

SOIL PROFILE DESCRIPTION FOR SELECTED SITES IN HAITI.

HAITI AGROFORESTRY RESEARCH PROJECT.

by
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January, 1990.

This work was performed under USAID Contract No.
521-0122-C-00-7104-00.

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SECID/AUBURN AGROFORESTRY REPORT No 16

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SUMMARY.

Reliable recommendations for the development of agroforestry systems require accurate descriptions of the environment.

Information on the properties of soils in selected sites is needed to expand agroforestry in regions with similar conditions.

The information generated from this report is useful in characterizing soils in the regions where the project is performing. A total of 30 profiles are described in all the regions where the grantees have their activities, and a wide range of representative soils are examined. This report may be regarded as the initial phase of the development of a simple classification system adapted for Haiti that would allow extension personnel to accurately advise the farmers on the species to plant in given soil conditions. Organizations engaged in implementing agroforestry efforts can greatly benefit from these data because they then can predict with some confidence the potential output of particular areas. The selected soils are described using the soil description methods and sheet from the Soil Conservation Service of the U.S. Department of Agriculture.

Given the many constraints for the soils described, the use of inputs such as fertilizer is not recommended. When selecting species special attention needs to be given to the chemical unbalance of the soils due to extremely high calcium content, which often induces micronutrient deficiencies.

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RESIMÉ KREYOL

Pou youn rekomandasyon kapab debon, fok li maré ak youn potre jis anbyans-la pou li kap sevi pou lot koté ki geyen kondisyon paray. Rapo sa-a se resilta de konsiltasyon Haiti Agroforestry Research Project (HARP) mandé. Infomasyon nan rapo sa-a ap sevi kom referans pou clasé sol nan zon projé sa-a ap travay. Geyen youn total de 30 profil ki soti nan tout zon koté planté ki travay ak organizsyon enténasyonal gen aktivité, é li decrit ampil diferan kalité sol. Rapo sa-a se comensman youn sistem clasifikasyon adapté pou Aiyti ki ap pemet moun kap édéd agrikile yo bay bon consej sou ki espes ta reusi nan ki té. Oranis entenasyonal yo ta beneficyé tou paske yo ta kapab predi ak confyens ki renman planté-a ta ka esperé. Nan chak regyon yo pran youn echantiyon té é yo fet youn deskripsyon ak fom ki soti Sevis Konsevasyon Sol de Depatman Agrikili Etazuni.

SOIL PROFILE DESCRIPTION FOR SELECTED SITES IN HAITI.

INTRODUCTION.

Production data must be examined in relation to accurate descriptions of the environment to allow extension services to make sound recommendations for specific sites. Current Haiti Agroforestry Research Project (HARP) field data forms for hedgerow, tree and crop yield measurements allow for the physical description of fields in terms of slope, aspect, altitude, field sizes, natural vegetation, crop association, and other characteristics. This information needs to be expanded, however, with a complete soil profile description and classification for selected benchmark sites. The information provided here can be used as reference to characterize soils for the regions where research is underway. It can also be useful for the grantees, PADF and CARE in their implementation of agroforestry efforts in specific locations.

Soils information can either be related to production figures or used in planning the most appropriate land uses. Grantee staff requested soil profile descriptions and classification for selected demonstration sites. They wish to link field observations to specific soil data. This work is also important to SECID/Auburn researchers because the emphasis in the research effort for the follow-on project will include more sophisticated experiments on demonstration sites. A total of 30 profiles were described in all the regions where the grantees have their activities, and a wide range of soil have been

described. The following table gives a summary count by region of the soils that have been characterized.

NUMBER OF PROFILES DESCRIBED.

REGION 1	5
REGION 2	6
REGION 3	2
REGION 4	3
REGION 5	7
CARE	9
TOTAL	30

One of the most important issues addressed by the grantees concerns the selection of tree species for specific soil conditions. Land degradation in Haiti is a continuing, dynamic process and accelerated soil erosion is taking place. The data provided here helps with the initial definition of factors affecting tree and crop growth on farms in Haiti. A system adapted for Haiti that would allow extension personnel to accurately advise the farmers on the species to plant in given soil conditions would be a considerable asset. Funding agencies would also greatly benefit from such an effort because they could then predict with some certainty the potential output of a given area.

METHODS

Representative sites were selected in each region. Sites where data on tree growth and crop yields had already been collected were included.

The soils examined are described using soil description sheets from the Soil Conservation Service of the U.S. Department of Agriculture. This form was somewhat adapted to fit the conditions in Haiti. Some of the items that were irrelevant were eliminated while other information was added. For example, because information on soil type is not available, we replaced it with data from the geological map units taken from the OAS Geology Map for Haiti (Geologie, Republique d'Haiti, 1972). Instead of area, we indicated the AOP regions where the soils were found. This data was deemed more meaningful to the grantees. The date the soil was described was recorded. A preliminary classification of the soil was also made in the field. Soil samples were taken by horizon for physical and chemical analyses. In a few instances the tentative soil classification made in the field was revised according to the results of the laboratory analyses. Location includes the locality where the field is located, and the name of the farmer. Natural vegetation, crops and crop association were described. The parent material refers to the geological material from which the soil developed. If parent material is known, it is often possible to have an indication of the fertility constraints that are present or which may occur.

The following physiographic data were recorded: description of landform, slope, altitude and aspect. Slope is important in predicting the intensity of the runoff. Aspect indicates the direction the slope faces and is a measure of how exposed or protected the landform is from solar radiation, dominant winds and rain. These last two factors are important when evaluating risks for erosion.

Relevant information regarding soil properties specific for each site are also given. Drainage, moisture, and permeability will be used to assess the soil moisture regime. Stoniness and soil texture of the surface, as well as root distribution and the depth of the soil to a root restrictive soil layer are used to identify constraints to land preparation and cultivation. An estimate of the degree of soil erosion is also given and will help assess the urgency of needed soil conservation measures.

After the general site description is complete, a complete soil profile description by horizon was made from a soil pit. These pits are dug one meter deep or until the parent material or the bedrock has been reached. The horizons were named using the standard horizon nomenclature and their depth measured. The color is defined as being either "dry" or "moist" using the Munsell soil color chart. The Munsell system includes three variables, the hue, value and chroma. The hue indicates the relation of the color to red, yellow, green, blue, and purple (Munsell color chart manual) and is generally linked to the form of the iron in the soil. Within each hue, the value indicates its lightness and the chroma its strength. For practical purposes, the lower the chroma and the value, the higher the organic matter content.

The texture (particle size distribution) is estimated in the field, but when necessary, soil samples taken in the field can also be analyzed in the laboratory for their content in clay, silt and sand. Based on these result the exact textural classes can be defined. Structure is described by grade, or distinctness, size and type of soil aggregates. Consistence is a measure of the ability of a soil to adhere or cohere, that is, to resist deformation or rupture. These last three properties combined provide a good estimate of the soil moisture regime which is very important when considering plant resistance to moisture stress and drought. Structure and consistence also affect root penetration, which will affect tree establishment and growth as well as efficiency in conserving soil.

The reaction of the soil to hydrochloric acid tests the presence of calcium carbonates. This is a very important aspect of site specific tree selection. Some plants are extremely sensitive to calcium carbonates and others are tolerant. This test is very simple and can be performed in the field by the extension personnel.

The lower boundary of the horizon is indicated by its distinctness and its topography.

Presented here are the row analyses for each site. These data will be used in relation to the production data in the future. This analysis will provide generalizations about the best soil types and tree species combinations.

Profile Description

Ap - 0 to 5 cm; dark brown (7.5YR 3/2) clay loam; moderate medium subangular blocky structure; friable; gradual smooth boundary.

Bw1 - 5 to 15 cm; dark brown (10YR 3/3) clay loam; moderate medium subangular blocky structure; friable; gradual smooth boundary.

Bw2 - 15 to 26 cm; dark yellowish brown (10YR 4/4) clay loam; weak fine subangular blocky structure; friable; abrupt irregular boundary.

Cr - 26 cm - ; very pale brown (10YR 8/3) soft limestone.

Soil Analysis Data

Parent Material: Limestone

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	13.6	5.5	8.1	27	389	414	4995	37.50	42.50	20.00	L	.15
Bw1	24.3	4.5	8.1	9	192	258	4995	42.50	32.50	25.00	L	.14
Bw2	8.1	3.7	8.1	10	126	173	4995	36.25	43.75	20.00	L	.15

Stoniness: less than 0.1%

Depth to Root Restrictive Layer:

Degree of Erosion: Severe

Sampled and Described by: PG, PR, GA, M-PE.

Date: April 24, 1984

Comments: Did not sample B&C horizon, but sampled C1 and C2. Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion.

Geologic Map Unit, Symbol: Epc Name: Abuillot Formation.
Limestones.

Sample Number: 43041, 43022, 43058

Classification: Udic Haplustalf, coarse-loamy, mixed, isohyperthermic.

Area: PADF Region 1.

Location: Victor Samelca. Cayes, Latigonave

Use and Vegetation: Mixed cropping, Cajanus cajan (pwa kongo), Zea mais (mayi), and Phaseolus sp (pwa blan, nwa ou wouj) planted between Leucaena leucocephala (lesena) hedgerows. Also has a few project trees planted in the hedgerow. There are naturally grown Swietenia mahogani (kajou peyi) in the field, both adults and young ones that the farmer is managing well.

Parent Material: Limestone

Landform: Upland Slope.

Topography, Percent Slope: 41%

Elevation: 155 meters Aspect: ENE 60 degrees

Stoniness: less than 0.1%

Depth to Root Restrictive Layer:

Degree of Erosion: Severe

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 24, 1989

Comments: Did not sample B&C horizon, but sampled Bt and C2. Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion.

- Ap -0 to 8 cm ; dark brown (7.5YR 4/2); moderate very fine subangular blocky structure; firm; 5-10% coarse fragments; clear smooth boundary.
- Bt -8 to 45 cm ; dark reddish brown (5YR 3/3) gravelly clay; strong fine subangular blocky structure; firm; 15-25% coarse fragments; clear irregular boundary.
- B&C-45 to 65 cm; dark reddish brown (5YR 3/3) clay; strong fine subangular blocky structure; firm; clear smooth boundary.
- C2 -65cm ; very pale brown (10YR 8/3) soft limestone;

Soil Analysis Data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	16.2	4.6	8.2	5	93	265	4995	46.25	53.75	0.00	SIL	.13
Bt	40.4	3.0	8.2	4	71	170	4995	50.00	35.00	15.00	L	.12
C	74.9	.	8.4	3	27	73	4995	75.00	25.00	0.00	LS	.06

Degree of Erosion: Severe

Sampled and Described by: RG, PD, GL, H-PE

Date: April 24, 1983

Comments: The field is generally well drained. Given the steepness of the slope and the very shallow soil, lateral drainage can be expected and rapid runoff is leading to severe erosion.

