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Relative Influence of Edaphic-Site Characteristics on Vegetative Parameters along a Toposequence in Odukpani Local Government Area of Cross River State, Nigeria

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Abstract: ***The study on the relative influence of edaphic factors and site characteristics on vegetative parameters, along a toposequence in Odukpani Local Government Area of Cross River State, Nigeria was carried out. The multiple linear regression models was employed to examine the relative effect of edaphic factors and site characteristics on vegetative parameters. The tree height (R) explains 76.9% variation, seventeen independent variables (Adjusted R-square) explain 49.5% and dependent variables (R-square) explain 59.1% of the total variation from the upper to the bottom slopes. Tree density (R) explains 63.9% variation, seventeen independent variables (Adjusted R-square) explain 26.8% and dependent variables (R-square) explain 40.8% of the total variation from the upper to the bottom slopes. Species richness (R) explains 74.2% variation, seventeen independent variables (Adjusted R-square) explain 44.5% and dependent variables (R-square) explain 55.1% of the total variation from the upper to the bottom slopes. The soil texture varies from coarse, fine, silt and clay soil. Coarse sand was the dominant soil in the upper, middle and bottom slopes. The dominant of coarse sand affects its ability to retain moisture. Water holding capacity was low and Soil PH was acidic (PH 5.4-5.7) in the upper, middle and bottom slopes. Organic carbon, exchangeable calcium, magnesium, sodium, and potassium were generally low in the upper, middle and bottom slopes. Exchangeable acid, cation exchange capacity and base saturation were also low in the upper, middle and bottom slopes. The study therefore recommends vegetation conservation and sustainable management strategies in the study area.***

Keywords: Edaphic factors, Site Characteristics, Vegetative parameters, Upper, Middle, Bottom Slopes.

1. Introduction

The relationship between edaphic factors and vegetation gained prominence in the 1950's to the present (Clayton, 1958; Wilde, 1958; langdale-Brown, 1968; Trudgill, 1977; Eyre, 1968; Adejuwon & Ekanade, 1984; Abua & Ajake, 2015). Edaphic factors and vegetation have a common relationship. According to Food and Agriculture Organization of the United Nation (2015), edaphic factors encourages plant growth, in return vegetation, tree cover and forests prevent soil degradation. Though, variation in elevation, gradient and positions on a toposequence greatly influence vegetative parameters (Gerrard, 1981; Abua & Ajake, 2015).

A toposequence comprises of upper, middle and bottom slope, each is covered by different edaphic factors and vegetation (Lawson, 1970). Edaphic factors vary from the upper to the foot slopes on topographical sequences (Aweto, 1987; Furley, 1971). Edaphic factors and site characteristics such as slope gradients, elevation and distance from crest summit, coarse sand, silt, fine sand, clay, soil PH, exchangeable bases, exchangeable acid, cation exchange capacity and base saturation may greatly influence vegetative parameters from the upper to the bottom slopes.

Several studies have been carried out on slope, soil and vegetation relationship (Acton, 1965; Lansdale, 1968; Furley, 1976; Areola, 1982; Strahler, 1990; Abua & Ajake, 2015). Unfortunately, little work has been done about the relative influence of edaphic factors and site characteristics on vegetative parameters, along a toposequence in Odukpani Local Government Area of Cross River State, Nigeria. This limitation forms the conviction of this study. The aim of the study is to examine the relative influence of edaphic factors and site characteristics on vegetative parameters, along a toposequence in Odukpani Local Government Area of Cross River State, Nigeria.

2. Study Location

The study area is located in Odukpani Local Government Area of Cross River State, Nigeria. The study area lies approximately between longitude 8^0 08'and 8^0 8' E, and Latitude 6^0 09 and 6^0 7'N. The climate of the area is humid tropical and consists of rainy and dry season. The area experiences double rainfall from 1880mm which span from May-August and 240Smm which span from December-February. Annual rainfall is approximately 402mm. Temperature are uniformly high with a maximum of 30^0C and minimum of 23^0C (Abali & Abua, 2016). The annual average vapour pressure is 29 Millibars and has a high relative humidity which ranged from 80-100%. The area has a high salinity which ranged from 3.8% in the dry season and low salinity of about 0.5% in the rainy season (Ukpong, 1995). The study area lies within the Flood Plain Zone of Cross River and has relatively low lying terrain from the shore of the Calabar River. The vegetation is a mixture of mangrove and tropical rainforest. The area serves as the only woodlot of the then natives and source of non-timber products (Fig. 1).

