

## Tree Species Diversity within Kaduna State College of Education (KSCOE) Gidan Waya, Nigeria

By

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Bayero University Kano, NigeriaEmail: [zankanabdul@gmail.com](mailto:zankanabdul@gmail.com)**ABSTRACT**

Vegetation is an important component of the ecosystem that provides habitat for wildlife and maintains the functioning of the ecosystem. Trees play a vital role in the interconnected system of life on earth such as control of soil erosion, watershed management, windbreak and shelterbelt, desertification control and climate change mitigation. The ever increasing demand for the establishment of higher institutions of learning due to high population growth causes the depletion of tree species density and diversity in Nigeria. However, this study assesses the diversity of tree species in Kaduna State College of Education Gidan Waya with a view to providing information for sustainable management and conservation of the remaining vegetation resources. Stratified sampling design was used to group the study area into three land use types, namely: Plantation, Built-up Areas and Farmland. Data for this study were collected from 24 temporary sample plots of 20 × 20m laid out systematically across the study sites. The laying of the sampling plots was based on the extent of the land use type in the study area. Within each plot, tree species density and diversity, height, dbh were obtained. Trees with diameter at breast height (dbh) ≥ 10 cm were identified and their dbh measured. Data were analyzed using descriptive statistics. A total of 217 individual stands of woody species were identified and enumerated within Kaduna State College of Education Gidan Waya, representing forty (40) species of trees which cut across twenty (20) family and thirty eight (38) genera. *Gmelina arborea* had the highest density of 240, followed by *Parkia biglobosa* (94). It was recommended that farming, woodfuel collection, timber extraction, bush burning and grazing of livestock be prevented in the Campus in order to allow indigenous species to thrive well and trees should be planted in the affected areas.

**INTRODUCTION**

Vegetation is an important component of the ecosystem that provides habitat for wildlife and maintains the functioning of the ecosystem. Trees play a vital role in the interconnected system of life on earth, such as control of soil erosion, watershed management, windbreak and shelterbelt, desertification control and climate change mitigation. Others vital roles include being sources of income to people, through the sale of woodfuel, timber, edible fruits, leaves and other non-timber forest products and also importantly providing cultural values such as medical, spiritual, aesthetic, historical *et al* values (Wakawa *et al*, 2016). Vegetation is defined as a system

of largely spontaneously growing plants (van der Maarel, 2005). The ever increasing demand for the establishment of higher institutions of learning due to high population growth causes the depletion of tree species density and diversity in Nigeria. Tree species diversity varies from one location to another, depending on different factors, such as the weather and climatic conditions of the area, edaphic factors and anthropogenic disturbances.

Nigeria is blessed with rich biodiversity with an estimated plant species of 5103 of which 171 are endangered (FEPA, 1992 in USAID/Nigeria, 2008). However, most of these plant species are disappearing at an alarming rate due to clearing for road construction, settlement, farming, timber, woodfuel or for feeding of livestock. For example, Keenan *et al* (2015) reported that the highest net losses in forest area between 2010 and 2015 in Africa were in Nigeria (410K ha  $y^{-1}$ ), Tanzania (372K ha  $y^{-1}$ ), Zimbabwe (312K ha  $y^{-1}$ ) and Democratic Republic of Congo (311K ha  $y^{-1}$ ). The vegetation of the study area is a Guinea savanna type which has been altered by human activities such as woodfuel collection, overgrazing, urbanization, land clearing for agriculture and bush burning (Abdul, 2010).

There is the need for deliberate and consistent effort towards the management and conservation of vegetation resources in Nigeria so that we may avoid the scarcity of this resource in future time. Accurate and adequate information on the composition and diversity of tree species is an important step towards the management and conservation of our vegetation resources. For example, Ikyaagba *et al*, (2015) reported that species of plants that are thought to be abundant in a particular habitat might actually be endangered, while those thought to be endangered might be on the verge of extinction due to limited data on floristic composition of the area. In the case of KSCOE, no detailed information has been documented concerning the diversity of tree species which is a vital instrument for management and conservation of tree resources especially that this institution serves as the main seed source for several forest related departments in the state, courtesy of its perimeter fencing which excludes illegal felling. Therefore, the aim of this paper is to assess the diversity of tree species in Kaduna State College of Education Gidan Waya, Nigeria, with a view to providing data for sustainable management and conservation of the remaining vegetation resources.

