Sjournals
Scientific Journals
Scientific Journal of Biological Sciences (2012) 1(2) 61-69

Contents lists available at Sjournals
Scientific Journal of
Biological Sciences
Journal homepage: www.Sjournals.com

Original article

Floristics and structure of fallow vegetation

R.M. Ubom, F.O. Ogbemudia, R.E. Ita
Department of Botany and Ecological studies, University of Uyo, Uyo, Akwa-Ibom State, Nigeria

*Corresponding author; Department of Botany and Ecological studies, University of Uyo, Uyo, Akwa-Ibom State, Nigeria; Tel: + 234837927465

ARTICLE INFO

Article history:
Received 02 July 2012
Accepted 20 August 2012
Available online 29 August 2012

Keywords:
Floristics
Vegetation-environment
Soil
Phosphorus
Magnesium
Potassium
Exchangeable acidity

ABSTRACT

Vegetation-environment (soil) was studied in fallow plots in Uyo, ranging from 0-year-old to 6-year-old. Systematic sampling method was used to sample both vegetation and soil. The parameters determined for vegetation included; Height, Frequency, Basal area and Crown cover for all species. The soil physical and chemical properties were also determined. Results obtained showed that there were eight (8) plant species in the 0-year old plot, 12 species in the 2-year old plot, 20 species of plants in 4-year old plot and 23 species of plants in the 6-year old plot. The soils were acidic across the years of fallow, but most acidic in 6-year old plot. Organic carbon was high in 4-year old plot, exchangeable cations decreased along the fallow, available phosphorus increased in 0, 2 and 4 year old and decreased in 6-year old plot. The percentage of sand increased as years of fallow increased. The texture of the soil in all the plots was loamy sand. Correlation co-efficient of soil parameters showed that magnesium, potassium, zinc, irons, silt, organic carbon, calcium, exchangeable acidity, total nitrogen, base saturation influenced the vegetation parameters. The vegetation parameters were significant at P = 0.05.

1. Introduction

Over a large area of the humid tropics where fallowing of agricultural land is practiced, secondary succession on abandoned farmland provides the means of rehabilitating land for renewed cropping. This is also interrelated with bush fallowing. The relationship between the time the land is cultivated and the time it is left to fallow is critical to the stability of shifting cultivation systems (Oke and Isichie, 1997). The longer a field is cropped, the greater the loss of organic matter, the reduction in the cation exchange capacity and in nitrogen and phosphorus, the greater the increase in acidity, the more likely soil porosity and infiltration capacity is reduced (Whitemore, 1990). According to Dowdle and Vonuexkull (1998), clearing a tropical forest (or fallow plots) before the end of the fallow period will increase nutrient losses by leaching and erosion and decrease nutrient availability in soils. The growth and establishment of a forest is a function of changes in soil properties induced by progressive colonization of the land by different species (Dutta, 2002). The variability in height, coverage, density and basal area of species in shifted plots is brought about by their prospective responses to the environmental factors (Suzuki, 1997). Litter from vegetation sources increases the soil nutrient availability to the plants, Ala *et al* (1997). Thus it may be said that nutrient availability increases with an increase in fallow years. Edet (2001) stated that phosphorus released from the decaying leaves is quantitatively captured by the surface roots in the top 5cm of soil and subsequently taken up by plants. Edet (2001) stated that the restoration of soil fertility during fallow depends on the nature of the vegetation as well as the soil. Edet (2001) pointed out that though there is high nutrient accumulation, some nutrient may be lost during the fallow period by the combined forces of run-off, water erosion, leaching and denitrification processes. The Nitrogen contents of the soils are significantly higher in soils under these predominant fallow species than the exotic tree species (Ano, 1997). Therefore, the study objective is aimed at explaining the vegetation components and their attributes within the fallow plots and thus correlate soil factors and the vegetation component variables of the fallow plots with the structure of the fallow vegetation.

