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SOIL CHARACTERIZATION DATA FROM THE UPPER AMAZON

JUNGLE OF PERU - Preliminary Results

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AMAZON SOILS CHARACTERIZATION-SAMPLES FROM YUPIMAGUAS AND IQUITOS, PEPU, MAY 1971.

Sampled by SM Buol and PA Sanchez. Analyzed at the Soils Dept.

La Molina Experiment Station, Lima

No.	Horizon (cms)	pH 1:2.5 H ₂ O	% O.M	N- sen p ppm	Exchangeable Cations meq/100g						Base satn	Clay	Silt	Sand	Mineralogy	
					Al	Ca	Mg	K	Na	CEC sum						
Y-8 SIPA	A ₁	0-19	4.6	2.1	3	0.25	2.20	0.20	0.20	0.04	2.89	91	4.4	6.0	89.6	
	A ₂₁	19-115	4.6	0.3	1	0.10	0.40	0.10	0.16	0.04	0.80	88	2.4	12.0	85.6	
	A ₂₂	115-150	4.6	0.3	1	0.15	0.20	0.10	0.14	0.04	0.63	76	2.4	12.0	85.0	
	A ₂₃	150-180	4.1	3.7	1	1.50	0.20	0.10	0.12	0.02	1.94	23	0.4	8.0	91.6	
	Bhirm	180-210	4.5	0.3	1	0.20	0.20	0.10	0.12	0.02	0.64	69	16.4	10.0	73.6	
Y-9 SANANGO	A ₁	0-12	4.5	2.1	1	2.60	3.60	1.20	0.16	0.08	7.64	66	20.4	58.0	21.6	
	B ₁	12-30	4.6	0.7	1	10.80	2.60	1.50	0.28	0.10	15.28	29	32.4	42.0	25.6	
	B ₂	30-55	4.9	0.5	1	12.25	1.20	1.20	0.24	0.12	15.01	18	24.4	40.0	35.6	
	IIB ₂₁	55-65	4.9	0.2	1	11.10	1.20	0.90	0.24	0.14	13.58	18	20.4	28.0	51.6	
	IIB ₂₂	65-85	5.1	0.4	1	11.50	1.80	0.90	0.24	0.18	14.62	21	20.4	40.0	39.6	
	IIIB _{3g}	85-105	5.1	0.4	1	18.00	3.80	1.70	0.30	0.36	24.16	25	46.4	35.0	18.6	
	IVC _{1g}	105-135	5.2	0.2	1	8.45	2.60	1.00	0.28	0.28	12.61	33	26.4	30.0	43.6	
	IVC _{2g}	135-140+	5.0	0.2	1	7.10	3.00	1.00	0.24	0.26	11.60	39	22.4	24.0	53.6	

No.	Horizon (cms)	H p 1:2.5	%	N- sen P ppm	Exchangeable Cations meq/100g					%	%	%	%	Mineralogy		
					Al	Ca	Mg	K	Na						CEC Sum	Base Satn
YURIMAGUAS VIRGIF	A ₁	0-5	3.6	4.0	7	1.90	1.00	0.40	0.26	0.03	3.64	48	12.4	28.0	59.6	
	A ₂₁	5-40	4.2	1.1	1	4.20	0.20	0.10	0.16	0.04	4.70	11	20.4	36.0	43.6	
	A ₂₂	40-60	4.1	0.8	1	4.50	0.40	0.10	1.20	0.04	6.24	28	24.4	28.0	47.6	
	B ₁	60-90	4.2	0.6	1	6.05	0.20	0.10	0.18	0.02	6.55	8	24.4	36.0	39.6	
	B ₂	90-140+	4.0	0.4	1	6.15	0.20	0.10	1.92	0.02	8.37	27	30.4	26.0	43.6	
YURIMAGUAS Adjacent Pasture	A ₁	0-8	5.0	7.6	4	0.30	2.80	1.80	0.56	0.06	5.52	95	10.4	36.0	53.6	
	A ₂₁	8-40	4.7	1.3	1	4.40	0.80	0.20	0.34	0.04	5.78	24	22.4	36.0	39.6	
	A ₂₂	40-80	4.1	0.5	1	5.20	0.40	0.10	0.24	0.04	5.98	13	24.4	36.0	39.6	
	B ₂₁	80-135	4.1	0.5	1	6.20	0.40	0.10	0.12	0.04	6.86	10	28.4	32.0	39.6	
	B _{22g}	135-145+	3.9	0.4	1	10.00	0.20	0.10	0.12	0.04	10.56	5	40.4	28.0	31.6	
SINCHICUY- IQUITOS	I-1	A	0-5	5.6	7.9	3	0.00	12.80	3.40	0.36	0.16	16.72	100	36.0	36.0	27.6
		A _{2g}	5-10	4.7	2.1	1	5.50	3.60	3.50	1.56	0.16	19.32	72	60.4	21.0	18.6
		B _{21g}	10-50	4.6	1.1	1	14.60	2.00	1.30	0.44	0.08	18.42	21	60.4	21.0	18.6
		B _{22g}	50-90	4.7	0.5	1	29.30	1.80	3.40	0.72	0.09	35.30	17	80.4	2.0	17.6