## MATERIALS AND METHODS

### *Study Area*

The study area is found in Jema'a Local Government Area of Kaduna State. Jema'a local government is located between latitudes 9° 11' to 9° 30' N and longitudes 8° 00' to 8° 30' east of the Greenwich Meridian. It has AW type of climate, as classified by Koppen. It is characterized by two distinct seasons: wet and dry. The wet season occurs between April to October with a peak of rainfall in August, and dry season occurs between November to March. These seasons are influenced by the tropical maritime and tropical continental air masses. The mean annual rainfall is about 1800mm and the mean monthly temperature is 25°C, while relative humidity is about 62% (Abaje and Giwa 2007, as cited in Ishaya and Abaje 2008).

The vegetation of the study area is a Guinea savanna type, as classified by Udo (1970) in Abdul (2010). It is a savanna woodland, characterized by tall trees of about 20-40m predominates, shrubs and tall grasses up to 3m tall. Some of the tree species found in the area includes: *Ceiba*

*petandra*, *Parkia biglobosa*, *Khaya senegalenses*, *Mangifera indica*, *Vitex doniana*, *Anogeissus leiocarpus*, *Borrassus aethiopum*, *Piliostigma thonningii*, *Prosopis africana* and grasses like elephant grass, *Andropogon gayanus* and *tridax* are common

### Data Collection

Stratified sampling design was used to group the study area into three land use types, namely: Plantation, Built-up Areas and Farmland. Data for this study were collected from 24 temporary sample plots of 20 × 20m laid out systematically across the study land use types. The laying of the sampling plots was based on the extent of the land use type in the study area. These include Plantation, six (6), Built-up areas eight (8) and farmland ten (10). Within each plot, tree species density and diversity, height, dbh were obtained. Trees with diameter at breast height (dbh) ≥ 10 cm were identified and their dbh measured.

## PROCEDURE FOR DATA ANALYSIS

### Species Density (SD)

Species density which refers to the total number of individual trees in a unit area (Peterson, 2009), was determined by summing up the number of individuals of respective species in the study area and expressing it on per hectare basis (Hundera and Deboch, 2008 as cited by Dangulla, 2013).

(1)

### Relative Density

Species relative density (RD), which is an index for assessing species relative distribution, (Brashears et al, 2004 in Agbelade et al, 2016) was computed with equation

$$RD = (n_i/N) \times 100 \quad (2)$$

Where: RD (%) = species relative density;  $n_i$  = number of individuals of species  $i$ ;  $N$  = total number of all individual trees of all species in the entire community.

### Basal Area

Basal area (BA) which measured the cross-sectional area of tree trunk at DBH was calculated using

$$BA = (\pi/4 \times 10000) \times DBH^2 \quad (\text{Larsen, 1999}) \quad (3)$$

Where BA= Basal area in square metres (m<sup>2</sup>), DBH= Diametre at breast height

$$\pi = 3.1415 \quad (\text{constants})$$

### Species Relative Dominance

Species relative dominance (RDo) used in assessing relative space occupancy, was estimated using equation

$$RDo = (\sum Bai \times 100) / \sum Ban \quad (4)$$

Where:  $Bai$  = basal area of all trees belonging to a particular species  $i$ ;  $Ban$  = basal area of all trees in a city.

### Species Diversity (D)

Shannon–Weiner (1949) diversity index as cited by Abagai (2011) was employed to determine the diversity of plant species in the sample plots

$$H' = - \sum_{i=1}^S p \ln(p) \quad (5)$$

Where  $H'$  = Shannon – wiener diversity index

$S$  = Total number of Species in the Community,  $P_i$  = Proportion of  $S$  made up of the  $i^{\text{th}}$  species,  $\ln$  = Natural Logarithm.

### **Species richness**

Species richness ( $d$ ) which is a count of the number of different species in a given area was calculated by the formula

$$d = S/\sqrt{N} \text{ (Margalef, 1958 in Danjibo, 2015).} \quad (6)$$

Where  $S$  = Number of Species,  $N$  = Number of Individuals of all species.