Profile description:

- Ap -0 to 13 cm; grayish brown (10YR 5/3) clay loam; moderate very fine subangular blocky structure; 15% coarse fragments; abrupt smooth boundary.
- Cr -13 to 35 cm; very pale brown (10YR 8/3), soft limestone;

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	11.3	4.3	8.3	7	85	161	4995	46.25	43.75	10.00	L	.13
Cr	82.7	0.3	8.8	2	13	75	4995	48.75	51.25	0.00	SIL	.12

Geologic Map Unit, Symbol: Epc

Name: Abuilhot Formation.
Limestones.

Sample Number: 43025, 43057.

Classification: Typic Ustropept, loamy, mixed, shallow, (calcarous),
isohyperthermic.

Area: PADF Region 1.

Location: Bergeau-PADF demonstration site.

Use and Vegetation: Field in fallow. Has Leucaena leucocephala (lesena)
hedgerows planted in the spring of 1985.

Parent Material: Limestone

Landform: Upland slope

Topography; Percent Slope: 27%

Elevation: 50 meters Aspect: WSW 255 degrees.

Stoniness: less than 0.1%

Depth to Root Restrictive Layer: 15cm

Degree of Erosion: Severe

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 24, 1989

Comments: The field is generally well drained. Given the steepness of
the slope and the very shallow soil, lateral drainage can be
expected and rapid runoff is leading to severe erosion.

Profile description.

Ap - 0 to 15 cm; grayish brown (10YR 5/2) clay loam; moderate very fine
subangular blocky structure; 15% coarse fragments; abrupt
smooth boundary.

Cr - 15 to 15 cm; very pale brown (10YR 8/3); soft limestone;

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	11.3	4.3	8.3	7	55	161	4995	46.25	43.75	10.00	L	.13
Cr	5.2	0.3	8.6	2	15	76	4995	48.75	51.25	0.00	SIL	.12

Geologic Map Unit, Symbol: Epc

Name :

Abuillot Formation.
Limestones.

Sample Number: 43016, 43017, 43027, 43056.

Classification: Typic Ustropept, loamy, mixed, shallow.

Area: PADF Region 1

Location: PADF Demo Bergeau Species Trial

Use and Vegetation: Species Trial, creole name in parenthesis:
Casuarina glauca and Casuarina equisifolia (kaswarina); Simarouba glauca (frenn); Eucaliptus camaldulensis (kaliptus); Acacia auriculoformis (akasya); Cassia siamea (Kasya); Albizia lebbec (tcha tcha); Colubrina arborescens (Kapab). There is also a good grass cover.

Parent Material: Limestone.

Landform: Upland slope.

Topography; Percent Slope: 44%

Elevation: 55 meters

Aspect: WSW 256 degrees

Stoniness: less than 0.1%

Depth to Root Restrictive Layer: 40cm

Degree of Erosion: Severe

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 24, 1989

Comments: Sample named Bergeau 2 - Species Trial was planted in 1982. Given the steepness of the slope lateral drainage can be expected and rapid runoff could lead to severe erosion, but adequate soil cover limits soil loss.

Profile Description.

- A - 0 to 7 cm; clay loam, light brownish gray (10YR 6/2) dry; moderate fine subangular blocky structure; soft; gradual smooth boundary.
- Bw - 7 to 22 cm; clay loam, light brownish gray (10YR 6/2) dry; moderate fine subangular blocky structure; soft; clear smooth boundary.
- C -22 to 40 cm; clear smooth boundary.
- Cr - 40 cm ; soft limestone.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	3.6	5.2	8.3	9	57	78	4995	35.00	57.50	7.50	SIL	.16
B	3.1	4.4	8.4	8	38	159	4995	41.25	51.25	7.50	SIL	.14
C	4.6	1.7	8.4	6	18	81	4995	26.25	66.25	7.50	SIL	.18
Cr	1.8	1.1	8.4	4	14	79	4995	22.50	57.50	20.00	SIL	.19

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 24, 1989

Comments: Even though there were no or very few stones, by definition (>25cm in diameter), there was a lot of cobbly (7.5-25cm) coarse material and fairly little gravel (< 7.5cm) in the A and B1 horizon. The soil samples we took therefore did not include much coarse material.

Geologic Map Unit, Symbol: Qal Name: Alluvium, Terrace deposits

Sample Number: 43028, 43033, 43018, 43021.

Classification: Udic Haplustoll, clayey skeletal, mixed isohyperthermic.

Area: PADF Region 1

Location: Semilien Saint Victor - Cayes, Saint Helene

Use and Vegetation: Zea mais (mayi) and Phaseolus vulgaris (pwa nwa)

Parent Material: Alluvial + Colluvial

Landform: Plain, flat very gentle slope terrace.

Topography, Percent Slope: 2%

Elevation: 65 meters Aspect: ESE 120 degrees.

Stoniness: less than 0.01%

Depth to Root Restrictive Layer:

Degree of Erosion: Slight

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 24, 1989

Comments: Even though there were no or very few stones, by definition (>25cm in diameter), there was a lot of cobbly (7.5-25cm) coarse material and fairly little gravel (< 7.5cm) in the A and B1 horizon. The soil samples we took therefore did not include much coarse material.

Profile description.

- Ap- 0 to 12 cm ; dark brown (10YR 3/3) clay; moderate medium subangular blocky structure; firm; <15% gravel; clear smooth boundary.
- B1-12 to 43 cm ; very dark grayish brown (10YR 3/2) clay; moderate fine subangular blocky structure; friable; 15% gravel; clear smooth boundary.
- B2-43 to 75 cm ; very dark brown (10YR 2/2) gravelly clay; weak fine subangular blocky structure; friable; >50% coarse gravel; abrupt smooth boundary.
- C -75 to 100 cm; gravelly clay, > 70% gravel.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	6.0	3.5	8.2	36	306	270	4995	28.75	46.25	25.00	L	.17
B1	0.0	3.6	8.0	5	263	400	4995	18.75	38.75	42.50	C	.2
B2	32.9	2.8	8.1	8	238	346	4995	32.50	32.50	35.00	CL	.16
C	40.8	1.6	8.2	31	158	175	4995	47.50	25.00	27.50	SCL	.13

Depth to Root Restrictive Layer:

Degree of Erosion: none

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 23, 1989

Comments: The farmer has planted a lot of trees on his own as well as with the PADP project. He looks at it as an investment. The soil has some vertical morphological properties. The soil is well drained and well structured throughout the profile.

2. PADF Region 2.

Profile description.

Geologic Map Unit, Symbol: Qa1 Name: Alluvium, Terrace deposits

Sample Number: 43029, 43036, 43034, 43032, 43040.

Classification: Cumulic Hapustoll, clayey, mixed, isohyperthermic.

Area: PADF Region 2

Location: Olivier - Love Bellabe

Use and Vegetation: Woodlot - Cassia siamea (kasya) - Eucalyptus sp (kaliptis) - Catalpa longissima (chenn) - Magnifera indica (mango). Mixed cropping; Zea mais (mayi), Cajanus cajan (pwa kongo), Sorghum bicolor (pitimi), and Gossypium barbadense (koton).

Parent Material: colluvium

Landform: Colluvial fan

Topography, Percent Slope: 11%

Elevation: 40 meters Aspect: SW 214 degrees.

Stoniness: none

Depth to Root Restrictive Layer:

Degree of Erosion: none

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 25, 1989

Comments: The farmer has planted a lot of trees on his own as well as with the PADF project. He looks at it as an investment. The soil has some vertisols morphological properties. The soil is well drained and well structured throughout the profile.

Profile description.

- Ap - 0 to 10 cm; very dark gray (10YR 3/1) clay; moderate fine subangular blocky structure; friable; clear smooth boundary.
- Bw1- 10 to 50 cm; very dark gray (10YR 3/1) clay; moderate fine subangular blocky structure; friable; clear smooth boundary.
- Bw2- 50 to 75 cm; very dark gray (10YR 3/1) clay; weak fine subangular blocky structure; firm; clear smooth boundary.
- C1 - 75 to 100 cm; black (10YR 2/1) clay; structureless; firm; gradual smooth boundary.
- C2 -100 to 125 cm; black (7.5YR 2/0) clay; structureless; firm; gradual smooth boundary.
- C3 -125 to 150 cm; olive brown (2.5Y 4/4) and white (10YR 8/2) clay; structureless; extremely firm; 15% coarse fragments.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	4.9	7.9	8.1	10	208	1014	4995	43.75	46.25	10.00	L	.14
Bw1	2.5	5.2	8.2	3	82	1003	4995	32.50	45.00	22.50	L	.16
Bw2	0.9	3.3	8.4	3	81	1125	4995	25.00	37.50	37.50	CL	.18
C1	2.6	2.2	8.2	1	77	1292	4995	27.50	20.00	52.50	C	.18
C2	0.7	2.2	8.1	1	79	1191	4995	22.50	32.50	45.00	C	.19

Comments: soil is well drained and soil moisture is good. Given the position along the slope, it is surprising to not find clay in the particle size distribution.

Geologic Map Unit, Symbol: Kb

Name: Basalts, Metamorphic and/or intrusive.

Sample Number: 3874, 3876, 3877.

Classification: Cumulic Hapludolls

Area: PADF Region 2

Location: Olivier-Petit Goave--lower slope

Use and Vegetation: Scattered trees; Magnifera indica (mango), Crescentia cujete (kalbasik), Spondias mombin (momben), Persea americana (zaboka), Annona squamosa (kachiman), Gliricidia sepium (lila etranje). Few trees were also planted; Catalpa longissima (chenn) and Simarouba glauca (frenn). Crops include Cajanus cajan (pwa kongo), Arachis hypogaea (pistach), Citrillus vulgaris (melon), Zea mais (mayi).

Parent Material: Calcareous colluvium

Landform: Foot slope

Topography, Percent Slope: 20%

Elevation: 120 meters Aspect: SW 130 degrees

Stoniness: Few stones on surface

Depth to Root Restrictive Layer:

Degree of Erosion: Slight

Sampled and Described by: RG, PR, M-PE.

Date: 10-2-89

Comments: Soil is well drained and soil moisture is good. Given the position along the slope, it is surprising to not find clay in the particle size distribution.

Geologic Map Unit, Symbol Profile Description: Basalts, Metamorphic and/or Intrusive.

Ap - 0 to 18 cm; very dark brown (10YR 2/2) loam; weak fine subangular blocky structure; friable; strongly alkaline; gradual smooth boundary.

Bw - 18 to 70 cm; very dark brown (10YR 2/2) loam; weak fine subangular blocky structure; friable; Few rounded stones; strongly alkaline; gradual smooth boundary.

C - 70 to 120 cm; very dark grayish brown (10YR 3/2) loam; structureless massive; friable; Few rounded stones; strongly alkaline.

Soil analysis data.

