

Morphological Characteristics and Classification of Mangrove Swamp Soils in the Cross River Estuary, Southeast Nigeria*

By

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Objectives of Study

Main Objective:

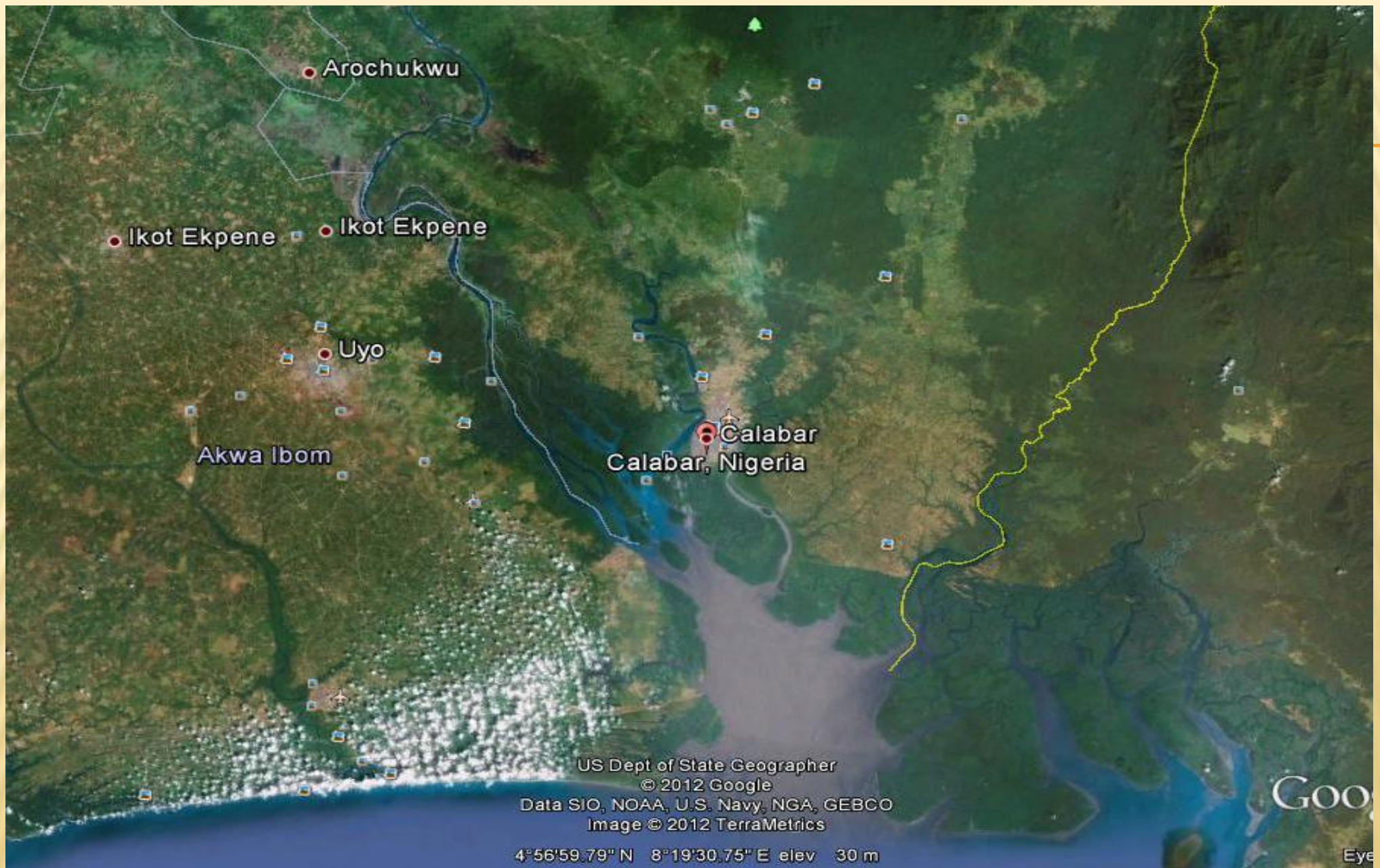
To generate pedological information regarding soils underlying the three major mangrove swamp vegetation types (tall & short mangroves and nypa palms) which occupy the cross river estuary.

Specific Objectives:

- (i) To carry out morphological and selected physico-chemical characterization of the soils.
- (ii) To classify the soils according to the criteria of the USDA *Soil Taxonomy* system (Soil Survey Staff, 1999)
- (iii) To correlate the classification with those of the FAO World Reference Base for Soil Resources (1988).



