g		1.32	0.040	44.6	40.0	35.8			4.5	4.9
35-45	0.35	0.036	10	17.6			1.19h		1.37h	0.047	49.2h	36.6	33.2			4.2	4.9
35-45a																	5.1
45-56	0.13			16.5			1.30		1.44	0.036	39.4		30.0			3.9	4.9
56-84	0.16			16.1			1.30		1.42	0.028	36.7		29.6			3.8	4.8
56-84a																	5.0
84-108	0.12			13.7									28.6			3.7	4.7
120-144	0.08			13.6									28.6			3.7	4.7
144-180	0.05			11.8									27.7			3.7	4.6
180-216	0.02			12.6									27.2			3.7	4.5
216-240	-			12.2									27.3			3.7	4.6
240-246	-			11.5									26.0			3.7	4.4
0-6	4.97	0.370	13	10.5									28.5			4.1	4.7

Depth (in.)	6N2b Ca	Extractable bases 6Q2b Mg	6P2a Na	5B1a 6Q2a K	Sum	6H1a Ext. Acidity	Sat. Exch. Cap 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al	5A3b Bases Plus Al me/100g Clay					Base saturation 5C3 Sum Cations Pct	5C1 NH_4OAc Pct
	meq/100 g															
0-6	4.0	1.0	0.1	0.4	5.5	25.2	30.7	17.4	0.9	8.0					18	32
6-12	0.8	0.1	0.1	0.1	1.1	19.8	20.9	9.0	1.4	3.0					5	12
6-12a	0.7	0.3	0.1	0.1	1.2	20.4	21.6	9.1							6	13
12-18	0.4	0.1	0.1	0.1	0.7	18.5	19.2	7.9	1.1	2.1					4	9
18-25	tr	0.1	0.1	0.1	0.3	17.2	17.5	7.1	0.6	1.1					2	4
18-25a	0.2	-	0.1	tr	0.3	16.8	17.1	7.0							2	4
25-35	tr	0.2	0.1	0.1	0.4	16.4	16.8	6.6	0.5	1.2					2	6
35-45	tr	-	0.1	tr	0.1	15.7	15.8	7.4	1.1	1.7					1	1
35-45a	-	0.2	tr	tr	0.2	15.6	15.8	7.8							1	2
45-56	0.1	0.1	0.1	tr	0.3	15.4	15.7	8.9	2.5	4.9					2	3
56-84	0.1	0.1	0.1	tr	0.3	15.6	15.9	9.7	3.6	5 i					2	3
56-84a	-	0.2	tr	tr	0.2	19.5	19.7	10.4							1	2
84-108	0.1	0.1	0.1	tr	0.3	15.7	16.0	10.9	5.5	8 i					2	3
120-144	0.2	0.3	0.1	tr	0.6	16.6	17.2	10.8	5.6	9 i					3	6
144-180	0.3	0.1	0.1	tr	0.5	16.9	17.4	11.1	6.3	10 i					3	4
180-216		0.1	0.1	tr	0.2	16.7	16.9	10.3	6.6	10 i					1	2
216-240	0.1	0.3	0.1	0.1	0.6	18.7	19.3	11.8	7.2	12 i					3	5
240-246	0.1	0.1	0.1	0.1	0.4	18.2	18.6	11.9	7.4	12 i					2	3
0-6	2.2	0.7	0.1	0.2	3.2	25.4	28.6	16.3	1.4	5.9					11	20

Depth (in)	Ratios to Clay 8B1 NH_4OAc CEC	Ext. Iron	15-Bar Water
0-6	0.22	0.13	0.39
6-12	0.11	0.13	0.37
6-12a	0.11		
12-18	0.09	0.14	0.40
18-25	0.08	0.17	0.42
18-25a	0.08		
25-35	0.09	0.22	0.43
35-45	0.11	0.26	0.48
35-45a	0.11		
45-56	0.16	0.29	0.53
56-84	0.20	0.33	0.61
56-84a	0.22		
84-108	0.26	0.33	0.63
120-144	0.31	0.39	0.82
144-180	0.37	0.39	0.92
180-216	0.35	0.43	0.92
216-240	0.38	0.40	0.89
240-246	0.42	0.40	0.92
0-6	0.21	0.13	0.37

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Field-moist sample.
b. Sampled along pit face several feet from first sample.
c. Earthy nodules: > 50 percent (2-0.25 mm.); 5-25 percent (0.25-0.05 mm.).
d. Earthy nodules: > 50 percent (2-0.05 mm.).
e. Earthy nodules: > 50 percent (2-0.025 mm); 15-25 percent (0.25-0.05 mm.).
f. 20 kg/m² to 60 inches (Method 6A).
g. Range in duplicate clods is 0.14 g/cc.
h. One clod.
i. Clay percentage is estimated (15-bar water percentage x 2.5).

Particle-Size Distribution of Dithionite-Treated Material

Horizon	Sand	Silt	Clay	Soluble
	Percent of < 2mm.			
B25	1.4	13.4	55.4	29.8
C2	6.2	32.0	39.0	22.8
C6	11.7	36.8	29.0	22.5

USDA SCS LINCOLN NEBR 1966

USDA SCS HYATTSVILLE MD 1964

Soil Classification: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic
Soil Type: *Comerio clay
Soil Nos.: S59PR-10-3
Location: Torrecillas Soil Conservation District, Puerto Rico, Barranquitas Soil Study Area; 150 feet north of house and 275 feet north of driveway junction with road; house on north side of road approximately 0.7 mile southeast of kilometer marker 9.7, Highway 152.
Elevation: 591 plus or minus 5 meters.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic

SOIL #Comerio clay SOIL Nos. S59PR-10-9 LOCATION Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 12857-12868 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	3A1c Water-Disp. Clay <0.002		Coarse fragments: 2A2 > 2 (<19) Pct	2-19	19-76
		Pct. of < 2 mm															Pct. of < 76mm	
0-7	Ap	11.5b	21.8	66.7	0.8	2.0	1.4	3.3	4.0	6.8	15.0	12.6	7.5	31		tr		
7-13	B21	8.6b	14.6	76.8	0.9	1.3	1.0	2.4	3.0	5.3	9.3	9.7	5.6	<1		tr		
13-21	B22	7.0b	13.9	79.1	0.8	1.1	0.8	1.9	2.4	4.7	9.2	8.2	4.6			tr		
21-32	B23	7.4b	13.7	78.9	0.8	1.2	1.0	2.0	2.4	4.3	9.4	7.8	5.0			tr		
32-44	B24	5.7b	17.5	76.8	0.9	0.9	0.6	1.5	1.8	3.4	14.1	6.0	3.9			tr		
44-59	B25	6.2b	24.6	69.2	0.4	0.9	0.8	1.9	2.2	4.8	19.8	8.1	4.0			-		
59-72	B26	5.9c	25.9	68.2	0.4	0.6	0.6	1.9	2.4	4.6	21.3	8.2	3.5			-		
72-84	C1	5.6c	35.0	59.4	-	0.3	0.4	1.8	3.1	6.3	28.7	10.6	2.5			tr		
84-108	C2	7.6c	40.7	51.7	0.2	0.2	0.4	2.4	4.4	8.0	32.7	14.0	3.2			tr		
108-126	C3	8.4c	42.5	49.1	0.3	0.5	0.6	2.5	4.5	7.9	34.6	14.1	3.9			tr		
126-132	C4	10.8b	50.2	39.0	0.9	0.8	0.7	2.9	5.5	8.2	42.0	15.7	5.3			tr		
0-7	Ap a	11.6b	21.2	67.2	1.5	2.2	1.3	3.0	3.6	5.6	15.6	11.0	8.0			tr		

Depth (In.)	6A1a Organic carbon d Pct	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct	Carbonate as $CaCO_3$ Pct		Bulk density: 4A1a Field-State g/cc	g/cc	4A1h Oven-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct	4B1b 1/3-Bar Pieces Pct	4B2 15-Bar Pct			pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-7	4.27	0.342	12	9.0			1.06		1.32	0.078	47.2	37.0	28.4			4.4	5.0
7-13	1.51	0.146	10	10.9			1.20		1.46	0.068	41.9	39.1	32.7			4.0	4.7
13-21	1.08	0.118	9	12.6			1.13		1.40	0.073	51.0	39.7	33.9			4.2	4.9
21-32	0.68	0.085	8	12.6			1.28		1.41	0.032	41.1	36.4	32.7			4.2	4.9
32-44	0.54	0.063	8	14.4			1.19		1.42	0.059	49.8	37.0	34.6			4.3	4.7
44-59	0.36	0.043	8	14.4			1.32		1.42	0.024	38.0	32.5	31.9			4.1	4.7
59-72	0.16			14.8			1.38		1.48	0.024	35.5	33.2	30.8			3.9	4.7
72-84	0.18			17.0									29.1			3.8	4.7
84-108	0.15			15.2									28.0			3.8	4.7
108-126	0.10			14.0									27.1			3.7	4.7
126-132	0.13			12.6									27.1			3.7	4.4
0-7	4.65	0.348	13	9.6									28.2			4.5	5.1

Depth (In.)	Extractable bases: 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	5B1a Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6C1d KCl-Ext. Al		5A3b Bases Sus Al me/100g Clay					Base saturation: 5C3 Sum Cations Pct	5C1 NH_4OAc Pct.
	meq/100 g																
0-7	6.2	1.0	0.1	0.6	7.9	21.0	28.9	19.0	0.2		12.1					27	42
7-13	1.2	0.3	tr	0.1	1.6	15.9	17.5	9.5	1.3		3.8					9	17
13-21	0.8	0.1	tr	0.1	1.0	15.4	16.4	8.1	0.9		2.4					6	12
21-32	0.5	0.1	tr	0.1	0.7	13.9	14.6	7.5	1.1		2.3					5	9
32-44	0.3	0.2	tr	0.1	0.6	16.2	16.8	7.1	0.7		1.7					4	8
44-59	0.1	0.1	tr	tr	0.2	15.9	16.1	6.5	1.1		1.9					1	3
59-72	0.1	0.1	tr	tr	0.2	15.9	16.1	7.9	2.0		3.2					1	2
72-84	0.1	0.3	tr	tr	0.4	16.2	16.6	8.6	3.8		7.1					2	5
84-108	tr	0.3	tr	tr	0.3	16.1	16.4	9.6	4.4		9.1					2	3
108-126	tr	0.3	tr	0.1	0.4	16.4	16.8	10.5	5.6		12.2					2	4
126-132	tr	0.4	tr	0.1	0.5	15.4	15.9	9.8	5.5		9 e					3	5
0-7	6.7	1.1	0.1	0.4	8.3	21.6	29.9	21.3	0.4		13.0					28	39

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water		
0-7	0.28	0.13	0.43		
7-13	0.12	0.14	0.43		
13-21	0.10	0.16	0.43		
21-32	0.10	0.16	0.41		
32-44	0.09	0.19	0.45		
44-59	0.09	0.21	0.46		
59-72	0.12	0.22	0.45		
72-84	0.14	0.29	0.49		
84-108	0.18	0.29	0.54		
108-126	0.21	0.29	0.55		
126-132	0.25	0.32	0.69		
0-7	0.32	0.14	0.42		

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Sampled along pit face several feet from first sample.
b. Earthy nodules: 25-50 percent (2-0.5 mm.), 5-25 percent (0.5-0.05 mm.).
c. Earthy nodules: > 50 percent (2-0.05 mm.)
d. 20 kg/m² to 60 inches (Method 6A).
e. Clay percentage is estimated (15-bar water percentage x 2.5).