No.	Horizon (cms)	pH (1:2.5)	% O.M	p ppm	Exchangable Cations meq/100g						CEC Sum	%	%	%	%	Mineralogy
					Al	Ca	Mg	K	Na	Base Satn						
I-1	C _g	90-120+	4.4	0.3	3	11.00	2.20	2.30	0.56	0.12	16.68	34	40.4	46.0	13.0	
MANGUA, NAPU R	I-2	A ₁	0-15	4.0	4.2	1	5.90	1.00	0.20	0.20	0.10	7.40	20	30.4	36.0	33.6
		B ₁	16-35	4.5	1.8	1	6.70	0.40	0.10	0.08	0.10	7.38	9	40.4	30.0	29.6
		B ₂₁	35-70	4.3	0.9	1	9.50	0.20	0.10	0.08	0.04	9.92	4	54.4	26.0	19.6
		B ₂₂	70-100	4.5	0.6	1	11.60	0.20	0.10	0.06	0.04	12.00	3	54.4	26.0	19.6
		B ₂₃	100-150	4.5	0.6	1	10.90	0.20	0.10	0.08	0.04	11.32	4	46.4	34.0	19.6
		C ₁	150-240	4.7	0.4	1	5.35	0.20	0.10	0.08	0.04	5.77	7	28.4	20.0	51.6
		C _{2g}	240-250	4.6	0.3	1	9.05	0.70	0.10	0.08	0.04	9.47	4	40.4	36.0	23.6
NAPU RIVER	I-3	A		5.9	1.7	1	0.00	8.20	2.40	0.20	0.12	10.92	100	20.4	66.0	13.6
		B		6.1	1.1	1	0.00	7.60	2.90	0.20	0.16	10.85	100	24.4	58.0	17.6
LIZON RIVER	I-4	A		6.0	2.6	10	0.00	11.00	3.10	0.22	0.16	14.50	100	24.4	63.0	12.6
		IIC		6.1	1.3	66	0.00	10.40	3.60	1.52	0.20	15.80	100	20.4	61.0	18.6
		IIIC		6.3	0.6	11	0.00	6.80	2.30	0.20	0.18	9.5	100	10.4	54.0	35.6

No.	Horizon (cms)	pH 1:2.5	% O.M.	Olsen p ppm	Exchangable Cations meg/100g					CEC Sum	Base Satn	Clay	Silt	Sand	Mineralogy	
					AL	CA	Mg	K	NA							
I-5	A ₁	0-15	4.2	4.9	4	0.15	2.60	0.20	0.12	0.04	3.11	95	2.4	10.0	87.6	
QUISTOCHA, INUITOS	A ₂	15-50	5.1	0.5	1	0.10	0.60	0.10	0.03	0.02	0.90	89	2.4	14.0	83.6	
	B _h	50-66	5.1	1.3	8	0.10	1.20	0.10	0.06	0.04	1.50	93	2.4	14.0	83.6	
	A ₁ 2	66-75	5.1	1.0	1	0.05	0.60	0.10	0.03	0.04	0.87	94	2.4	14.0	83.6	
	B ₂	75-100	5.1	1.3	1	0.10	0.40	0.10	0.06	0.04	0.70	86	2.4	12.0	85.6	
	B ₃	110-150	5.2	1.1	1	0.00	0.20	0.10	0.04	0.04	0.38	100	2.4	12.0	85.6	
	C ₁	150-190+	5.2	0.6	1	0.00	0.40	0.10	0.04	0.04	0.22	100	2.4	14.0	83.6	
	"SPODIC" HOR NEARBY		5.1	2.7	1	0.00	0.40	0.10	0.04	0.04	0.22	100	0.4	6.0	93.6	

