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Floristic Enumeration of Selected Secondary Vegetation in Nigerian Defence Academy Afaka, Kaduna

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Abstract
A floristic study was conducted in selected secondary vegetation areas of the Nigerian Defence Academy, Afaka, Kaduna. Study plots (25m x 25 m) were established, and woody plants above 1 meter tall were identified and enumerated using Flora of West Africa by Hutchinson and Daziel and Nigerian trees and plants by Keay and Stanfield. Plant height and girth measurements were taken using ranging pole and tailor's tape respectively. Twenty-nine plant species from 17 families and 14 genera were identified. Woody plants with mean heights below 2.5 meters dominated the area. Plot 2 had the highest average height (46 m), while plots 3 and 8 had the lowest (8 m). The highest basal area was observed in plot 1 (74.99 m2 ha-1), and the lowest in plot 2 (7.7 m2 ha-1). The highest girth size value was observed in plot 2, while the least occurred in plot 8. Some plant species, including Bombax costatum, Gardenia aqualla, Nauclea diderrichii, Lannea microcarpa, Prosopis Africana, Urena lobata, and Entada Africana, were poorly represented and require urgent conservation attention to protect these species.
Keywords: Conservation, Plant enumeration, Vegetation, Woody plants,

Introduction

Vegetation is an area of land commonly dominated by plants which are the predominant terrestrial ecosystem. Vegetation accounts for 75% of the gross primary production, [5]. Natural vegetation is a plant community which has grown naturally without human interference. They have been left without human activities for a long time; this type of vegetation is usually called a primary vegetation. Thus, cultivated crops and fruits, orchards etc. form part of Forest but are not natural Forest. [1],[4]. Several economic benefits are derived from forest.

The Global Forest Resources Assessment 2020 estimates that the total forest cover is about 4.06 million hectares, or 10 million acres, accounting for 31% of the total land area of the earth in 2020, Forests(vegetation) in West Africa are under serious threat [4]. The [3] estimated that the annual forest loss in the region stands at 4.2 million acres or 0.64% per year, but this average figure hides most drastic situation in several countries. From 2000 to 2005 So far, Food and agricultural organization has monitored 4.5% forest loss in Togo, over 3% in Nigeria and 2.0% in Ghana. The combined deforestation in these three countries is 745,000 ha per year, [9].

During the period 1990 to 2000 the global estimation of 14.6 million hectares of forest were lost to deforestation per year, [10].
The combined effects of overexploitation of forest resources, unsustainable land use practices (slash-and-burn for farming), wildfires, mining, and political unrest (e.g. Liberia and Sierra Leone) have significantly reduced forest cover, [9].
Deforestation causes loss of habitat for flora, fauna and floristic elements, thereby reducing biodiversity, accelerating soil erosion and reducing agricultural productivity and ultimately worsening the livelihood of rural communities. About 70-75% of the genetic diversity of domesticated crop plants has been lost in the past century, [3]. Decrease in biodiversity is a consequence of a decreasing number of forest habitat niches, [8]. Unless the forest is completely cleared and converted to another land use, damaged or destroyed vegetation will never be the same again. It may restore the dominant ecosystem in the

regenerating forest with something similar to the original composition, [9].

Today, the high pressure on natural resources from anthropogenic disturbances affects the succession significance resulting in rapid increase in secondary forests in the West African forest zone. In 2005 the proportion of secondary forests of the total forest cover in Guinea, Liberia, and Benin was 98%, 96%, and 95% respectively, [3]. The Review of Forest and Landscape Restoration in Africa (2021), focuses on restoring degraded landscapes. Key aspects include, Restoration Goals aim to restore 150 million hectares by 2020 and 350 million hectares by 2030, [9]. Additionally, other countries in the region report that 90% or more of their forests are secondary.

This work was aimed at assessment of all woody plants above 1 meter within the study area. and to identify the plants that are rare and/or endangered.

Enumeration of the plants has provided a data base of plants in vegetation studies. Rare and endangered plant species will be identified. The knowledge of the plants importance in the area be uses will enhance their management, and plants of conservation interest will be programmed.

Materials and Methods

The study area was laid out into 25 x 25 meters plots, an interval 10 m was allowed in between each plot, Similar experimental design was adopted by Kombi *et al.* 2023 in their study of secondary vegetation in southwestern Nigeria.

Each plot was demarcated using measuring tape and thin line. Sample plots were taken at a distance of not less than 10m away from the road; this was to avoid edge effect.