2. Materials and methods

2.1. Study area

This study was carried out in University of permanent site in Uyo local government Area of Akwa Ibom State. Akwa Ibom State is situated between latitudes $4^0$31 and $5^0$30N and longitude $7^0$31 and $8^0$20E. It has a total land area of about 8,412km^2 (Slus, 1989). The topography is plain/flat, the surrounding lands are cultivated. The area has characteristically two season dry and wet season. The dry season of the area occurs between November and April, while the wet season stretches between May and October. Rainfall is heavy and ranges from 3,000mm along the coast, but decreases to 2,000mm on the North fringe. Mean temperature of the area is usually uniformly high throughout the year with slight variation between $25^0$6 and 28c. Relative humidity is high between 75% and 85%.

The study covers an area of about twenty hectares upon which vegetation and soil were sampled. The vegetation is dense and evergreen in some plots.

2.2. Vegetation and soil sampling

Systematic (vegetation and soil) sampling method was used to sample the vegetation in 5m x 5m quadrats, spaced at regular intervals of 25m along established transects. In each quadrat, vegetation components (plants) were identified to species level and their frequency and density were obtained by enumeration. Unknown species specimens were collected for identification and confirmation from voucher specimens in the Departmental Herbarium.

The parameters of the vegetation measured were frequency of plant species, height, density, basal area, and the crown cover. Using the soil auger in each of the quadrat, soil samples were obtained to a depth of 40cm. Two soil samples were collected in each quadrat and bulked into one composite sample. The soil samples were put in polythene bags and taken to the laboratory, the samples were air-dried at room temperature, crushed with mortar and pestle and then pressed through a 2mm – sieve plate and stored in polythene bags for chemical and physical properties analysis. A total number of 24 soil samples were collected. The soil analyses were carried out in the Department of soil science, University of Uyo, Uyo, Akwa Ibom State.

2.3. Physicochemical analysis of soil samples

Soil samples were analyzed following the standard procedures outlined by the Association of Official Analytical Chemist (AOAC, 1975). Soil pH was measured using Beckman's glass electrode pH meter (Meclean, 1965). Organic Carbon by the Walkey Black wet oxidation method (Jackson, 1962) available Phosphorus by Bray P-1 method (Jackson, 1992). The total Nitrogen content was determined by Micro-Kjeldahl method (Jackson, 1992). Soil particle size distribution was determined by the hydrometer method (Udo and ogunwale, 1986) using mechanical shaker, and sodium hexametaphosphate as physical and chemical dispersant. Exchange Acidity was determined by titration with 1N KCL (Kramprath, 1967). Total Exchangeable Bases were determined after extraction with 1M NH_4OAc (One molar ammonium acetate solution). Total Exchangeable Bases were determined by EDTA titration method while sodium and Potassium were determined by photometry method. The Effective Cation Exchange Capacity (ECEC) was calculated by the summation method (that is summing up of the Exchangeable Bases and Exchange Acidity (EA). Base Saturation was calculated by dividing total Exchangeable Bases by ECEC multiplied by 100. Heavy metals were analysed using Unicam 939 Atomic Absorption Spectrometer (AAS).

3. Results

The results of the vegetation analysis of the 0 year plot revealed that eight species of plants were identified (Table I). The vegetation characteristics showed that *Axonopus compressus* had the lowest frequency. *Telfairia occidentalis* had the highest frequency and was the most dominant (1800 ± 0.24 stems/ha). It also had the highest crown cover (10.4 ± 3.4m2/ha), *Manihot esculentus* was the only species that had basal area (0.00016 ± 0.000008) the rest were not measured because they were very tiny. *Manihot esculentus* was the tallest species with height of 0.90 ± 0.06m followed by *Pennisetum purpureum* with height of 0.63 ± 0.13m. *Chromolaena odorata* was the shortest species (0.15 ± 0.05m) followed by *Combretum racemosum* (0.25 ± 0.06m) and *Combretum zenkeri* and *Rauvolfia vomitoria* had the same height (0.35 ± 0.05m). The eight species from this plot represented 6 families and 7 genera. However most of the plant species in this plot were ephemerals with negligible girths and cover.

