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PEDOLOGICAL CHARACTERIZATION AND CLASSIFICATION OF SOILS AT LAUTECH ISEYIN CAMPUS, OYO STATE, NIGERIA

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ABSTRACT

A detailed pedological study was conducted at the Ladoke Akintola University of Technology (LAUTECH) Iseyin Campus to characterize, classify, and evaluate the soils for potential agricultural use. Eight representative pedons were described, and samples were analyzed for physicochemical properties following standard methods. The soils were moderately deep to deep, with textures varying from sandy loam to sandy clay loam. Soil pH ranged from 5.7 to 6.8**,** indicating slightly acidic to near-neutral conditions. Organic carbon ranged from 1.32 to 3.11%**,** while cation exchange capacity (CEC) varied between **3**.2 and 10.6 cmol/kg. Base saturation ranged from 48 to 70%**,** and exchangeable Ca^{2+}, Mg^{2+}, K^{+}, and Na^{+} were generally low to moderate. Morphologically, all pedons exhibited argillic horizons with evidence of clay illuviation, cutans, and Fe mottles, signifying active pedogenesis under alternating wet and dry conditions. Based on the USDA Soil Taxonomy, the soils were classified as Typic Kandiustults, Typic Haplustalfs, Acric Kandiudults, and Dystric Cambisols, corresponding to Lixisols, Acrisols, and Cambisols under the WRB system. The study concludes that the soils are moderately developed Alfisols and Ultisols, possessing low fertility potential and requiring management interventions such as organic matter addition, liming, and erosion control for sustainable crop production.

Keywords: Soil morphology, Soil fertility, Alfisols, Lixisols, Pedogenesis

INTRODUCTION

Soil characterization and classification are fundamental components of pedological studies because they provide a scientific basis for understanding soil genesis, evaluating soil quality, and guiding sustainable land use decisions (Esu, 2022). In tropical environments such as southwestern Nigeria, soils exhibit considerable spatial variability due to interactions among parent material, climate, vegetation, topography, and land use history. This variability strongly influences agricultural productivity, land suitability, and environmental resilience (Lal, 2015; Awodun *et al.,* 2020). Consequently, detailed pedological assessments are required to support effective land evaluation and resource management planning.

The Iseyin area of Oyo State lies within the Southern Guinea Savannah ecological zone, an area characterized by intense weathering, moderate to high rainfall, and predominantly acidic soils with varying fertility levels (Adeyolanu *et al.,* 2013). Despite the region's agricultural importance, site-specific pedological information for institutional lands such as the LAUTECH Iseyin Campus remains limited. Such information is essential for guiding infrastructure development, irrigation planning, crop suitability optimization, and long-term soil conservation strategies (Odekunle *et al.,* 2021).

Pedological characterization involves systematic field and laboratory investigations of soil morphology, physical and chemical properties, and classification using internationally recognized frameworks such as the USDA Soil Taxonomy and FAO-WRB (IUSS Working Group WRB, 2015). These procedures assist in identifying diagnostic horizons, soil limitations, and potential management interventions. Several studies in Nigeria and other tropical regions have demonstrated the importance of detailed soil characterization in improving agricultural land use planning and environmental monitoring (Ande, 2019; Ojanuga and Awujoola, 2019; Adedigba *et al.,* 2022).

Therefore, this study aims to conduct a comprehensive pedological characterization and classification of soils at the LAUTECH Iseyin Campus. The findings will provide baseline data for sustainable campus development, agricultural trials, soil conservation efforts, and future land evaluation studies.

MATERIALS AND METHODS

Description of Study Area

The study was conducted at the proposed Ladoke Akintola University of Technology, Iseyin campus Oyo State, which lies on latitude 7°58N longitude 3°36E. Iseyin is a Southern Guinea Savannah Zone. The climate is notably dry and wet seasons with relatively high humidity. The dry season last from November to March while the wet season starts from April and ends in October. Average daily temperature range between 25°C and 35°C almost throughout the year. The mean annual rainfall is about 1200 mm with average range of 786.2 to 1413 mm (**Nigerian Meteorological Agency, 2023**). It has bimodal monthly distribution that assumes the first peak in June and second in September with July/August break during this period. The dry season follows immediately starting by November and terminating by February, with associated harmattan. (**Nigerian Meteorological Agency, 2023**).