Source: Cartography / GIS Unit, Dept. of Geography & Environmental Sc., Unical

Figure 1: Showing map of Odukpani Local Government Area in Cross River State, Nigeria.

3. MATERIALS AND METHODS

Field Study

The upper, middle and bottom slopes were dug 0-15cm depth. Thirty replicate of 20m × 20m were collected from topsoil on the upper, middle and bottom slopes. The samples were collected randomly from selected points using soil Auger. The soil samples were air dried, sieved through a 2mm sieve and taken to the Laboratory for analysis. Tree height was measured with Altimeter. The context of a tree ranged from 2 meter tall and breast width 2cm diameter (Aweto, 1987). Slope angle and site elevation above stream level were measured with the aid of Abney level. The elevation was determined by the trigonometrical principle.

Laboratory Procedure

Particle size composition was analyzed using hydrometer (Bouyocous, 1926). Water holding capacity was determined by saturating the soil sample and later subjecting them to gravitational draining, and oven drying for 24 hours at 105^0C. Exchangeable bases were determined by first leaching the soil sample with 1m neutral ammonium acetate. The concentrations of calcium, potassium and sodium were determined with a Flame Photometer. Magnesium was determined with an Atomic Absorption Spectrophotometer. Soil PH was determined Potentiometrically in 0.01m calcium chloride using soil to calcium chloride solution ratio 1:2. Cation exchange capacity was determined by summation method (Chapman, 1965). Soil organic matter was determined by Anglicizing the organic carbon content of the soil. The percentage Organic Matter was converted by multiplying 1.724 (Walkey & Black, 1934).

Statistical Analysis

The multiple linear regression models (SPSS Software version 22, entering 0.05 and remove variables 0.10) were used to determine the relative influence of edaphic factors and site characteristics on vegetative parameters, from the upper slope to the foot slope. The vegetation parameters are tree height, tree density and species richness as dependent variables. Seventeen edaphic factors and site characteristics represent independent variables.

4. RESULTS AND DISCUSSION

Edaphic Factors

Table 1 is the representation of the results of edaphic factors. The table represents the results of topsoil in the upper, middle and bottom slopes. The total size distribution of coarse sand in the topsoil varies from 60.3, 62.1 and 57.5% in the upper, middle and bottom slopes respectively. Fine sand constitutes 16.0, 14.5 and 18.3%, silt varies from 15.4, 14.8 and 1.6%, while clay varies from 8.2, 8.1 and 11.1% respectively in the upper, middle and bottom slopes. Coarse sand is the dominant soil particle and constitutes over 50% in the upper, middle and bottom slopes. Fine sand, silt and clay were less than 19% in the upper, middle and bottom slopes. The water holding capacity in the topsoil varies from 37.9, 36.3 and 38.4% respectively in the upper, middle and bottom slopes. The water holding capacity decrease slightly in the middle slope and increases slightly in the bottom slope.

Organic carbon content varies from 1.6, 1.7 and 1.7% respectively, in the upper, middle and bottom slopes. The organic content was very low below 2% and increases slightly in the middle and bottom slopes by 0.1%. The organic matter accumulates in the middle and bottom slope, as a result of slow decomposition rate due to water logging. Soil PH ranged from PH 5.4-5.7. This indicates that, the soils are acidic and may not favor majority of agricultural crops. Soil PH for majority of agricultural crops ranged from PH 6.0-7.5 (Brady, 1990). Exchangeable calcium varies from 1.7, 1.5 and 1.5me/100g, magnesium ranged from 1.3, 1.1 and 1.4me/100g, sodium constitutes 0.2, 0.2 and 0.1me/100g, and potassium ranged from 0.1, 0.1 and 0.1me/100g respectively in the upper, middle and bottom slopes. Exchangeable bases in the upper, middle and bottom slopes were generally low. Exchangeable acid ranged from 0.4, 0.5 and 0.5me/100g respectively in the upper, middle and bottom slopes. Cation exchange capacity varies from 3.9, 3.6 and 3.9me/100g respectively in the upper, middle and bottom slopes. Base saturation ranged from 86, 83 and 85% respectively in the upper, middle and bottom slopes.