Hor	% OM	pH	P	K	Mg	Ca	SAND	SILT	CLAY	TEX	H2O AVAIL
	Gravel				ppm		%	%	%		
Ap	22.8	12.2	7.6	1	30	635	4995	68.75	31.25	0.00	SAL .07
Bw	22.4	3.4	7.8	2	33	596	4995	57.50	42.50	0.00	SAL .1
C	18.6	2.5	8.1	2	19	603	4995	60.00	40.00	0.00	SAL .1

Elevation: 130 meters Aspect: S 168 degrees

Stoniness:

Depth to Root Restrictive Layer: 21 cm

Degree of Erosion: Very severe

Sampled and Described by: HG, FR, W-PE

Date: 10-2-69

Comments: Earthworms are very active. Parent material consists of weathered Basalt. Many fine roots in A horizon. The soil is well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff could lead to severe erosion.

Geologic Map Unit, Symbol: Kb

Name: Basalts, Metamorphic
and/or intrusive.

Sample Number: 3875, 3878.

Classification: Lithic Troorthents

Area: PADF Region 2

Location: Olivier--Petit Goave

Use and Vegetation: Hedgerow species demonstration -- Leucaena sp (lesena) and Moringa oleifera (benzoliv) as hedgerows. There is also Eucalyptus sp (kaliptis), Acacia auriculiformis, Chrisophillum cainito (kayimit), Haematoxylon campechianum (kampech), Spondias mombin (momben), Magnifera indica (mango). Mixed cropping field where Cajanus cajan (pwa kongo) is doing very well.

Parent Material: Basalt

Landform: Steeply sloping upland

Topography, Percent Slope: 32%

Elevation: 130 meters Aspect: S 168 degrees

Stoniness:

Depth to Root Restrictive Layer: 21 cm

Degree of Erosion: Very severe

Sampled and Described by: RG, PR, M-PE.

Date: 10-2-89

Comments: Earthworms are very active. Parent material consists of weathered Basalt. Many fine roots in A horizon. The soil is well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff could lead to severe erosion.

Geologic Map Unit, Symbol: K5

Name: Basalts, Metamorphic

Profile description.

and/or intrusive.

Sample Number: 43030, 43035, 43039.

Ap - 0 to 21 cm; very dark brown (10YR 2/2) sandy loam; moderate fine subangular blocky structure; friable; many earthworms; abrupt wavy boundary.

Cr - 21 to 21 cm; Weathered basalt.

Location: Santa Jacques -- Brick Alluvium.

Soil analysis data.

Use and Vegetation: Surshua, Hedgerow species trial. (see comments)

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	19.8	4.6	8.1	4	58	648	4995	55.00	45.00	0.00	SAL	.11
Cr	36.3	3.0	7.9	0	9	600	4995	96.25	3.75	0.00	S	0

Topography, Percent Slope: 90%

Elevation: 185 meters Aspect: ESE 117 degrees.

Stoniness: less than 0.1%

Depth to Root Restrictive Layer:

Degree of Erosion: severe

Soiled and Described by: RG, PR, CH, H-DF.

Date: April 25, 1980

Comments: Hedgerow species trial. *Cassia esarginata* (bwa kabrit), *Lourea leucocephala* (fresca), *Lourea diversifolia* (leara la rey), *Moringa glifera* (moro), *Guirasia* spp., *Lilia stratiel*, *Ipomoea alisonum* (kan n), *Ipomoea laxa* (eb guahana), *Amphora 2-lanoides* (el-ya), *Panicum maximum* (eb gine). Over the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion. On this particularly steep slope it is essential to keep a coverage of the soil.

Geologic Map Unit, Symbol: Kb

Name: Basalts, Metamorphic
and/or intrusive.

Sample Number: 43030, 43038, 43039.

Classification: Lithic Ustropept, sandy, skeletal, siliceous, non
acid.

Area: PADF Region 2.

Location: Saint Jacques -- Brice Albrun.

Use and Vegetation: Sorghum bicolor (pitimi). Hedgerow species trial.
(see comments)

Parent Material: colluvial (basalt)

Landform: Upland slope.

Topography, Percent Slope: 80%

Elevation: 185 meters Aspect: ESE 117 degrees.

Stoniness: less than 0.1%

Depth to Root Restrictive Layer:

Degree of Erosion: severe

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 25, 1989

Comments: Hedgerow species trial. Cassia emarginata (bwa kabrit),
Leucaena leucocephala (lesena); Leucaena diversifolia
(lesena ti fey); Moringa olifera (benzoliv); Gliricidia
sepium (lila etranje); Saccharum officinarum (kan'n);
Tripsacum laxum (zeb guatemala); Anatherum zizanoides
(vetive); Pennisetum pupureum (zeb elefan); Panicum
maximum (zeb gine). Given the steepness of the slope
lateral drainage can be expected and rapid runoff is
leading to severe erosion. On this particularly steep
slope it is essential to keep a coverage of the soil.

Profile description.

- Ap - 0 to 11 cm; very dark grayish brown (10YR 3/2) gravelly loam; weak very fine subangular blocky structure; very friable; clear wavy boundary.
- C1 - 11 to 28 cm; dark yellowish brown (10YR 4/4) gravelly loamy sand; structureless single grain; loose; many coarse fragments; gradual smooth boundary.
- C2 - 28 cm ; yellowish brown (10YR 5/6) very gravelly sand; structureless single grain; loose.

Soil analysis data

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	3.6	7.6	7.6	2	47	896	4995	76.25	21.25	2.50	LS	.05
C1	2.0	0.1	7.8	0	7	708	4995	91.25	8.75	0.00	S	.02
C2	15.1	0.2	7.4	0	9	622	3660	91.25	6.25	2.50	S	.02

Depth to Root Restrictive Layer: 120cm

Degree of Erosion: severe

Sampled and Described by: RG, PR, GH, N-PE.

Date: April 25, 1989

Comments: *Hedgerow species trial: Carelia amarantina (bwa kabrit), Loucaena (lucoccephala) (lesons), Loucaena diversifolia (lesons) (fey), Dorinda alifera (benyuliv), Gliricidia sepium (lila estranje), Saccharum officinarum (kan'n), Trianthema laxum (zab quatemala), Anatharium zizanioides (rativel), Pennisetum purpureum (zab wifan), Panicum polyanthum (zab sine).* Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion. On this particularly steep slope it is essential to keep a coverage of the soil. This soil is much deeper, has a more favorable texture (more silt and less sand), a better structure and thus a much better moisture holding capacity. From a physical stand point it is more suitable for agriculture, but risks for erosion are high. Phosphorus is extremely low and undoubtedly a very strong limiting factor.

Geologic Map Unit, Symbol: Kb Description Name: Basalts, Metamorphic and/or intrusive.

Sample Number: 43024, 43037, 43035.

Classification: Cumulic Haplustoll, Sandy, Silicious, isohyperthermic.

Area: PADF Region 2.

Location: Saint Jacques - Brice Albrun. South end of the field.

Use and Vegetation: Sorghum bicolor (pitimi). Hedgerow species trial. (see comments)

Parent Material: colluvial (basalt)

Landform: Upland slope.

Topography, Percent Slope: 80%

Elevation: 185 meters Aspect: ESE 117 degrees.

Stoniness: less than 0.1%

Depth to Root Restrictive Layer: 120cm

Degree of Erosion: severe

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 25, 1989

Comments: Hedgerow species Trial. Cassia emarginata (bwa kabrit), Leucaena leucocephala (lesena); leucaena diversifolia (lesena ti fey); Moringa olifera (benzoliv); Gliricidia sepium (lila etranje); Saccharum officinarum (kan'n); Tripsacum laxum (zeb guatemala); Anatherum zizanoides (vetive); Pennisetum pupureum (zeb elefan); Panicum maximum (zeb gine). Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion. On this particularly steep slope it is essential to keep a coverage of the soil. This soil is much deeper, has a more favorable texture (more silt and less sand), a better structure and thus a much better moisture holding capacity. From a physical stand point, it is more suitable for agriculture, but risks for erosion are high. Phosphorus is extremely low and undoubtedly a very strong limiting factor.

Profile description.

Sample Number: 3869, 3873.

- Ap - 0 to 12 cm; very dark brown (10YR 2/2) gravelly loam; weak fine subangular blocky structure; friable; clear smooth boundary.
- Bw - 12 to 30 cm; very dark brown (10YR 2/2) gravelly loam; moderate fine subangular blocky structure; friable; clear wavy boundary.
- C - 30 to 120 cm; very dark grayish brown (10YR 3/2) very gravelly loam; structureless; friable; clear wavy boundary.
- CR - 120 cm ;

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	.	4.2	7.2	3	83	1058	4995	71.25	26.25	2.50	SL	.07
Bw	13.2	6.1	7.6	0	31	1029	4995	76.25	18.75	5.00	LS	.05
C	21.2	0.6	7.8	3	26	898	4995	82.50	15.00	2.50	LS	.04

Date: 10-3-88

Comments: Regrowth of forest species; PADP plans to start a new demonstration site for hedgerow fruit trees. The soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff could lead to severe erosion, but adequate soil cover would limit soil loss. A lot of roots are found throughout the profile.

Geologic Map Unit, Symbol: Epc

Name: Abuillot Formation.
Limestones.

Sample Number: 3869, 3873.

Classification: Typic Hapludolls

Area: PADF Region 2

Location: Baint - Capanyo

Use and Vegetation: Freshly cleared secondary forest.

Parent Material: Conglomerate, recif, limestone.

Landform: Upland slope

Topography, Percent Slope: 34%

Elevation: 110 meters Aspect: SE 136 degrees

Stoniness: Stony

Depth to Root Restrictive Layer: 54cm.

Degree of Erosion: Severe

Sampled and Described by: RG, PR, M-PE

Date: 10-3-89

Comments: Regrowth of forest species; PADF plans to start a new demonstration site for hedgerow fruit trees. The soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff could lead to severe erosion, but adequate soil cover would limit soil loss. A lot of roots are found throughout the profile.

3. PADP Region 3.

Profile description.

A - 0 to 34 cm; very dark brown (10YR 2/2) very gravelly loam; moderate fine subangular blocky structure; friable; few earthworms; strongly alkaline; abrupt wavy boundary.

Bw - 34 to 54 cm; dark brown (7.5YR 4/4) very gravelly loam; weak fine subangular blocky structure; friable; strongly alkaline; abrupt irregular boundary.

Cr - 54 cm to ; soft limestone.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
A	37.0	11.8	8.1	4	198	567	4995	66.25	28.75	5.00	SL	.08
Bw	50.3	4.6	8.3	4	139	271	4995	50.00	37.50	12.50	L	.12

Elevation: 30 meters Aspect:

Depth to Root Restrictive Layer:

Degree of Erosion: None-slight

Sampled and Described by: RS, PR, GH, R PE.

Date: 7-25-63

Comments: Soluble salts should be analyzed; this soil may be saline. Stratification is evident below 100 cm. The soil is poorly drained.

Profile description.

Ap - 0 to 18 cm; dark gray (10YR 4/1) clay loam; weak fine subangular blocky structure; friable; strongly alkaline; abrupt wavy boundary.

C - 18 to 100 cm; gray (10YR 5/1) clay; structureless massive; firm; strongly alkaline.