Soil Classification: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic
Soil Type: *Comerio clay
Soil Nos.: S59PR-10-9
Location: Torrecillas Soil Conservation District, Puerto Rico, Barranquitas Soil Study Area; 160 feet south of S59PR-10-8 and approximately 115 feet southeast of the house reached by the lane that meets Highway 152 at kilometer marker 8.8.
Elevation: 582 plus or minus 5 meters.
Vegetation and Land Use: Native pasture.
Slope: 9 percent to the southeast.
Parent Material: Chloritized greenish black basaltic andesite flow breccia (personal communication from R. P. Briggs, USGS, to T. U. Yager).
Collected and Described by: R. A. Bocheciamp, K. W. Flach, R. E. Gierbolini, R. B. Grossman and T. U. Yager, December 16, 1959

Horizon and Lincoln Lab. No.	
Ap 12857 12868	0 to 7 inches. Dark brown (7.5YR 4/2) clay; moderate very fine subangular blocky; firm, nonsticky, plastic; pieces of charcoal common, roots common; abrupt wavy boundary. Second LSL No. refers to an additional sample taken several feet away along the pit face; the data are given at the end of the regular sequence.
B21 12858	7 to 13 inches. Reddish brown (5YR 5/4) clay with reddish-brown (5YR 4/4) ped surfaces; moderate fine angular to subangular blocky; firm, slightly sticky, plastic; fails semiplastically;1/ few fine and common very fine pores; many sand-size aggregates; few quartz grains; clear smooth boundary.
B22 12859	13 to 21 inches. Yellowish red (5YR 5/6) clay with reddish-brown (5YR 5/4) ped surfaces common; moderate fine angular to subangular blocky; firm, slightly sticky, plastic; fails semiplastically; few fine and very fine pores; common sand-size aggregates; few roots; gradual smooth boundary.
B23 12860	21 to 32 inches. Yellowish red (5YR 4/6 to 5/6) clay with a few reddish brown (5YR 4/4) ped surfaces and common fine faint strong brown (7.5YR 5/6) mottles; weak to moderate angular to subangular blocky; firm, slightly sticky, plastic; fails abruptly; few fine and common very fine pores; few sand-size aggregates; few sand-size angular grains of quartz or chert; few very weak reflective or pressure surfaces; few roots; clear smooth boundary.
B24 12861	32 to 44 inches. Yellowish red (5YR 4/6) clay to silty clay loam with 20 percent red (2.5YR 4/6) to yellowish red (5YR 4/6) and with many medium distinct strong brown (7.5YR 5/6) mottles; weak fine angular blocky; firm, slightly sticky, plastic; fails abruptly; few fine and common very fine pores; common sand-size aggregates; sand-size angular grains of quartz or chert common; reflective or pressure surfaces common with an occasional striated surface; very few roots; gradual boundary.
B25 12862	44 to 59 inches. Yellowish red (5YR 4/6) to red (2.5YR 4/6) fine silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak very fine angular blocky; firm, nonsticky, plastic; fails abruptly; few very fine pores; very few sand-size aggregates; angular quartz or chert grains, up to 5 mm. in diameter, common; reflective or pressure surfaces common; some weak patchy clay films; no roots; clear wavy boundary.
B26 12863	59 to 72 inches. Red (2.5YR 4/6) fine silty clay loam with common medium distinct strong brown (7.5YR 5/6) mottles; weak very fine angular blocky; firm, nonsticky, plastic; fails abruptly; few very fine pores; very few sand-size aggregates; occasional sand-size angular grains of quartz or chert; reflective surfaces common with some surfaces weakly striated; weak patchy clay films; arbitrary boundary.
C1 12864	72 to 84 inches (6 to 7 feet). Red (10YR 4/6) silty clay loam; arbitrary boundary.
C2 12865	84 to 108 inches (7 to 9 feet). Similar to C1.
C3 12866	108 to 126 inches (9 to 10½ feet). Saprolite, 50 to 75 percent; dusky red (10R 3/4) silty clay loam matrix; arbitrary boundary.
C4 12867	126 to 132 inches (10½ to 11 feet). Saprolite, more than 75 percent; dark reddish brown (2.5YR 3/4) silty clay loam matrix; sand-size quartz grains common.

Remarks: A few pebbles up to 50 to 75 mm. across occur below 32 inches. The pebbles consist of clusters of quartz crystals that appear to have grown inward toward a common center. These pebbles are probably remnants of a quartz vein.

1/ Two terms are used to describe the rate of failure of natural fabric: fails abruptly and fails semiplastically. To fail abruptly means that no plasticity is observed prior to failure. Stress builds up as the piece of soil is squeezed and dissipates quickly as the piece of soil breaks apart into numerous fragments or peds due to failure along natural planes of weakness. In semiplastic failure, deformation is readily observed prior to rupture.

Mineralogy (Method 7A).

Interpretations of X-ray and Differential Thermal Analyses of the Clay and Silt Fractions

Horizon	Depth Inches	< 2μ fraction Vermiculite	Kaolinite %	Gibbsite %	2-50μ fraction Kaolinite %	Gibbsite %	Quartz
Ap	0-7	xx	40	—	tr	—	cccc
B22	13-21	x	35	—	10	—	ccccc
B26	59-72	—	40	—	30	—	cc

Notes: Vermiculite: X-ray, oriented samples; (x = small, xx = moderate amounts). Quartz: X-ray, powder (unoriented); c = height unit of 3.35Å reflection. 7.2Å reflection peak (kaolinite) slightly diffuse and decreasing in amplitude with depth. Kaolinite and gibbsite by DTA.

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, kaolinitic, isohyperthermic

SOIL Coto clay SOIL Nos. S63PR-6-1 LOCATION Noroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18972-18980 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	<0.0002	<0.074	Coarse fragments 2A2 > 2 (<19) Pct.	2-19 (Pct. of < 76mm)	19-76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-5	Ap	22.3	7.0	70.7	tr	2.5	5.1	7.9	6.8	2.9	4.1	13.8	15.5		81.5	-		
5-10	A12	21.8	7.1	71.1	tr	2.5	5.2	7.7	6.4	3.2	3.9	13.7	15.4		80.9	-		
10-17	B21	18.8	5.3	75.9	0.1	2.3	4.4	6.5	5.5	2.6	2.7	11.5	13.3		83.5	-		
17-25	B22	14.5	5.9	79.6	0.2	1.7	3.1	5.1	4.4	1.7	4.2	8.8	10.1	36.5	87.4	-		
25-36	B23	11.4	6.7	81.9	0.1	1.2	2.2	4.0	3.9	1.4	5.3	7.4	7.5		90.2	-		
36-50	B24	13.3	10.5	76.2	0.1	0.9	2.1	4.7	5.5	2.9	7.6	11.1	7.8		88.8	-		
50-64	B25	16.4a	16.2	67.4	0.1	1.2	2.2	5.3	7.6	6.0	10.2	16.9	8.8		88.4	-		
84-120	B26	14.8	15.1	70.1	0.1	1.4	2.6	4.2	6.5	4.6	10.5	13.3	8.3		87.4	-		
120-144	B27	13.8	15.7	70.5	tr	1.0	1.8	3.9	7.1	5.1	10.6	14.6	6.7		88.6	-		

Depth (In.)	6A1a Organic carbon b Pct	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct		Bulk density: 4A1a Field-State g/cc	4A1d 1/3-Bar g/cc	4A1b Air-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	4B1c 1/3-Bar Pct.	4B2 15-Bar Pct.	4C1 1/3-to 15-Bar in./in.		pH: 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-5	2.44	0.252	10	9.6			1.25	1.30	1.39	0.020	28.5	25.0	22.5	0.03		4.1	4.8
5-10	1.69	0.197	9	9.8			1.30	1.34	1.44	0.024	28.2	28.0	22.8	0.07		3.9	4.5
10-17	0.99	0.143	7	10.1			1.30	1.32	1.41	0.020	28.6	31.5	23.7	0.10		3.9	4.5
17-25	0.62	0.127	5	10.6			1.28	1.30	1.38	0.020	29.3	30.6	26.4	0.05		4.1	4.6
25-36	0.46	0.113	4	11.5			1.24	1.25	1.32	0.017	31.5	33.3	26.8	0.08		5.5	5.9
36-50	0.25			11.2			1.46c	1.45	1.48	0.007	26.1	27.3	25.0	0.03		5.9	6.3
50-64	0.19			11.2				1.4d					23.5			5.8	6.0
84-120	0.15			12.9									23.0			5.4	5.5
120-144	0.11			13.3									23.1			4.9	4.6

Depth (In.)	Extractable bases: 6N2a Ca	6O2a Mg	6P2a Na	6Q2a K	5B1a Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6C1d KCl-Ext. Al	6L2a NH_4OAc Ext. SO_4		5A3b Bases Plus Al me/100g Clay				Base saturation: 5C3 Sum Cations Pct	5C1 NH_4OAc Pct.
	meq/100 g																
0-5	3.6	0.9	0.1	0.4	5.0	20.4	25.4	13.3	0.6	0.5		7.9				20	38
5-10	2.1	0.5	0.1	0.1	2.8	20.0	22.8	10.6	1.4	1.7		5.9				12	26
10-17	1.2	0.4	0.1	0.1	1.8	16.4	18.2	7.1	1.6	3.3		4.5				10	25
17-25	3.7	0.6	0.1	0.1	4.5	15.6	20.1	5.8	0.9	3.8		6.8				22	78
25-36	3.6	0.7	0.1	0.1	4.5	9.7	14.2	5.8		1.8		5.5				32	78
36-50	4.1	0.6	0.1	0.1	4.9	8.5	13.4	5.7		1.6		6.4				37	86
50-64	3.7	0.9	0.1	tr	4.7	8.9	13.6	5.5		2.3		7.0				35	85
84-120	1.8	2.0	0.1	tr	3.9	11.4	15.3	4.9		3.3		5.6				25	80
120-144	1.4	1.2	0.1	tr	2.7	11.2	13.9	4.8	0.1	2.6		3.8				19	56

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water		
0-5	0.19	0.14	0.32		
5-10	0.15	0.14	0.32		
10-17	0.09	0.13	0.31		
17-25	0.07	0.13	0.33		
25-36	0.07	0.14	0.33		
36-50	0.07	0.15	0.33		
50-64	0.08	0.17	0.35		
84-120	0.07	0.18	0.33		
120-144	0.07	0.19	0.33		

a. Earthy nodules: 15-25 percent (0.5-0.05 mm.).
b. 14 kg/m^2 to 60 inches (Method 6A).
c. Estimated.
d. Range in duplicate clods is 0.11 g/cc.