Site Characteristics

Table 1 is the representation of the results of site characteristics. The table represents the results of topsoil in the upper, middle and bottom slopes. Site characteristics constitutes slope gradients, elevation of sampling points above stream level, and distance of points between the streams and crest summit. The mean gradient ranged from 3.1, 2.3 and 0.9^0 respectively in the upper, middle and bottom slopes. Mean elevation above stream level ranged from 4.3, 3.2 and 1.0m respectively in the upper, middle and bottom slopes. Mean distance between the stream and crest summit varies from 110, 292, and 510m respectively in the upper, middle and bottom slopes. Mean gradient and elevation decreases downward from middle to bottom slopes. Though, the mean distance between the stream and crest summit decrease upward from middle to upper slope.

Vegetative Parameters

Table 1 shows the results of vegetative parameters. The table represents the results of topsoil in the upper, middle and bottom slopes. Vegetative parameters constitute tree height, tree density and species richness in the upper, middle and bottom slopes. Tree height ranged from 28.2, 26.7 and 18.4m respectively in the upper, middle and bottom slopes. Tree density varies from 147.8, 142.9 and 112.1/400m^2 respectively in the upper, middle and bottom slopes. Species richness ranged from 14.8, 14.2 and 11.4/400m^2 in the upper, middle and bottom slopes. Tree height decreases in the middle and bottom slope, similarly there is a decrease in tree density and species richness in the middle and bottom slopes. This can be attributed to the elevation and position of points on the slopes.

Table 1: Mean values of edaphic factors, site characteristics and vegetative parameters

Mean Water Holding Capacity (%)			Mean Coarse Sand (%)			Mean Fine Sand (%)			Mean Silt (%)		
Upper	Middle	Bottom	Upper	Middle	Bottom	Upper	Middle	Bottom	Upper	Middle	Bottom
37.91	36.38	38.47	60.36	62.17	57.56	16.03	14.52	18.35	15.46	14.80	1.60
Mean Clay (%)			Mean Organic Carbon (%)			Mean Soil PH			Mean Base Saturation (%)		
Upper	Middle	Bottom	Upper	Middle	Bottom	Upper	Middle	Bottom	Upper	Middle	Bottom
8.2	8. 1	11.1	1.67	1.71	1.71	5.7	5.4	5.5	86.9	83.9	85.8
EXCHANGEABLE BASES											
Mean Ca^{++} me/100g			Mean Mg^{++} me/100g			Mean Na^{+} me/100g			Mean K^{+} me/100g		
Upper	Middle	Bottom	Upper	Middle	Bottom	Upper	Middle	Bottom	Upper	Middle	Bottom
1.75	1.54	1.59	1.39	1.16	1.48	0.21	0.20	0.19	0. 16	0. 15	0. 15
Mean Exchangeable Acid me/100g			Mean Cation Exchange Capacity me/100g			Mean Gradient (Degree)			Mean Elevation above stream level (m)		
Upper	Middle	Bottom	Upper	Middle	Bottom	Upper	Middle	Bottom	Upper	Middle	Bottom
0.49	0.58	0.52	3 .90	3 .61	3. 92	3.1	2.3	0.9	4.3	3.2	1.0
Mean Distance from Crest Summit (m)			Mean Tree Height (m)			Mean Tree Density (No./400m^2)			Mean Species Richness (No./400m^2)		
Upper	Middle	Bottom	Upper	Middle	Bottom	Upper	Middle	Bottom	Upper	Middle	Bottom
110	292	510	28.2	26.7	18.4	147.8	142.9	112.1	14.8	14.2	11.4