All woody plants above 1 meter were enumerated and identified to the species level within each plot, this method was adopted by Nelson *et al.* 2022 in their work on woody plant diversity in secondary forest in Ile Ife. All enumerated plants were marked, so as to avoid double enumeration. The plants growth parameters taken were:

***Height of the plants*:** this was measured using surveyor's measuring tape for plants that are not too high, for tall trees, ranging pole was used to estimate the height of the tree. The height was recorded in meters (m).

***Bole*: -** This is the height to the first branch of the plant from the ground; it was measured using tailor's tape or ranging pole.

***Girth size*: -** This is the measurement of the circumference of the stem, measure in centimeter (cm), and tailor's tape was used for the measurement. The girth was measure at breast height for plants above 3 meter in height, for plants below 3 meters; the girth was measured at the mid region.

In situations where trees began branching from the base, in this case the girths of individual branches were taken, and the averages calculated, and this is use as the girth size of the plant.

Plant identification was done on the field. Unidentified plants and those plants whose identification were doubtful were collected, pressed in a plant press and taken to the laboratory of Forest mechanization, Afaka, Kaduna for proper identification.

The girth was measured at breast level for plants above 3 meter in height, for plants below 3 meters; the girth was measured at the mid region. The girth sizes were measured in centimeters.

Floristic data to be derived

Stem density: - This is the value of number of stems per hectare (*ha*), this was calculated by multiplying number of stems per *ha*,

Stem Density = Total number of stems / Total area sampled,

= (25m x 25m) x10,000/25 x25. where 10,000 / 25 x 25 is the conversion factor.

***Basal area*:** of each plant is calculated by using the formula:

$\pi\ D^2/4$, where D=girth size in meter, and π =3.14, Total basal area is the sum of each plot's basal area expressed in (m^2/ha) of all plant species in the study area.

Shannon Weiner's index was used to calculate the diversity indices of the study plots; it was calculated using the formula:

Shannon Index $(H) = -\sum p_i \ln p_i$ Mark *et al.* (2024).

where p_i is the proportion of individuals found in the i^{th} species and ***ln*** is the natural logarithm

Results

Table 1 This shows the number of plant species encountered (counted) in the study area. Seventeen (17) Families were encountered, these include Anacardiaceae, Dipterocarpacea, Fabaceae, Phyllanthaceae. The Fabaceae has the highest number of plant species with a value of one thousand one hundred eighteen (1118) plants, this was followed by Dipterocaceae with a value of One thousand one hundred and seven (1107) plants. The families Phyllanthaceae and Moraceae, contained the lowest numbers of plant species with seven (7) plants each.

TABLE 1: List of Plant species enumerated in the study plots

S/N	NAME	NUMBER OF PLANTS	% CONTRIBUITION
1	*Acacia farnesiana, (L)*	343	8.6
2	*Acacia polyacantha, Willd.*	1,107	27.8
3	*Acacia senegalese* , Booth FEM.	118	3.0
4	*Afrormosia laxiflora,* (Baker) Harms	89	2.2
5	*Antidesma venosum,* E. Mey ex Tul.	205	5.2
6	*Annona senegalensis,* Persoon.	496	12.5
7	*Azadirachta indica, (L)*	32	0.8
8	*Bombax buonopozense, P. Beauv.*	91	2.3
9	*Bombax costatum,*Aceved.	23	0.6
10	*Danielliaoliveri, Hutch & Dalziel*	7	0.2
11	*Detarium microcarpum Guill. & Perr.*	289	7.3
12	*Dialium guineense, Willd.*	551	13.9
13	*Entada africana , Guill. & Perr.*	275	6.9
14	*Ficus thorningii, Blume*	26	0.7
15	*Gardenia aqualla Stapf & Hutch*	144	3.6
16	*Isoberlinadoka,* Craib& Stapf.	19	0.5
17	*Khaya senegalensis, (Desr) A.Juss.*	3	0.1
18	*Lanneamicrocarpa, Engl. & K. Krause*	8	0.2
19	*Monoteskerstingii, Gilg.*	8	0.2
20	*Naucleadiderrichii, Merr.*	10	0.3
21	*Parkia biglobosa,(Jacq.) Benth*	8	0.2
22	*Piliostigma thorninghi, (Schumach) Milne-Redh-*	12	0.3
23	*Prosopis africana , (Guill,Perrott, & Rich) (Taub)*	16	0.4
24	*Syzygium guineense, (Willd.) DC.*	7	0.2
25	*Terminalia avicennoides, Guill & Perr.*	18	0.5
26	*Uapaca guineensis,* Müll. Arg.	9	0.2
27	*Urena lobata, (L)*	37	0.9
28	*Vitellaria paradoxa, Gaertn.F.*	21	0.5
29	*Vitex doniana, SIDA.*	6	0.2
	TOTAL	**3978**	**100.0**