Table 2 shows the frequency, height, basal area and crown cover of the vegetation components of the 2-year old fallow. There were twelve (12) identified species belonging to 10 families and 12 genera. *Pennisetum purpuerum* had the highest density (6100 ± 1.56 stems/ha), followed closely by *Ipomoea involucrata, Chromolaena odorata, Aspilia africana, Calopogonium mucunoides* with 2300 ± 1.03, 1500 ± 2.37, 1500 ± 0.91 and 1500 ± 0.91 stems/ha, respectively. Anthocleista vogellii had the lowest density of 200 ± 0.00. *Pennisetum purpureum* was the tallest species with height of 1.29 ± 0.07m while *Colocasia esculentus* was the shortest species with a height of 0.9 ± 0.04m. *Anthocleista vogellii* had the highest basal area and also had the largest crown cover of 0.03 ± 0.001m^2/ha and 12.67 ± 3.14m^2/ha respectively. The values of the vegetation parameters are relatively low with respect to plant height and basal area.

Table 3 shows the vegetation Characteristics of 4-year old plot. Results revealed that the most dominant species was *Rauvolfia vomitoria* with density of 5800 ± 0.96 stems/ha followed by *Palisota hirsuta* (2500 ± 0.00) and *Chromolaena odorata* (1600 ± 0.71 stems/ha). The tallest species was *Ficus exasperata* with height of 4.93 ± 0.5lm followed *Hannoa Klaineana* (2.30 ± 0.05m) and *Barteria nigritiana* (2.26 ± 0.38m). The shortest species was *Commelina benghalensis* (0.43 ± 0.13m) followed by *Baphia nitida* (0.47 ± 0.08m). *Hannoa Klaineana* had the highest crown cover (4.91 ± 0.87m^2/ha) followed by *Harugana madagascariensis* (4.42 ± 2.65m^2/ha). *lcacina trichantha* had the lowest crown cover (0.12 ± 0.09m^2/ha) and this was followed by *Pennisetum purpureum* with (0.13 + 0.03m^2/ha). There were 20 species identified in the plot; these belonged to 17 families and 20 genera.

Table 4 shows result of the vegetation analysis in the 6-year old fallow. The table reveals that 23 species of plants were identified. These belonged to 16 families and 23 genera. *Pennisetum purpureum* and *Baphia nitida* were the most dominant plant species with density of 2200 ± 1.42 stems/ha and 1600 ± 1.41 stems/ha respectively. This was followed by *Costus schlechteri* (1600 ± 0.00 stems/ha). *Senna alata* was the tallest plant (12.15 ± 0.65m), while *Microdesmis puberula* was the shortes with height 0.30 ± 0.00m. *Senna alata* had the largest crown cover of 132.86 ± 10.20m^2/ha followed by *Harungana madagascariensis* (11.45 ± 4.23m^2/ha). The basal areas of the different plant species in this plot were relatively small. The most dominant family was Fabaceae with five members