**Shannon's maximum diversity index** was calculated using the formula:

$$H_{\max} = \ln(s) \quad (7)$$

$S$  = Total number of species in the community

### **Species evenness**

Evenness ( $E$ ) as a measure of equitability of spread of available species in the community, was obtained using Shannon's equitability.

$$E = \frac{H'}{H_{\max}} = \frac{\sum_{i=1}^S p_i \ln(p_i) / \ln(S)}{\ln(S)} \quad (8)$$

Where  $H'$  = Shannon-wiener diversity index,  $P_i$  = Proportion of  $S$  made up of the  $i^{\text{th}}$  species

$\ln$  = Natural logarithm,  $S$  = Total number of species in the community

### **Importance Value Index**

The Importance Value Index (IVI) of each species was computed with the relationship:  $(RD + RD_0)/2$  (Brashears *et al.*, 2004 as cited by Agbelade *et al.*, 2016) (9)

## **RESULTS AND DISCUSSION**

### **Composition and Distribution of Tree Species in KSCOE**

A total of 217 individual stands of woody species were identified and enumerated within Kaduna State College of Education Gidan Waya, representing forty (40) species of trees which cut across twenty (20) families and thirty eight (38) genera (Table 1). Family Combretaceae recorded the highest number of species with 5 in three genera, followed by Mimosoideae which had four species in four genera, Caesalpinaceae, Fabaceae, Anacardiaceae and Rubiaceae with three species each, belonging to twelve genera. Families Moraceae, Leguminosae, Arecaceae, Annonaceae, and Euphorbiaceae, had two species each belonging to ten genera, and families Verbenaceae, Maliaceae, Lamiaceae, Sterculiaceae, Rutaceae, Tiliaceae, Sapotaceae, Pinaceae and Myrtaceae had one species each belonging to nine (9) genera.

The number of tree species (40) recorded in this study is lower than the 52 recorded by Ikyagba *et al.* (2015) in Federal University of Agriculture, Makurdi, Nigeria, but higher than the

29 species recorded by Ahmad (2012) in Kogo Forest Reserve, Katsina State, The differences in woody species in the different areas may be attributed to weather and climate and the level of human activities, such as farming, woodfuel collection by the neighbouring communities, timber extraction or level of management and conservation of the resources. In terms of frequency distribution, *Gmelina arborea* recorded the highest number of species (60) 27.8%, followed by *Parkia biglobosa* with (24) 11.1% and *Tectona grandis* with (18) 8.33%. This result is contrary to that of Wakawa *et al* (2016) who recorded *Azadrachta indica*, *Eucalyptus camaldulensis* and *Khaya senegalensis* as having the highest frequencies in Kano State University of Science and Technology, Wudil. The high number of *Gmelina arborea*, *Parkia biglobosa* and *Tectona grandis* found in the study area may be attributed to their role in rural livelihood and planted for the prevention of soil erosion so as to control further degradation of soil. Seventeen (17) species which recorded one stand (0.46%) each may be said to be endangered. This may be due to over exploitation for woodfuel, bush burning, farming, overgrazing, timber or erection of buildings. If severe exploitation continues, they might become extinct or disappear from the environment. Ikyaaagba *et al* (2015) also expressed similar view on some species in Federal University of Agriculture Makurdi, Nigeria. These species include: *Terminalia avicenioides*, *Cassia fistula*, *Nauclea latifolia*, *Chlorophora excelsa*, *Bridella ferruginea*, *Delonix regia*, *Pseudotsuga menziesii*, *Terminalia catapa*, *Zanthocylum zanthozyloides*, *Vitaleria paradoxa*, *Combretum micranthum*, *Syzygium cuminii*, *Piliostigma reticulatum*, *Anona senegalensis*, *Borassus aethiopum*, *Albizzia lebbeck* and *Acacia siberiana*.