Relative influence of Edaphic Factors and Site Characteristics on Tree Height

Tables 2 and 3 are the results of tree height, edaphic factors and site characteristics. Multiple linear regression models were used to analyze the relative influence of edaphic factors and site characteristics on vegetative parameters from the upper to the bottom slopes. Seventeen independent variables of edaphic and site characteristics were regressed with tree height as dependent variable. The model summary (R) explains 76.9%, seventeen independent variables (adjusted R-Square) explain 49.5% and dependent variables (R-Square) explain 59.1% of the total variation of edaphic factors and site characteristics on tree height from the upper to the bottom slopes. The rotated component matrix and regression coefficient was used to analyze the variables and converged in nine iterations. The component matrix loads strongly on the following components, silt 0.97, base saturation 0.58, soil PH 0.92, potassium 0.95, calcium 0.92, clay 0.89, organic carbon 0.97 and sodium 0.95 respectively. These components matrix have positive regression coefficient on the following factors silt 0.89, soil PH 1.66, potassium 2.03, calcium 1.04, clay 0.34, organic carbon 0.72, base saturation 0.90 and sodium 18.3 from the upper to the bottom slopes. This suggest that, tree height is expected to be higher in every unite increase in the soil PH, silt, potassium, calcium, base saturation, clay, organic carbon and sodium.

Similarly, the component matrix loads strongly on the following components with negative regression coefficient. The component matrix includes gradient -0.89, elevation -0.94, cation exchange capacity -0.62, coarse sand -0.97and water holding capacity -0.97 respectively. These component matrix have negative regression coefficient on the following factors gradient -3.49, elevation -3.24, cation exchange capacity -1.52, coarse sand -0.016 and water holding capacity -0.008 from the upper to the bottom slopes. This results revealed that, tree height is expected to be low in every unite decrease in the gradient, elevation, cation exchange capacity, coarse sand and water holding capacity.

Table 2: Tree Height Rotated Component Matrix[a] Extraction Method: Principal Component Analysis Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 9 iterations.

	Component									
	1	2	3	4	5	6	7	8	9	10
WHC	-.014	-.011	-.027	-.045	.007	.115	-.042	-.056	.978	.053
FineSand	-.809	.296	.243	.006	.191	.172	-.035	.101	.049	-.079
Silt	.973	-.088	-.023	-.012	.005	-.117	.002	-.013	-.026	.024
OrganicC	-.050	-.005	.045	.014	.048	.010	.973	-.058	-.043	.109
SoilPH	.207	.110	.922	.119	.107	-.056	.076	-.007	-.011	.005
BaseS	.025	.585	.361	.041	.416	.270	-.244	-.029	-.048	.033
Calcium	.140	.130	.129	.051	.918	-.130	.078	-.107	.016	-.057
Magnesium	-.511	.342	.480	-.057	.309	.246	-.081	.064	-.097	.015
Sodium	.170	-.094	.002	-.028	-.098	.036	-.060	.952	-.061	-.094
Potassium	.047	.002	.033	.952	-.030	.012	-.004	-.067	-.065	-.031
EAcid	-.021	-.929	-.058	-.089	-.046	.124	-.058	.101	-.002	.077
CEC	-.184	.412	.196	.619	.267	.310	.051	.123	.059	.049
Gradient	.894	.116	.115	-.032	.051	-.107	-.044	.201	.039	.074
Elevation	.944	.111	.167	-.012	.015	-.104	.009	.100	.019	.016
DCrestS	-.929	-.153	-.177	-.002	-.159	.068	.051	-.086	-.021	-.021
Clay	-.203	-.020	-.010	.105	-.118	.892	.016	.033	.141	.056
CoarseS	.076	-.058	.008	-.014	-.046	.046	.110	-.089	.054	.974
THeight	.741	-.164	-.048	.013	.192	.375	-.067	-.014	-.111	-.109