Table 5 shows physical and chemical characteristics of the soils in the different fallow plots. The results showed that the pH of the soil in all the fallow plots was highly acidic in all years. Organic carbon was fairly low in all fallows but the highest concentration was in the 4-year old plot (4.49 ± 0.28%). 0-year-old plot and 2-year-old plot had the same organic carbon content (4.49 ± 0.28%). Available phosphorus was highest in 4-year old plot with mean of 68.62 ± 9.16mg/kg and the lowest was from 0-year plot with a value of 27.79 ± 3.13mg/kg. Calcium content was high in 6-year old fallow (4.63 ± 0.12mol/kg) and 2-year-old fallow had the lowest (4.07 ± 0.05mol/kg). Magnesium content was high in 2-year-old and 4-year old fallows. Sodium content in the soil was almost the same in 0-year and 2-year fallows. Similarly 4-year-old and 6-year-old fallows had same sodium content of 0.12 ± 0.006mol/kg and 0.12 ± 0.009mol/kg. There was a gradual increase in potassium content from 0-year old to 4-year old, but the potassium later dropped in 6-year old fallow. Total nitrogen decreased with increase in fallow years, while exchangeable acidity decreased with increase in fallow years. Effective Cation Exhange Capacity (ECEC) values decreased in fallow years Base saturation was high and increased as the fallow year increased. Copper content was high in all fallow years. Zinc content was low and increased with the increasing fallow years. Iron concentration was high in all fallows with the highest mean value of 91.70 ± 7.20mg/L in 4-year fallow.

Generally, the pattern of distribution of soil properties showed variations among the plots. Soil physical characteristics of the study area showed that 6-year old plot had the highest sand content. The percentages of silt and clay were highest in 2-year-old plot. The soil texture of all the fallows was sandy-loam.

Table 5

Summary of mean (±) soil parameters for fallow vegetation.

Parameter	0-year	2-year	4-year	6-year
pH	4.70 ± 0.14	4.78 ± 0.05	4.65 ± 0.03	4.60 ± 0.04
E.C (ds/m)	0.07 ± 0.03	0.11 ± 0.07	0.04 ± 0.006	0.04 ± 0.002
Organic carbon (%)	4.49 ± 0.18	4.49 ± 0.28	4.87 ± 0.25	4.41 ± 0.14
AV.P (mg/kg)	27.79 ± 3.13	51.73 ± 3.07	68.62 ± 9.16	42.31 ± 6.13
Total N (%)	0.14 ± 0.02	0.12 ± 0.006	0.12 ± 0.009	0.11 ± 0.004
Ca (cmol/kg)	4.28 ± 0.31	4.07 ± 0.05	4.23 ± 0.44	4.63 ± 0.12
Mg (cmol/kg)	1.30 ± 0.04	1.40 ±0.04	1.40 ± 0.09	1.25 ± 0.06
Na (cmol/kg)	0.11 ± 0.0047	0.11 ± 0.005	0.12 ± 0.006	0.12 ± 0.009
K(cmol/kg)	0.19 ± 0.01	0.20 ± 0.004	0.22 ± 0.009	0.16 ± 0.05
EA(cmol/kg)	2.37 ± 0.33	1.73 ± 0.12	1.50 ± 0.13	1.37 ± 0.11
ECEC(cmol/kg)	8.24 ± 0.52	7.52 ± 0.15	7.47 ± 0.44	7.67 ± 0.22
B.S (%)	71.55 ± 2.95	77.01 ± 1.13	79.49 ± 2.58	81.94 ± 1.84
Cu^{2+} (mg/L)	5.96 ± 0.29	5.05 ± 0.17	9.26 ± 0.37	8.97 ± 0.04
Zn^{2+} (mg/L)	2.86 ± 0.07	3.96 ± 0.31	5.19 ± 0.21	5.96 ± 0.21
Mn ((mg/L)	10.36 ± 0.26	9.37 ± 0.25	19.15 ± 3.67	33.76 ±3.07
Pb (mg/L)	0.97 ± 0.12	1.25 ± 0.05	1.87 ± 0.13	4.09 ± 0.76
Fe (mg/L)	71.22 ± 3.69	85.13 ± 10.37	91.70 ± 7.20	79.34 ± 3.05
Sand %	81.34 ± 2.89	76.34 ± 4.08	82.34 ± 2.16	83.34 ± 2.38
Silt %	6.14 ± 2.63	10.99 ± 3.29	5.64 ± 0.82	5.64 ± 2.16
Clay %	12.52 ± 2.63	12.52 ± 0.96	12.02 ± 1.83	11.02 ± 0.58
Soil texture	Loamy-sand	Loamy-sand	Loamy-sand	Loamy-sand

Table 6 shows correlation coefficients between soil and vegetation parameters of 0-year-old plot. The pH correlated negatively but significantly with density of species while E.C, total nitrogen clay correlated positively and significantly with density. Calcium and Iron correlated positively with frequency while lead (Pb) correlated negatively with frequency. There was a positive correlation between total nitrogen, clay and the height of the plant species while lead correlated negatively with height. pH correlated negatively with crown cover and EC, total nitrogen and clay correlated positively with the crown cover.