**Table 1:** Tree Species Composition within Kaduna State College of Education Gidan Waya

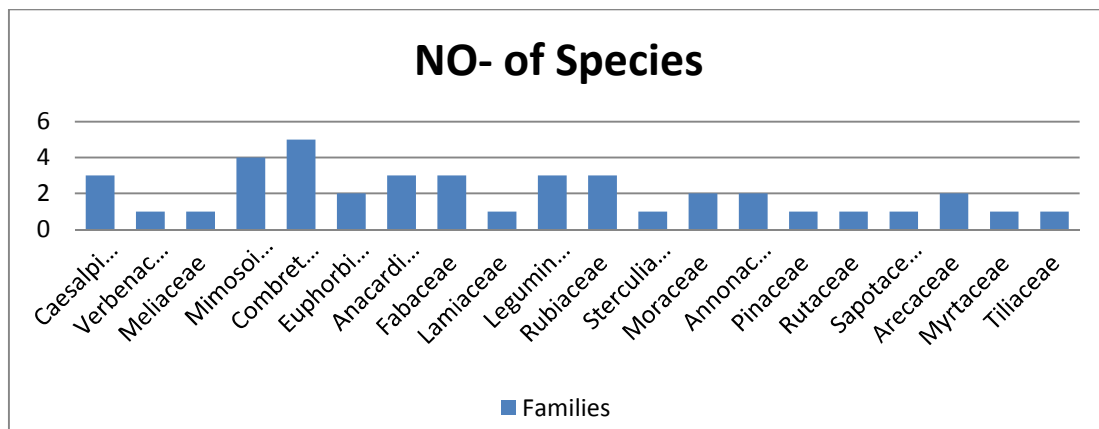
S/N	Tree species	Family	F	B.A	M Dbh	MHt	P/ HD	RD	RD <sub>0</sub>	IVI
1	<i>Daniellia oliveri</i>	Caesalpiniaceae	16	0.69	94.0	27.7	64	7.41	13.5	10.5
2	<i>Gmelina arborea</i>	Verbenaceae	60	0.16	44.7	20.8	240	27.8	3.13	15.5
3	<i>Khaya grandifoliola</i>	Meliaceae	2	0.02	15.0	5.5	8	0.93	0.39	0.66
4	<i>Parkia biglobosa</i>	Mimosoideae	24	0.43	73.7	21.1	96	11.1	8.39	9.75
5	<i>Terminalia avicenioides</i>	Combretaceae	1	0.44	75.0	25.0	4	0.46	8.59	4.53
6	<i>Euphorbia convolvuloides</i>	Euphorbiaceae	5	0.01	9.0	4.0	20	2.31	0.19	1.25
7	<i>Vitex doniana</i>	Anacardiaceae	6	0.21	52.3	13.3	24	2.78	4.10	3.44
8	<i>Cassia fistula</i>	Fabaceae	1	0.72	96.0	18.0	4	0.46	14.1	7.28
9	<i>Tectona grandis</i>	Lamiaceae	18	0.04	22.9	14.6	72	8.33	0.78	4.56
10	<i>Cassia arereh</i>	Leguminosae	5	0.02	15.8	12.2	20	2.31	0.39	1.35
11	<i>Dichrotachya cinera</i>	Fabaceae	2	0.01	11.5	5.0	8	0.93	0.19	0.56
12	<i>Nauclea latifolia</i>	Rubiaceae	1	0.01	10.0	4.0	4	0.46	0.19	0.33
13	<i>Sterculia setigera</i>	Sterculiaceae	6	0.01	8.2	5.5	24	2.78	0.19	1.49
14	<i>Erythrophleum suaveonlens</i>	Caesalpinaceae	5	0.02	14.6	6.6	20	2.31	0.39	1.35