Table 3: Tree Height Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-37.756	50.696		-.745	.459
	WHC	-.008	.054	-.011	-.139	.890
	FineSand	-.466	.909	-.118	-.513	.609
	Silt	.892	.485	.869	1.841	.070
	OrganicC	.729	3.230	.018	.226	.822
	SoilPH	1.661	3.766	.044	.441	.661
	BaseS	.901	.474	.229	1.901	.061
	Calcium	1.044	3.410	.031	.306	.760
	Magnesium	-3.511	4.788	-.092	-.733	.466
	Sodium	18.305	9.140	.182	2.003	.049
	Potassium	2.033	8.896	.021	.228	.820
	EAcid	5.183	8.897	.057	.583	.562
	CEC	-1.529	2.812	-.063	-.544	.588
	Gradient	-3.493	1.376	-.519	-2.539	.013
	Elevation	-3.242	2.014	-.695	-1.610	.112
	DCrestS	-.034	.020	-.844	-1.716	.091
	Clay	.343	.130	.243	2.630	.010
	CoarseS	-.016	.027	-.048	-.584	.561

Relative influence of Edaphic Factors and Site Characteristics on Tree Density

Tables 4 and 5, show the results of tree density, edaphic factors and site characteristics. Multiple linear regression models revealed that, (R-Square) explains 63.9%, seventeen independent variables (adjusted-R Square) explain 26.8% and dependent variables (R-Square) explain 40.8% of the total variation of edaphic factors and site characteristics on tree density from the upper to the bottom slopes. The rotated component matrix and regression coefficient were used to analyze the variables and converged in nine iterations. The component matrix loads strongly on the following components, silt 0.975, base saturation 0.628, clay 0.887, calcium 0.88, sodium 0.961 and coarse sand respectively. These components matrix have positive regression coefficient on the following

Table 4: Tree Density Rotated Component Matrix[a] Extraction Method: Principal Component Analysis Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 9 iterations.

	Component									
	1	2	3	4	5	6	7	8	9	10
WHC	-.011	-.012	-.038	-.046	.104	.012	-.047	-.041	.977	.061
FineSand	-.809	.320	.264	.004	.130	.142	.100	-.026	.057	-.075
Silt	.975	-.107	-.040	-.011	-.063	.047	-.017	-.006	-.039	.015
OrganicC	-.048	-.010	.041	.016	.002	.048	-.057	.973	-.040	.111
SoilPH	.230	.097	.892	.114	-.055	.097	-.001	.084	-.024	.009
BaseS	.003	.628	.415	.058	.190	.323	-.031	-.237	-.014	.036
Calcium	.117	.182	.190	.061	-.140	.880	-.127	.075	.030	-.070
Magnesium	-.517	.376	.532	-.049	.185	.217	.045	-.070	-.073	.004
Sodium	.161	-.084	.008	-.023	.028	-.096	.961	-.058	-.050	-.087
Potassium	.045	-.001	.017	.950	.001	-.023	-.057	-.005	-.068	-.022
EAcid	-.044	-.919	-.032	-.079	.136	-.022	.093	-.069	.008	.072
CEC	-.192	.438	.234	.625	.282	.203	.098	.059	.069	.030
Gradient	.911	.098	.116	-.028	-.052	.056	.173	-.045	.028	.043
Elevation	.958	.089	.148	-.012	-.048	.040	.088	.006	.003	-.002
DCrestS	-.933	-.145	-.174	-.006	.028	-.169	-.074	.054	-.013	-.005
Clay	-.233	.001	.035	.120	.887	-.155	.000	.014	.153	.031
CoarseS	.076	-.049	.012	-.012	.038	-.050	-.083	.112	.062	.979
TDensity	.512	-.201	-.184	-.115	.475	.398	.184	-.091	-.164	.071

factors silt4.46, base saturation 1.04, clay, 1.93, calcium 22.18, sodium, 100.00, and coarse sand, 0.11 respectively from the upper, middle to the bottom slopes. This suggest that, tree density is expected to be higher in every unite increase in the bases saturation, silt, calcium, sodium, clay and coarse sand.