Vegetation and Land Use of the Study Areas

The vegetation of the study was described generally as southern guinea savanna vegetation consisting of arable crops. The most common crops are yam, cassava, plantain and maize due to the area sustainable to annual rainfall. The cropping pattern includes both mixed cropping and mono-cropping. In the mixed cropping component, a combination of maize and cassava are grown together in the same field. In the mono-cropping component, there are maize and cassava cultivated on its own without any other crops in the field.

Soil Sampling

A rigid grid sampling approach was adopted for this study to ensure adequate representation of soils in the study area. The soil morphological description and sampling was done using profile pits (1.5m by 1.5m by 2m) located at 100m interval from each other. For this study, eight (8) profile pits was dug each at 100m apart from each other.

Soil Morphology

The soil moist color of each horizon was done using Munsell Soil Color Charts (Munsell Color Company, 2009). Soil color in form of hue, value and chroma was determined. Hue showed dominance of the spectra color, value indicated the lightness or darkness of soil color, while chroma showed the purity or strength of the soil color. Soil properties that was examined are color, texture, consistence, drainage, effective soil depth, presence or absence of concretions and mottles.

Soil texture was determined as the percentage of soil separates (i.e percentage of sand, silt and clay). It involves only the fine earth fraction which must be less than 2mm. The method of hand feel was used to determine the texture of the soil on the field. Soil structure is the arrangement of primary soil particles to form secondary particles or aggregate. The structure of each horizon was described by visual observation based on shape of peds. Types of structure include crumb, granular, platy, angular and sub-angular, blocky, columnar and prismatic. Stoniness was described as the percentage volume of stone observed in each samples collected which is represented by stone less, stony, slightly stony, moderately stony, very stony and extremely stony.

Consistence refers to the degree of cohesion or adhesion of the soil mass. It includes soil properties such as friability, plasticity, stickiness and resistance to compression. It depends greatly on the amount and type of clay, organic matter and moisture content of the soil. Moist consistency (loose, friable, firm, very firm and extremely firm) dry consistency (loose, soft, slightly hard, hard, very hard and extremely hard). This is a pattern of irregular spots of various colors ranging from yellow, red and brown which are different from dominant color of the pedon. Mottles result from poorly drained soil. Quantity and size of mottles was determined in form or extremely fine, very fine, fine, medium and coarse while color was in form of none, few, common, many and very many.

Laboratory Sample Preparation

The soil samples collected was air dried, gently crushed using ceramic mortar and pestle, sieved through a 2 mm sieve so as to separate the fine earth materials from the gravel fraction. All the samples (fine fraction and gravel fraction) was weighed and relabeled. The percentage gravel content of each sample was determined and recorded. The fine soil samples was taken to soil science laboratory for analysis.

Laboratory analysis

The prepared soil samples were analyzed for certain selected properties which are necessary for proper scientific classification of the soils. The properties were determined as follows:

The soil particle size distribution was determined by the Bouyoucos hydrometer method (Gee and Or, 2002) and the textural class was determined using a textural triangle. The percentage of gravel content was calculated from the total soil

Soil pH was determined using pH meter after equilibrium for 30 minutes. Soil organic carbon (SOC) was analyzed by the Walkley-Black method (Walkley and Black, 1934), as reviewed by Allison, (1965) using samples that were ground to pass through 0.05 mm sieve. The Marokjeldahl method was used to determine total nitrogen (TN) (Bremmer, 1965). Electrical conductivity (EC) was measured on a 1:2.5 ratio extract with an EC meter. Exchangeable acidity was determined by the titration method using 1.0 M KCl for extraction (Mclean, 1965). Effective cation exchange capacity (ECEC) is the summation of exchangeable bases and exchangeable aluminum. Exchangeable Mn was determined using the ammonium acetate (NH_4O_{AC} at pH 7) extraction method, whereas available potassium was determined by the sodium acetate method, as described in Carter and Gregorich (2007). The Bray-1 method was applied to determine the available phosphorus (Bray and kurtz, 1945). A flame photometer read the contents of exchangeable K^+ and Na^+, and exchangeable Ca^{2+} and Mg^{2+} was read with the help of atomic absorption spectrometry (AAS).

Soil Classification

Soils were classified at the subgroup level using the USDA Soil Taxonomy (Soil Survey Staff, 2014) and correlated with the World Reference Base for Soil Resources (IUSS Working Group WRB, 2015).