Table 7 shows correlation coefficients of soil and vegetation parameters of 2-year old fallow. Calcium correlated positively with frequency while clay and copper correlated negatively with frequency. The height of the plant correlated negatively with copper and lead but positively with Iron.

Table 6
Correlation coefficients of vegetation soil parameters for 0-year old fallow.

Parameters	Density	Frequency	Height	Crown cover
pH	- 0.97*	- 0.64	- 0.98	- 0.99*
E.C	0.99*	0.54	0.84	0.99*
Organic matter	- 0.75	0.07	- 0.35	- 0.75
Total nitrogen	0.97*	0.76	0.96*	0.97*
Available P	- 0.34	0.31	0.03	- 0.31
Calcium	0.58	0.98*	0.89	0.59
Magnesium	0.00	0.71	0.43	0.02
Na	0.21	- 0.30	- 0.09	0.17
K	- 0.69	- 0.48	- 0.67	- 0.72
EA	- 0.15	0.37	0.12	- 0.19
ECEC	0.23	0.86	0.62	0.21
B.Sat	0.29	0.0004	0.18	0.34
Sand	- 0.6	0.00	- 0.29	- 0.58
Silt	- 0.30	- 0.77	- 0.63	- 0.33
Clay	0.97*	0.77	0.96*	0.96*
Zinc	- 0.60	- 0.53	- 0.60	- 0.56
Cu	- 0.38	- 0.07	- 0.27	- 0.43
Mn	- 0.59	- 0.14	- 0.42	- 0.63
Pb	- 0.77	- 0.97*	- 0.97*	- 0.77
Fe	0.49	0.99*	0.85	0.49

*Significant at P = 0.05

Table 7
Correlation coefficients of vegetation soil parameters for 2-year old fallow.

Parameters	Density	Frequency	Height	Crown cover
pH	- 0.38	- 0.09	0.32	0.42
E.C	- 0.43	- 0.51	- 0.15	0.006
Organic matter	0.44	0.69	0.57	0.94
Total nitrogen	0.41	0.67	0.64	0.56
Available P	- 0.36	- 0.41	- 0.01	0.14
Calcium	0.94	0.99*	0.86	0.77
Magnesium	0.00	0.00	- 0.40	- 0.54
Na	- 0.09	0.09	- 0.13	- 0.24
K	- 0.85	- 0.85	- 0.51	- 0.36
EA	- 0.52	- 0.40	- 0.08	- 0.64
ECEC	- 0.12	0.003	- 0.29	- 0.41
B.Sat	0.65	0.53	0.65	0.69
Sand	0.85	0.85	0.51	0.36
Silt	- 0.78	- 0.77	- 0.39	- 0.24
Clay	- 0.94	- 0.97*	- 0.88	- 0.79
Zinc	0.01	- 0.34	- 0.63	- 0.66
Cu	0.83	- 0.96*	- 0.97*	- 0.91
Mn	0.72	0.91	0.93	0.88
Pb	- 0.89	- 0.94	- 0.96*	- 0.93
Fe	0.12	0.03	0.97*	- 0.58

*Significant at P = 0.05

Table 8
Correlation coefficients of vegetation soil parameters for 4-year old fallow