Soil analysis data

Hor	% Gravel	OM	pH	P	K	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL	
Ap	2.8	2.8	8.0	16	414	724	4995	12.00	35.00	35.00	SCL	.22
C	2.8	1.7	8.4	17	341	807	4995	7.50	50.00	42.50	SC	.23

3. PADF Region 3.

Geologic Map Unit, Symbol: Qal 3858. Name: Alluvium

Sample Number: 3861, 3859.

Classification: Typic Tropaquents/Typic Halaquepts

Area: PADF Region 3

Location: Jone Belanse - Ebenezer Mission

Use and Vegetation: PADF species trial -- Prosopis sp (bayawonn), Azadirachta indica (nim), Leucaena sp (lesena).

Parent Material: Old alluvium

Landform: Terrace

Topography, Percent Slope: 0%

Elevation: 30 meters Aspect: WNW 290 degrees

Depth to Root Restrictive Layer:

Degree of Erosion: None-slight

Sampled and Described by: RG, PR, GH, M-PE.

Date: 9-25-89

Comments: Soluble salts should be analyzed; this soil may be saline. Stratification is evident below 100 cm. The soil is poorly drained.

Profile description.

Ap - 0 to 18 cm ; dark gray (10YR 4/1) clay loam; weak fine subangular blocky structure; friable; strongly alkaline; abrupt smooth boundary.

C -18 to 100 cm; gray (10YR 5/1) clay; structureless massive; firm; strongly alkaline.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	4.8	2.5	8.6	70	419	724	4995	10.00	55.00	35.00	SCL	.22
C	4.8	1.7	8.4	47	341	663	4995	7.50	50.00	42.50	SC	.23

Geologic Map Unit, Symbol: Kdq

Name: Diorites quartzose

Sample Number: 3862, 3866, 3865, 3858.

Classification: Typic Haplohumults (5YR 3/3) sandy loam; weak fine subangular blocky structure; friable; clear wavy boundary.

Area: PADF Region 3

Location: Lare -- PADF demonstration site - section; Mt. Organise.

Use and Vegetation: Mixed hedgerow species; Samanea saman (saman), Albizia lebbeck (tcha tcha), Moringa oleifera (benzoliv), Leucaena sp (lesena). Between hedgerows planted fallow with seed plots of Pueraria phaseoloides (kudzu).

Parent Material: Diorite - quartzite weathering products (tan yellow)

Landform: Upland slope

Topography, Percent Slope: 11%

Elevation: 640 meters Aspect: WNW 290 degrees

Stoniness:

Depth to Root Restrictive Layer: 535 81.25 28.75 10.00 SL .12

Degree of Erosion: Slight 14 535 52.50 22.50 25.00 SCL .11

Sampled and Described by: RG, PR, GH, M-PE.

Date: 9-26-89

Comments: Soil is acid throughout. This is a CECI, a Canadian funded development project, demonstration and training site, also used by PADF. The soil is generally well drained. Even on this fairly gentle slope, rapid runoff could lead to severe erosion, and therefor adequate soil cover would limit soil loss. Pueraria phaseoloides (kudzu) seems to be a promising cover crop for the area. The soil phosphorus level in the soil is extremely low.

Profile description.

Geologic Map Unit, Symbol: Omc Name: Formations Madame Jole et La Crete.

Ap - 0 to 18 cm; dark reddish brown (5YR 3/3) sandy loam; weak fine subangular blocky structure; friable; clear wavy boundary.

Bt1- 18 to 55 cm; red (2.5YR 4/8) sandy clay loam; weak fine subangular blocky structure; friable; gradual smooth boundary.

Bt2- 55 to 100 cm; red (2.5YR 4/8) cobbly sandy clay loam; weak fine subangular blocky structure; friable; gradual smooth boundary.

C -100 to 120 cm; Mottled red (10R 4/6; 2.5YR 4/8) and brownish yellow (10YR 6/6) cobbly sandy loam; structureless massive; friable.

Soil analysis data.

Parent Material: Calcareous sediments

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	9.0	3.0	5.4	5	53	29	695	61.25	28.75	10.00	SL	.12
B1t	13.3	1.0	5.4	0	9	18	190	50.00	20.00	30.00	SCL	.12
B2t	20.2	0.6	5.5	0	8	14	535	52.50	22.50	25.00	SCL	.11
C	4.4	0.4	5.1	0	9	12	575	52.50	32.50	15.00	SL	.11

Depth to Root Restrictive Layer:

Degree of Erosion: Slight

Sampled and Described by: RG, PR, GH, M-PE.

Date: 9-27-67

Comments: Two samples were taken for Ap, even though two horizons could not clearly be defined, we split it because the lower part is probably a transition with C; Ap1 0-16cm (3856) and Ap2 16-24cm (3857). Soil is generally well drained. A lot of roots can be observed in the Ap horizon.

4. PADF Region 4.

Geologic Map Unit, Symbol: Omc

Name: Formations Madame Joie et
La Crete.

Sample Number: 3856, 3863, 3852.

Classification: Typic Hapludolls

Area: PADF Region 4

Location: La Jeune - missionary camp near Pignon

Use and Vegetation: Demonstration site and species trial - Species tested include Azadirachta indica (nim), Acacia auriculoformis (akasya), Eucalyptus sp (kaliptis), Cassia siamea (kasya), Catalpa longissima (chenn). Many other trees that are not part of the demonstration are on the site. These are; Delonix regia (flambwayan), Swietenia mahagoni (kajou peyi), Haematoxylon campechianum (kampech), Samanea saman (saman).

Parent Material: Calcareous sediments

Landform: Central Plateau

Topography, Percent Slope: flat

Elevation: 350 meters Aspect: west

Stoniness:

Depth to Root Restrictive Layer:

Degree of Erosion: Slight

Sampled and Described by: RG, PR, GH, M-PE.

Date: 9-27-89

Comments: Two samples were taken for Ap, even though two horizons could not clearly be defined, we split it because the lower part is probably a transition with C; Ap1 0-16cm (3856) and Ap2 16-24cm (3863). Soil is generally well drained. A lot of roots can be observed in the Ap horizon.

Geologic Map Unit, Symbol Profile description. Formation Madame Jolie et la Creta.

Ap - 0 to 24 cm; dark brown (10YR 3/3) clay; weak fine subangular blocky structure; friable; lower part has properties of a B horizon; strongly alkaline; gradual smooth boundary.

C -24 to 100 cm; Mottled strong brown (7.5YR 5/6), red (2.5YR 5/6), and pale brown (10YR 6/3) silty clay loam; structureless massive; friable; many soft fragments of limestone; strongly alkaline.

Use and Vegetation: Alley crop trial-- Mixed species; *Gliricidia sepium* (lila etranis), *Calliandra calothyrsus*, *Moringa oleifera* (benzolive), *Leucaena leucocephala auriculiformis* (akasya), *Catalpa bignonioides* (chenn), were planted in 1985. Native *Cassia fistula* (kass), *Haematoxylon campechianum* (kampech), *Guazuma tomentosa* (kass).

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap1	18.3	4.2	8.1	3	158	244	4995	40.00	42.50	17.50	L	.15
Ap2	55.6	2.9	8.2	3	128	204	4995	35.00	45.00	20.00	L	.16
C	9.2	1.0	8.3	1	76	144	4995	17.50	60.00	22.50	SIL	.2

Landform: Alluvial plain

Topography, Percent Slope: flat.

Elevation: 360 meters Aspect:

Stoniness: none

Depth to Root Restrictive Layer: 34 cm

Degree of Erosion: none-slight

Sampled and Described by: RG, PR, GH, M-PE.

Date: 9-27-89

Comments: Nice stand of *Sesbania grandiflora* (bwa valve) near site. The species were planted in 1985.

Geologic Map Unit, Symbol: Omc Name: Formation Madame Joie et
la Crete.

Sample Number: 3853, 3854, 3855.

Classification: Lithic Hapludolls (YR 2/2) clay; moderate very fine
subangular blocky structure; very friable; many fine

Area: Central Plateau - PADF Region 4

Location: PADF nursery site - Lapila - commune; Pignon. medium
subangular blocky structure; very firm; many fine

Use and Vegetation: Alley crop trial-- Mixed species; Gliricidia
sepium(lila etranje), Calliandra calothyrsus, Moringa oleifera
(benzoliv), Leucaena sp (lesena), Acacia auriculiformis (akasya),
Catalpa longissima (chenn), were planted in 1986. Native Cassia
fistula (kas), Haematoxylon campechianum (kampech), Guazuma
ulmifera (bwa domm), Noix cajouwere also in the field as well as
Magnifera indica (mango).

Parent Material: Old alluvium analysis data.

Landform: Alluvial plain

Topography, Percent Slope: flat.

Elevation: 360 meters Aspect:

Stoniness: none

Depth to Root Restrictive Layer: 34 cm

Degree of Erosion: none-slight

Sampled and Described by: RG, PR, GH, M-PE.

Date: 9-27-89

Comments: Nice stand of Sesbania grandiflora (bwa valye) near site.
The species were planted in 1985.

Profile description.

- Ap - 0 to 8 cm; very dark brown (10YR 2/2) clay; moderate very fine subangular blocky structure; very friable; many fine roots; abrupt smooth boundary.
- Bw1 - 8 to 18 cm; very dark brown (10YR 2/2) clay; strong medium subangular blocky structure; very firm; many fine roots; clear smooth boundary.
- Bw2 - 18 to 34 cm; dark brown (10YR 3/3) clay; strong medium subangular blocky structure; firm; abrupt wavy boundary.
- R - 34 cm; Limestone bedrock.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	9.0	7.2	6.7	16	179	465	4995	31.25	33.75	35.00	CL	.17
Bw1	6.6	6.5	6.6	3	154	393	4995	36.25	31.25	32.50	CL	.15
Bw2	10.6	4.2	6.5	1	205	333	4995	25.00	25.00	50.00	C	.18

Geologic Map Unit, Symbol: Mmi

Name: Thomonde and Riviere grise formation. Shales and calcareous sandstones

Sample Number: 954, 955, 956.

Classification: Typic Eutropepts

Area: PADF Region 4

Location: Thomonde -- Methodist - Wesleyan camp.

Use and Vegetation: Hedgerow species trial -- Moringa oleifera (benzoliv), Leucaena sp (lesena) and Albizia lebbeck (tcha tcha); secondary forest of Swietenia mahagoni (kajou peyi), Tectona grandis (tek), Colubrina arborescens (kapab), Lysilona latisiliqua (taveno) .

Parent Material: Old alluvium

Landform: upland slope.

Topography, Percent Slope: 35%

Elevation: 300 meters Aspect: S 170 degrees

Stoniness:

Depth to Root Restrictive Layer:

Degree of Erosion: Severe

Sampled and Described by: RG, PR, GH, M-PE.

Date: 9-27-89

Comments: Hedgerows planted in March 1989; Swietenia mahagoni (kajou peyi) mostly planted in 1982. Even on this fairly gentle slope, rapid runoff could lead to severe erosion, and therefore adequate soil cover is needed to limit soil loss.

5. PADF Region 5.

Profile description.