15	<i>Entanda africana</i>	Mimosoideae	2	0.01	9.0	6.5	8	0.93	0.19	0.56
16	<i>Chlorophora excelsa</i>	Moraceae	1	0.13	40.0	30.0	4	0.46	2.54	1.50
17	<i>Prosopis africana</i>	Mimosoideae	3	0.15	44.0	16.7	12	1.39	2.93	2.16
18	<i>Bridella farruginea</i>	Anacardiaceae	1	0.12	39.0	15.0	4	0.46	2.34	1.40
19	<i>Mangifera indica</i>	Anacardiaceae	3	0.72	95.7	27.0	12	1.39	14.1	7.75
20	<i>Delonix regia</i>	Fabaceae	1	0.19	50.0	5.0	4	0.46	3.71	2.09
21	<i>Terminalia mentalis</i>	Combretaceae	7	0.07	29.4	5.6	28	3.24	1.37	2.31
22	<i>Polyalthia longifolia</i>	Annonaceae	3	0.01	11.0	4.0	12	1.39	0.19	0.79
23	<i>Pseudotsuga menziesii</i>	Pinaceae	1	0.04	22.0	12.0	4	0.46	0.78	0.62
24	<i>Terminalia catapa</i>	Combretaceae	1	0.02	17.0	4.0	4	0.46	0.39	0.43
25	<i>Zanthocylum zanthozyloides</i>	Rutaceae	1	0.02	16.0	18.0	4	0.46	0.39	0.43
26	<i>Breonadia salicina</i>	Rubiaceae	2	0.02	15.5	26.0	8	0.93	0.39	0.66
27	<i>Hallea stipulosa</i>	Rubiaceae	9	0.02	17.0	18.3	36	4.17	0.39	2.28
28	<i>Vitaleria paradoxa</i>	Sapotaceae	1	0.02	14.0	14.0	4	0.46	0.39	0.43
29	<i>Elaeis guinensis</i>	Arecaceae	5	0.11	36.8	20.6	20	2.31	2.15	2.23
30	<i>Combretum micranthum</i>	Combretaceae	1	0.01	10.0	6.0	4	0.46	0.19	0.33
31	<i>Anogeissus leiocarpus</i>	Combretaceae	6	0.08	31.2	17.2	24	2.78	1.56	2.17
32	<i>Syzygium cuminii</i>	Myrtaceae	1	0.01	12.0	19.0	4	0.46	0.19	0.33
33	<i>Piliostigma reticulatum</i>	Caesalpineaceae	1	0.01	11.0	4.0	4	0.46	0.19	0.33
34	<i>Anona senegalensis</i>	Annonaceae	1	0.01	8.0	1.30	4	0.46	0.19	0.33
35	<i>Borassus aethiopum</i>	Arecaceae	1	0.09	34.0	30.0	4	0.46	1.76	1.11
36	<i>Albizia lebbek</i>	Mimosoideae	1	0.08	32.0	15.0	4	0.46	1.56	1.01
37	<i>Ficus syscomorus</i>	Moraceae	3	0.36	67.3	12.3	12	1.39	7.03	4.21
38	<i>Acacia siberiana</i>	Leguminosae	1	0.01	10.0	5.0	4	0.46	0.19	0.33
39	<i>Hymenocardia acida</i>	Euphorbiaceae	3	0.01	9.7	1.8	12	1.39	0.19	1.58
40	<i>Grewia bicolour</i>	Tiliaceae	4	0.01	8.3	4.3	16	1.85	0.19	1.02
			217	5.12			864			

Note: F=Frequency, B.A=Basal Area, MDbh=Mean Diameter at Breast Height, MHT= Mean Height, D/Ha= Per Density Hectare, RD=Relative Density, RDo= Relative Dominance, IVI=Important Value Index.

In terms of family distribution, mimosoideae, combretaceae and Caesalpinoideae were the most common families in the study area (Figure 1). This agrees with Ikyagba *et al*, (2015) in Federal University of Agriculture, Makurdi, Nigeria, but it is contrary to Zakari (2015) in Baturiya Wetland, Jigawa State and Wakawa *et al*, (2016) in Kano State University of Science and Technology Wudil, in the same ecological system, who reported that families Fabaceae and Apocynaceae had the highest representation in their study areas. The reasons for the differences

in the family distribution of the tree species between the study areas may be attributed to weather and climate of the different areas and the level of exploitation of the woody resources for timber, woodfuel, overgrazing and the management of the resources. Nine families recorded one species each in the study area. These families are as follow: Verbenaceae, Maliaceae, Lamiaceae, Sterculiaceae, Rutaceae, Tiliaceae, Sapotaceae, Pinaceae and Myrtaceae. This has indicated that there was high exploitation of the woody resources for woodfuel, timber, farming, erection of buildings and overgrazing which have led to reduction in the number of the species belonging to these families in the study area. These families may be said to be endangered. If adequate measures are not taking to prevent the tree species from further degradation, there might be extinction or disappearance of most of the species in Kaduna State College of Education Gidan Waya. This observation is similar to that of Ikyaagba *et al* (2015) in their study in University of Agriculture, Makurdi.