Parameter	Density	Frequency	Height	Crown cover
pH	- 0.40	- 0.58	- 0.53	- 0.07
E.C	- 0.91	- 0.77	- 0.82	- 0.99*
Organic matter	- 0.54	- 0.74	- 0.68	- 0.09
Total nitrogen	- 0.73	- 0.88	- 0.84	- 0.32
Available P	- 0.87	- 0.82	- 0.83	- 0.74
Calcium	- 0.55	- 0.32	- 0.39	- 0.89
Magnesium	- 0.59	- 0.95*	- 0.44	- 0.91
Na	0.64	0.77	0.73	0.19
K	0.53	0.29	0.36	0.82
EA	0.97*	0.88	0.91	0.93
ECEC	- 0.36	- 0.12	- 0.19	- 0.78
B.Sat	- 0.80	- 0.62	- 0.68	- 0.99*
Sand	- 0.96*	- 0.93	- 0.95*	- 0.87
Silt	0.65	0.82	0.77	0.18
Clay	0.85	0.73	0.78	0.95
Zinc	- 0.99*	- 0.98*	- 0.99*	- 0.83
Cu	- 0.11	- 0.35	- 0.28	0.40
Mn	- 0.88	- 0.76	- 0.80	- 0.86
Pb	- 0.87	- 0.92	- 0.90	- 0.54
Fe	- 0.08	- 0.13	- 0.13	- 0.11

*Significant at P = 0.05

Table 9
Correlation coefficients of vegetation soil parameters for 6-year old fallow

Parameters	Density	Frequency	Height	Crown cover
pH	0.59	0.82	0.63	0.79
E.C	0.04	0.43	0.18	0.39
Organic matter	0.93	0.93	0.88	0.92
Total nitrogen	0.99*	0.82	0.89	0.83
Available P	0.12	0.35	0.09	0.30
Calcium	- 0.91	- 0.92	- 0.99*	- 0.94
Magnesium	- 0.94	- 0.77	- 0.91	- 0.80
Na	0.46	0.52	0.67	0.56
K	- 0.85	- 0.99*	- 0.96*	- 0.99*
EA	0.18	0.51	0.51	0.52
ECEC	- 0.37	- 0.60	- 0.66	- 0.62
B.Sat	- 0.26	- 0.56	- 0.57	- 0.58
Sand	- 0.10	0.14	0.22	0.16
Silt	0.14	0.00	- 0.13	- 0.03
Clay	- 0.14	- 0.58	- 0.40	- 0.55
Zinc	- 0.62	- 0.57	- 0.75	- 0.61
Cu	- 0.73	- 0.34	- 0.49	- 0.36
Mn	- 0.11	- 0.55	- 0.38	- 0.53
Pb	- 0.99*	- 0.91	- 0.97*	- 0.92
Fe	0.05	- 0.32	- 0.29	- 0.32

*Significant at P = 0.05

Table 8 shows the correlation coefficients of soil and vegetation parameters of 4-year-old fallow. Density correlated positively with Exchangeable Acidity (EA) and negatively with sand and zinc. Frequency correlated negatively with magnesium and zinc. Height of the plants correlated negatively with sand and zinc while crown cover correlated negatively with EC, base saturation and positively with clay.

Table 9 shows the correlation coefficients of soil and vegetation parameters of 6-year-old fallow. Density correlated positively with total nitrogen and negatively with lead. Frequency correlated negatively with potassium. The height of the plant species correlated negatively with calcium, postassium and lead. Crown cover correlated negatively with potassium.