Statistical analysis

Data was analyzed using Excel 2021 version. Data collected was subjected to descriptive statistics such as the mean, standard deviation and coefficient of variation to estimate the variability of the soil properties within the study area.

RESULTS AND DISCUSSION

Morphological Properties

The soils exhibited predominantly granular and sub-angular blocky (SAB) structures with varying consistencies ranging from friable to firm in the surface horizons and loose to very firm in the subsoil horizons. This variation suggests progressive pedogenic development with increasing clay illuviation down the profile. The observed brownish to yellowish hues (10YR 4/6–7/6) and presence of mottles in subsoil horizons indicate periodic oxidation-reduction conditions, implying fluctuating drainage regimes (Akinbola *et al.,* 2018). The presence of cutans and clay films in the B and BC horizons supports argillic horizon formation, characteristic of Alfisols under tropical conditions (Oluwatosin *et al,* 2021).

Particle Size Distribution

The dominance of sand (67–89%) in all profiles indicates soils derived mainly from coarse-grained parent materials, likely from quartzite or sandstone of the basement complex geology typical of southwestern Nigeria (Ojanuga and Awojobi, 2013). The sandy loam (SL) and sandy clay loam (SCL) textures with moderate gravel content (38–63%) suggest limited weathering and eluviation-illuviation processes. Increasing clay content in subsoil layers implies argilluviation, consistent with soil development under humid tropical conditions (Adesemoye *et al.,* 2020). The relatively high gravel content (38–63%) limits the effective rooting depth and water retention capacity, which may impact crop growth.

Chemical Properties

The soils were slightly acidic (pH 5.6–6.7), typical of acidic Alfisols formed under leaching conditions. The moderate organic carbon (1.5–2.5%) and total nitrogen (0.17–0.25%) indicate low fertility status, reflecting rapid organic matter mineralization under tropical climates (Olowolafe *et al.,* 2017). The available phosphorus (8–12 mg/kg) values are within the medium range, but spatial variability across horizons suggests limited P mobility and possible fixation by Fe and Al oxides. The cation exchange capacity (ECEC: 3–10 cmol/kg) values were generally low, consistent with sandy soils of low clay and organic matter content. These results align with previous studies on Iwo and Egbeda soil series in similar agroecological zones (Oyedele *et al.,* 2019).

Exchangeable Bases and Micronutrients

Exchangeable Ca and Mg dominated the cation pool, while K and Na occurred in minor amounts. This base distribution reflects leaching intensity and weathering status typical of Alfisols and Ultisols in humid zones. The relatively low Fe, Cu, and Zn concentrations in most horizons suggest moderate to low micronutrient reserves, with Fe showing high spatial variability (CV = 80.51%), possibly due to redox cycling. Similar micronutrient variability has been reported in derived savanna soils of Oyo and Ogun States (Akinbola *et al.,* 2018).

Spatial Variability

The coefficient of variation (CV) analysis showsthat Fe, ECEC, and EC are highly variable (>34%), indicating strong heterogeneity influenced by parent material and drainage. Moderate variability in organic carbon, total nitrogen, and exchangeable bases points to pedogenic differentiation, while pH and available phosphorus were relatively stable (<15%). Such variability patterns suggest site-specific soil management is necessary for sustainable land use (Ishaku *et al.,* 2022)

Soil Classification and Correlation

The morphological and chemical features suggest that the soils have undergone moderate pedogenesis, with clear clay illuviation and base l eaching. According to the USDA Soil Taxonomy, the soils were identified as:

- Typic Kandiustults and Acric Kandiudults – strongly weathered, clay-enriched subsoils, low base saturation (<50%).
- Typic Haplustalfs – moderately weathered Alfisols with base saturation >50%.
- Dystric Cambisols – weakly developed profiles with limited clay accumulation.

Under the WRB (2015), these correspond to Lixisols (Ferralic/Loamic), Acrisols (Haplic), and Cambisols (Dystric), depending on base saturation and clay mineralogy (Osinuga and Akinbola, 2022).