Similarly, the component matrix loads strongly with negative regression coefficient. The component matrix includes soil PH -0.892, potassium -0.950, magnesium -0.532, gradient -0.911, elevation -0.958, organic carbon -0.973 and water holding capacity -0.979 respectively .The components matrix negative regression coefficient comprises soil PH -8.11, potassium -29.49, magnesium -18.84, gradient -8.65, elevation -9.52, organic carbon -7.08 and water holding capacity -0.23 from the upper to the bottom slopes. This indicates that, tree density is expected to be low in every unite decrease in the gradient, elevation, soil PH, organic carbon, magnesium and potassium.

Table 5: Tree Density Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	15.530	297.175		.052	.958
	WHC	-.239	.319	-.074	-.750	.456
	FineSand	4.688	5.329	.244	.880	.382
	Silt	4.463	2.842	.892	1.570	.121
	OrganicC	-7.088	18.937	-.037	-.374	.709
	SoilPH	-8.114	22.074	-.045	-.368	.714
	BaseS	1.041	2.779	.054	.374	.709
	Calcium	22.189	19.992	.134	1.110	.271
	Magnesium	-18.848	28.064	-.102	-.672	.504
	Sodium	100.000	53.576	.204	1.866	.066
	Potassium	-29.499	52.150	-.062	-.566	.573
	EAcid	42.598	52.154	.096	.817	.417
	CEC	-8.096	16.487	-.068	-.491	.625
	Gradient	-8.656	8.064	-.264	-1.073	.287
	Elevation	-9.527	11.806	-.419	-.807	.422
	DCrestS	-.082	.115	-.423	-.714	.478
	Clay	1.936	.764	.281	2.535	.013
	CoarseS	.117	.157	.074	.745	.459

Relative influence of Edaphic Factors and Site Characteristics on Species Richness

Tables 6 and 7 depict the results on the edaphic factors and site characteristics on species richness. Multiple linear regression models were used to analyze the relative influence of edaphic factors and site characteristics on vegetative parameters from the upper to the bottom slopes. Seventeen independent variables of edaphic factors and site characteristics were regressed with Species Richnessas dependent variable. The model summary (R-Square) explains 74.2%, seventeen independent variables (adjusted-R Square) explain 44.5% and dependent variables (R-Square) explain 55.1% of the total variation of edaphic factors and site characteristics on species richness from the upper to the bottom slopes. The rotated component matrix and regression coefficient were used to analyze the variables and converged in eleven iterations. The component matrix loads strongly and have positive regression coefficient. The component matrix includes Silt 0.975, base saturation, 0.554, calcium, 0.936, clay, 0.944, organic carbon, 0.974, sodium, 0.960 and water holding capacity 0.983 respectively. The positive regression coefficients constitute silt, 0.17, base saturation, 0.47, calcium, 0.38, organic carbon, 1.86, sodium, 5.64 and water holding capacity, 0.03 respectively from the upper to the bottom slopes. This suggest that, species richness is expected to be higher in every unite increase in the organic carbon, silt, base saturation, calcium, clay, sodium and water holding capacity.

Table 6: Species Richness Rotated Component Matrix[a] Extraction Method: Principal Component Analysis Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 11 iterations.

	Component										
	1	2	3	4	5	6	7	8	9	10	11
Species	.605	-.140	-.075	-.011	.029	.037	.094	.087	.137	-.007	.707
WHC	-.019	.000	-.021	-.044	-.002	.101	-.042	-.051	.983	.060	.048
FineSand	-.814	.296	.262	.001	.164	.157	-.031	.098	.050	-.074	.045
Silt	.975	-.101	-.036	-.008	.022	-.099	-.005	-.019	-.037	.014	.052
OrganicC	-.053	.006	.045	.015	.046	.000	.974	-.057	-.043	.111	.011
SoilPH	.215	.094	.921	.121	.097	-.057	.083	-.003	-.002	.005	.005
BaseS	-.037	.554	.401	.063	.300	.152	-.231	-.046	-.062	.033	.487
Calcium	.142	.123	.139	.041	.936	-.096	.058	-.116	.002	-.059	.053
Magnesium	-.498	.331	.499	-.070	.311	.271	-.095	.056	-.101	.018	-.052
Sodium	.162	-.085	.005	-.026	-.105	.018	-.059	.960	-.054	-.087	.032
Potassium	.036	.008	.036	.957	-.035	.002	.000	-.058	-.056	-.025	-.012
EAcid	-.040	-.943	-.075	-.084	-.066	.091	-.047	.091	-.012	.068	.079
CEC	-.177	.395	.203	.604	.280	.359	.043	.108	.040	.039	.058
Gradient	.912	.089	.104	-.035	.077	-.046	-.059	.176	.005	.051	.062
Elevation	.956	.091	.156	-.012	.036	-.065	.000	.088	.000	.001	.054
DCrestS	-.929	-.132	-.174	-.005	-.165	.047	.061	-.073	-.003	-.008	-.115
Clay	-.194	-.054	-.018	.085	-.094	.944	-.002	.010	.111	.039	.040
CoarseS	.080	-.054	.009	-.013	-.051	.039	.113	-.083	.062	.979	.002