Table 2 shows the plant frequency distribution in the different study plots. *Afrormosia laxiflora* and *Terminalia avicennoides* occurred in all the plots giving a percentage frequency of 100 %. This is followed by *Isoberlina doka* and *Acacia Senegalese* with presence in 14 plots given a percentage frequency of 93%. *Detarium microcarpum* is third with presence in 13 plots given a percentage frequency of 86.7%. Plants that were poorly distributed in the study area include, *Bombax costatum* and *Gardenia aqualla,* which were each represented in less than 3 plots. *Nauclea diderrichii, Lannea microcarpa, Prosopis africana, Urena lobata* and *Entada africana* were each represented in 2 out of the 15 plots giving a percentage frequency of 13.2%.

Other plants that occurred in just a plot each include: *Antidesma venosum, Uapaca guineensis, Azadirachta indica,*

Bombax buonopozense, Acacia farnesiana, Khaya senegalensis, Syzygium guineense, Ficus thorningii, Acacia polyacantha, Dialium guineense and *Parkia biglobosa*, consequently, they have the least percentage frequency of 6.6% each.

Table 2: Frequency Distribution of Plant Species in the Study Area

		Plot																
Sn	**Plant name**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Total**	%
1	*Acacia farnesiana*		X														**1**	6.6
2	*Acacia polyacantha*													X			**1**	6.6
3	*Acacia Senegalese*	X	X	X	X	X	X	X	X	X	X	X	X		X	X	**14**	93
4	*Afrormosia laxiflora*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**15**	100
5	*Annona senegalensis*	X	X	X	X	X	X	X	X	X	X				X	X	**12**	80
6	*Antidesma venosum*	X															**1**	6.6
7	*Azadirachta indica*		X														**1**	6.6
8	*Bombax buonopozense*		X														**1**	6.6
9	*Bombax costatum*	X												X	X		**3**	20
10	*Daniellia oliveri*	X	X		X	X	X	X		X	X			X			**9**	60
11	*Detarium microcarpum*	X		X	X	X	X	X	X	X		X	X	X	X	X	**13**	86.7
12	*Dialium guineense*														X		**1**	6.6
13	*Entada Africana*													X	X		**2**	13.2
14	*Ficus thorningii*		X														**1**	6.6
15	*Gardenia aqualla*		X											X	X		**3**	20
16	*Isoberlinadoka,*	X	X	X	X	X	X	X	X	X	X	X	X	X		X	**14**	93
17	*Khaya senegalensis*		X														**1**	6.6
18	*Lannea macrocarpa*		X												X		**2**	13.2
19	*Monotes kerstingii*	X		X	X	X	X	X	X	X	X	X	X			X	**12**	80
20	*Nauclea diderrichii*	X	X														**2**	13.2
21	*Parkia biglobosa*														X		**1**	6.6
22	*Piliostigma thorninghi*		X	X	X	X	X	X	X	X	X	X	X			X	**12**	80
23	*Prosopis Africana*		X											X			**2**	13.2
24	*Syzygium guineense*		X														**1**	6.6
25	*Terminalia avicennoides*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	**15**	100
26	*Uapaca guineensis*	X															**1**	6.6
27	*Urena lobate*													X	X		**2**	13.2
28	*Vitellaria paradoxa,*	X		X	X	X	X	X	X	X	X	X	X			X	**12**	80
29	*Vitex doniana*	X		X	X	X	X	X	X	X	X	X	X			X	**12**	80

Table 3, gives the girth size distribution of plant species. *Bombax costatum* has the highest mean girth size values of 617.8 m^2/ha; this is equivalent to 9.2% of the mean girth size. This was followed by *Bombax buonopozense* with a value of 396 m^2/ha, which is equivalent to 6.2%. The least mean girth size value was recorded in *Antidesma venosum* with a value of 141.7m2/ha, this translates to 2.2% followed by 150.5 m^2/ha from *Uapaca guineensis* equivalent to 2.4%.