Geologic Map Unit, Symbol: Qa1 Name: Alluvium, Terrace deposits

Ap - 0 to 7 cm; dark grayish brown (10YR 4/2) clay loam; weak fine subangular blocky structure; friable; strongly alkaline; abrupt smooth boundary.

Bw - 7 to 20 cm; yellowish brown (10YR 5/4) clay loam; weak fine subangular blocky structure; friable; strongly alkaline; clear wavy boundary.

C -20 to 50 cm; yellowish brown (10YR 5/6) very gravelly sandy clay loam; structureless massive; friable; very gravelly below 50 cm; impossible to dig with a spade.; strongly alkaline.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	21.0	1.7	7.8	9	227	336	4995	31.25	61.25	7.50	SIL	.17
Bw	13.6	3.2	8.3	6	263	347	4995	26.25	56.25	17.50	SIL	.18
C	45.5	1.5	8.4	5	165	392	4995	38.75	43.75	17.50	L	.15

Degree of Erosion: slightly

Sampled and Described by: RG, PR, GH, M-PE.

Date: May 2, 1989

Comments: Severe erosion is taking place on the adjacent slopes which is bringing colluvium but also substantial amounts of runoff water. At the site the soil is well drained, but there are signs of runoff taking place.

5. PADF Region 5.

Profile description.

Geologic Map Unit, Symbol: Qa1 Name: Alluvium, Terrace deposits
Sample Number: 43002, 43009, 43010.

Classification: Typic Haplustoll, coarse-loamy, mixed, isohyperthermic.
Area: PADF - Region 5

Location: PADF Demo Mirebelais Alley Crop Trial

Use and Vegetation: Gliricidiasepium (lila etranje) alley cropping trial.
Crops planted are Zea mais (mayi) Vigna sinensi (pwa enconi)
Cajanus cajan (pwa kongo) and Sorghum bicolor (pitimi).

Parent Material: Alluvium and colluvium.

Landform: Alluvial plain, flat gentle slope

Topography, Percent Slope: 2%

Elevation: Aspect:

Stoniness: Less than 0.01%

Depth to Root Restrictive Layer:

Degree of Erosion: slightly

Sampled and Described by: RG, PR, GH, M-PE.

Date: May 2, 1989

Comments: Severe erosion is taking place on the adjacent slopes which is bringing colluvium but also substantial amounts of runoff water. At the site the soil is well drained, but there are signs of runoff taking place.

Geological map Unit, 5 Profile description. Name: Formation Lascahobee-

Maissade at Morne Delmas;
conglomerates, and sandstone.

Ap - 0 to 12 cm; very dark grayish brown (10YR 3/2) loam; weak very fine subangular blocky structure; very friable; strongly alkaline; clear wavy boundary.

Bw - 12 to 28 cm; dark brown (10YR 3/3) loam; weak fine subangular blocky structure; friable; strongly alkaline; clear wavy boundary.

Classification: Typic Ustropept, coarse-loamy, mixed.

C - 28 to 90 cm; yellowish brown (10YR 5/4) loam; massive structure; friable; strongly alkaline.

Location: PADP Demo Mirabelais - hedgerow trial location.

Soil analysis data.

Use and Vegetation: Hedgerow demonstration. Crops planted include: Ipomoea batatas (potato), Zea mays (maize), Ceanothus ciliatus (pawpaw)

Hor	% Gravel	OM	pH	P	K	Mg	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
				ppm								
Ap	2.6	4.9	8.3	5	110	105	4995	61.25	31.25	7.50	SL	.09
Bw	1.4	3.0	8.1	4	62	102	4995	65.00	25.00	10.00	SL	.08
C	20.6	1.0	8.2	3	66	93	4995	62.50	30.00	7.50	SL	.09

Parent Material: Colluvial

Elevation: Aspect: SW 220 degrees.

Stoniness: 2%

Depth to Root Restrictive Layer: 10cm

Degree of Erosion: Severe

Sampled and Described by: RG, PR, CH

Date: April 29, 1989

Comments: The landform is concave and has two distinct slopes, the upper one much steeper, which is a zone of very active erosion and a gentler lower slope where colluvium accumulates. Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion. A good vegetation at the foot of the slope could prevent a significant amount of sediments from being washed away.

Geological map Unit, Symbol: Mca Name: Formation Lascahobas-
Maissade et Morne Delmas;
Mixture of Calcaires
Madrepouques,
conglomerates, and
sandstone.

Sample Number: 43012, 43013, and 43014

Classification: Typic Ustropept, coarse-loamy, mixed.

Area: PADF Region 5.

Location: PADF Demo Mirebelais - hedgerow trial location.

Use and Vegetation: Hedgerow demonstration. Crops planted include:
Ipomea batatas (patate), Zea mais (mayi), Cajanus cajan (pwa
congo).

Parent Material: Colluvial

Landform: Upland

Topography, Percent Slope: 75-80%

Elevation: Aspect: SW 220 degrees.

Stoniness: 2%

Depth to Root Restrictive Layer: 70cm

Degree of Erosion: Severe

Sampled and Described by: RG, PR, GH

Date: April 29, 1989

Comments: The landform is concave and has two distinct slopes, the upper one much steeper, which is a zone of very active erosion and a gentler lower slope where colluvium accumulates. Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion. A good vegetation at the foot of the slope could prevent a significant amount of sediments from being washed away.

Profile Description

- Ap - 0 to 12 cm; dark brown (10YR 4/3) gravelly loam; weak fine subangular blocky structure; friable; strongly alkaline; gradual wavy boundary.
- Bw - 12 to 40 cm; dark brown (10YR 4/3) gravelly loam; weak fine subangular blocky structure; friable; strongly alkaline; clear wavy boundary.
- C - 40 to 70 cm; light brownish gray (10YR 6/2) and very pale brown (10YR 8/3) very gravelly loam; massive structure; firm; strongly alkaline; clear wavy boundary.
- Cr - 70 to 90 cm; soft limestone or marl; strongly alkaline.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	48.0	5.3	7.9	5	117	102	4995	48.75	46.25	5.00	SL	.12
Bw	23.3	3.8	8.3	4	52	49	4995	41.25	48.75	10.00	L	.14
C	60.8	1.2	8.2	1	37	22	4995	47.50	45.00	7.50	L	.13

Geologic Map Unit, Symbol: Mca Name: Lascahobas- Maissade et Delmas formation

Sample Number: 945, 946, 947, 948, 949.

Classification: Typic Ustropepts

Area: PADF Region 5

Location: Gros Morne Desvarieux

Use and Vegetation: Moringa oleifera (benzoliv) hedgerows. Mixed cropping, Sorghum bicolor (pitimi), Saccharum officinarum (kan'n), Manihot utilissima (manyok), Cajanus cajan (pwa kongo), also Sesamum orientale (hoholi).

Parent Material: Conglomerates, finely stratified siltstones, limestones, and possibly also shales.

Landform: Upland slope.

Topography, Percent Slope: 40%

Elevation: Aspect: South

Moisture: Moist

Stoniness:

Depth to Root Restrictive Layer:

Degree of Erosion: Severe

Sampled and Described by: RG, PR, GH

Date: 9-22-89

Comments: Highly weathered shales provides good structure to the Bw1 Horizon. BC horizon is mottled showing water table movements and possible limitation due to poorer drainage. Lateral drainage can be expected and rapid runoff could lead to severe erosion, but adequate soil cover would limit soil loss.

Profile description.

- Ap - 0 to 14 cm; 10yr 4 4 loam; weak very fine subangular blocky structure; friable; strongly alkaline; clear smooth boundary.
- Bw1- 14 to 34 cm; Yellowish brown (10YR 5/6)(70%) and reddish brown (5YR 4/4)(30%) loam; moderate medium subangular blocky structure; firm; strongly alkaline; gradual smooth boundary.
- Bw2- 34 to 52 cm; Dark brown (7.5YR)(70%), yellowish brown (10YR)(20%), and gray (10GY)(10%) loam; moderate medium subangular blocky structure; firm; strongly alkaline; gradual smooth boundary.
- BC - 52 to 72 cm; Yellowish brown (10YR)(60%), dark brown (7.5YR)(20%), and gray (10GY)(20%) sandy loam; weak fine subangular blocky structure; friable; strongly alkaline; gradual smooth boundary.
- C -72 to 110 cm; Yellowish brown (10YR 5/6), gray (10GY N/6) and, white (10YR 8/2) sandy loam; structureless massive; very firm; strongly alkaline.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
AP	26.7	2.4	8.1	8	184	546	4995	40.00	52.50	7.50	SIL	.15
Bw1	48.4	0.5	7.7	4	216	329	4995	42.50	55.00	2.50	SIL	.14
Bw2	8.8	1.3	8.4	4	187	318	4995	25.00	65.00	10.00	SIL	.18
Bc	12.1	0.1	8.3	2	159	231	4995	26.25	73.75	0.00	SIL	.18
C	16.0	0.1	8.0	2	229	305	4995	25.00	70.00	5.00	SIL	.18

Geologic Map Unit Symbol: Mmi

Name: Thomonde and Riviere grise formation. Shales and calcareous sandstones

Sample Number: 950, 951, 952, 953.

Classification: Typic Eutropepts

Area: PADF Region 5

Location: Lascahobas demonstration site.

Use and Vegetation: Alley cropping field -- Mixed alleys Cassia siamea (kasya), Gliricidiasepium (lila etranje), Leucaena sp (lesena). Mixed cropping between the alleys; Zea mais (mayi), Manihot utilissima (manyok).

Parent Material: clayey alluvium, also weathered shales and siltstone.

Landform: Old terrace

Topography, Percent Slope: 10%

Elevation:

Aspect: North

Stoniness: none

Depth to Root Restrictive Layer:

Degree of Erosion: Moderate

Sampled and Described by: RG, PR, GH

Date: 9-22-89

Comments: Drainage is described as moderate to well, and since Bw is mottled indicating water table movements and possible limitation due to poorer drainage. Lateral drainage can be expected and rapid runoff could lead to severe erosion, but adequate soil cover would limit soil loss.

Profile description.

- Ap - 0 to 24 cm; dark grayish brown (10YR 4/2) clay; moderate fine subangular blocky structure; friable; strongly alkaline; gradual smooth boundary.
- Bw - 24 to 40 cm; yellowish brown (10YR 5/6) clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable; strongly alkaline; clear smooth boundary.
- C1 - 40 to 57 cm; Yellowish brown (10YR 5/4), light brownish gray (10YR 6/2), and brown (7.5YR 5/2) clay loam; structureless massive; friable; strongly alkaline; clear smooth boundary.
- C2 - 57 to 80 cm; Gray (10YR 6/1), light brown (7.5YR 6/4), and strong brown (7.5YR 5/8) loam; structureless massive; firm; strongly alkaline.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	80.1	4.0	7.9	5	258	266	4995	23.75	53.75	22.50	SIL	.19
Bw	45.5	4.2	7.9	5	231	289	4995	21.25	56.25	22.50	SIL	.19
C1	14.9	0.2	8.1	8	135	176	4995	15.00	62.50	22.50	SIL	.21
C2	21.4	0.2	8.1	15	131	176	4995	6.25	76.25	17.50	SIL	.23

Geologic Map Unit, Symbol: Mca Name: Calcaires Madreporiques, with conglomerates and/or shales.