Soil Classification: Tropeptic Haplorthox; clayey, kaolinitic, isohyperthermic
Soil type: Coto clay
Soil No.: S63PR-6-1
Location: Noroeste SCD, Puerto Rico, ten miles west of Quebradillas, 200 feet south of kilometer marker 115.0 on highway No. 2.
Vegetation and use: Sorra grass (Trichachnee insularis). Used as pasture.
Slope and land form: 3 percent. North aspect. Alluvial fan north of limestone hills.

Drainage and permeability: Well drained, with medium runoff. Permeability is moderate.
Parent materials: Transported sediments probably derived from weathered limestone and quartzitic sand deposits.
Rainfall: About 50 inches a year.
Collected by: R. B. Grossman, W. E. McKinzie, R. E. Gierbolini, J. Torres-Más on September 26, 1963.
Described by: R. E. Gierbolini.

Horizon and Lincoln Lab. Number	
Ap 18972	0 to 5 inches, dark brown (7.5YR 4/4) silty clay; weak fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine roots; strongly acid; clear smooth boundary.
A12 18973	5 to 10 inches, dark brown (7.5YR 4/4) silty clay; weak medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common fine roots; common fine quartz grains; common fine black nodules; medium acid; clear smooth boundary. Field moisture, 31.4 percent.
B21 18974	10 to 17 inches, yellowish red (5YR 5/8) moist with reddish brown (5YR 5/4) coatings, yellowish red (5YR 5/8) dry; clay; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; thin discontinuous clay films; few fine roots; few fine quartz grains; few fine black nodules; strongly acid; gradual smooth boundary. Field moisture, 30.8 percent.
B22 18975	17 to 25 inches, yellowish red (5YR 4/8) moist, yellowish red (5YR 5/8) dry; clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; thin patchy clay films on ped surfaces and root channels; small pieces fail abruptly upon slight pressure between fingers 1/; few fine roots; common fine pores; few fine quartz grains; few fine black nodules; black coatings along root channels; strongly acid; gradual smooth boundary. Field moisture 34.6 percent.
B23 18976	25 to 36 inches, yellowish red (5YR 4/8) moist, yellowish red (5YR 5/8) dry;clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; thin patchy clay films on ped surfaces and root channels; small pieces fail abruptly upon slight pressure between fingers 1/; common fine pores; common fine quartz grains; few fine black nodules; black coatings along root channels; clear smooth boundary. Field moisture 34.0 percent.
B24 18977	36 to 50 inches, yellowish red (5YR 4/8) with few fine red (2.5YR 4/8) and few fine yellowish brown (10YR 5/4) mottles; clay loam; weak fine blocky structure; friable, slightly sticky, slightly plastic; shiny ped faces; small pieces fail abruptly upon slight pressure between fingers 1/; few fine roots; few fine quartz grains; common fine pores; slightly acid; gradual smooth boundary.
B25 18978	50 to 64 inches. Same as above; split for sampling.
B26 18979	7 to 10 feet, auger sample; strong brown (7.5YR 5/8) crushed color; clay loam.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, kaolinitic, isohyperthermic

SOIL Coto clay SOIL Nos. S63PR-6-2 LOCATION Noroeste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 18981-18988 January 1967

General Methods: 1A, 1B1b, 2A1, 2B

	Total		Sand				Silt				Coarse fragments
			Very		Medium	Fine					2A2

Soil Classification: Tropeptic Haplorthox; clayey, kaolinitic, isohyperthermic
Soil type: Coto clay.
Soil Nos.: S63PR-6-2
Location: Noroeste SCD, Puerto Rico, 11 kilometers east from the town of Aguadilla, 6 kilometers southwest of Isabela, 200 feet south of kilometer marker 120-15 on highway 2. Photo number GS-LR 5-94.
Vegetation and use: Native grasses: Carpet, Horquetilla. Used for pasture.
Slope and Land form: 3 **percent. North aspect. Alluvial fan to north of limestone hills.**
Drainage and permeability: Well drained, medium runoff and moderate permeability.
Parent material: Fine-textured sediments derived from limestone and quartzitic sand deposits.
Rainfall: About 50 inches a year.
Samples collected by and date: R. B. Grossman, W. E. McKinzie, J. Torres-Mas, and R. E. Gierbolini on September 26, 1963.
Described by: R. E. Gierbolini.

Horizon and Lincoln Lab. Number	
Ap 18981	0 to 9 inches, dark brown (7.5YR 4/4) clay; moderate fine subangular blocky structure; hard, firm, slightly sticky, slightly plastic; many fine roots; medium acid; clear smooth boundary.
B21 18982	9 to 14 inches, reddish brown (5YR 4/4) clay; moderate fine and medium subangular blocky structure; firm, slightly sticky, slightly plastic; thin discontinuous clay films; common fine roots; few fine black nodules, very strongly acid; clear smooth boundary.
B22 18983	14 to 19 inches, yellowish red (5YR 4/8) clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few thin patchy clay films; small pieces fail abruptly upon slight pressure between fingers 1/; few fine roots; few fine black nodules; common fine pores; very strongly acid; clear smooth boundary.
B23 18984	19 to 26 inches, strong brown (7.5YR 5/8) silty clay; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few thin patchy clay films; small pieces fail abruptly upon slight pressure between fingers 1/; few fine roots; many fine pores; few fine black nodules; very strongly acid; clear smooth boundary.
B24 18985	26 to 37 inches, strong brown (7.5YR 5/8) silty clay; weak medium and coarse subangular blocky structure; friable, slightly sticky, slighlty plastic; thin patchy clay films, small pieces fail abruptly upon slight pressure between fingers 1/; few fine roots; common fine pores; few fine quartz grains; few fine black nodules; very strongly acid; clear smooth boundary.
B25 18986	37 to 49 inches, strong brown (7.5YR 5/8) clay loam with few fine distinct red (7.5R 4/8) mottles; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few thin clay films; many fine quartz grains; very strongly acid; gradual smooth boundary.
B26 18987	49 to 70 inches, strong brown (7.5YR 5/8) clay loam with common fine and medium distinct red (7.5R 4/8) mottles; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few thin patchy clay films; many fine quartz grains; very strongly acid.
B27 18988	70 to 92 inches, auger sample, strong brown (7.5YR 5/8) with common medium distinct red (7.5R 4/8) mottles; clay loam; massive; slightly sticky, slightly plastic; very strongly acid.

1/ - See introductory part of the Soil Survey Investigations Report for an explanation of this and similar terms that are designed to describe the failure of the material in its natural state of organization.

Remarks: Ap, B22, B24 sampled for the Bureau of Public Roads. Colors given are for moist soil. Soil was at field capacity when sampled. Reaction determined by Soiltex. Red mottles in the B25, B26 and B27 horizons tend to be in horizontal bands.

SOIL CLASSIFICATION: Tropopsamment Hydrothermic, clayey, mixed, isohyperthermic

SOIL Series not designated SOIL Nos. S58PR-11-1 LOCATION Noreste SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 9838-9844 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2–0.05) a	Total: Silt (0.05–0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2–1)	Sand: Coarse (1–0.5)	Sand: Medium (0.5–0.25)	Sand: Fine (0.25–0.1)	Sand: Very fine (0.1–0.05)	Silt: 0.05–0.02	Silt: Int. III (0.02–0.002)	Int. II (0.2–0.02)	(2–0.1)	3A1c Water Disp. Clay <0.002		Coarse fragments 2A2 > 2 (<19)	2–19	19–76
		Pct. of < 2 mm														Pct.	Pct. of < 76mm	
0-4	A11	14.0	35.7	50.3	7.4	2.3	0.9	1.4	2.0	4.3	31.4	7.1	12.0			tr		
4-7	A12	12.5	38.0	49.5	4.4	2.1	1.0	2.1	2.9	5.7	32.3	9.9	9.6			-		
7-14	B21	15.3	45.9	38.8	0.9	2.0	1.7	5.4	5.3	7.2	38.7	15.8	10.0	tr		-		
14-19	B22	29.5	36.7	33.8	2.9	5.9	4.1	9.3	7.3	8.1	28.6	20.6	22.2			-		
19-28	B3	13.7	57.3	29.0	0.4	1.1	1.6	5.5	5.1	6.9	50.4	15.4	8.6			-		
28-34	Ab	18.1	54.8	27.1	0.7	1.5	2.2	7.1	6.6	7.2	47.6	18.1	11.5			-		
34-44+	ACb	31.3	46.6	22.1	3.4	5.6	4.8	10.2	7.3	7.5	39.1	20.5	24.0			-		

Depth (In.)	6A1a Organic carbon	6B1a Nitrogen	C/N	6C2a Ext. Iron as Fe	Carbonate as $CaCO_3$		Bulk density g/cc	g/cc	4A1h Oven-Dry g/cc		Water content Pct	Pct.	4B2 15-Bar			pH 8C1c (1:1)	8C1a (1:1)
	Pct.	Pct.		Pct.	Pct.								Pct.			N KCl	H_2O
0-4	5.16	0.389	13	6.1									24.6			3.9	4.7
4-7	3.05	0.278	11	6.9									24.1			4.0	4.8
7-14	0.59	0.053	11	6.8					0.97				26.3			3.9	5.0
14-19	0.53	0.045	12	7.8					1.15				27.1			4.0	5.0
19-28	0.25	0.022		6.8					1.12				22.7			3.9	5.1
28-34	0.13			5.3					1.18				21.4			3.9	5.0
34-44+	0.16			5.4									22.0			3.8	5.0

Depth (In.)	Extractable bases 6N2b Ca	6Q2b Mg	6P2a Na	5B1a 6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3e Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		5A3b Bases Plus Al me/100g Clay					Base saturation 5C3 Sum Cations	5C1 NH_4OAc
	meq/100 g															Pct.	Pct
0-4	0.5	0.8	0.2	0.1	1.6	28.8	30.4	17.4	2.1		7.4					5	9
4-7	0.3	0.8	0.2	0.1	1.4	21.3	22.7	13.9	1.9		6.7					6	10
7-14	0.3	0.5	0.3	tr	1.1	15.5	16.6	11.1	2.9		6 b					7	10
14-19	0.1	0.1	0.3	tr	0.5	17.2	17.7	9.0	2.2		4 b					3	6
19-28	-	0.1	0.2	tr	0.3	14.7	15.0	8.1	2.4		5 b					2	4
28-34	-	0.1	0.2	tr	0.3	13.8	14.1	8.8	3.2		7 b					2	3
34-44+	-	-	0.2	tr	0.2	17.2	17.4	9.9	3.7		7 b					1	2

Depth (In.)	Ratios to Clay 8I1 NH_4OAc CEC	Ext. Iron	15-Bar Water		
0-4	0.35	0.12	0.49		
4-7	0.28	0.14	0.49		
7-14	0.29	0.18	0.68		
14-19	0.27	0.23	0.80		
19-28	0.28	0.23	0.78		
28-34	0.32	0.20	0.79		
34-44+	0.45	0.24	1.00		

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Earthy nodules: > 50 percent.

b. Clay percentage is estimated (15-bar water percentage x 2.5).