Table 3: Plant species mean girth size distribution in the study area (m^2ha^{-1})

	Plots																
Plants	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Mean	% girth
Acacia farnesian	-	187.2	-	-	-	-	-	-	-	-	-	-	-	-	-	187.2	2.9
Acacia polyacantha	-	-	-	-	-	-	-	-	-	-	-	-	180.7	-	-	180.7	2.8
Acacia Senegalese	181.6	191.5	193.5	205.7	214.4	213.8	203.6	178.9	218.2	203.2	210.9	181.8	-	91.1	196.4	191.8	3.0
Afrormosia laxiflora	162.7	182.4	167.2	156	155.1	155.5	160.9	152.3	198.2	152.4	181.5	179	199.8	193.8	168.3	171.0	2.7
Annona senegalensis	192	158.2	176	106.7	180	179.2	166.4	201.6	250.1	163.6	163.6	-	-	210.3	182.4	179.2	2.8
Antidesma venosum	141.7															141.7	2.2
Azadirachta indica	-	288	-	-	-	-	-	-	-	-	-	-	-	-	-	288.0	4.5
Bombax buonopozense	-	396.0	-	-	-	-	-	-	-	-	-	-	-	-	-	396.0	6.2
Bombax costatum	698.7												536	618.7		617.8	9.2
Daniellia oliveri	191.4	195.6	-	-	192	176	189.3	-	240	272	-	-	-	-	-	204.5	3.2
Detarium microcarpum	167.3	-	168.0	216.0	224.0	252.8	196.6	160.0	224.0	-	169.3	173.3	179.4	176.6	170.7	191.0	3.0
Dialium guineense	-	-	-	-	-	-	-	-	-	-	-	-	-	240	-	240.0	3.7
Entada Africana	-	-	-	-	-	-	-	-	-	-	-	-	250.7	221.9	-	236.3	3.7
Ficus thorningii	-	150.8	-	-	-	-	-	-	-	-	-	-	-	-	-	150.8	2.5
Gardenia aqualla	-	281.6	-	-	-	-	-	-	-	-	-	-	204.8	234.7	-	240.4	3.8
Isoberlina doka	156.1	194.4	191.2	230.9	214.4	230.1	219.4	166.1	224	230.1	195	195.8	232.4	-	190.5	205.0	3.2
Khaya senegalensis	-	152	-	-	-	-	-	-	-	-	-	-	-	-	-	152.0	2.4
Lannea macrocarpa	-	265.6	-	-	-	-	-	-	-	-	-	-	-	213.3	-	239.5	3.8
Monotes kerstingii	197.3	-	195.5	191.1	218.8	194	199.8	200.9	192.8	203.9	193.6	192.6	-	-	194.5	197.9	3.3
Nauclea diderrichii	168	230.4	-	-	-	-	-	-	-	-	-	-	-	-	-	199.2	3.1
Parkia biglobosa	-	-	-	-	-	-	-	-	-	-	-	-	-	280	-	280.0	4.4
Piliostigma thorningii	-	147.6	164.4	121.6	144	139.2	187.2	174.5	179.2	172	165.8	187.6	-	-	167.3	162.5	2.5
Prosopis africana	-	168	-	-	-	-	-	-	-	-	-	-	228	-	-	198.0	3.1
Syzygium guineense	-	258.4	-	-	-	-	-	-	-	-	-	-	-	-	-	258.4	4.0
Uapaca guineensis	150.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	150.5	2.4
Urena lobata	-	-	-	-	-	-	-	-	-	-	-	-	170.7	250.7	-	210.7	3.3
Vitalaria perodoxa	234.3	-	430	326.4	420	414	434	152	395.6	400	394	384	-	-	424	367.4	5.7
Vitex doniana	144	248	139.4	117.3	112	144	192	137.1	115.2	164	252	234			144	164.8	2.6
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**6402.3**	**100**

Table 4 shows Plant species mean height distribution. The plant with heightest values was observed in *Detarium microcarpum* with a value 10.4 m, this was followed by *Uapaca guineensis* with 9.4m. *Detarium microcarpum* has a mean value of 2.5 meters representing 3.2%, while *Uapaca guineensis* has mean value of 9.4 m representing 11.9%. The plants with least mean height values occurred in *Acacia farnesian* with a mean height value of 1.6 m representing 2%, This was followed by *Gardenia aqualla* with a mean height value of 1.3m, equivalent to 1.6% of the total height of 79.1 m.