AMAZON SOILS CHARACTERIZATION

Profile No. Y-8

Location: Km 22, Yurimaguas-Tarapoto road, Yurimaguas, Peru.

Climate: Humid tropical forest 2000 - mm. rainfall.

Vegetation: Secondary forest.

Topography: 5-8% slope.

Drainage: Good.

Mapping units: Sipa series

Described by: S. W. Buol and P. A. Sanchez, May 28, 1971

<u>Horizon</u>	<u>Depth cm.</u>	<u>Description</u>
A ₁	0-19	Gray (10 YR 5/1) sand with common, medium mottling of very dark grey (10 YR 3/1) and light gray (10 YR 6/1); single grain structure, loose, non sticky and non plastic; diffuse, wavy boundary.
A ₂₁	19-115	Light gray (10 YR 7/1) loamy sand; single grain structure; loose; non sticky and non plastic; clear irregular boundary.
A ₂₂	115-150	Light gray (10 YR 7/1) loamy sand; slightly brittle; weakly cemented; non sticky and non plastic; clear irregular boundary. Note 5% fine gradual

Profile No. Y-8

<u>Horizon</u>	<u>Depth cm.</u>	<u>Description</u>
A ₂₃	150-180	Light grey (10 YR 7/1) sand; brittle; very hard when moist; cemented; non sticky and non-plastic clear irregular boundary.
Bhirm	180-120	Brown (10 YR 5/3) sandy loam black (10 YR 2/1) and dar reddish brown (5 YR 3/3) staining; brittle; slightly hard when moist; non-sticky and non-plastic; abrupt irregular boundary. Note: layer is discontinuous in pit.
c	210-220 †	Light grey (10 YR 7/1) sand; single grain structure, loose, non-sticky and non plastic.

Note: sample taken of A_{23cm.} and Bhirm for sand analysis.

AMAZON SOILS CHARACTERIZATION

Profile No. Y-9

Location: First bottom, 100 m. from Shanusi river, Hacienda San Ramon, Yurimaguas, Peru.

Climate: Humid tropical forest 2000- mm. rainfall.

Vegetation: 4 years old secondary forest.

Topography: First alluvial terrace, 0-3% slope.

Drainage: Restricted, water table 140-cm.

Fiel classification: Aquic fluentic tropudalf, fine loamy siliceous schiperthermic.

Mopping unit: Sanango series.

Described by: S.W. Buol and P. A. Sanchez, May 29, 1971.

<u>Horizon</u>	<u>Depth cm</u>	<u>Description</u>
A ₁	0-12	Reddish brown (5 YR 4/4) silt loam with moderate, fine to medium subangular blocky structure; friable when moist, slightly sticky, slightly plastic when wet; common to many, medium to fine roots; gradual wavy boundary.
B ₁	12-30	Reddish brown (5 YR 4/4) clay loam with moderate, medium subangular blocky structure; friable when moist, slightly sticky and plastic when wet; few patchy clay films; common, medium roots; gradual and wavy boundary.
B ₂	30-55	Reddish brown (5 YR 4/4) loam with moderate, medium angular blocky structure; friable when moist, slightly sticky and plastic when wet; common, medium roots; gradual and wavy boundary.