**Figure 1:** Family distribution of tree species within Kaduna State College of Education GidanWaya

#### **Per Hectare Density of Woody Species in KSCOE**

Species with the highest density per hectare in the study area are: *Gmelina arborea* (240), followed by *Parkia biglobosa* (94), *Tectona grandis* (72) and *Daniellia oliveri* (64). *Gmelina arborea* had the highest per hectare density due to the fact that it is an exotic species which was deliberately planted to replace the indigenous tree species which have been removed purposely for timber, farming, and woodfuel collection. Tree species with the highest relative dominance (RDo) are *Cassia fistula* and *Mangifera indica* (14.1) each, followed by *Daniellia oliveri* (13.5), *Terminalia avicenioides*, and *Parkia biglobosa* with a relative dominance of 8.59 and 8.39 respectively. The highest basal area of trees in the study area was recorded by *Mangifera indica* and *Cassia fistula* (0.72 each). This was followed by *Daniellia oliveri*, *Terminalia avicenioides*, and *Parkia biglobosa* (0.69, 0.44 and 0.43 respectively). The least basal area (0.01) were recorded by thirteen species which include: *Acacia siberiana*, *Hymenocardia acida*, *Grewia bicolor*, *Anona senegalensis*, *Piliostigma reticulatum*, *Syzygium cuminii*, *Combretum micranthum*, *Polyalthia longifolia*, *Entanda africana*, *Sterculia setigera*, *Nauclea latifolia*, *Dichrotachya cinera* and *Euphorbia convolvuloides*. *Gmelina arborea* had the highest importance value (IVI) of 15.5 followed

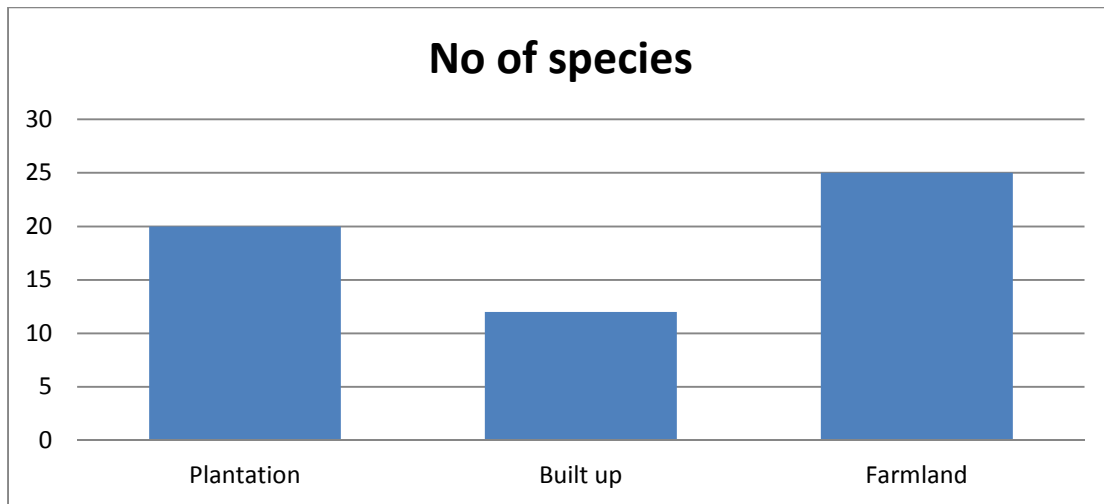
by *Daniellia oliveri* (10.5) and *Parkia biglobosa* and *Cassia fistula* which had 9.75 and 7.28 respectively.

**Table 2:** Distribution of Woody Species on Different Land Use Types in KSCOE

Species	Plantation	Built-up Area	Farmland	Total	%
<i>Daniellia oliveri</i>	3	5	8	16	7.37
<i>Gmelina arborea</i>	48	1	11	60	27.6
<i>Khaya grandifoliola</i>	1	0	1	2	0.92
<i>Parkia biglobosa</i>	6	10	8	24	11.1
<i>Terminalia avicenioides</i>	1	0	0	1	0.46
<i>Euphorbia convolvuloides</i>	3	0	2	5	2.30
<i>Vitex doniana</i>	3	1	2	6	2.76
<i>Cassia fistula</i>	1	0	0	1	0.46
<i>Tectona grandis</i>	6	12	0	18	8.29
<i>Cassia arereh</i>	4	0	1	5	2.30
<i>Dichrotachya cinera</i>	2	0	0	2	0.92
<i>Nauclea latifolia</i>	1	0	0	1	0.46
<i>Sterculia setigera</i>	1	0	5	6	2.76
<i>Erythrophleum suaveonlens</i>	1	0	4	5	2.30
<i>Entanda africana</i>	2	0	0	2	0.92
<i>Chlorophora excelsa</i>	1	0	0	1	0.46
<i>Prosopis africana</i>	1	2	0	3	1.38
<i>Bridella farruginea</i>	1	0	0	1	0.46
<i>Mangifera indica</i>	0	2	1	3	1.38
<i>Delonix regia</i>	0	1	0	1	0.46
<i>Terminalia mentalis</i>	0	7	0	7	3.23
<i>Polyalthia longifolia</i>	0	3	0	3	1.38
<i>Pseudotsuga menziesii</i>	0	1	0	1	0.46
<i>Terminalia catapa</i>	0	1	0	1	0.46
<i>Zanthocylum zanthocyloides</i>	0	0	1	1	0.46
<i>Breonadia salicina</i>	0	0	2	2	0.92
<i>Hallea stipulosa</i>	0	0	9	9	4.15
<i>Vitaleria paradoxa</i>	0	0	1	1	0.46
<i>Eleis guineensis</i>	0	0	5	5	2.30
<i>Combretum micranthum</i>	0	0	1	1	0.46
<i>Anogeissus leiocarpus</i>	0	0	6	6	2.76
<i>Syzygium cuminii</i>	0	0	1	1	0.46
<i>Piliostigma reticulatum</i>	0	0	1	1	0.46
<i>Anona senegalensis</i>	0	0	1	1	0.46
<i>Borassus oethiopum</i>	0	0	1	1	0.46