Sample Number: 43015, 43003, 43001, 43004, 43008.

Classification: Typic Ustropept, coarse-loamy, mixed.

Area: PADF Region 5.

Location: Andre Pierre - Lascahobas - Rampas

Use and Vegetation: Leucaena leucocephala (lesena) hedgerows, very poor management for existing crops, even though the farmer had planted new multi-species hedgerows and very nice looking Sorghum bicolor (pitimi) in a nearby field.

Parent Material: Unconsolidated marine sediment.

Landform: Upland, slope.

Topography, Percent Slope: 24%

Elevation: Aspect: S 170 degrees.

Stoniness: less than 0.1%

Depth to Root Restrictive Layer:

Degree of Erosion: severe

Sampled and Described by: RG, PR, GH

Date: May 2, 1989

Comments: Field has a developing small gully that the farmer is trying to control. Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion as is shown by the gully.

Geologic Map Unit, Symb Profile description. Calcarias Madreporiques, with conglomerates and/or shales

- Ap - 0 to 9 cm; dark brown (10YR 4/3) gravelly sandy loam; weak very fine subangular blocky structure; very friable; clear wavy boundary.
- Bw1- 9 to 20 cm; dark brown (10YR 3/3) very gravelly loam; moderate medium subangular blocky structure; friable; abrupt wavy boundary.
- Bw2- 20 to 44 cm; dark brown (10YR 4/3) gravelly loam; moderate fine subangular blocky structure; friable; clear wavy boundary.
- Bw3- 44 to 52 cm; dark brown (10YR 4/3) gravelly loam; weak fine subangular blocky structure; friable; clear wavy boundary.
- C -52 to 100+ cm; light olive brown (2.5Y 5/4) loam; massive structure; firm.

Elevation: Soil analysis data. S 125 degrees

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	51.4	2.7	7.8	0	92	188	4580	77.50	15.00	7.50	LS	.05
Bw1	45.5	2.6	7.6	2	67	242	4995	76.25	21.25	2.50	LS	.05
Bw2	22.2	6.7	7.7	2	75	276	4995	60.00	25.00	15.00	SL	.1
Bw3	23.2	1.1	7.8	1	74	335	4995	51.25	41.25	7.50	L	.12
C	1.9	0.3	7.7	2	88	321	4995	66.25	31.25	2.50	SL	.08

Comments: Very degraded hedgerows, probably damaged by grazing animals. The landform is convex in that the upper part of the field has a gentler slope than the lower part. It is important here to try to reduce the amount of runoff water as much as possible, through diversion for instance, before it reaches the steeper slope and prevent severe erosion.

Geologic Map Unit, Symbol: Mca

Name: Calcaires Madreporiques,
with conglomerates and/or
shales.

Sample Number: 43005, 43007, 43006, 43000, 43011.

Classification: Typic Haplustoll, loamy, mixed, shallow, isohyperthermic.

Area: PADF Region 5.

Location: Gabriel Saintil.

Use and Vegetation: Leucaena leucocephala (lesena) hedgerows. Crops
between the hedgerows include Arachis hypogaea (pistach), and
Zea mais (mayi). Hedgerows were planted in 1986.

Parent Material: colluvial

Landform: Upland, slope

Topography, Percent Slope: 28%

Elevation:

Aspect: S 185 degrees

Stoniness: 5%

Depth to Root Restrictive Layer: 43 cm

Degree of Erosion: Severe

Sampled and Described by: RG, PR, GH, M-PE.

Date: May 2, 1989

Comments: Very degraded hedgerows; probably damaged by grazing animals.
The landform is convex in that the upper part of the field
has a gentler slope than the lower part. It is important
here to try to reduce the amount of runoff water as much as
possible, through diversion for instance, before it reaches
the steeper slope and prevent severe erosion.

Profile description.

- Ap - 0 to 10 cm; very dark brown (10YR 2/2) gravelly loam; weak very fine subangular blocky structure; very friable; strongly alkaline; clear smooth boundary.
- Bw1- 10 to 18 cm; dark brown (10YR 3/3) gravelly clay loam; weak fine subangular blocky structure; friable; strongly alkaline; abrupt wavy boundary.
- Bw2- 18 to 30 cm; dark brown (10YR 4/3) very gravelly clay loam; weak very fine subangular blocky structure; friable; clear smooth boundary.
- C - 30 to 43 cm; brown (10YR 5/3) loam; massive structure; very firm; clear smooth boundary.
- CR - 43 cm; yellowish brown (10YR 5/4) and very pale brown (10YR 8/3); massive structure; unconsolidated marine sediments.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg	Ca	SAND	SILT	CLAY	TEX	H2O AVAIL
						ppm		%	%	%		
Ap	24.9	3.1	7.8	3	90	382	4995	56.25	36.25	7.50	SL	.1
Bw1	11.1	2.0	6.7	2	55	404	4710	53.75	33.75	12.50	SL	.11
Bw2	42.1	1.1	7.4	2	49	262	4995	57.50	25.00	17.50	SL	.1
2C	.	1.1	8.0	3	54	274	4995	43.75	46.25	10.00	L	.14
2Cr	44.2	0.3	7.9	1	33	184	4995	100	0.00	0.00	S	.0

Geologic Map Unit, Symbol: Mca Name: Lascahobas- Maissade et Delmas formation

Sample Number: 3868, 3867, 3860, 3864.

Classification: Entic Hapludolls

Area: PADF Region 5

Location: Dorval -- haut de St. Marc

Use and Vegetation: Moringa oleifera (benzoliv) and Leucaena sp (lesena) hedgerows. Mixed cropping, Sorghum bicolor (pitimi), Zea mais (mayi), Citrillus vulgaris (melon) and Dioscorea alata (yanm). Also some native Leucaena glauca (delin) as well as planted Azadirachta indica (nim) trees.

Parent Material: Colluvium from limestone

Landform: Steep upland slope

Topography, Percent Slope: 48%

Elevation: 155 meters Aspect: ENE 62 degrees.

Stoniness: Surface covered with coarse fragments (35% in upper 40cm)

Depth to Root Restrictive Layer:

Degree of Erosion: severe

Sampled and Described by: RG, PR, GH, M-PE.

Date: 9-25-89

Comments: Hedgerows planted in May 1989. Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion.

6. CARE

Profile description.

- Ap - 0 to 20 cm; very dark grayish brown (10YR 3/2) very gravelly loam; weak medium subangular blocky structure; friable; strongly alkaline; abrupt smooth boundary.
- C1 - 20 to 42 cm; pale brown (10YR 6/3) very gravelly loam; structureless massive; friable; strongly alkaline; abrupt smooth boundary.
- 2C2- 42 to 82 cm; pale brown (10YR 6/3) loam; structureless massive; friable; strongly alkaline; gradual smooth boundary.
- 2C3-82 to 100 cm; pale brown (10YR 6/3) loam; common medium prominent strong brown (7.5YR 5/6) mottles; structureless massive; firm; strongly alkaline.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	65.7	3.4	6.5	8.1	12	285	292	4995	40.00	50.00	10.00	SL.15
C1	62.7	2.3	8.3	5	152	148	4995	26.25	56.25	17.50	SL	.18
C2	2.1	1.1	8.4	4	193	181	4995	10.00	65.00	25.00	SL	.22
C3	21.7	0.4	8.4	2	210	200	4995	7.50	60.00	32.50	SCL	.23

Sampled and Described by: RB, PR, GH

Date: April 27, 1989

Comments: Soil is generally well drained. Lateral drainage can be expected and rapid runoff is leading to severe erosion.

6. CARE

Profile Description

Geologic Map Unit, Symbol: Qc Name: Calcaires Recifaux.
Coral Reef

Sample Number: 42997, 43050, 43045

Classification: Lithic Haplustalf, loamy, mixed.

Area: CARE

Location: Bombardopolis - Demonstration site - Upper part of the field.

Use and Vegetation: Gliricidiasepium (lila etranje) trial and crops

Parent Material: Slope wash - colluvial

Landform: Marine terrace

Topography, Percent Slope: 12%

Elevation: 500 meters

Aspect: SE 120 degrees.

Stoniness: 0-3%

Depth to Root Restrictive Layer: 30cm

Degree of Erosion: Moderate

Sampled and Described by: RG, PR, GH

Date: April 27, 1989

Comments: Soil is generally well drained. Lateral drainage can be expected and rapid runoff is leading to severe erosion.

Profile Description

Geologic Map Unit, Symbol, etc

Name: Calcaires Recifaux, Coral Reef

Ap - 0 to 6 cm; dark reddish brown (5YR 2.5/2) clay loam; weak very fine subangular blocky structure; friable; abrupt wavy boundary.

Bw1 - 6 to 16 cm; dark reddish brown (5YR 3/2) clay loam; weak fine subangular blocky structure; friable; abrupt wavy boundary.

Bw2 - 16 to 30 cm; dark reddish brown (5YR 3/2); weak fine subangular blocky structure; friable; soil only in cracks and crevices; abrupt wavy boundary.

R - 30 cm; calcareous recifaux.

Topography, Percent Slope, etc

Soil analysis data.

Elevation: 222 meters

Aspect: SE 125 degrees.

Hor	% OM Gravel	pH	P	K	Mg	Ca ppm	SAND	SILT %	CLAY %	TEX %	H2O AVAIL		
Ap	14.2	15.2	8.0	6	81	261	797	4995	76.25	18.75	5.00	LS	.05
Bw1	14.4	14.0	7.9	4		187	665	4995	85.00	15.00	0.00	LS	.03
Bw2	23.5	8.3	7.9	3	603	112	528	4995	81.25	18.75	0.00	LS	.04

Depth to Root Restrictive Layer: rock

Date: April 27, 1969

Comments: Took subsol sample below 16 cm. This is a very gentle slope but large amounts of runoff water are coming from uphill leading to potential erosion.

Profile description

0 to 6 cm; dark reddish brown (5YR 2.5/2) clay loam; weak very fine subangular blocky structure; friable; abrupt wavy boundary.

6 to 16 cm; dark reddish brown (5YR 3/2) clay loam; weak fine subangular blocky structure; friable; abrupt wavy boundary.

Soil analysis data.

Hor	% OM Gravel	pH	P	K	Mg	Ca ppm	SAND	SILT %	CLAY %	TEX %	H2O AVAIL		
Ap	14.2	15.2	8.0	6	81	261	797	4995	76.25	18.75	5.00	LS	.05
Bw1	14.4	14.0	7.9	4		187	665	4995	85.00	15.00	0.00	LS	.03
Bw2	23.5	8.3	7.9	3	603	112	528	4995	81.25	18.75	0.00	LS	.04

Geologic Map Unit, Symbol: Qc

Name: Calcaires Recifaux.

Geologic Map Unit, Symbol: Qc

Name: Calcaires Recifaux.
Coral Reef

Sample Number: 42988, 43049

Classification: Lithic Ustorthent, loamy, mixed, non acid, isohyperthermic.