Soil Classification: Tropeptic Haplorthox; clayey,1/ mixed,2/ isohyperthermic
Soil Type: Series not designated
Soil Nos.: S58PR-11-1
Location: Noreste Soil Conservation District, Puerto Rico in the Bosque Nacional del Caribe, 40 feet west and 50 feet above road at kilometer marker 11.2 plus 80 feet; Highway No. 191.
Elevation: 600 plus or minus 25 meters.
Precipitation: 152 inches at Rio Blanco, (34-year average).
Vegetation and Use: Rain forest (ferns, palms, vines and trees). U. S. Forest Service control.
Slope and Land Form: 60 percent with east aspect, approximately midway on mountain slope. El Yunque peak (elevation 1,065 meters) lies 0.9 mile to the west and north.
Drainage and Permeability: Well drained but permanently wet.
Parent Material: Residuum or local colluvium from tuffaceous(?) volcanic rock.
Collected by: L. T. Alexander, K. W. Flach, L. H. Rivera and T. U. Yager, November 13, 1958.
Described by: T. U. Yager.

Horizon and Lincoln Lab. No.	
Aoo	2 1/2 to 2 inches. Partially decomposed leaves.
Ao	2 to 0 inch. Very dark brown (10YR 2/2) highly decomposed plant litter; abundant roots.
A11 9838	0 to 4 inches. Brown (10YR 4/3) clay with areas of dark brown (10YR 3/3) common; weak fine subangular blocky structure; nonsticky, nonplastic (this consistence very noticeable throughout all lower horizons); abundant roots constitute approximately 50 percent of the total mass; clear smooth boundary.
A12 9839	4 to 7 inches. Dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) clay; moderate fine subangular blocky structure; nonsticky, nonplastic; horizon has inclusions up to 10 percent of the B21; roots constitute approximately 25 percent of the total mass; thickness of horizon varies from 2 to 6 inches; abrupt wavy boundary.
B21 9840	7 to 14 inches. Yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) clay with many medium distinct yellowish red (5YR 5/6) and few fine and medium prominent very pale brown (10YR 7/4) mottles; moderate medium subangular blocky structure; nonsticky, nonplastic; abrupt wavy boundary. Water appears to flow laterally on top of this horizon.
B22 9841	14 to 19 inches. Similar to B21 except that it has weak medium subangular blocky structure; few subangular fragments of highly weathered gray and brown tuffaceous rock, up to 2 inches in diameter, may be broken by hand with ease; (these fragments are found throughout all lower horizons); clear smooth boundary.
B3 9842	19 to 28 inches. Yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) clay with few fine prominent very pale brown (10YR 7/4) mottles and with yellowish brown (10YR 5/4) fillings common in old root channels; very weak medium subangular blocky structure; nonsticky, nonplastic; abrupt wavy boundary.
Ab 9843	28 to 34 inches. Brown (10YR 4/3) clay with 1/3 admixture of yellowish brown (10YR 5/4) clay from the ACb horizon; and a few fine faint very pale brown (10YR 7/4) mottles; massive; nonsticky, nonplastic; abrupt irregular boundary.
ACb 9844	34 to 44 inches plus. Yellowish brown (10YR 5/6) clay with 1/3 admixture of brown (10YR 4/3) clay of the Ab horizon and a few fine very pale brown (10YR 7/4) mottles; massive; nonsticky and nonplastic.

Remarks: Colors given are for moist soil. Soil sampled at field capacity. No clay films were observed. Mottling in B21 and B22 probably due to expression of C material rather than poor drainage. Some charcoal noted in Ab. Sample collected 6 feet from a large boulder (8 to 10 feet in diameter). There has undoubtedly been considerable sliding of large blocks of soil down the mountain in this area.

1/ Family texture based on clay percentage estimated as 2.5 times the 15-bar water content.
2/ Fails oxidic family class because of decrease in iron to clay ratios when clay percentage estimated as 2.5 times the 15-bar water content.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic

SOIL: Series not designated — SOIL Nos. S59PR-10-1, S59(66)PR-10-1† — LOCATION: Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska — LAB. Nos. 12763-12777, 66L122-66L123† — November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1: Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int. III (0.02-0.002)	Silt: Int. II (0.2-0.02)	(2-0.1)	3A1c Water-Disp. Clay <0.002		Coarse fragments 2A2 > 2 (<19)	2-19	19-76
		Pct. of < 2 mm														Pct.	Pct. of < 76mm	
0-5	Ap	6.2b	19.0	74.8	1.4	1.5	0.6	1.0	1.7	4.1	14.9	6.4	4.5	32		tr		
5-10	B21	3.3b	14.0	82.7	0.3	0.8	0.4	0.6	1.2	3.1	10.9	4.7	2.1	39		tr		
10-16	B22	1.5b	14.3	84.2	0.2	0.3	0.1	0.3	0.6	4.4	9.9	5.2	0.9	34		-		
16-23	B23	2.0c	24.0	74.0	-	0.1	0.1	0.6	1.2	5.6	18.4	7.2	0.8	tr		-		
23-32	B24	4.8c	30.5	64.7	-	0.2	0.2	2.0	2.4	7.8	22.7	11.6	2.4			-		
32-42	B25	4.2c	33.7	62.1	0.2	0.4	0.3	1.2	2.1	7.1	26.6	10.0	2.1			-		
42-57	C1	8.1c	43.3	48.6	-	0.4	0.5	2.7	4.5	9.5	33.8	15.9	3.6			-		
57-72	C2	6.5c	50.4	43.1	-	0.3	0.4	1.9	3.9	10.1	40.3	15.3	2.6			-		
72-102	C3	13.7c	44.5	41.8	0.1	0.9	1.3	4.8	6.6	11.6	32.9	21.2	7.1			-		
102-132	C4	14.6c	56.4	29.0	0.4	1.8	1.6	4.5	6.3	12.8	43.6	21.7	8.3			-		
132-168	C5	17.0c	56.4	26.6	0.6	2.3	2.0	5.2	6.9	13.2	43.2	23.1	10.1			-		
168-204	C6	13.9c	60.9	25.9	0.2	1.1	1.3	4.5	6.1	12.0	48.9	19.1	7.1			-		
204-240	C7	13.7c	63.6	22.7	0.4	2.0	1.4	3.8	6.1	11.8	51.8	20.2	7.6			-		
240-252	C8	15.0c	59.2	25.8	0.4	1.9	1.5	4.8	6.4	12.7	46.5	22.0	8.6			-		
0-5	Ap a	4.3b	18.4	77.3	0.2	0.8	0.5	1.0	1.8	4.7	13.7	7.1	2.5			tr		

Depth (In.)	6A1a Organic carbon d Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct		Bulk density 4A1a Field-State g/cc	Bulk density g/cc	Bulk density 4A1h Oven-Dry g/cc	4D1 COLE	Water content 4B4 Field-State Pct.	Water content 4B1b 1/3-Bar Pieces Pct	Water content 4B2 15-Bar Pct			pH 8C1c (1:1) N KCl	pH 8C1a (1:1) H_2O
0-5	5.84	0.389	15	9.7			0.92		1.33	0.13	58.1	39.9	31.2			3.7	4.3
5-10	1.86	0.160	12	12.7			1.13		1.35	0.059	46.5	43.0	36.5			3.9	4.5
10-16	1.64	0.136	12	13.8			1.06		1.31	0.073	52.6	44.2	39.8			4.1	4.6
16-23	1.32	0.109	12	15.7			1.08		1.28	0.059	49.8	43.0	38.2			4.3	4.6
23-32	1.02	0.079	13	16.1			1.13		1.32	0.052	48.0	41.7	37.4			4.3	4.6
32-42	0.41	0.034	12	16.5			1.29		1.42	0.032	39.2	35.3	32.0			4.2	4.8
42-57	0.13			16.1			1.46		1.54	0.017	31.2	30.8	27.5			3.9	4.8
57-72	0.06			14.3			1.44		1.52	0.017	30.8	30.3	26.8			3.9	4.9
72-102	0.13			15.6									27.2			3.9	4.8
102-132	0.08			14.0									24.5			3.8	4.8
132-168	0.04			14.7									25.9			3.8	4.7
168-204	<0.01			12.2									24.2			3.8	4.6
204-240	0.02			11.2									20.7			3.7	4.6
240-252	0.01			11.5									21.0			3.7	4.5
0-5	7.73	0.509	15	9.7									32.1			3.9	4.7

Depth (In.)	Extractable bases 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		5A3b Bases Plus Al me/100g Clay			6N2e Ext. Ca f me/100g		Base saturation 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct
	meq/100 g																
0-5	0.4	0.7	0.1	0.2	1.4	31.5	32.8	16.1	3.2		6.2					4	9
5-10	tr	0.1	0.1	0.1	0.3	22.1	22.4	9.8	2.3		3.1					1	3
10-16	tr	0.1	tr	0.1	0.2	21.1	21.3	8.8	1.5		2.0					1	2
16-23	tr	-	tr	tr	tr	19.3	19.3	7.5	1.0		1.4					<1	<1
23-32	-	-	tr	tr	tr	17.5	17.5	7.6	0.9		1.4			0.02		<1	<1
32-42	tr	-	tr	tr	tr	15.6	15.6	7.7	1.5		2.4					<1	<1
42-57	tr	-	tr	tr	tr	14.6	14.6	8.4	3.0		6.2					<1	<1