Fig. 1: Location Map of Mangrove Ecology in West Africa



✖ **Fig. 2: Location Map of Calabar Estuary, Southeast Nigeria**



Fig. 3: Tall and Short Mangrove Vegetation Types



Fig. 4: Nypa Palm and Short Mangrove Vegetation Types

Table 1: Morphological Properties of Modal Profiles

Horizon	Depth (cm)	Munsell Colour	Texture	Roots	Remarks
Pedon 1: Bakassi (Tall Mangroves)					
Ag	0–20	5Y 2.5/1	c	sap	Periwinkles, crabs, mudfish, H ₂ S emission
Cg1	20–40	5Y 2.5/1	cl	sap	H ₂ S emission
Cg2	40–60	5Y 3/1	cl	sap	H ₂ S emission
Cg3	60–80	5Y 3/1	cl	sap	H ₂ S emission
Cg4	80–100	5Y 3/1	cl	sap	H ₂ S emission
Pedon 4: Ebughu (Short Mangroves)					
Ag	0–20	5Y 4/1	sic	fip	Periwinkles, crabs, mudfish, H ₂ S emission
Cg1	20–40	5Y 3/1	scl	fip	H ₂ S emission
Cg2	40–60	5Y 4/1	cl	fip	H ₂ S emission
Cg3	60–80	5Y 4/1	cl	fip	H ₂ S emission
Cg4	80–100	5Y 4/1	cl	fip	H ₂ S emission

Table 1 contd.: Morphological Properties of Modal Profiles

Horizon	Depth (cm)	Munsell Colour	Texture	Roots	Remarks
Pedon 5: Ekeya (Nypa Palms)					
Ag	0–20	5Y 3/2	cl	fip	Periwinkles, crabs, mudfish, H ₂ S emission
Cg1	20–40	5Y 3/2	sil	fip	H ₂ S emission
Cg2	40–60	5Y 3/1	sil	sap	H ₂ S emission
Cg3	60–80	5Y 3/1	cl	sap	H ₂ S emission
Cg4	80–100	5Y 3/1	cl	sap	H ₂ S emission



Table 2: Selected Physico-chemical Properties of Modal Profiles

Depth (cm)	Particle-size Distribution (gkg ⁻¹)			pH (H ₂ O)		EC (dsm ⁻¹)	Org. C (gkg ⁻¹)	ESP (%)	SO ₄ -S (gkg ⁻¹)
	Sand	Silt	Clay	Wet	Dry				
Pedon 1: Bakassi (Tall Mangroves)									
0 – 20	332	220	448	7.4	3.6	16.2	51.2	1.1	0.007
20–40	372	300	328	7.4	3.4	14.2	87.7	1.0	0.008
40–60	372	380	248	7.4	2.9	14.3	81.5	1.2	0.009
60–80	392	320	288	7.1	3.2	14.6	61.2	1.0	0.008
80-100	392	320	288	7.1	3.2	14.6	61.2	1.1	0.008
Pedon 4: Ebughu (Short Mangroves)									
0 – 20	746	134	120	7.5	4.1	44.6	74.8	9.1	0.002
20–40	666	174	160	7.9	2.0	41.0	83.8	8.0	0.003
40–60	572	254	234	7.2	2.0	34.5	82.4	8.2	0.003
60–80	372	280	348	7.4	2.9	38.7	87.8	8.2	0.004
80-100	372	280	348	7.4	2.2	9.8	77.8	7.8	0.004

Table 2 Contd. Selected Physico-chemical Properties of Modal Profiles

Depth (cm)	Particle-size Distribution (gkg ⁻¹)			pH (H ₂ O)		EC (dsm ⁻¹)	Org. C (gkg ⁻¹)	ESP (%)	SO ₄ -S (gkg ⁻¹)
	Sand	Silt	Clay	Wet	Dry				
Pedon 5: Ekeya (Nypa Palms)									
0 – 20	152	394	454	7.8	2.8	44.6	74.8	12.4	0.002
20–40	672	220	108	7.0	3.0	41.4	83.8	5.9	0.003
40–60	672	200	108	7.1	2.9	34.5	82.4	5.6	0.003
60–80	272	354	374	7.1	3.0	38.7	87.8	9.5	0.004
80-100	552	260	188	7.2	2.8	9.8	77.8	10.3	0.004



Dominant Soil Forming Processes:

(i) Gleization:

Hues of 5Y and 2.5Y and Chroma of 1 due to daily inundation with sea water.

(ii) Pedoturbation:

- Faunalpedoturbation from periwinkles, crabs and mud fish abundant in the swamps.
- Aquapedoturbation due to daily upsurge of tidal water.
- Aeropedoturbation due to the constant emission of H_2S gas.

(iii) Sulfidization:

Content of sulfidic materials as evidenced by the rapid acidification of the soils on drying.

(iv) Salinization:

Due to saline sea water as evidenced by the EC values of $>4dSm^{-1}$

Soil Classification:

- The soils have no diagnostic horizons except ochric epipedon and are therefore **Entisols** (Order).
- They have peraquic soil moisture with grey hues of 5Y & 2.5Y with chromas of 1 and are **Aquents** (Suborder).
- They have sulfidic materials with wet pH 7.0-7.9 and dry pH <3.5 and are unripe and are thus **Sulfaquents** (Great group) except for Pedon 6 whose pH is between 3.9-4.4 and are **Hydraquents**.
- At the subgroup level, the soils qualify as **Typic Sulfaquents** (dominant) & **Typic Hydraquents**.
- According to the criteria of the FAO-WRB, the soils are **Fluvisols** with irregular distribution of organic carbon with depth and with their sulfidic materials, they qualify as **Thionic Fluvisols**.

Thanks

For your

Attention