<i>Albizzia lebbeck</i>	0	0	1	1	0.46
<i>Ficus syscomorus</i>	1	0	2	3	1.38
<i>Acacia siberiana</i>	0	0	2	2	0.92
<i>Hymenocardia acida</i>	0	0	3	3	1.38
<i>Grewia bicolour</i>	1	0	3	4	1.84
	88	46	83	217	



**Figure 2:** Tree Species Distribution Based on Land Use Type in KSCOE

The study area is characterized by three different land use types. They include: plantation, built-up areas and farmlands. Farmland and Plantation recorded the highest number of species (25 and 20 respectively) in the study area (Tab. 2) and (figure 2). The distribution of tree species in different land use types indicated that *Gmelina arborea* was the most encountered tree species in the plantation and farmland (48 and 11), while *Tectona grandis* and *Parkia biglobosa* were the most encountered tree species in built-up areas, recording 12 and 10 stands respectively. Exotic species are the dominant in the three land uses may because the indigenous species were removed for different purposes such as woodfuel collection, timber, farming, building construction and were not allowed to regenerate instead they were replaced with exotic species because of their fast growth rate and adaptability to the region (Wakawa *et al*, 2016).

**Table 3:** Tree Species Diversity Indices across Land Use Types in the Study Area

Index	Plantation	Built-up Area	Farmland
Species Evenness (EH)	<b>0.64</b>	<b>0.83</b>	<b>0.89</b>
Species richness (d)	<b>2.13</b>	<b>1.77</b>	<b>2.74</b>
Shannon Max diversity (Hmax)	<b>2.99</b>	<b>2.48</b>	<b>3.22</b>
Shannon diversity index	<b>1.92</b>	<b>2.08</b>	<b>2.85</b>

Farmland recorded the highest values for tree species richness, evenness and diversity (d= 2.74), (EH= 0.89), (Hmax= 3.22) respectively. Agbelade *et al* (2016) recorded Shannon’s max diversity index (Hmax) of 3.99 and 2.94 which they stated that tree species were relatively diverse.

This study also recorded Hmax of 3.22, 2.99 and 2.48 from the different landuse types which is an indication of diverse tree species in the study area with a Shannon diversity index of 2.85, 2.08 and 1.92 and equitability index (evenness) of 0.89, 0.83 and 0.64 (Table 3).

## CONCLUSION

Kaduna State College of Education Gidan Waya has diverse tree species, but most of them are exotic species. Though, there are indigenous species that were recorded in large number such as *Parkia biglobosa*, *Daniellia oliveri*, *Vitex doniana*, *Sterculia setigera* and *Anogeissus leiocarpus*, many recorded single stand which shows that they are at the top of the list of becoming extinct on the Campus, if adequate measures are not taking concerning the management and conservation of the woody resources. It is recommended that farming, woodfuel collection, timber extraction, bush burning and grazing of livestock be prevented on the Campus in order to allow indigenous species to regenerate well. There is also the need for planting of trees in some of the affected areas to prevent further degradation. Further study can be done on the soil status of the institution which will provide adequate information on the vegetation and soil of the Campus.

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