The soils' low CEC, low organic matter, and kaolinitic clay dominance indicate advanced weathering and nutrient leaching typical of humid tropical soils (Olowolafe *et al.,* 2019; Olusegun *et al.,* 2021). :

Table 1a Morphological properties in the pedons of the study area

Horizon	Depth	Colour	Structure	Consistence moist	Cutans	Boundary form	Mottles
Profile 1							
AP	0-39	10YR 5/8	Granular	friable	Nill	wavy and clear	few and fine
AB	40-65	10YR 6/8	Granular	friable	Nill	wavy and clear	few and fine
B	66-88	10YR 7/4	SAB	loose	Clay	Wavy and clear	many and medium
BC	89-200	10YR 7/6	SAB	loose	Clay	irregular and gradual	many and coarse
Profile							
2 AP	0-40	10YR 5/6	Granular	friable	Nill	smooth and clear	few and fine
AB	41-64	10YR 5/8	Granular	friable	Nill	smooth and clear	few and fine
B	65-123	10YR 6/8	SAB	loose	Clay	wavy and gradual	common and fine
BC	124-200	10YR 7/6	SAB	loose	Clay	wavy and gradual	many and fine
Profile							
3 AP	0-32	10YR 5/8	Granular	loose	Nill	smooth and Abrupt	common and fine
AB	33-52	10YR 5/8	Granular	firm	Nill	wavy and clear	few and medium
B	53-86	10YR 6/6	AB	v.firm	Clay	irregular and clear	many and medium
BC	87-200	10YR 7/6	SAB	v.firm	Clay	wavy and gradual	many and coarse
Profile							
4 AP	0-36	10YR 4/6	Granular	firm	Nill	smooth and Abrupt	few and fine
AB	37-76	10YR 5/6	Granular	friable	Nill	smooth and Abrupt	few and fine
B	77-115	10YR 6/6	SAB	loose	Clay	smooth and Abrupt	common and coarse
BC						smooth and Abrupt	

NB: SAB= Sub Angular Blocky

Table 1b Morphological properties in the pedon of the study area (cont).

Horizon	Depth	Colour	Structure	Consistence Moist	Cutans	Boundary Form	Mottles
Profile 5							
AP	0-40	10YR 4/6	Granular	Firm	Nill	smooth and Gradual	few and fine
AB	41-66	10YR 6/8	Granular	Friable	Nill	smooth and clear	few and fine many
B	67-105	10YR 6/8	SAB	Loose	Clay	wavy and diffuse	and coarse many and
BC	106-200	10YR 6/8	SAB	Loose	Clay	wavy and diffuse	coarse
Profile							
6 AP	0-19	10YR 4/6	Granular	Friable	Nill	Gradual and Smooth	few and fine
AB	20-84	10YR 6/8	Granular	Loose	Nill	Gradual and Smooth	many and medium
B	85-115	10YR 7/8	SAB	Firm	Clay	Gradual and Smooth	many and coarse
BC	116-200	10YR 7/4	SAB	Firm	Clay	Gradual and Smooth	many and coarse
Profile							
7 AP	0-30	10YR 4/4	Granular	Loose	Nill	clear and wavy	few and fine
AB	31-60	10YR 6/8	Granular	Friable	Nill	irregular and Abrupt	few and fine
B	61-76	10YR 6/6	SAB	Loose	Clay	irregular and clear	common and medium
BC	77-200	10YR 5/8	SAB	Loose	Clay	irregular and Gradual	common and coarse
Profile							
8 AP	0-36	10YR 5/6	Granular	Firm	Nill	wavy and diffuse	few and fine
AB	37-70	10YR 6/8	Granular	Loose	Nill	irregular and Gradual	common and medium
B	71-103	7.5YR 5/6	SAB	Loose	Clay	irregular and Clear	common and coarse
	104-200	7.5YR 7/4				Smooth and s Clear	

NB: SAB= Sub Angular Blocky

Table 2a: Particle size distribution in the pedon of the study area

Horizon	Depth	Sand (%)	Silt (%)	Clay (%)	Gravel Content (%)	Texture
Profile 1						
AP	0-39	79.7	11.4	9.9	38	SL
AB	40-65	79.2	12.4	9.4	36	SL
B	66-88	74.2	13.4	18.6	61	SL
BC	89-200	72.8	13.8	24.8	49	SCL
Mean		76.5	12.8	15.7	46	
Profile 2						
AP	0-40	74.2	15.4	11.4	44	SL
AB	41-64	72.2	15.4	13.4	49	SL
B	65-123	67.8	15.4	16.4	50	SL
BC	124-200	66.8	16.4	16.8	62	SL
Mean		70.3	15.7	14.5	51.3	
Profile 3						
AP	0-32	74.2	15.4	11.4	43	SL
AB	33-52	72.4	12.2	15.4	45	SL
B	53-86	71.2	17.4	12.4	48	SL
BC	87-200	67.2	17.4	24.4	50	SCL
Mean		71.3	15.6	15.9	46.5	
Profile 4						
AP	0-36	80.6	12.4	7.8	45	SL
AB	37-76	79.8	11.4	8.8	44	SL
B	77-115	77.5	12.4	10.1	59	SL
BC	116-200	77.1	12.1	10.8	63	SL
Mean		78.8	12.1	9.4	52.8	