Area: CARE

Location: Bombardopolis - Demonstration site - Middle part of the field.

Use and Vegetation: Gliricidiasepium (lila etranje) trial and crops

Parent Material: Marine deposits

Landform: Marine terrace, gentle slope

Topography, Percent Slope: 4%

Elevation: 422 meters

Aspect: SE 128 degrees.

Stoniness: 0-1%

Depth to Root Restrictive Layer: 16cm

Degree of Erosion: Slight

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 27, 1989

Comments: Took subsoil sample below 2R. This is a very gentle slope but large amounts of runoff water are coming from uphill leading to potential erosion.

Profile Description

Ap - 0 to 16 cm; dark reddish brown (5YR 3/3) clay; moderate fine subangular blocky structure; friable; abrupt wavy boundary.

2R - 16 cm; limestone bedrock (recifaux).

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
				ppm								
Ap	0.0	7.5	7.7	3	139	854	4995	55.00	27.50	17.50	SL	.11
2R	7.5	3.0	7.9	0	87	411	4995	22.50	25.00	52.50	C	.19

Geologic Map Unit, Symbol: Qc Name: Calcaires Recifaux.
Coral Reef

Sample Number: 43051, 43052, 42994

Classification: Typic Ustropept, very fine, mixed.

Area: CARE

Location: Bombardopolis - Demonstration site - Lower part of the field.

Use and Vegetation: Gliricidia sepium (lila etranje) trial and crops

Parent Material: Marine deposits

Landform: Marine terrace, gentle slope

Topography, Percent Slope: 1%

Elevation: 490 meters Aspect:

Stoniness: none

Depth to Root Restrictive Layer: 57cm

Degree of Erosion: Slight

Sampled and Described by: RG, PR, GH

Date: April 27, 1989

Comments: This is a very gentle slope but large amounts of runoff water are coming from uphill leading to potential erosion.

Profile description.

- Ap - 0 to 13 cm; dark reddish brown (2.5YR 3/4) clay loam; moderate fine subangular blocky structure; friable; gradual smooth boundary.
- Bw1- 13 to 25 cm; dark red (2.5YR 3/6) clay loam; weak fine subangular blocky structure; friable; gradual smooth boundary.
- Bw2- 25 to 57 cm; dark red (2.5YR 3/6) clay loam; weak fine subangular blocky structure; weaker structure; abrupt wavy boundary.
- 2R - 57 cm; calcareous - coral reef.

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	0.1	5.9	7.0	1	101	687	4995	41.25	31.25	27.50	CL	.1
Bw1	0.7	3.6	6.9	0	46	416	4085	17.50	35.00	47.50	C	.2
Bw2	0.0	2.1	6.9	1	50	262	4995	6.25	23.75	70.00	C	.23

Depth to Root Restrictive Layer: 40cm

Degree of Erosion: Severe

Sampled and Described by: RG, PR, GP, M-PL

Date: April 27, 1988

Comments: Soil nearby found in other parent material, possibly tuff. Stones on surface are colluvial. Soils from other farms in the area have been described as being developed from on coral reefs. Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion.

Geologic Map Unit, Symbol: Qc

Name: Calcaires Recifaux.
Coral Reef

Sample Number: 42998, 42995, 42999, 42996.

Classification: Typic Haplustoll, loamy, mixed, shallow, isohyperthermic.

Area: CARE

Location: Des Forge - Jardin Roseneil - Janite.

Use and Vegetation: Just planted Hedgerows. Mixed cropping; Cajanus cajan (pwa kongo), Ipomea batatas (papate), Zea mais (mayi), Sorghum bicolor (pitimi), Phaseolus sp (pwa blan, nwa ou wouj).

Parent Material: Colluvial - Limestone conglomerate

Landform: Upland slope

Topography, Percent Slope: 47%

Elevation: 500 meters Aspect: E 84 degrees.

Stoniness: less than 0.1%

Depth to Root Restrictive Layer: 40cm

Degree of Erosion: Severe

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 27, 1989

Comments: Soil nearby found in other parent material, possibly tuff, stones on surface are colluvial. Soils from other farms in the area have been described as being developed from on coral reefs. Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion.

Profile description.

Coral Reef

Sample Number: 42987, 42990

- Ap - 0 to 11 cm; very dark grayish brown (10YR 3/2) very gravelly loam; weak very fine subangular blocky structure; very friable; clear wavy boundary.
- Bw - 11 to 31 cm; dark brown (10YR 3/3) gravelly loam; weak very fine subangular blocky structure; very friable.
- C - 31 to 40 cm; dark brown (10YR 3/3) very gravelly loam; structureless friable; clear wavy boundary.
- CR - 40 to 50 cm; white (10YR 8/2); soft limestone conglomerate;

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	30.0	5.0	8.3	7	87	350	4995	67.50	30.00	2.50	SL	.08
Bw	21.8	2.3	8.3	9	42	148	4995	65.00	25.00	10.00	SL	.08
C	24.2	1.7	8.4	9	37	132	4995	66.25	23.75	10.00	SL	.08
Cr	50.9	0.4	8.4	10	25	73	4995	83.75	13.75	2.50	LS	.04

Depth to Root Restrictive Layer: 28cm

Degree of Erosion: Severe

Sampler and Date used by: RG, PR, GH, W-PE.

Date: 11/1/68

Comments: Soil is generally well drained. Lateral drainage can be expected and rapid runoff is leading to severe erosion.

Geologic Map Unit, Symbol: Qc Name: Calcaires Recifaux.
Coral Reef

Sample Number: 42987, 42990

Classification: Lithic Haplustoll, loamy, mixed, isohyperthermic.

Area: CARE

Location: Bombardopolis - Des Forges - Hasse - Borno Saint Elius.

Use and Vegetation: Crops, mainly Zea mais (mayi), Sorghum bicolor (pitimi), Cajanus cajan (pwa kongo) and Phaseolus vulgaris (pwa blan, nwa ou wouj) in the upper part and Saccharum officinarum (kan'n) in lower part of the landform. In the very bottom, in the ravine where the soil remains wet for longer periods of time, Musa paradisiaca (banann) is found. The entire landform has Leucaena leucocephala (lesena) hedgerows that are quite well maintained.

Parent Material: limestone - coral reef - conglomerate

Landform: Upland slope

Topography, Percent Slope: 20%

Elevation: 450 meters

Aspect: E 93 degrees.

Stoniness: 0-1%

Depth to Root Restrictive Layer: 28cm

Degree of Erosion: Severe

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 27, 1989

Comments: Soil is generally well drained. Lateral drainage can be expected and rapid runoff is leading to severe erosion.

Profile Description

Ap - 0 to 10 cm; black (10YR 2/1) gravelly loam; weak very fine subangular blocky structure; friable; clear smooth boundary.

Bw - 10 to 28 cm; black (10YR 2/1) gravelly loam; moderate fine subangular blocky structure; friable; abrupt wavy boundary.

R - and 28 cm;

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	19.9	8.4	8.1	14	264	704	4995	56.25	33.75	10.00	SL	.1
Bw	19.1	.	8.3	7	168	540	4995	61.25	26.25	12.50	SL	.09

Topography: Upland slope Percent Slope: 42%

Elevation: 440 meters Aspect: E 90 degrees.

Stoniness: 0-1%

Depth to Root Restrictive Layer: 32cm

Degree of Erosion: Severe

Sampled and described by: RG, PR, GH, M-PE

Date: April 27, 1983

Comments: Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion.

Geologic Map Unit, Symbol: Qc Name: Calcaires Recifaux.
Coral Reef

Sample Number: 42989, 42991

Classification: Typic Haplustoll, loamy, mixed, shallow isohyperthermic.

Area: CARE

Location: Bombardopolis - Des Forges - Hasse - Borno Saint Elius

Use and Vegetation: Crops, mainly Zea mais (mayi), Sorghum bicolor (pitimi), Cajanus cajan (pwa kongo) and Phaseolus sp (pwa blan, nwa ou wouj) in the upper part and sugar cane in lower part of the landform. In the very bottom, in the ravine where the soil remains wet for longer periods of time, Musa paradisiaca (banann) is found. The entire landform has Leucaena leucocephala (lesena) hedgerows that are quite well maintained.

Parent Material: quaternary limestone - coral reef - conglomerate

Landform: Upland slope

Topography, Percent Slope: 42%

Elevation: 440 meters

Aspect: E 90 degrees.

Stoniness: 0-1%

Depth to Root Restrictive Layer: 32cm

Degree of Erosion: Severe

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 27, 1989

Comments: Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion.

Geologic Map Unit, Symb Profile Description name: Calcaires Récifaux.
Coral Reef

Sample Number: 42992, 42993

Ap - 0 to 12 cm; black (10YR 2/1) clay loam; moderate medium subangular blocky structure; friable; clear wavy boundary.

Bw - 12 to 32 cm; black (10YR 2/1) clay loam; moderate medium subangular blocky structure; friable; abrupt wavy boundary.

2CR- 32 to 52 cm; white (10YR 8/2) soft sandy limestone; weathered limestone.

Soil analysis data.

Parent Material: coral reef - conglomerate

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	.	7.5	8.1	23	382	760	4995	50.00	40.00	10.00	L	.12
Bw	10.4	5.9	8.2	16	308	664	4995	40.00	47.50	12.50	L	.15

Stoniness: 0-1%

Depth to Root Restrictive Layer:

Degree of Erosion: very severe

Sampled and Described by: RB, PR, OH

Date: April 27, 1983

Comments: Field is located very close to the fields of Borne Saint Elias that we described. Very eroded surface: A horizon is eroded and the B horizon is partly eroded. We have a very degraded site, and the farmer has planted trees to preserve what is left. The soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff could lead to severe erosion, but adequate soil cover limits further soil loss.

Geologic Map Unit, Symbol: Qc

Name: Calcaires Recifaux.
Coral Reef

Sample Number: 42992, 42993

Classification: Typic Ustropept, loamy, mixed, shallow.

Area: CARE

Location: Nan Creve - Mme. Saint Rilis/Mme. Alisie

Use and Vegetation: Leucaena leucocephala (lesena) woodlot / not coppiced.

Parent Material: coral reef - conglomerate

Landform: Upland slope

Topography, Percent Slope: 42%

Elevation: 430 meters

Aspect: SE 133 degrees.

Stoniness: 0-1%

Depth to Root Restrictive Layer:

Degree of Erosion: very severe

Sampled and Described by: RG, PR, GH

Date: April 27, 1989

Comments: Field is located very close to the fields of Borno Saint Elius that we described. Very eroded surface: A horizon is eroded and the B horizon is partly eroded. We have a very degraded site, and the farmer has planted trees to preserve what is left. The soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff could lead to severe erosion, but adequate soil cover limits further soil loss.

Geologic Map Unit, Symbol: Dmc or Hca Name: Calcaires Madreporeiques, with conglomerates and/or shales.