4. Discussion

The floristic composition of the fallow vegetation was very low compared to the study area. The vegetation shows variations in the structural characteristics and this may be attributed to the prevailing environmental/soil conditions as well as rate of litter falls in each of the fallows. There was variability in the values of density, basal area, height and crown cover of the fallow areas. 0-year-Old fallow and 2-year-Old fallow had lowest density of plant species (table 1 and 2) while 4 year old fallow and 6-year-old fallow had higher density of plants (Table 3 and 4). These reflected the stages and development of the vegetation. High density shows the maturity stage of development of the vegetation while low density shows the juvenile stage of development. The girth size of plant species in all the fallow areas (Table 1, 2, 3 and 4) were very low and less than $1m^2$/ha. A girth size less than $1m^2$/ha show that the vegetation was not fully mature. The girth size could have been affected by the rate of biomass production which is seen to be a function of soil fertility and nutrient availability. The mean height of the plants varied across the fallow years. The species of plants in 0-year-old fallow were very low in height and this could be attributed to insufficient litter in the fallow which could have added nutrients to the soil. The height of species kept increasing as the fallow increased due to a greater addition of litter in the respective plots and this also represented that as the years of fallow increased, the maturity stage also increased. The general survey of the study area revealed that few plant species were dominant. With long periods of fallow, plant debris helped in replenishing the soil nutrients which influenced the establishment of new plant species. The humus from these plant litters served as a reservoir of mineral nutrients that are made available to plants. This probably brought about the dominance of certain species.

The summary of soil analysis for particle size determination showed that the soils of the study plots were predominantly sandy. Texturally, the soils were loamy-sand throughout all the years. The soils were highly acidic but most acidic in 6-year-old plot, due to high degradation of litter in the plot. Organic carbon, available phosphorus total nitrogen, Magnesium and Potassium across the fallow years increased except in 6-year-old plot where there was a decrease. This decrease was due to the fact that there was increase in number of plants species than what those elements could support, hence there was competition/rapid uptake of these element which led to their decrease in the soil. For these elements to be high in quantity in the soil there must be a balance/equilibrium between the density of plant and the elements. Base saturation increased as the years of fallow increased. This could have been caused by low/decrease in exchangeable acidity in the soil as the fallow increased. Copper, zinc manganese and lead increased along the fallow plots due to high increase in litter fall as the fallow period increased and these elements were added to the soil during decomposition or degradation of these litters. Iron increased along the fallow but later decreased in 6-year-old plot. Atmospheric fallout could be responsible for the high level of this element in 0, 2 and 4 year old plot. A study has shown that the fallout of Iron and Copper to soils as a result of human activity is widespread (Bridges, 1992). Again the increase in iron in the three plots could be due to plant requiring them in little quantities while decrease in 6-year-old plots may be due to plants requiring them in high quantities.

4.1. Vegetation-soil correlates

Correlations represent the pattern of interrelationship, between the vegetation and soil characteristics. Most of the soil properties were significant in determining the vegetation properties in the study plots. However, variations occurred in the level of correlation of the vegetation components which relate the species responses to complex soil variables. Table 6 showed that pH correlated negatively with density in the 0-year plot signifying that the higher the acidity of the soil, the lower the density of plants. EC, total nitrogen and clay correlated positively with density in the 0-year-plot. This signifies the EC, total nitrogen and clay have a major role to play in other to increase the density of the plant species. In other words their increase will cause a corresponding increase in density. Frequency correlated positively with calcium and Fe and negatively with lead in the 0-year-old fallow. The former shows that high quantity of Calcium and Iron will increase the occurrence of plants species while the latter shows that lead in high quantity will cause a decrease in the frequency of plants. Height correlated with total nitrogen and clay positively and negatively with lead in the 0-year-old plot. This shows that the presence of nitrogen and clay in the soil play a lot of role in increasing plant height while the lead in high amount causes stunting in plants. Clay correlated positively with crown cover signifying that it high amount in the soil will cause an increase in the coverage of plants.

In the 2-year-old plot (Table 7), frequency correlated positively with Calcium and negatively with Clay and Copper. The positive correlation shows that as the Calcium increases, the occurrence of the plants increased while the negative correlation shows that Clay and Copper have minute roles to play towards the occurrence of plants. Height correlated negatively with Copper and Lead, and positively with iron in the 2-year-old plot.