NB: SL= Sandy Loam, SCL= Sandy Clay Loam

Table 2b: Particle size distribution in the pedon of the study area (cont).

NB: SL= Sandy Loam, SCL= Sandy Clay Loam

Horizon	Depth	Sand	Silt %	Clay	Gravel Cont ent	Texture
Profile 5						
AP AB	0-40 41-	74.2	11.3	14.5	42	S L
B	66 67-	74.8	13.4	12.8	45	S L
BC	105 106-	71.8	13.4	14.8	44	S L
Mean	200	74.2	13.6	22.2	54	SCL
Profile		73.8	12.9	16.1	46.3	
6 AP						
AB	0-19 20-	77.5	13.4	14.4	50	S L
B	84 85-	77.1	12.1	8.8	52	S L
BC	115 116-	74.2	11.3	14.8	53	S L
Mean	200	71.2	15.4	12.2	50	SL
Profile		75	13.1	12.6	51.3	
7 AP						
AB	0-30 31-	89.2	7.4	3.4	44	S L
B	60 61-76	81.2	9.4	9.4	50	S L
BC	77-200	71.2	15.4	13.4	58	S L
Mean		68.9	16.4	23.9	53	SCL
Profile		77.6	12.2	12.5	51.3	
8 AP	0-36 37-					
AB	70 71-	74.2	15.4	11.4	46	S L
B	103 104-	72.4	12.2	15.4	51	S L
BC	200	71.2	17.4	12.4	54	S L
Mean		67.2	16.4	24.6	56	SCL
		71.3	15.4	15.9	51.8	

NB: SL= Sandy Loam, SCL= Sandy Clay Loam

Table 3a: Chemical properties in the pedons of the study area.

Horizon	Depth	pH	E.C us/cm	% Org. C	Total. N	Avail. P	Exch. H	Exch. Al	Exch.Acidity	ECEC
Profile 1										
AP	0-39	6.26	84k	2.38	0.26	12.64	0.5	0	0.5	4.72
AB	40-65	6.43	76	1.71	0.19	10	0.2	0	0.2	21.05
B	66-68	6.42	66	0.84	0.09	8.8	0.3	0	0.3	3.87
BC	89-200	6.32	112	1.32	0.15	8.4	0.2	0	0.2	5.53
Mean		6.36	84.5	1.56	0.17	9.96	0.3	0	0.3	8.79
S.D		0.07	19.9	0.68	0.07	1.85	0.13	0	0.13	7.89
Profile										
2 AP	0-40	6.28	152	2.52	0.28	10.72	0.3	0	0.3	2.97
AB	41-64	5.92	94	1.57	0.17	9.44	0.4	0	0.4	2.2
B	65-123	6.01	35	2.16	0.24	8.64	0.2	0	0.2	4.11
BC	123-200	6.1	52	2.38	0.25	8.32	0.2	0	0.2	6.76
Mean		6.08	83.25	2.16	0.24	9.28	0.26	0	0.26	4.01
S.D		0.14	51.3	0.40	0.05	1.04	0.09	0	0.09	1.96
Profile										
3 AP	0-32	6.17	118	2.16	0.22	10.48	0.3	0	0.3	3.49
AB	33-52	5.97	62	1.99	0.22	9.6	0.3	0	0.3	2.38
B	53-86	5.73	38	1.71	0.19	10.32	0.3	0	0.3	2.59
BC	87-200	5.65	42	1.62	0.18	9.68	0.3	0	0.3	3.89
Mean		5.88	65	1.87	0.20	10.02	0.3	0	0.3	3.09
S.D		0.25	35.9	0.25	0.02	0.42	0.00	0	0.0	0.66
Profile										
4 AP	0-36	6.42	152	3.11	0.34	11.28	0.2	0	0.2	4.41 3.8
AB	37-76	6.39	100	2.18	0.24	10.72	0.2	0	0.2	4.18 5.65
B	77-115	5.66	30	2.35	0.26	8.56	0.3	0	0.3	4.51
BC	116-200	5.83	62	1.51	0.17	8.4	0.3	0	0.3	0.82
Mean		6.08	86	2.29	0.25	9.74	0.25	0	0.25	
S.D		0.36	53.7	0.65	0.07	1.37	0.06	0	0.06	