Profile No. Y-9

<u>Horizon</u>	<u>Depth cm</u>	<u>Description</u>
11B	55-65	Reddish brown (5 YR 4/4) loam with weak, fine and medium angular blocky structure; friable when moist, slightly sticky and plastic when wet; common fine faint 5 YR 5/4 mottles; clear and wavy boundary.
11B	65-85	Reddish brown (5 YR 4/4) loam with weak fine and medium angular blocky structure; friable when moist; non sticky, non plastic when wet; few fine faint 5 YR 5/8 mottles; clear, wavy boundary. Roots present down to this layer.
111B 3g	85-105	Yellowish red (5 YR 5/6) ped interiors with pinkish gray (5 YR 6/2) and light reddish brown (5 YR 6/3) coatings which cover the entire ped face; clay with moderate fine angular blocky structure; friable when moist, sticky and plastic when wet. Clay skins in channels and bridges; clear, wavy boundary.
111 C _{ig}	105-132	Light gray (5 YR 7/1) base and common, fine to medium, distinct 5 YR 5/8 mottles; loam strong, fine angular blocky structure, firm when moist, sticky and plastic when wet; clay skins in channels and bridges.
IV cg	135-140+	Fine sandy clay loam half and half light gray (5 YR 7/1) and yellowish brown (10 YR 5/6); moderate, medium to fine angular blocky structure; firm when moist, slightly sticky, slightly plastic when wet; black Mn stains and fine Fe concretations around channels but no clay skins.

AMAZON SOILS CHARACTERIZATION

Profile No. Y-10

Location: A 4 ha virgin forest near el Yutal, Hacienda San Ramon,
Yurimaguas, Peru.

Climate: Humid tropical forest 2000 + mm. rainfall.

Vegetation: Virgin forest.

Topography: Gentle hill 5-6% slope.

Drainage: Moderately well drained.

Field Classification: Fine loamy, siliceous isohiperthermic

Mapping unit: Yurimaguas series.

Described by: S.W. Buol and P. A. Sanchez, May 31, 1971.

<u>Horizon</u>	<u>Depth cm</u>	<u>Description</u>
A ₁	0-5	Dark reddish brown (5 YR 3/2) sandy loam with weak, medium to fine subangular blocky structure; friable when moist, slightly sticky, slightly plastic when wet; numerous fine, medium and coarse roots; clear smooth boundary (Note: a discontinuous layer 0-4 cm thick occurs between A ₁ and A ₂₁ : 10 YR 5/2) sandy loam with common fine prominent 5 YR 4/4 mottles).
A ₂₁	5-40	Yellowish brown (10 YR 5/4) loam with common channel fillings of 10 YR 4/4 and few fine faint 10 YR 6/3 mottles; moderate medium subangular blocky structure; friable when moist, slightly, sticky and plastic when wet; common fine and medium roots; wavy and gradual boundary.

Profile No. Y-10

<u>Horizon</u>	<u>Depth cm</u>	<u>Description</u>
A ₂₂	40-60	Brown (7.5 YR 5/4) loam with no mottles; weak, medium and fine subangular blocky structure; friable when moist, slightly sticky and plastic when wet; common fine medium roots; clear and wavy boundary.
B ₁	60-90	Yellowish red (5 YR 5/8) loam with few fine faint 10 YR 6/4 mottles; moderate, medium and fine angular and subangular blocks; friable when moist, sticky and plastic when wet; few fine medium roots; no clay skins; many fine channels all the way down to this layer; gradual and wavy boundary.
B ₂	90-140	Yellowish red (5 YR 4/6) clay loam with moderate medium to coarse angular blocky structure; firm when moist, sticky and plastic when wet; few patchy clay films; few medium roots; less channels than above.

AMAZON SOILS CHARACTERIZATION

Profile No. Y-11

Location: About 40 m. east of Profile Y-10, Hacienda San Ramon,
Yurimaguas, Peru.

Climate: Humid tropical forest 2000 - mm. rainfall.

Vegetation: 8 years old unimproved pasture.

Topography: Similar to Y-10, gentle 5-6% slope.

Drainage: Moderately well drained.

Field classification: Typic paleudult, fine loamy, siliceous isohyper-
thermic.

Mapping unit: Yurimaguas series.

Described by: S. W. Buol and P. A. Sanchez, May 31, 1971.