Similarly, the component matrix loads strongly and have negative regression coefficient. The component matrix comprises soil PH 0.921, potassium, 0.957, gradient, 0.912, elevation, 0.956 and coarse sand, 0.979 respectively. The negative regression coefficient varies from soil PH, -0.44, potassium, -2.26, gradient, -0.48, elevation, -0.29 and coarse sand, -0.01 from the upper to the bottom slopes. This indicates that, species richness is expected to be low in every unite decrease in the gradient, elevation, coarse sand, soil PH and potassium.

5. CONCLUSIONS

Study of the relative influence of edaphic factors-site characteristics on vegetative parameters along a toposequence was conducted. The results revealed that, the soil texture varies from coarse, fine, silt and clay soil. Coarse sand was the dominant soil in the upper, middle and bottom slopes. The dominant of Coarse sand affects its ability to retain moisture. Water holding capacity was low and soil PH was acidic along the slope facets. Organic carbon, exchangeable calcium, magnesium, sodium, and potassium were generally low in the upper, middle and bottom slopes. Exchangeable acid, cation exchange capacity and base saturation were also low in the upper, middle and bottom slopes. There was slight decrease on chemical properties in the middle slope and slight increase in the bottom slope. Silt, clay, gradient and elevation dominated and were effective across the vegetative parameters in the multiple linear regression analysis. Though, find sand and distance between the streams and crest summit were not effective on vegetative parameters in the study area. The study further revealed that, the model explains (R-Square) 76.9%, (Adjusted R) 49.5% and R-square 59.1% variation of (17) edaphological factors and site characteristics, when regressed with tree height along the upper, middle and bottom slopes segments of the toposequence respectively. The influence of edaphic factors and site characteristics on tree density explains (R) 63.9%, (Adjusted R) 26.8% and R-square 40.8% variation respectively in the upper, middle and bottom slopes segments along the catena. On species richness, edaphological factors and site characteristics explains (R) 74.2%, (Adjusted R) 44.5% and R-square 55.1% variation of species richness respectively along the toposequence. The results revealed that, edaphic factors and site characteristics greatly influence vegetative parameters. The study therefore recommends vegetation conservation and sustainable management strategies in the area.

Table 7: Species RichnessCoefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-26.967	19.395		-1.390	.169
	WHC	.034	.021	.139	1.625	.108
	FineSand	-.032	.348	-.022	-.093	.927
	Silt	.176	.185	.470	.949	.346
	OrganicC	1.861	1.236	.129	1.506	.137
	SoilPH	-.448	1.441	-.033	-.311	.757
	BaseS	.479	.181	.334	2.643	.010
	Calcium	.380	1.305	.031	.292	.771
	Magnesium	-3.898	1.832	-.281	-2.128	.037
	Sodium	5.643	3.497	.154	1.614	.111
	Potassium	-2.267	3.404	-.064	-.666	.508
	EAcid	5.044	3.404	.152	1.482	.143
	CEC	.129	1.076	.014	.120	.905
	Gradient	-.487	.526	-.198	-.926	.357
	Elevation	-.290	.771	-.170	-.377	.707
	DCrestS	-.006	.008	-.405	-.785	.435
	Clay	.059	.050	.114	1.177	.243
	CoarseS	-.001	.010	-.011	-.122	.903

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