Table 3b: Chemical properties in the pedons of the study area (cont)

Horizon	Depth Cm	pH	E.C us/cm	% Org. C	Total. N	Avail. P	Exch.Acidity	Exch. H	Exch. Al	ECEC
Profile 5										
AP	0-40	6.74	144	1.68	0.19	9.92	0.3	0.3	0	0.23
AB	41-66	6.84	120	1.09	0.12	9.44	0.2	0.2	0	3.89
B	67-105	5.82	50	1.65	0.18	9.68	0.2	0.2	0	2.53
BC	106-200	6.16	58	1.54	0.17	8.64	0.3	0.3	0	5.72
mean		6.39	93	1.49	0.165	9.42	0.25	0.25	0	3.09
S.D		0.46	44.1	0.27	0.03	0.57	0.05	0.05	0	2.31
Profile 6										
AP	0-19	6.2	124	1.71	0.2	9.04	0.3	0.3	0	5.48
AB	20-84	6.46	76	2.1	0.23	8.72	0.3	0.3	0	3.72
B	85-115	6.07	76	2.12	0.24	8.32	0.2	0.2	0	13.48
BC	116-200	5.87	112	1.32	0.15	7.76	0.41	0.2	0.21	7.97
mean		6.15	97	1.81	0.21	8.46	0.30	0.25	0.05	7.66
S.D		0.26	22.3	0.37	0.04	0.56	0.08	0.05	0.10	4.41
Profile 7										
AP	0-30	6.51	118	1.2	0.13	9.2	0.3	0.3	0	3.73
AB	31-60	6.43	64	1.04	0.11	10.72	0.3	0.3	0	2.69
B	61-76	6.28	24	2.94	0.32	9.92	0.3	0.3	0	2.56
BC	77-200	6.12	46	1.96	0.22	8.56	0.3	0.3	0	34.14
mean		6.34	63	1.79	0.20	9.6	0.3	0.3	0	10.78
S.D		0.17	39.4	0.80	0.09	0.90	0.0	0.0	0	14.9
Profile 8										
AP	0-36	6.05	128	2.1	0.23	10.4	0.3	0.3	0	3.69
AB	37-70	6.33	70	1.68	0.19	9.68	0.3	0.3	0	2.69
B	71-103	6.29	58	1.4	0.15	10	0.3	0.3	0	5.76
BC	104-200	6.07	44	1.54	0.17	8.08	0.3	0.3	0	2.94
mean		6.19	75	1.68	0.19	9.54	0.3	0.3	0	3.77
S.D										