Soil Classification: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic
Soil Type: Series not designated
Soil Nos.: 859PR-10-1
Location: Torrecillas Soil Conservation District, Puerto Rico, Barranquitas Soil Study Area; 400 feet east and 335 feet north of the junction of a field road with a dirt road and approximately 1/2 mile southeast of the junction of the dirt road with Highway 152 at kilometer marker 9.7.
Elevation: 593 plus or minus 5 meters.
Vegetation and Land Use: Very recently cleared. Previously cut-over second growth woodland of pomarrosa, camasey, tree ferns, ferns and weeds.
Slope: Smooth, 7 percent to east; about midway on a 600-foot long slope.
Parent Material: Chloritized greenish black basaltic andesite flow breccia (personal communication from R. P. Briggs, USGS, to T. U. Yager).
Collected and Described by: R. A. Bocchesiamp, K. W. Flach, R. E. Gierbolini, R. B. Grossman and T. U. Yager, December 9, 1959

Horizon and Lincoln Lab. No.	
Ap 12763 12777	0 to 5 inches. Dark yellowish brown (10YR 3/4 to 4/4) clay; weak fine subangular blocky to strong fine granular; friable, slightly sticky; abundant roots; abrupt smooth boundary. Second LSL No. refers to an additional sample taken several feet away along the pit face; the data are given at the end of the regular sequence.
B21	5 to 10 inches. Strong brown (7.5YR 5/6) clay with yellowish brown (10YR 5/4) ped surfaces and common

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic

SOIL: Series not designated — SOIL Nos. S59PR-10-1, S59(66)PR-10-1† — LOCATION: Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY: Lincoln, Nebraska — LAB. Nos 12763-12777, 66L122-66L123† — November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In)	Horizon	Size class and particle diameter (mm) — Total: Sand (2-0.05)	Total: Silt (0.05-0.002)	Total: Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: (0.05-0.02)	Silt: Int. III (0.02-0.002)	Silt: Int. II (0.2-0.02)	3A1 (2-0.1)	3A1c Water-Disp. Clay <0.002		Coarse fragments: 2A2 > 2 (<19) Pct	2-19	19-76
		Pct. of < 2 mm														Pct.	Pct. of < 76mm	
0-5	Ap	6.2b	19.0	74.8	1.4	1.5	0.6	1.0	1.7	4.1	14.9	6.4	4.5	32		tr		
5-10	B21	3.3b	14.0	82.7	0.3	0.8	0.4	0.6	1.2	3.1	10.9	4.7	2.1	39		tr		
10-16	B22	1.5b	14.3	84.2	0.2	0.3	0.1	0.3	0.6	4.4	9.9	5.2	0.9	34		-		
16-23	B23	2.0c	24.0	74.0	-	0.1	0.1	0.6	1.2	5.6	18.4	7.2	0.8	tr		-		
23-32	B24	4.8c	30.5	64.7	-	0.2	0.2	2.0	2.4	7.8	22.7	11.6	2.4			-		
32-42	B25	4.2c	33.7	62.1	0.2	0.4	0.3	1.2	2.1	7.1	26.6	10.0	2.1			-		
42-57	C1	8.1c	43.3	48.6	-	0.4	0.5	2.7	4.5	9.5	33.8	15.9	3.6			-		
57-72	C2	6.5c	50.4	43.1	-	0.3	0.4	1.9	3.9	10.1	40.3	15.3	2.6			-		
72-102	C3	13.7c	44.5	41.8	0.1	0.9	1.3	4.8	6.6	11.6	32.9	21.2	7.1			-		
102-132	C4	14.6c	56.4	29.0	0.4	1.8	1.6	4.5	6.3	12.8	43.6	21.7	8.3			-		
132-168	C5	17.0c	56.4	26.6	0.6	2.3	2.0	5.2	6.9	13.2	43.2	23.1	10.1			-		
168-204	C6	13.2c	60.9	25.9	0.2	1.1	1.3	4.5	6.1	12.0	48.9	19.1	7.1			-		
204-240	C7	13.7c	63.6	22.7	0.4	2.0	1.4	3.8	6.1	11.8	51.8	20.2	7.6			-		
240-252	C8	15.0c	59.2	25.8	0.4	1.9	1.5	4.8	6.4	12.7	46.5	22.0	8.6			-		
0-5	Ap a	4.3b	18.4	77.3	0.2	0.8	0.5	1.0	1.8	4.7	13.7	7.1	2.5			tr		

Depth (In)	6A1a Organic carbon d Pct	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct	Bulk density: 4A1a Field-State g/cc	Bulk density: g/cc	Bulk density: 4A1h Oven-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct	Water content: 4B1b 1/3-Bar Pieces Pct.	Water content: 4B2 15-Bar Pct.			pH: 8C1c (1:1) N KCl	pH: 8C1a (1:1) H_2O
0-5	5.84	0.389	15	9.7		0.92		1.33	0.13	58.1	39.9	31.2			3.7	4.3
5-10	1.86	0.160	12	12.7		1.13		1.35	0.059	46.5	43.0	36.5			3.9	4.5
10-16	1.64	0.136	12	13.8		1.06		1.31	0.07[illegible]	52.6	44.2	39.8			4.1	4.6
16-23	1.32	0.109	12	15.7		1.08		1.28	0.059	49.8	43.0	38.2			4.3	4.6
23-32	1.02	0.079	13	16.1		1.13		1.32	0.058	48.0	41.7	37.4			4.3	4.6
32-42	0.41	0.034	12	16.5		1.29		1.42	0.032	39.2	35.3	32.0			4.2	4.8
42-57	0.13			16.1		1.46		1.54	0.017	31.2	30.8	27.5			3.9	4.8
57-72	0.06			14.3		1.44		1.52	0.017	30.8	30.3	26.8			3.9	4.9
72-102	0.13			15.6								27.2			3.9	4.8
102-132	0.08			14.0								24.5			3.8	4.8
132-168	0.04			14.7								25.9			3.8	4.7
168-204	<0.01			12.2								24.2			3.8	4.6
204-240	0.02			11.2								20.7			3.7	4.6
240-252	0.01			11.5								21.0			3.7	4.5
0-5	7.73	0.509	15	9.7								32.1			3.9	4.7

Depth (In)	Extractable bases (meq/100 g): 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	6R1a Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		5A3b Bases Plus Al meq/100g Clay		6N2e Ext. Ca f meq/100g		Base saturation: 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct.
0-5	0.4	0.7	0.1	0.2	1.4	31.5	32.8	16.1	3.2		6.2				4	9
5-10	tr	0.1	0.1	0.1	0.3	22.1	22.4	9.8	2.3		3.1				1	3
10-16	tr	0.1	tr	0.1	0.2	21.1	21.3	8.8	1.5		2.0				1	2
16-23	tr	-	tr	tr	tr	19.3	19.3	7.5	1.0		1.4				<1	<1
23-32	-	-	tr	tr	tr	17.5	17.5	7.6	0.9		1.4		0.02		<1	<1
32-42	tr	-	tr	tr	tr	15.6	15.6	7.7	1.5		2.4				<1	<1
42-57	tr	-	tr	tr	tr	14.6	14.6	8.4	3.0		6.2				<1	<1
57-72	tr	-	0.1	tr	0.1	14.4	14.5	9.0	3.8		6 e				1	1
72-102	0.4	-	0.1	0.1	0.6	14.3	14.9	8.4	3.4		6 e				4	7
102-132	0.6	-	0.1	0.1	0.8	14.8	15.6	10.0	5.3		10 e				5	8
132-168	0.1	-	0.1	0.1	0.3	15.4	15.7	9.8	5.0		8 e				2	3
168-204	tr	-	0.1	0.1	0.2	15.3	15.5	11.3	6.3		11 e				1	2
204-240	tr	-	0.1	0.1	0.2	15.4	15.6	12.4	6.8		14 e				1	2
240-252	tr	-	0.1	0.1	0.2	15.3	15.5	11.7	7.0		14 e				1	2
0-5	1.6	1.8	0.1	0.3	3.8	33.5	37.3	21.5	2.1		7.6				10	18

Depth (In)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water
0-5	0.22	0.13	0.42
5-10	0.12	0.15	0.44
10-16	0.10	0.16	0.47
16-23	0.10	0.21	0.52
23-32	0.12	0.25	0.58
32-42	0.12	0.27	0.52
42-57	0.17	0.33	0.57
57-72	0.21	0.33	0.62
72-102	0.20	0.37	0.65
102-132	0.34	0.48	0.84
132-168	0.37	0.55	0.97
168-204	0.44	0.47	0.93
204-240	0.55	0.49	0.91
240-252	0.45	0.45	0.81
0-5	0.28	0.13	0.42

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Sampled along pit face several feet from first sample.
b. Earthy nodules: > 50 percent (2-0.25 mm.).
c. Earthy nodules: > 50 percent (2-0.05 mm.).
d. 19 kg/m² to 60 inches (Method 6A).
e. Clay percentage is estimated (15-bar water percentage x 2.5).
f. Analysis by Beltsville Soil Survey Laboratory.
† Site resampled in 1966 to obtain field-moist soil material for 15-bar study (Method 4B2).

Laboratory No.	Depth (in.)	15-bar Water Content: Air-Dry Pct.	Field-Moist Pct.
66L122	19-27	32.8	39.3
66L123	48	34.9	40.8

USDA SCS HYATTSVILLE MD 1964

Soil Classification: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic
Soil Type: Series not designated
Micromorphology (Method 4E1).

Ap horizon
The ped peripheries are strong brown (7.5YR 5/6), the ped centers are less translucent dark reddish brown (5YR 3/3 or 3/4). The centers and peripheries are nearly isotropic. The ped peripheries occupy about two-thirds of the area. Clear grains, mostly quartz, are abundant. Very few magnetite(?) grains and a few small pieces of charcoal were detected. There were no other identifiable organic residues in the thin sections.

B22 horizon
Extremely uniform strong brown (7.5YR 5/6) matrix with weak flecked anisotropy. Very few quartz grains with silt and grain-size inclusions, and extremely few opaques are present. Pores are very few, some with strongly anisotropic peripheries, either illuviation cutans or stress cutans. Crevices divide the matrix into subangular blocks of roughly 3 to 5 mm. diameter. The crevice peripheries lack cutans, but light bands 0.3 to 0.5 mm. wide of lower chroma and lower luster can be observed. Ped centers are less translucent and less anisotropic than the peripheries.

B24 horizon
The matrix has two distinct parts separated usually by abrupt boundaries, one is red (2.5YR 4/6) and the other is strong brown (7.5YR 5/6 to 5/8). The matrix of both parts is weakly flecked and anisotropic. Crevice peripheries in the red part are either compression cutans or thin illuviation cutans. On many surfaces, the illuviation cutan overlies the compression cutan. The strong brown parts lack these cutans. Both parts contain small colorless grains, some are kaolinite books, some may be quartz. Both parts contain opaques (magnetite?).