<u>Horizon</u>	<u>Depth</u> <u>cm</u>	<u>Description</u>
A ₁	0-8	Very dark grayish brown (10 YR 3/2) and brown (10 YR 5/3) sandy loam with common, fine, distinct 5 YR 4/4 mottles in the lower part; fine granular structure; friable when moist, slightly sticky, slightly plastic when wet; numerous fine and medium roots; clear, wavy boundary. Note: Thin horizon grades from darker on top to grayer on bottom.
A ₂₁	8-40	Yellowish brown (10 YR 5/4) loam with moderate medium and fine angular blocky structure; friable when moist; sticky and plastic when wet; numerous fine and medium roots; gradual and wavy boundary.

Profile No. Y-11

<u>Horizon</u>	<u>Depth cm</u>	<u>Description</u>
A ₂₂	40-80	Brown (7.5 YR 5/4) loam with moderate medium to fine angular and subangular blocky structure; friable when moist, sticky and plastic when wet; few fine roots; faint sandier bodies (7.5 YR 5/2) of 2-10 mm. diameter (not a drainage mottle): gradual and wavy boundary.
B ₂₁	80-135	Yellowish red (5 YR 5/6) clay loam with moderate, medium to fine angular and subangular blocky structure; friable when moist, sticky, very plastic when wet; few patchy clay skins; diffuse, wavy boundary.
B _{22g}	135-145 -	Yellowish red (5 YR 4/8) clay with moderate medium angular blocky structure; common, fine to medium distinct 10 YR 7/2 mottles; firm when moist, sticky and very plastic when wet.

AMAZON SOILS CHARACTERIZATION

Profile No. I-1

Location: Sinchicuy huts, about 50 km. east of Iquitos on the left bank of Amazon river, Iquitos, Peru.

Climate: Humid tropical forest, 2300 mm. rainfall.

Vegetation: Pasture.

Topography: Upland terrace about 14 m. above river level 0-3% slope.

Drainage: Poor.

Field classification: Typic tropaqual, clayey, mixed isohyperthermic

Mapping unit: None, similar to the Pucallpa series concept.

Described by: S. W. Buol and P. A. Sanchez, June 2, 1971

<u>Horizon</u>	<u>Depth cm</u>	<u>Description</u>
A	0-5	Very dark grayish brown (10 YR 3/2) clay loam, too wet for structure determination; slightly sticky and plastic when wet.
A _{2g}	5-10	Light brownish gray (10 YR 6/2) and pale brown (10 YR 6/3) base color, with ped coatings of 5 YR 6/4; clay; structureless, sticky and plastic when wet; boundary clear and wavy.
B _{21g}	10-50	Reddish brown (5 YR 5/4) clay with few fine faint 5 YR 6/2 mottles and few fine, distinct 10 R 4/8 mottles; gray color increases with depth; sticky and plastic when wet.
B _{22g}	50-90	Light gray (5 Y 7/1) clay with common peel coatings of red 10 R 4/6; fine and medium angular blocky structure; very sticky and very plastic; clear and wavy boundary.

Profile No. I-1

<u>Horizon</u>	<u>Depth</u> <u>cm</u>	<u>Description</u>
C _g	90-120 -	Greenish gray (5 GY 6/1) silty clay with few coarse 5 YR 5/8 mottles, thin streaks of 5 YR 4/8; continuous Mn coatings of 5 YR 2/1 about 50 microns thick; cracks with clay skins (5 YR 6/4) up to 3/8" wide surrounding the gray matrix on a polygonal pattern 7 inches thick. At about 4-5 meters depth absence the black laminal material seeping water.

AMAZON SOILS CHARACTERIZATION

Profile No. I-2

Location: Mangua huts, on right bank of Napo River at about 20 km from the Amazon.

Climate: Humid tropical forest 2000 mm. rainfall.

Vegetation: Cleared area near huts.

Topography: High bank 0-3% slope.

Drainage: Good, river level at 7 m. from topsoil.

Classification: Typic paleudult, clayey, isohypertherm

Mapping unit: None, similar to the Yurimaguás series.

Described by: S. W. Buol and Pedro A. Sanchez, June 2, 1971.