Table 4: Plant species mean height distribution in the study area

	Plots																
Plant name/ family	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Mean	% Mean Height
Acacia farnesian		1.6														1.6	2.0
Acacsia polyacantha													2.3			2.3	2.9
Acacia Senegalese	2.1		2.3	2.2	2.6	6.2	2.7	2.2	2.1	2.6	2.3	2		1.6	2.3	2.6	3.3
Afrormosia laxiflora	1.8	4.3	1.9	1.7	1.6	1.6	1.6	1.7	1.9	2	2	1.9	2.4	2.4	1.9	2.0	2.5
Annona senegalensis	1.4	2.7	1.5	1.5	1.5	4.6	1.5	2	2	1.8				2.4	1.5	2.0	2.5
Antidesma venosum	1.9															1.9	2.4
Azadirachta indica		2.9														2.9	3.7
Bombax buonopozense		2.5											3.2			2.9	3.7
Bombax costatum	2.2												3.2	3.4		2.9	3.7
Daniellia oliveri	1.8	2.8		1.5	2.1	2	2.5		2	2.5						2.2	2.8
Deterium microcarpum	10.4		1.6	1.9	1.9	2.2	2.3	1.5	2		1.7	1.7	1.8	1.8	1.6	2.5	3.2
Dialium guineense														2.6		2.6	3.3
Entada Africana													2,9	2.6		2.6	3.3
Ficus thorningii		3.4														3.4	4.3
Gardenia aqualla		1.4											1.3	1.3		1.3	1.6
Isoberlina doka	1.4	1.9	1.8	2.1	1.9	1.9	2.1	1.6	2.4	2.1	1.8	1.7	1.9		1.8	1.9	2.4
Khaya senegalensis		3.3														3.3	4.2
Lannea macrocarpa		1.9												2.4		2.2	2.8
Monotes kerstingii	2.3		2.3	2.3	2.3	2.4	2.3	2.4	2.5	2.2	2.2	2.2			2.3	2.3	2.9
Nauclea diderrichii	1.9	1.8														1.9	2.4
Parkia biglobosa														2.8		2.8	3.5
Piliostigma thorninghi		1.8	1.6	1.5	1.7	1.8	2.2	1.6	2.1	1.8	1.6	1.7			1.6	1.8	2.3
Prosopis Africana		2.1											3.2			2.7	3.4
Syzygium guineense		5.2														5.2	6.6
Terminalia avicennoides	2.1	2.1	2.3	2	2	2	2	2	2	2	2.3	2.3	1.6	2	2.3	2.1	2.7
Uapaca guineensis	9.4															9.4	11.9
Urena lobate													2	4.3		3.2	4.0
Vitalaria perodoxa	1.8		3.3	3	3.3	3.3	3.2	1.6	2.9	3.2	3.1	2.9			3.4	2.9	3.7
Vitex doniana	1.5	1.7	1.4	1.2	1.3	1.5	1.8	1.5	1.3	1.7	2.7	2.8			1.5	1.7	2.1
Total																79.1 m	**100**

Table 5 shows the calculated species diversity according to Shannon Weiner index of diversity of all the individual re-growth plots, it shows that plots 1 and 2 have the highest diversity indices

The maximum diversity index was determined using the Shannon–Wiener diversity index, [7]. This was because it takes into account the many species in different plots.

$$H = -\sum p_i \ln (p_i).$$

Where, H' = Shannon diversity index, S = the total number of species in the community, pi = proportion S (species in the family) made up of the i^{th} species and Ln = natural logarithm

.

Table 5: Shannon Wiener diversity index of the study plots

PLOT	INDEX
1	2.39
2	2.65
3	1.94
4	1.68
5	1.85
6	1.90
7	1.97
8	1.99
9	1.97
10	1.94
11	1.99
12	1.88
13	1.93
14	1.94
15	1.95

Table 6: Summary of contributions of plant parameters in all study plots which gives the status of plants in each plot