B25 horizon
The matrix is predominantly red (10R 4/6) with very weak flecked anisotropy. Many red blotches (2.5YR 4/8) are distinctly different from the matrix and are commonly elongated and interfingered with the matrix. The blotches are generally very weakly anisotropic. Crevice peripheries are less translucent than the matrix and may or may not be more anisotropic. A few of the crevice peripheries are complex cutans--yellow strongly anisotropic bands near the matrix and red rather opaque and weakly anisotropic bands bordering the crevice.

C2 horizon
Colorless microcrystalline material alternating with red material, nearly opaque and isotropic.

C8 horizon
Alternating bands of colorless, strongly anisotropic material and red, nearly opaque parts. Small colorless kaolinite books are present.

Mineralogy (Method 7A).
Interpretation of X-ray and Differential Thermal Analyses of the Clay and Silt Fractions[a]

Horizon	Depth Inches	< 2μ fraction			2-50μ fraction		
		Vermiculite	Kaolinite %	Gibbsite %	Kaolinite %	Gibbsite %	Quartz
Ap	0-5	—	50	—	5	3	cccccc
B22	10-16	—	50	—	15	3	ccc
B24	23-32	—	40	—	40	—	c
C2	57-72	—	50	—	40	—	—
C8	240-252	—	50	—	50	—	—

a. Vermiculite: X-ray, oriented samples; (x = small, xx = moderate amounts). Quartz: X-ray, powder (unoriented); c = height unit of 3.35Å reflection. 7.2Å reflection (kaolinite 001) becomes somewhat more diffuse with depth. Kaolinite and gibbsite by DTA.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic

SOIL Series not designated SOIL Nos. S59PR-10-2 LOCATION Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 12778-12787 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Total Sand (2-0.05)	Total Silt (0.05-0.002)	Total Clay (< 0.002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0.05-0.02	Silt: Int III (0.02-0.002)	Silt: Int II (0.2-0.02)	(2-0.1)	3A1c Water Disp. Clay <0.002		Coarse fragments 2A2 > 2 (<19) Pct.	Coarse fragments 2-19 (Pct. of < 76mm)	Coarse fragments 19-76 (Pct. of < 76mm)
		Pct. of < 2 mm																
0-6	Ap	5.1b	12.7	82.2	0.9	1.4	0.8	1.0	1.0	3.1	9.6	4.6	4.1	32		tr		
6-12	B21	3.5b	20.5	76.0	0.6	0.8	0.6	0.8	0.7	2.2	18.3	3.3	2.8	44		tr		
12-19	B22	3.1b	17.8	79.1	0.4	1.0	0.5	0.6	0.6	2.8	15.0	3.7	2.5	4		tr		
19-25	B23	2.3b	24.6	73.0	0.3	0.6	0.4	0.5	0.6	3.2	21.4	4.0	1.8	tr		tr		
25-32	B24	3.4b	21.9	74.7	0.4	0.9	0.6	0.8	0.7	3.3	18.6	4.4	2.7			-		
32-41	B25	4.1c	26.3	69.6	0.2	0.9	0.6	1.1	1.3	5.0	21.3	6.9	2.8			-		
41-52	B26	7.1c	25.1	67.8	0.4	1.2	1.0	2.2	2.3	4.0	21.1	7.6	7.6			-		
52-66	C1	10.3c	38.5	51.2	0.8	2.0	1.2	2.9	3.4	5.1	33.4	10.2	4.8			-		
66-78	C2	11.1c	51.9	37.0	0.5	1.7	1.4	3.4	4.1	7.0	44.9	13.2	7.0			-		
0-6	Ap a	4.4b	15.5	80.1	0.4	1.3	0.7	1.0	1.0	2.5	13.0	4.0	3.4	28		tr		

Depth (In.)	6A1a Organic carbon d Pct.	6B1a Nitrogen Pct	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct		Bulk density: 4A1a Field-State g/cc	Bulk density: g/cc	Bulk density: 4A1h Oven-Dry g/cc	4D1 COLE	Water content: 4B4 Field-State Pct.	Water content: 4B1b 1/3-Bar Pieces Pct.	Water content: 4B2 15-Bar Pct.			pH: 8C1c (1:1) N KCl	pH: 8C1a (1:1) H_2O
0-6	7.05	0.449	16	12.0			0.84		1.24	0.14	62.5	45.4	32.6			3.8	4.6
6-12	2.11	0.167	13	12.9			1.10		1.43	0.092	48.4	38.8	33.2			4.0	4.5
12-19	1.75	0.150	12	13.7			1.03		1.33	0.092	51.9	38.7	35.2			4.2	4.6
19-25	1.42	0.122	12	14.8			1.02		1.28	0.078	52.3	40.8	36.5			4.4	4.7
25-32	1.05	0.094	11	15.2			1.07		1.25	0.052	48.7	41.2	36.8			4.7	4.8
32-41	0.60	0.059	10	16.1			1.17e		1.32	0.040	44.8	40.0	36.4			5.0	5.0
41-52	0.34	0.040	9	17.6			1.27		1.37	0.024	39.8	36.6	33.8			4.9	5.0
52-66	0.15			17.0			1.29f		1.36f	0.017	37.7f	32.1	29.2			4.0	4.9
66-78	0.12			15.1			1.34		1.40	0.014	35.4	37.2	23.9			3.9	4.8
0-6	7.59	0.444	17	11.0									31.7			4.0	4.7

Depth (In.)	Extractable bases 6N2b Ca	6Q2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap. 5A3a Sum Cations	5A1a NH_4OAc	6G1d KCl-Ext. Al		5A3b Bases Plus Al me/100g Clay			6N2e Ext. Ca h me/100g			Base saturation 5C3 Sum Cations Pct.	5C1 NH_4OAc Pct
	meq/100 g																	
0-6	0.7	0.8	0.1	0.2	1.8	36.1	37.9	20.5	2.8		5.6						5	9
6-12	tr	0.2	0.1	0.1	0.4	24.6	25.0	10.7	2.3		3.6						2	4
12-19	0.1	0.1	tr	0.1	0.3	22.1	22.4	9.2	1.6		2.4						1	3
19-25	tr	-	tr	0.1	0.1	20.0	20.1	7.8	0.9		1.4						<1	1
25-32	tr	tr	tr	0.1	0.1	17.5	17.6	6.0	0.4		0.7						1	2
32-41	tr	0.1	tr	tr	0.1	16.4	16.5	5.3	0.2		0.4			0.01			1	2
41-52	tr	tr	tr	tr	tr	16.2	16.2	5.5	0.2		0.3						<1	<1
52-66	tr	0.2	0.1	tr	0.3	15.1	15.4	9.2	2.1		4.7						2	3
66-78	tr	-	0.1	0.1	0.2	14.1	14.3	10.1	3.8		7 g						1	2
0-6	1.1	0.4	0.1	0.2	1.8	34.2	36.2	21.0	2.6		5.5						5	9

Depth (In.)	Ratios to Clay 8D1: NH_4OAc CEC	Ext. Iron	15-Bar Water		
0-6	0.25	0.15	0.40		
6-12	0.14	0.17	0.44		
12-19	0.12	0.17	0.45		
19-25	0.11	0.20	0.50		
25-32	0.08	0.20	0.49		
32-41	0.08	0.23	0.52		
41-52	0.08	0.26	0.50		
52-66	0.18	0.33	0.57		
66-78	0.27	0.41	0.65		
0-6	0.26	0.14	0.40		

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Sampled along pit face several feet from first sample.
b. Earthy nodules: > 50 percent (2-0.25 mm.), 5-25 percent (0.25-0.05 mm.).
c. Earthy nodules: > 50 percent (2-0.05 mm.).
d. 23 kg/m^2 to 60 inches (Method 6A).
e. Range in duplicate clods is 0.16 g/cc.
f. One clod.
g. Clay percentage is estimated (15-bar water percentage x 2.5).
h. Analysis by Beltsville Soil Survey Laboratory.

980A SCS HYATTSVILLE, MD 1964

Soil Classification: Tropeptic Haplorthox[1/] clayey, oxidic, isohyperthermic
Soil Type: Series not designated
Soil Nos.: 85QPR-10-2

[redacted]

feet north of kilometer marker 9.0, Highway 779. Elevation: 590 plus or minus 5 meters.
Vegetation and Land Use: Second growth woodland of pomarrosa, camasay, tree ferns, ferns, weeds and few yagaumo macho trees. Slope: Three percent to west.
Parent Material: Chloritized greenish black basaltic andesite flow breccia (personal communication from R. P. Briggs, USGS, to T. U. Yager).
Collected and Described by: R. A. Boccheciamp, K. W. Flach, R. E. Gierbolini, R. B. Grossman and T. U. Yager, December 10, 1959.

Horizon and Lincoln Lab. No.	
Ap 12778 12787	0 to 6 inches. Dark brown (10YR 3/3) clay; moderate very fine subangular and fine granular; friable, nonsticky to slightly sticky, plastic; abrupt smooth boundary. Second LSL No. refers to an additional sample taken several feet away along the pit face; the data are given at the end of the regular sequence.
B21 12779	6 to 12 inches. Strong brown (7.5YR 5/6) clay with yellowish brown (10YR 5/4) ped surfaces; moderate to strong medium subangular to angular blocky; very firm to firm, slightly sticky, plastic; fails semiplastically,[2/] few very fine pores; common sand-size aggregates; clear smooth boundary.
B22 12780	12 to 19 inches. Strong brown (7.5YR 5/6) clay with strong brown to dark yellowish brown (7.5YR to 10YR 4/6) ped surfaces; moderate medium subangular to angular blocky structure; firm, slightly sticky to sticky, plastic; fails semiplastically to abruptly; common very fine pores; common sand-size aggregates; clear wavy boundary.
B23 12781	19 to 25 inches. Strong brown (7.5YR 5/6) clay with strong brown (7.5YR 4/6) ped surfaces and few to common medium faint strong brown (5YR to 7.5YR 5/6) mottles; moderate to weak fine subangular blocky; friable to firm, slightly sticky, plastic; fails abruptly to semiplastically; few fine pores and common to many very fine pores; very few sand-size aggregates; possibly faint patchy clay films on pore walls; clear wavy boundary.
B24 12782	25 to 32 inches. Yellowish red (5YR to 7.5YR 5/6) clay with common to few medium faint strong brown (7.5YR 5/8) mottles; very weak fine subangular blocky; firm, slightly sticky plastic; fails abruptly; many very fine pores and common fine pores (many pores tubular); possibly faint patchy clay films on pore walls; very few sand-size aggregates; clear to gradual wavy boundary.
B25 12783	32 to 41 inches. Yellowish red (5YR 4/6) clay with common yellowish red (5YR to 7.5YR 5/6) ped surfaces and with many coarse to medium distinct to faint strong brown (7.5YR 5/6) mottles; weak fine to very [redacted]

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic

SOIL Series not designated SOIL Nos. S59PR-10-4 LOCATION Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 12803-12812 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

		Size class and particle diameter (mm)																
		Total			Sand					Silt			3A1		3A1c		Coarse fragments	
Depth	Horizon	Sand	Silt	Clay	Very	Coarse	Medium	Fine	Very fine		Int. III	Int. II			Water		2A2	

Soil Classification: Tropeptic Haplorthox;[1] clayey, oxidic, isohyperthermic
Soil Type: Series not designated
Soil Nos.: S59PR-10-4
Location: Torrecillas Soil Conservation District, Puerto Rico, Barranquitas Soil Study Area; 440 feet south and 285 feet west of private road junction with main road. Private road junction about 1/4 mile southeast of Km. 9.7, Highway 152.
Elevation: 605 plus or minus 5 meters.
Vegetation and Land Use: Molassesgrass pasture. No fertilizer since seeding 5 years ago.
Slope: 7 percent south.
Parent Material: Chloritized greenish-black basaltic andesite flow breccia (personal communication from R. P. Briggs, USGS, to T. U. Yager).
Collected and Described by: R. A. Boccheciamp, K. W. Flach, R. E. Gierbolini, R. B. Grossman and T. U. Yager, December 12, 1959.