<u>Horizon</u>	<u>Depth cm</u>	<u>Description</u>
A ₁	0-16	Dark brown (10 YR 4/3 M and 10 YR 7/3 dry) clay loam with medium, granular and subangular blocky structure; friable when moist, slightly sticky, slightly plastic when wet; numerous medium roots; over 50% of structure in earthworm casts; clear, wavy boundary.
B ₁	16-35	Yellowish red (5 YR 5/6) clay, with moderate to strong, fine and medium subangular blocky structure; firm when moist, slightly sticky and plastic when wet; thick clay films on channels and faces; gradual, smooth boundary.
B ₂₁	35-70	Yellowish red (5 YR 4/8) clay with strong, medium to coarse angular blocky structure; firm when moist, sticky and plastic when wet; common medium roots; many medium clay films; gradual and smooth boundary.

Profile No. I-2

<u>Horizon</u>	<u>Depth cm</u>	<u>Description</u>
B _{22g}	70-100	Yellowish red (5 YR 4/8) clay with common medium distinct 5 YR 7/1 and 10 YR 6/6 mottles and few very fine 10 R 4/8 mottles; strong, coarse angular blocky structure; firm when moist, sticky and plastic when wet; thin patchy clay films; gradual smooth boundary.
B _{23g}	100-150	Clay with 33% of the following colors: 5 YR 7/1, 10 YR 6/8 and 5 YR 4/6 with numerous fine distinct 10 R 4/6 mottles; strong, coarse angular blocky structure; firm when moist, slightly sticky, slightly plastic when wet; few patchy clay films; smooth boundary.
C ₁	150-240	Red (2.5 YR 4/8) sandy clay loam with strong, coarse angular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; patchy clay films; clean mica-like mineral surfaces reflecting light in about 12% of sand grains; clear, smooth boundary.
C _{2g}	240-250+	Red (2.5 YR 5/6) clay with common, fine and medium faint 10 YR 6/6 mottles and common distinct 5 YR 7/1 mottles; weak medium subangular blocky structure; firm when moist; slightly sticky and plastic when wet; some pressure faces present; about 5% mica on sand grains.

AMAZON SOILS CHARACTERIZATION

Profile No. I-5

Location: 10 Km. on Iquitos - Quistococha road, Iquitos, Peru.

Climate: Humid tropical forest 2300 mm. rainfall.

Vegetation: Secondary forest.

Topography: High bank 3-8% slope.

Drainage: Good.

Field Classification: Ultic psammentic haplorthod sandy siliceous isohyperthermic.

Mapping unit: None; similar to Sipa series.

Described by: S. W. Buol and Pedro A. Sanchez, June 3, 1971.

<u>Horizon</u>	<u>Depth cm</u>	<u>Description</u>
A ₁	0-15	Black (7.5 YR 2/0) and white (7.5 YR 8/0) mixed sand; very weak, fine, granular structure. Mixed color is 7.5 YR 3/0; loose, non sticky, non plastic; numerous fine medium and coarse roots; clear and wavy boundary.
A ₂	15-50	Light gray (10 YR 7/1) loamy sand with single grained structure; loose when moist, non sticky, non plastic when wet; many medium and fine roots; abrupt, wavy boundary.
B _h	50-66	Dark brown (7.5 YR 4/4) loamy sand with massive structure; friable when moist, non sticky, non plastic when wet; many clean sand grains but some coated with Fe and black material; gradual and wavy boundary.
A ₂	66-75	Strong brown (7.5 YR 5/6) loamy sand with single grained structure; loose, non sticky, non plastic, clear wavy boundary.

Profile No. I-5

<u>Horizon</u>	<u>Depth cm</u>	<u>Description</u>
B ₂	75-110	Dark yellowish bron (10 YR 4/4) loamy sand with very weak, subangular blocky structure; very friable when moist, non sticky and non plastic when wet. Difference and gradual boundary.
B ₃	110-150	Strong brown (7.5 YR 5/6) loamy sand with very weak subangular blocky structures; very friable when moist, non sticky and non plastic when wet; diffuse and gradual boundary.
C ₁	150-190+	Reddish yellow (7.5 YR 6/8) sand.