In the 4-year-old plot (Table 8), density correlated with sand and zinc negatively signifying that a sandy and porous soil together with high zinc content in the soil do cause a decrease in the density of plants. Frequency correlated negatively with magnesium and zinc in the 4-year old plot representing that these two elements play a minor role in the occurrence of the species of plants. There was a negative correlation between the EC and Base saturation and a positive correlation between Clay and Crown cover.

In the 6 year old fallow (Table 9), frequency correlated negatively with Potassium signifying that as the frequency of the plant increased, the potassium decreased. Calcium, Potassium and lead correlated negatively with height showing that their increase may not favour plant height. Potassium correlated negatively with crown cover indicating that an increase in the crown cover of the plants caused a decrease in potassium in the soil.

Conclusively, the study shows that there is variation in the vegetation and soil parameters at different years of fallow. The vegetation performance is influenced by pH, nutrient cations and soil texture. pH is the stress factor, in that vegetation show adaption or tolerance to it, although some species may be confined to certain pH ranges.

Positive relationships of species to the nutrient cations and soil texture are indicating of the importance of soil texture and nutrient relationships in the productivity of the fallow ecosystem. Correlation coefficients showed that soil properties such as organic carbon, Mg, K Na, Calcium, Base saturation point, Nitrogen, phosphorus influenced vegetation parameters.

5. Conclusion

The study strongly recommends that farmers should be encouraged to practice bush fallowing not the slash and burn shifting cultivation. This method will enhance, maintain and restore soil fertility as well as increase soil nutrients. It is also recommended that, farmers should allow their plots of land to fallow for at least a minimum of 4-years, as this will improve maturity, strength and stability of the soil. Research institutes and Universities in the country should be given the mandate to enable them focus more attention on the development of productive systems of land use.

References

Ano, A.O., 1997. Effectiveness of Selected Indigenous and Exotic Multipurpose trees in soil fertility regeneration of highly weathered acid soil of Eastern Nigeria Conference Proceedings of Forestry Association of Nigeria (presented paper).

AOAC, 1975. Association of Official Analytical Chemist. Methods of Analysis, 12th edition. AVI Publishing Company Inc. Washington DC. 986p.

Bridges, E.M., 1992. Soil contamination and pollution Annual report. International Soil Conference and Information Centre, Wageningen. 270 pp.

Dowdle, Vonuexkull, 1988. The Study of Shifting Cultivation. Current Anthropol. 2(i), 27-61.

Dutta, A.C., 2002. Botany for Degree Students 6th ed. Manzar Khran, New Delhi. p 907.

Edet, J.M., 2001. The Effect of Shifting Cultivation on Nutrient Levels of Soil and Vegetation. Undergraduate project department of Botany, University of Uyo. p 45.

Jackson, M.I., 1962. Soil Chemical Analysis. Prentice-Hall Inc. Englewood Cliffs, New Jersey; 498p.

Jackobson, S.T., 1992. Chemical Reactions and Air Change during Decomposition of Organic matter. Res. Conserve and Recycle. 6, 259-266.

Kramprath, E.J., 1967. Conservation of soils and Tissue Testing for Accessing the phosphorus status of soils. In: The Role of phosphorus in Agriculture. Khagwnch (ed). Ameri. Soci. Agron. 433-469

Meclean, I.O., 1965. Aluminum. Agron. J. 9, 978-988.

Oke, S.O., Isichie, A.O., 1997. Floristics and Structure of the Fallow Vegetation in the Ile-Ife area of Southwestern Nigeria. Nigerian J. Botan. 10, 37-50.

Slus, A.k., 1989. Soil and Land use Survey Akwa Ibom State. Government Printer, Uyo.

Suzuki, D., 1997. The Sacred Balance. Rediscovering our place in nature. MIR publisher, MosCow.

Udo, E.J., Ogunwale, J.A., 1986. Laboratory Manual for the Analysis of Soil, Plants and Water Sample. University of Ibadan Press, Ibadan.

Whitemore, F., 1990. The Vegetation of Africa, UNESCO, Paris.