Horizon and Lincoln Lab. No.	
Ap 12803 12812	0 to 7 inches. Dark brown (7.5YR 3/2) clay; moderate to strong medium to fine granular; slightly sticky, plastic; common charcoal fragments up to 10 mm. across; roots common; abrupt smooth boundary. Dark reddish-brown (5YR 3/3) clay lens at bottom of horizon with maximum thickness of 2 inches was not sampled. Second LSL No. refers to an additional sample taken several feet away along the pit face; the
A3 12804	7 to 16 inches. Dark brown (7.5YR 3/2) clay; moderate fine subangular breaking to weak fine granular; friable to firm, sticky, plastic; fails semiplastically,[2] few very fine pores; many sand-size aggregates; roots common; gradual smooth boundary.
B1 12805	16 to 22 inches. Reddish-brown (5YR 3/3 to 4/3) clay; weak medium to fine subangular breaking to weak fine granular; friable to firm, slightly sticky, plastic; fails semiplastically to abruptly; few very fine pores; many sand-size aggregates; roots common; clear wavy boundary.
B21 12806	22 to 33 inches. Reddish-brown (5YR 3/4 to 4/4) clay; weak medium to fine subangular to angular blocky; firm, slightly sticky, plastic; fails abruptly to semiplastically; few slightly reflective pressure faces; few very fine pores; many sand-size aggregates; roots few to common; gradual smooth boundary.
B22 12807	33 to 44 inches. Yellowish-red (5YR 4/6) clay loam; weak very fine angular blocky (possibly less angular

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic

SOIL Series not designated SOIL Nos. 859PR-10-5 LOCATION Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 12813-12820 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) 3A1 — Total: Sand (2-0 05)	Total: Silt (0.05-0.002)	Total: Clay (< 0 002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0 5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0 1-0 05)	Silt: (0 05-0 02)	Silt: Int. III (0 02-0.002)	Silt: Int. II (0.2-0.02)	Silt: (2-0.1)	3A1c Water Disp. Clay <0.002		Coarse fragments 2A2 > 2 (<19) Pct.	2 - 19	19 - 76
		Pct. of < 2 mm															Pct. of < 76mm	
0-7	Ap	6.6a	20.4	73.0	0.4	0.7	0.7	2.1	2.7	4.1	16.3	7.9	3.9	32		tr		
7-13	B21	5.5a	16.3	78.2	0.2	0.6	0.6	1.7	2.4	3.0	13.3	6.4	3.1	tr		tr		
13-21	B22	6.6b	19.0	74.4	0.4	0.7	0.6	2.1	2.8	5.0	14.0	9.1	3.8			tr		
21-32	B23	9.5b	27.5	63.0	0.4	0.8	0.8	3.2	4.3	6.2	21.3	12.6	5.2			tr		
32-45	C1	12.9b	32.9	54.2	0.2	0.9	1.2	4.5	6.1	8.4	24.5	17.3	6.8			tr		
45-55	C2	15.5b	34.5	50.0	0.6	2.4	1.4	4.5	6.6	8.1	26.4	17.5	8.9			tr		
55-65	C3	18.4b	35.6	46.0	0.9	3.1	1.8	5.1	7.5	10.3	25.3	21.0	10.9			tr		
65-74	C4	21.0b	35.2	43.8	0.8	2.9	1.9	6.2	9.2	10.1	25.1	23.2	11.8			-		

Depth (In.)	6A1a Organic carbon C Pct.	6B1a Nitrogen Pct.	C/N	6C2a Ext. Iron as Fe Pct.	Carbonate as $CaCO_3$ Pct.		Bulk density 4A1a Field-State g/cc	g/cc	4A1h Oven-Dry g/cc	4D1 COLE	Water content 4B4 Field-State Pct	4B1b 1/3-Bar Pieces Pct	4B2 15-Bar Pct.			pH 8C1c (1:1) N KCl	8C1a (1:1) H_2O
0-7	4.07	0.332	12	11.9			1.04		1.29	0.073	46.0		31.5			5.7	6.3
7-13	1.13	0.142	8	12.9			1.06		1.32	0.078	49.2		34.8			4.8	5.0
13-21	0.81	0.102	8	15.7			1.11		1.34	0.064	46.4		34.3			4.7	5.1
21-32	0.55	0.056	10	18.6			1.18		1.38	0.052	42.9		31.8			4.3	5.2
32-45	0.20			17.6			1.34		1.47	0.032	37.2		28.7			3.9	4.9
45-55	0.17			15.2			1.27		1.40	0.032	40.1		30.8			3.8	4.8
55-65	0.16			14.8			1.26		1.41	0.040	40.7		30.2			3.8	4.8
65-74	0.15			14.8			1.14		1.28	0.040	44.8		30.2			3.7	4.7

Depth (In.)	Extractable bases 5B1a: 6N2b Ca	6O2b Mg	6P2a Na	6Q2a K	Sum	6H1a Ext. Acidity	Cat. Exch. Cap.: 5A3a Sum Cations	5A1a NH_4 OAc	6G1d KCl-Ext. Al		5A3b Bases Plus Al me/100g Clay					Base saturation 5C3 Sum Cations Pct.	5C1 NH_4 OAc Pct.
	meq/100 g																
0-7	13.7	0.7	0.1	0.3	14.8	13.7	28.5	18.1								52	82
7-13	1.7	0.4	tr	0.1	2.2	15.7	17.9	7.4	0.2		3.1					12	30
13-21	0.9	0.4	tr	0.1	1.4	14.1	15.5	7.3	0.4		2.4					9	19
21-32	0.6	0.3	tr	0.1	1.0	14.2	15.2	8.0	0.9		3.0					7	13
32-45	0.3	0.1	tr	0.1	0.5	14.2	14.7	8.8	2.2		5.0					3	6
45-55	0.1	0.5	0.1	0.1	0.8	15.4	16.2	9.8	4.4		7 d					5	8
55-65	tr	0.5	tr	0.1	0.6	15.4	16.0	10.2	5.2		8 d					4	6
65-74	-	0.5	tr	0.1	0.6	15.7	16.3	10.8	5.3		8 d					4	6

Depth (In.)	Ratios to Clay 8D1: NH_4 OAc CEC	Ext. Iron	15-Bar Water
0-7	0.25	0.16	0.43
7-13	0.09	0.16	0.45
13-21	0.10	0.21	0.46
21-32	0.13	0.30	0.50
32-45	0.16	0.32	0.53
45-55	0.20	0.30	0.62
55-65	0.22	0.32	0.66
65-74	0.25	0.34	0.69

Underlining indicates that the non-clay probably has strong clay-like properties.

a. Earthy nodules and charcoal fragments: > 50 percent (2-0.05 mm.).
b. Earthy nodules: > 50 percent (2-0.05 mm.).
c. 15 kg/m² to 60 inches (Method 6A).
d. Clay percentage is estimated (15-bar water percentage x 2.5).

Soil Classification: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic
Soil Type: Series not designated.
Soil Nos.: 859PR-10-5
Location: Torrecillas Soil Conservation District, Puerto Rico, Barranquitas Soil Study Area; 780 feet south of private road junction with main road; private road junction approximately 1/4 mile southeast of kilometer marker 9.7, Highway 152; about 340 feet south of 859PR-10-7.
Elevation: 598 plus or minus 5 meters.
Vegetation and Land Use: Abandoned plantain field presently with a growth of molassesgrass and weeds.
Slope: 7 percent to south.
Parent Material: Chloritized greenish black basaltic andesite flow breccia (personal communication from R. T. Briggs, USGS, to T. U. Yager).
Collected and Described by: R. A. Boccheciamp, K. W. Flach, R. E. Gierbolini, R. B. Grossman and T. U. Yager, December 15, 1959.

Horizon and Lincoln Lab. No.	
Ap 12813	0 to 7 inches. Dusky red (2.5YR 3/2) clay; moderate fine and medium subangular blocky, breaking readily to moderate fine granular; friable, plastic and slightly sticky to sticky; fails abruptly;1/ few concretions (aggregates); abrupt smooth boundary.
B21 12814	7 to 13 inches. Weak red to reddish brown (10R to 2.5YR 4/4) clay, slightly redder in hue when crushed; moderate medium and fine subangular blocky, tending toward angular blocky; friable, plastic and slightly sticky; fails abruptly; very few concretions (aggregates); common very fine pores; gradual smooth boundary.
B22 12815	13 to 21 inches. Weak red to red (10R 4/5) clay; weak fine and medium blocky; friable, slightly sticky and plastic; fails abruptly; no concretions (aggregates) few very fine pores; gradual smooth boundary.
B23 12816	21 to 32 inches. Weak red (10R 4/4) clay; weak medium and fine blocky, weaker in expression than in superjacent horizon; friable, very plastic and slightly sticky; fails abruptly; few pores; no concretions (aggregates); ped faces smoother than in horizons above; clear wavy boundary.
C1 12817	32 to 45 inches. Weak red (10R 4/4 to 3/4) clay with weak red (10R 4/4) ped faces; very weak fine and very fine blocky; friable when removed and firm in place, slightly plastic and slightly sticky to nonsticky; fails abruptly; few pores; no concretions (aggregates); ped faces are smoother and more distinct than in the B23 horizon; about 10 percent saprolite; clear wavy boundary.
C2 12818	45 to 55 inches. About 70 percent saprolite; silty clay or silty clay loam; weak red (10R 4/3) on the few distinct ped faces or slickensides with saprolite mottled red (7.5R 4/4) and reddish brown (5YR 4/3); massive; friable, slightly plastic and nonsticky; fails semiplastically where there is little saprolite and abruptly where the saprolite content is high; very few pores; few Mn-rich? coatings.
C3 12819	55 to 65 inches. 90 percent saprolite; similar to C2, except fewer pores and the weak red slickensides are almost completely absent; clear wavy boundary.
C4	65 to 74 inches. Saprolite with rock structure generally discernible; no macro-size pores.