Profile Description

- Bw - 0 to 10 cm; yellowish brown (10YR 5/4) clay loam; strong fine subangular blocky structure; slightly hard; abrupt wavy boundary.
- C -10 to 27 cm; pinkish gray (7.5YR 7/2) loam; massive structure; hard; abrupt wavy boundary.
- CR -27 to 35 cm; white (10YR 8/2); weathered limestone.

Use and Vegetation: Soil analysis data. Coppice and newly planted hedgerows.

Hor	% Gravel	OM	pH	P	K	Mg ppm	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Bw	2.9	3.4	8.3	12	152	303	4995	11.25	63.75	25.00	SIL	.22
C	0.1	1.5	8.4	8	73	187	4995	7.50	65.00	27.50	SCL	.23

Elevation: 140 meters Aspect: S 180 degrees.

Stoniness: 0-1%

Depth to Root Restrictive Layer: 65cm

Degree of Erosion: severe

Sampled and Described by: RG, PR, GH, M-PE

Date: April 28, 1989

Comments: Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion.

Geologic Map Unit, Symbol: Omc or Mca Name: Calcaires Madreporiques,
with conglomerates and/or shales.

Sample Number: 43043, 43046, 43044, 43048

Classification: Typic Ustropept, coarse-loamy, mixed.

Area: CARE

Location: Pas Katabwa - Fertile

Use and Vegetation: Leucaena sp (lesena) coppice and newly planted hedgerows.

Parent Material: Colluvial

Landform: Upland, strongly sloping

Topography, Percent Slope: 30%

Elevation: 140 meters Aspect: S 180 degrees.

Stoniness: 0-1%

Depth to Root Restrictive Layer: 65cm

Degree of Erosion: severe

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 28, 1989

Comments: Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion.

Profile Description

- Ap - 0 to 10 cm; dark grayish brown (10YR 4/2) very gravelly loam; weak very fine subangular blocky structure; soft; clear wavy boundary.
- Bw1- 10 to 20 cm; dark brown (10YR 4/3) very gravelly loam; moderate very fine subangular blocky structure; soft; clear wavy boundary.
- Bw2- 20 to 35 cm; grayish brown (10YR 5/2) very gravelly loam; moderate very fine subangular blocky structure; soft; clear wavy boundary.
- Bw3- 35 to 65 cm; light yellowish brown (10YR 6/4) very gravelly loam; weak very fine subangular blocky structure; soft; abrupt wavy boundary.
- R - 65 cm; shattered bedrock (limestone).

Soil analysis data.

Hor	% Gravel	OM	pH	P	K	Mg	Ca	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
				ppm								
Ap	35.0	5.8	8.1	19	284	453	4995	51.25	48.75	0.00	SL	.12
Bw1	30.9	4.4	8.2	8	170	426	4995	51.25	41.25	7.50	L	.12
Bw2	23.7	3.2	8.2	7	105	387	4995	45.00	45.00	10.00	L	.13
Bw3	25.2	2.2	8.3	8	94	400	4995	37.50	50.00	12.50	SIL	.15

Profile Description

Geologic Map Unit, Symbol: Omc or Mca Name: Calcaires Madreporiques, with conglomerates and/or shales.

Sample Number: 43047, 43053, 43054, and 43055

Classification: Typic Haplustoll, coarse-loamy, mixed, isohyperthermic.

Area: CARE

Location: Pas Katabwa

Use and Vegetation: Grass fallow and hedgerows

Parent Material: Colluvium / soft limestone

Landform: Upland, steep slope

Topography, Percent Slope: 40%

Elevation: 175 meters Aspect: NW 320 degrees.

Stoniness: 2%

Depth to Root Restrictive Layer:

Degree of Erosion: moderate

Sampled and Described by: RG, PR, GH, M-PE.

Date: April 29, 1989

Comments: 2% flagstone on surface. Soil is generally well drained. Given the steepness of the slope lateral drainage can be expected and rapid runoff is leading to severe erosion.

CONCLUSIONS AND RECOMMENDATIONS.

Profile Description

- Ap - 0 to 10 cm; very dark grayish brown (10YR 3/2) gravelly clay loam; moderate fine subangular blocky structure; slightly hard; gradual wavy boundary.
- Bw1- 10 to 27 cm; very dark grayish brown (10YR 3/2) gravelly clay loam; moderate fine subangular blocky structure; slightly hard; gradual wavy boundary.
- Bw2- 27 to 56 cm; very dark grayish brown (10YR 3/2) gravelly clay loam; moderate fine subangular blocky structure; peds slightly larger than Bw1, many fungi in Bw2; abrupt wavy boundary.
- C -56 to 110 cm; yellowish brown (10YR 5/4) loam; structureless; hard.

Soil analysis data.

Hor	% Gravel	OM	pH	<u>P</u>	<u>K</u>	<u>Mg</u> ppm	<u>Ca</u>	SAND %	SILT %	CLAY %	TEX	H2O AVAIL
Ap	10.6	5.2	8.3	3	276	389	4995	33.75	61.25	5.00	SIL	.16
Bw1	0.1	4.8	8.0	3	227	463	4995	32.50	57.50	10.00	SIL	.1
Bw2	3.1	3.9	8.3	2	181	490	4995	23.75	63.75	12.50	SIL	.1
C	8.6	1.0	8.5	2	135	594	4995	20.00	62.50	17.50	SIL	.2

CONCLUSIONS AND RECOMMENDATIONS.

Heavy fertilizer input would be required to achieve maximum production on these soils. However, these soils have other major constraints. The major limitation for the soils described in this report is low fertility, mainly for phosphorus, and poor physical properties, shallow soil, high sand and gravel content, poor moisture regime leading to low available water. Also the fact that most of them are on very steep slopes makes most land preparation, cultural practices and mechanization difficult.

Except on the gentler slopes and in the alluvial plains, where stoniness is not excessive, animal traction and mechanization are not possible. In the vast majority of the soils studies, however, only manual or very primitive and limited mechanization is possible.

Most of the soils described are developed from calcareous material and have a high pH, around pH 8 or more, which very often leads to induced low soil fertility through nutrient imbalance. In particular, phosphorus and micronutrients are blocked into insoluble form and thus not available to the plants. Low phosphorus prevents adequate growth and micronutrient deficiencies often affect photosynthetic and physiological activity and are indicated by chloroses. In addition the amount of available magnesium and potassium, even though they may be in adequate supply, are in imbalance compared to the very large amounts of calcium. A response to potassium is often observed in these situations.

cropping practices however will remain of low input low-output type. Heavy fertilizer input would be required to achieve maximum production on these soils. However, these soils have other major constraints, some of which are impossible to overcome; they are usually shallow, on steep slopes, they have rather poor moisture regime and the introduction of intensive cropping techniques is close to impossible in most of the sites studied. In addition to tree planting some kind of cattle raising activity is possible.

Fertilization of crops or trees is not recommended in most of the sites studied, because it will most probably be uneconomical. However it is believed that improved well-adapted crop varieties and improved cropping practices can increase food production. The planting of well developed and healthy tree seedlings will result in a better survival rate. The use of phosphorus-based fertilizer in the nursery is encouraged because phosphate fertilizer promotes root growth and increases overall physiological activity in young plants. Available phosphorus content is very low while available potassium is usually On the best soils, those on alluvial plains and on the gentler slopes, more intensive cropping techniques with limited but certain agricultural inputs needs to be introduced and promoted. Given the urgency of the food crisis in Haiti, emphasis for increased food production is needed on the alluvial and lowland soils that have the potential for higher yields. Nitrogen and sulphur are generally very low, but the balance between On the steeper slopes soil conservation techniques that are already recommended, such as hedgerows, need to be encouraged even further. The crop yields have been shown to at least stabilize and possibly even increase in some conditions. The

cropping practices however will remain of low input low-output type, even though they are labor intensive. Unless new varieties are introduced successfully, little improvement of these cropping techniques can be expected. Special attention to soil conservation is needed on hillsides which should primarily be devoted to reforestation, and on the better soils the existing agricultural practices can be improved. Elsewhere, in addition to tree planting some kind of cattle raising activity is possible in order to provide a stable income to the farmer.

In Lapila available phosphorus is higher and at 15 ppm almost equal to that in the other soils. Soils developed from basalt, Olivier demonstration site and Saint-Jacques, and from basement complex in the North-East, Lare, are generally chemically better balanced. However the soils developed from basalt that we described are very high in calcium, showing an obvious influence of the surrounding materials probably from colluvium or because most of the basalt came intrusively through existing calcareous material. Available phosphorus content is very low while available potassium is usually low and magnesium is high. In addition to phosphorus, a response to potassium can be expected because of the inadequate balance between calcium, magnesium and potassium.

In the North-East, on soils derived from basement complex (granite), the soils are acid, pH 5.4, and available phosphorus, potassium and magnesium are generally very low, but the balance between calcium, potassium and magnesium is much more favorable. In practical terms this means that, unless maximum yields are targeted, only phosphorus and nitrogen will be required to achieve good yields on this type of soil.

Soils developed on mixed material deposited either by alluvial or colluvial action have mixed properties depending on the material they are formed in. Those developed from alluvial deposits at the demonstration site in Lascahobas and those at Lapila, near Pignon on much older material, have a pH of the surface soil of pH 7.9 and pH 6.7 respectively. In the more recent alluvium, subsoil pH increases to levels above pH 8, while in the older material pH stays around a more favorable pH 6.5. In Lapila available phosphorus is higher and at 16 ppm almost reaches the medium level, and the levels of potassium, magnesium and calcium are high or very high. The balance between these elements is favorable for adequate production provided the necessary nitrogen and phosphorus is added to the soil. In Lascahobas demonstration site, we have a similar situation, except that phosphorus levels are very low and the subsoil pH increases to pH 8.1 which may induce micronutrient deficiencies. In the Maniche area one other alluvial soil was described. The pH is 8 or above throughout the profile, probably due to the material it is derived from, but other nutrients measured are in adequate supply, except for phosphorus which is medium in the top horizon and very low or low in the B horizons. This indicates that this field may have been fertilized recently. The phosphorus level increased again to medium level in the C horizon. In Bombardopolis on the demonstration site, in the lower part, soils are developed from old marine deposits on top

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of the coral reef. That soil is also very shallow, 57 cm, and has obviously been influenced by the calcareous materials underneath and in the surroundings. A neutral pH is certainly favorable, but available phosphorus is very low.

Most of the other soils described in this report are developed on colluvial material and have the properties of the material they derived from, which is mostly calcareous. Available phosphorus is generally very low, while magnesium is usually in good supply. The available potassium content is variable. Calcium is of course in excessive supply. In most cases the balance between potassium, magnesium and calcium is inadequate and would need adjustment through potassium fertilization for maximum yields.

As a general conclusion of this study, both chemical and physical limitations are affecting yields and tree production. Special attention needs to be given to the introduction of high pH tolerant tree species or crop varieties. This is certainly not news and this report hopefully provides a better understanding of the extent of the constraints to adequate tree planting. Similarly regarding resolving the food production shortages in Haiti, the introduction of improved varieties that are tolerant to high pH also needs to focus on the better land that has the best potential.

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