Plot	Girth size (mha^{-1})	% Girth size	Basal area (m^2ha^{-1})	% basal area	Stem density ha^{-1}	% Stem density	Bole (cm)	% Bole	Height (m)	% height	Plant density
1	30.96	8.6	74.99	12.8	4,704	9	737	8	42	11	294
2	38.88	10.8	0.28	0.0	3,296	6	1281	15	46	12	206
3	20.54	5.7	0.15	0.0	3,455	6	529	6	18	5	217
4	20.85	5.8	34.36	5.9	2,496	5	397	5	19	5	156
5	22.66	6.3	39.31	6.7	3,568	7	452	5	22	6	223
6	23.49	6.5	44.10	7.5	3,662	7	467	5	30	8	230
7	23.95	6.7	45.40	7.7	3,862	7	544	6	24	7	239
8	17.36	4.8	24.09	4.1	3,186	6	392	5	18	5	199
9	24.93	7.0	47.97	8.2	3,600	7	498	6	23	6	233
10	22.35	6.2	43.31	7.4	3,626	7	458	5	22	6	228
11	20.03	5.6	38.15	6.5	3,545	6	391	4	20	5	216
12	19.52	5.4	35.97	6.1	3,472	7	373	4	19	5	225
13	23.31	6.5	51.35	8.7	3,520	7	715	8	23	6	220
14	29.18	8.1	69.70	11.9	4,256	8	1162	13	30	8	266
15	20.67	5.8	38.01	6.5	3,424	6	417	5	20	5	216
Total	**358.86**	**100**	**587.14**	**100.0**	**53672**	**100**	**8810**	**100**	**374**	**100**	**3368**

Discussion

The 25m x 25m sample plot size used was effective in ensuring that enough stems of individual species were enumerated in each study plot. The choice of plant height of one meter and above ensured that small tree species in the study plots were enumerated and this made the data comparable to other works. Similar experimental work was adopted by [6], in their study of secondary vegetation in the Luki biosphere reserve, Democratic Republic of Congo.

The visible presence of farm land around the secondary vegetation shows that man much more than any other factor causes the modification of the vegetation. This is consistent with [3] and [5], who stated that agricultural practices can alter the vegetation of the landscape as farmers move from an area of insufficiency or poor land to new and more fertile vegetation land. [3], also reported that agriculture is the most visible cause of deforestation, this is because the clearing of agricultural land prior to tilling, ploughing and cultivation result in the elimination of most species.

Three thousand nine hundred and seventy-eight (3978) plants which cut across 17 families, 25 genera and 29 species were identified from the study plots. This can be considered low when compare with results from other similar floristic inventories on other re-growth vegetation by [2],[5]

The frequency distribution of plant species in the individual study plots exhibited substantial variation from each other. *Afrormosia laxiflora* and *Terminalia avicennoide*s have a frequency of 100%, this may be due to soil variation, chance and other unexplained factors. Ricardo *et al.* (2020) stated that soil quality and type can vary within short distances. Sixteen (16) plant species have low frequency distribution in the study area occurring in one or two plots. This makes it more difficult to draw any conclusion on their distribution. that scarce taxa begging for conservation are the most difficult to characterize.

Plot one and fourteen are plots with the highest plant density of 294 and 266 plants respectively. while the plant with least density was recorded in plots 4 and 8 with a value of 156 and 199 plants respectively. The presence of plants in an area may be due to chance, soil quality and other unexplained factors, [5].

The calculated species diversity in each plot according to Shannon Weiner index of diversity showed that plots 1 and 2 have the highest diversity indices. Plots 4, 5 and 12 have the lowest diversity indices of the entire study area. All the values for diversity indices can be considered to be low, and this is at variance with the submissions of [5], who stated that secondary vegetation tend to be higher in its species composition.

Conclusion

All woody plants above 1m in the study area were assessed with their numbers and floristic parameters documented. A total of 3978 plants which cut across 17 families, 25 genera and 29 species were identified from the study plots.

The medicinal plants encountered in the study area are from the17 families. Fabaceae has the highest representation of 29.8 % with a total number of 1,186, this was followed by family Dipterocarpaceae, which constitute 27.8% with a total number of 1,107 plants. Families with the least representation are Anacadiaceae and Bombacaceae with 8 plants each equivalent to 0.2%, Moraceae and Phylantaceae has 7 plants each which constitute 0.2%.

The Nigerian Defence Academy, Afaka campus has been seriously de-vegetated by farming activities and infrastructural development, there is an urgent need to curtail these activities so as not to lose plant resources. What is needed now is to put in place an effective management system that will checkmate biodiversity erosion.

This data can be used as a base line data for further research. This can help in disclosing the vegetation status for developmental management and conservation strategy in promoting sustainable plant usage in the permanent campus of Nigerian Defence Academy, Afaka, Kaduna

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