Remarks: Fails increasingly abruptly with depth through the B horizons. A quartz vein extends upward into the B22 horizon, but with an indefinite upper boundary. The vein strongly suggests that material below the B22-B23 boundary is residual.

1/ Two terms are used to describe the rate of failure of natural fabric: fails abruptly and fails semiplastically. To fail abruptly means that no plasticity is observed prior to failure. Stress builds up as the piece of soil is squeezed and dissipates quickly as the piece of soil breaks apart into numerous fragments or peds due to failure along natural planes of weakness. In semiplastic failure, deformation is readily observed prior to rupture.

U S DEPARTMENT OF AGRICULTURE
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SOIL CLASSIFICATION: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic

SOIL Series not designated SOIL Nos. S59PR-10-6 LOCATION Torrecillas SCD, Puerto Rico

SOIL SURVEY LABORATORY Lincoln, Nebraska LAB. Nos. 12821-12831 November 1966

General Methods: 1A, 1B1a, 2A1, 2B

Depth (In.)	Horizon	Size class and particle diameter (mm) Total: Sand (2-0 05) b	Total: Silt (0.05-0.002)	Total: Clay (< 0 002)	Sand: Very coarse (2-1)	Sand: Coarse (1-0 5)	Sand: Medium (0 5-0 25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Silt: 0 05-0.02	Silt: Int III (0.02-0.002)	Int. II (0.2-0.02)	(2-0.1)	3A1c Water-Disp. Clay <0.002		Coarse fragments 2A2 > 2 (<19) Pct.	2 - 19	19 - 76
		Pct. of < 2 mm														Pct. of < 76mm		
0-8	Ap	12.3	29.9	57.8	1.1	2.0	1.5	3.5	4.2	6.0	23.9	12.2	8.1	35		tr		
8-15	A1	8.4	22.8	68.8	1.0	1.2	0.9	2.3	3.0	3.6	19.2	8.0	5.4	tr		tr		
15-23	A3	8.5	18.4	73.1	1.4	1.4	0.9	2.2	2.6	4.6	13.8	8.4	5.9			tr		
23-31	B21	6.9	12.0	81.1	1.3	1.5	0.8	1.6	1.7	2.3	9.7	4.8	5.2			tr		
31-42	B22	5.9	15.1	79.0	1.2	1.3	0.7	1.3	1.4	2.9	12.2	5.0	4.5			tr		
42-53	B23	4.8	30.9	64.3	0.3	0.6	0.4	1.4	2.1	5.2	25.7	8.1	2.7			-		
53-68	C1	6.2	37.5	56.3	0.3	0.5	0.4	1.9	3.1	6.8	30.7	11.1	3.1			tr		
68-90	C2	7.4	44.2	48.4	0.1	0.5	0.6	2.3	3.9	9.1	35.1	14.4	3.5			tr		
90-114	C3	8.0	46.0	46.0	0.2	0.6	0.8	2.5	3.9	8.4	37.6	13.8	4.1			tr		
114-126	C4	8.9	44.8	46.3	0.1	0.4	0.8	3.3	4.3	7.7	37.1	14.0	4.6			tr		
0-8	Ap a	10.5	27.3	62.2	1.2	2.0	1.3	2.8	3.2	5.1	22.2	9.9	7.3			tr		

Soil Classification: Tropeptic Haplorthox; clayey, oxidic, isohyperthermic
Soil Type: Series not designated
Soil Nos.: 859PR-10-6
Location: Torrecillas Soil Conservation District, Puerto Rico, Barranquitas Soil Study Area; 435 feet west to northwest of kilometer marker 8.3, Highway 779, or 250 feet southeast of a transformer pole on north side of field road running to west from kilometer marker 8.4, Highway 779.
Elevation: 601 plus or minus 5 meters.
Vegetation and Land Use: Abandoned pineapple field now largely in weeds.
Slope: Sloping 4 percent to south with break 50 feet to north and 100 feet to south.
Parent Material: Chloritized greenish black basaltic andesite flow breccia (personal communication from R. P. Briggs, USGS, to T. U. Yager).
Collected and Described by: R. A. Bocchecisup, K. W. Flach, R. E. Gierbolini, R. B. Grossman and T. U. Yager, December 15, 1959.

Horizon and Lincoln Lab. No.	
Ap 12821 12831	0 to 8 inches. Dark brown (7.5YR 3/2 to 4/2) clay (slightly coarser than A1); moderate to strong fine granular; friable, slightly sticky, plastic; common sand-size (softer than described heretofore) aggregates; clear boundary. Second LSL No. refers to an additional sample taken several feet away along the pit face; the data are given at the end of the regular sequence.
A1 12822	8 to 15 inches. Dark brown (7.5YR 3/2) clay; weak medium subangular breaking to moderate fine granular; friable; slightly sticky to sticky, plastic; fails semiplastically to abruptly;1/ fine pores and some ped surfaces commonly have black (10YR 2/1) coatings; common black aggregates up to 5 mm. in diameter that can be cut easily with a knife and difficultly with the fingernail; clear boundary.
A3 12823	15 to 23 inches. Dark reddish brown (5YR to 7.5YR 3/3) clay; weak medium subangular breaking to moderate fine subangular and granular; friable to firm, slightly sticky, plastic; many very fine and few fine pores; fine pores and some ped surfaces commonly have black (10YR 2/1) coatings; many black aggregates up to 5 mm. in diameter that can be broken as described above; clear boundary.
B21 12824	23 to 31 inches. Reddish brown (5YR 4/3) clay; weak medium to fine subangular blocky; friable to firm, slightly sticky (more so than B22); fails semiplastically to abruptly; weak reflective surfaces; no slickenside surfaces noted; few fine and many very fine pores; many black sand-size aggregates with a few up to 5 mm. across that can be broken as described above; gradual boundary.
B22 12825	31 to 42 inches. Reddish brown (5YR 4/4) clay; weak medium subangular blocky; firm to friable, slightly sticky, plastic; fails semiplastically to abruptly; weak reflective or pressure surfaces; few slickensides; common very fine and few fine pores; many black aggregates up to 5 mm. in diameter that can be broken as described above; few roots; clear boundary.
B23 12826	42 to 53 inches. Yellowish red (5YR 4/6) clay to silty clay loam with ped surfaces slightly yellower; weak very fine angular blocky; firm, slightly sticky; fails abruptly; common weak reflective or pressure surfaces with striations on a few of the larger surfaces; few very fine pores; very few sand-size aggregates that can be broken as described above; very few roots; clear smooth boundary.
C1 12827	53 to 68 inches. Dark red (2.5YR 3/6) silty clay loam with scattered reddish brown (5YR 5/4) ped surfaces; weak very fine angular blocky; firm, slightly sticky; fails abruptly; common weak reflective or pressure surfaces; possibly few thin clay films; few very fine pores; very few sand-size aggregates; 2 percent saprolite; no roots; arbitrary boundary.
C2 12828	68 to 90 inches. Dark red (2.5YR 3/6) silty clay loam; slightly sticky to nonsticky, plastic; 3 percent saprolite; arbitrary boundary.
C3 12829	90 to 114 inches (7½ to 9½ feet). Similar to C2; very few sand-size aggregates; arbitrary boundary.
C4 12830	114 to 126 inches (9½ to 10½ feet). Similar to C2; 20 percent saprolite; abundant pink, green, and clear, fine to coarse sand-size crystalline-looking grains.

1/ Two terms are used to describe the rate of failure of natural fabric: fails abruptly and fails semiplastically. To fail abruptly means that no plasticity is observed prior to failure. Stress builds up as the piece of soil is squeezed and dissipates quickly as the piece of soil breaks apart into numerous fragments or peds due to failure along natural planes of weakness. In semiplastic failure, deformation is readily observed prior to rupture.

Mineralogy (Method 7A).

Interpretations of X-ray and Differential Thermal Analyses of the Clay and Silt Fractions

Horizon	Depth Inches	< 2μ fraction			2-50μ fraction		
		Vermiculite	Kaolinite %	Gibbsite %	Kaolinite %	Gibbsite %	Quartz
Ap	0-8	x	30	20	15	5	cc

Notes: Vermiculite: X-ray, oriented samples; (x = small amount). Quartz: X-ray, powder (unoriented); c = height unit of 3.35Å reflection. Kaolinite and gibbsite by DTA.

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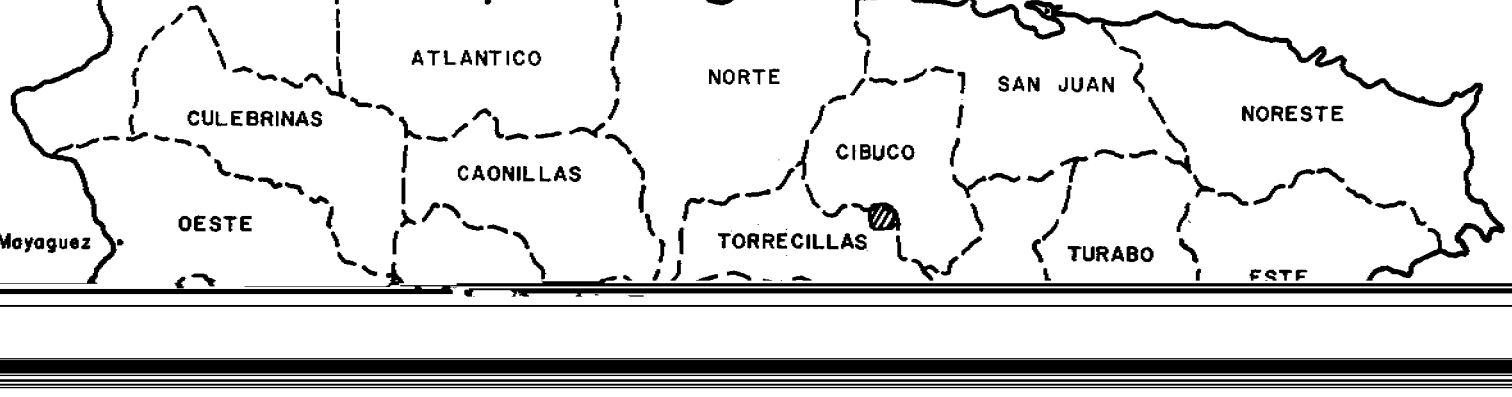
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