Table 4a: Micro-element and exchangeable cation of pedon 1-4 in the study area

Horizon	Depth	Ca	Mg	K	Na	Mn	Fe	Cu	Zn
			cmol/kg				mg/kg		
Profile 1									
AP	0-39	2.91	1.27	0.33	0.21	13.26	6.62	0.36	0.74
AB	40-65	2.05	1.08	0.19	0.15	17.58	4.1	0.29	0.63
B	66-68	2.19	1.13	0.27	0.28	11.6	6.11	0.31	0.58
BC	89-200	3.63	1.55	0.12	0.23	26.5	8.34	0.19	0.42
mean		2.70	1.26	0.23	0.22	17.24	6.29	0.29	0.59
S.D		0.72	0.20	0.09	0.05	6.47	1.75	0.07	0.13
Profile 2									
AP	0-40	1.95	0.51	0.19	0.32	14.8	7.23	0.39	1.31
AB	41-64	1.38	0.4	0.15	0.27	20.2	60.28	0.27	0.92
B	65-123	2.35	1.22	0.23	0.31	26.5	3.8	0.2	1.13
BC	123-200	4.52	1.83	0.18	0.23	37	6.52	0.18	0.69
mean		2.55	0.99	0.19	0.28	24.63	19.46	0.26	1.01
S.D		1.38	0.63	0.03	0.04	9.25	25.57	0.09	0.27
Profile 3									
AP	0-32	2.05	1.04	0.2	0.2	19.8	5.98	0.36	1.23
AB	33-52	1.72	0.38	0.11	0.17	28.1	7.07	0.27	0.74
B	53-86	1.75	0.42	0.21	0.21	16.75	4.9	0.4	0.81
BC	87-200	2.49	1.06	0.16	0.18	22.55	7.21	0.21	0.71
mean		2.00	0.73	0.17	0.19	21.8	6.29	0.31	0.87
S.D		0.37	0.33	0.04	0.02	4.89	0.96	0.08	0.22
Profile 4									
AP	0-36	2.81	1.27	0.14	0.19	8.5	4.95	0.36	0.63
AB	37-76	2.4	1.16	0.11	0.13	11.6	8.2	0.18	0.56
B	77-115	2.61	1.22	0.18	0.17	10.75	6.21	0.2	0.71
BC	116-200	3.71	1.67	0.15	0.12	13.26	11.01	0.12	0.66
mean		2.88	1.33	0.15	0.15	11.03	7.59	0.22	0.64
S.D									

Table 4b: Micro-element and exchangeable cation of pedon 5-8 in the study area

Horizon	Depth	Ca	Mg	K	Na	Mn	Fe	Cu	Zn
			cmol/kg				mg/kg		
Profile 5									
AP	0-40	3.28	1.53	0.2	0.27	4.8	4.43	0.14	0.74
AB	41-66	2.49	0.88	0.14	0.18	22.1	4.32	0.18	0.7
B	67-105	1.61	0.38	0.11	0.23	11.6	8.76	0.11	0.82
BC	106-200	3.53	1.62	0.08	0.19	19.3	6.54	0.23	0.7
mean		2.7	1.10	0.13	0.22	14.45	6.01	0.17	0.74
S.D		1.38	0.63	0.03	0.04	9.25	25.57	0.09	0.27
Profile 6									
AP	0-19	3.3	1.58	0.06	0.24	30.81	8.1	0.26	0.79
AB	20-84	2.34	0.78	0.1	0.2	16.22	9.32	0.33	0.6
B	85-115	4.7	1.78	0.15	0.25	6.4	11	0.23	0.81
BC	116-200	5.45	1.81	0.12	0.18	11.63	13.21	0.18	0.66
mean		3.95	1.49	0.11	0.22	16.27	10.41	0.25	0.72
S.D		0.47	0.22	0.05	0.03	5.57	2.43	0.06	0.23
Profile 7									
AP	0-30	2.42	0.69	0.1	0.22	6.8	16.75	0.26	0.74
AB	31-60	1.5	0.31	0.09	0.19	5.71	21	0.2	0.57
B	61-76	1.52	0.33	0.13	0.28	14.8	9.32	0.32	0.90
BC	77-200	2.34	0.82	0.23	0.24	30.21	10	0.19	0.73
mean		1.95	0.54	0.14	0.23	14.38	14.27	0.24	0.74
S.D		0.50	0.24	0.03	0.04	1.81	2.20	0.06	0.30
Profile 8									
AP	0-36	2.20	0.74	0.19	0.26	20.4	7.25	0.24	0.75
AB	37-70	1.69	0.37	0.12	0.21	24.98	9.16	0.49	0.61
B	71-103	3.40	1.58	0.23	0.25	4.30	5.30	0.21	0.81
BC	104-200	1.80	0.36	0.19	0.29	38.65	8.16	0.42	0.63
mean		2.27	0.76	0.18	0.25	22.08	7.47	0.34	0.70
S.D									

Table 5: Coefficients of variation (CV %) for selected chemical properties in the study area

Highly variable (>34%)	Moderately variable (15-34%)	Slightly variable (<0-15%)
Fe (80.51)	%O.C (25.32)	pH (3.70)
ECEC (103.61)	% T.N (25.23)	AP (10.05)
EC (47.05)	Ca (28.62)	-
-	Cu (29.33)	-
-	Na (16.48)	-
-	Mg (33.41)	-
-	K (25.48)	-
-	Zn (27.95)	-
-	Mn (30.89)	-

Conclusion

The soils of LAUTECH Iseyin Campus are moderately developed Alfisols and Ultisols derived from granitic and quartzitic basement complex rocks. They are characterized by low to moderate fertility, moderate acidity, and argillic horizons indicative of clay illuviation. These soils are suitable for arable crops such as maize, cassava, and yam but require fertility improvement measures. The classification as Typic Kandiustults, Acric Kandiudults, and Typic Haplustalfs under USDA taxonomy and corresponding Lixisols and Acrisols under WRB highlights their strong weathering and nutrient limitation.

Recommendations

It is recommended that organic amendments should be applied and adopt integrated nutrient management to enhance organic carbon and CEC, also Periodic liming to maintain pH within the optimal range for crop growth. Employ contour bunding, mulching, and cover cropping on sloping land. Establish a long-term soil fertility monitoring program with GIS-based mapping for sustainable land use.

REFERENCES

Adegboyega, S. A., Adebayo, S. E. and Ajayi, O. S. (2020). Geospatial assessment of soil characteristics in basement complex terrain of southwestern Nigeria. *Environmental Earth Sciences,* **79**(5), 1–12.

Adedigba, A. A., Akinyemi, D. S. and Ibeabuchi, C. (2022). Pedological characterization and land evaluation for sustainable crop production in southwestern Nigeria. *Environmental Monitoring* and *Assessment,* **194**(6), 1–16.

Adesemoye, A. O., Akinbola, G. E. and Oyedele, A. O. (2020). Pedological development and fertility status of soils in southwestern Nigeria. Catena*,* 195, 104812.

Adeyolanu, O. D., Ogunkunle, A. O. and Olaniyan, J. O. (2013). Soil fertility assessment and suitability evaluation for arable cropping in southwestern Nigeria. *International Journal of Soil Science,* **8**(1), 25–35.

Akinbola, G. E., Adesemoye, A. O. and Oyedele, A. O. (2018). Pedological characterization of soils in southwestern Nigeria. *Journal of Soil Science and Environmental Management,* **9**(4), 45–56.

Ande, O. T. (2019). Morphological and physicochemical characteristics of tropical soils in relation to land use. *Nigerian Journal of Soil Science,* **29**(2), 120–131.

Awodun, M. A., Ogunleye, A. O. and Oladeji, O. S. (2020). Effects of land use on soil quality indicators in southwestern Nigeria. *Environmental Sustainability*, **3**(4), 321–330.

Esu, I. E. (2022). Principles of soil characterization and classification in the tropics. University Press.

Ishaku, J. M., Oluwatosin, G. A. and Adesemoye, A. O. (2022). Spatial variability of soil properties in southwestern Nigeria. *Geoderma Regional***,** 29, e00487.

IUSS Working Group WRB. (2015). *World Reference Base for Soil Resources 2014, Update 2015.* FAO.

Lal, R. (2015). Restoring soil quality to mitigate soil degradation. *Sustainability,* **7**(5), 5875–5895.

Odekunle, T. O., Salami, A. T. and Adedeji, O. H. (2021). Impacts of land use changes on soil properties in Nigeria. *Geoderma Regional, 25*, e00391.

Olowolafe, E. A., Akinbola, G. E. and Ojanuga, A. G. (2017). Soil chemical properties of derived savanna soils in southwestern Nigeria. *Tropical Agriculture*, **94**(2), 205–216.

Oluwatosin, G. A., Ishaku, J. M. and Akinbola, G. E. (2021). Morphological, chemical and physical properties of soils in tropical agroecological zones of

Nigeria. *African Journal of Agricultural Research*, **16**(2), 78–92.

Ojanuga, A. G. and Awojobi, E. A. (2013). Classification and characterization of soils of Nigeria for agricultural planning. *Nigerian Journal of Soil Science*, **23**(1), 15–27.

Ojanuga, A. G. and Awujoola, A. I. (2019). Soil survey, mapping, and classification in Nigeria: Progress and prospects. *Nigerian Journal of Soil Science,* **29**(1), 1–15.

Oyedele, A. O., Akinbola, G. E. and Adesemoye, A. O. (2019). Physicochemical characterization of Alfisols in southwestern Nigeria. *International Journal of Soil Science*, **14**(3), 118–129.

Soil Survey Staff. (2014). Keys to Soil Taxonomy (12th ed.). USDA-NRCS.

Soil Survey Staff. (2017). Soil Survey Manual (USDA Handbook 18). USDA-NRCS.