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Original Research Article

An Ecological Assessment of Tree Species Diversity, Richness and Status in Faculty of Agriculture Shabu-Lafia, Nasarawa State University Keffi, Nasarawa State Nigeria

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Abstract: Trees are very important to mankind in different capacity. This study was carried out to assess the diversity, richness and status of tree species in Faculty of Agriculture Shabu-Lafia Campus Nasarawa State Keffi, Northern Nigeria. The study area was divided in four independent site. A line transect of 1000M were established at each site by passing through the center of the site along which 10 sample plots of 50 m × 50 m in size were established in alternate position along each transect at 80m interval. Species diversity richness were measured using Shannon-Weiner index (H) and Margalef species richness index (D), respectively, percentage relative density was used to measure trees status. Thirty six (36) tree species belonging to twenty one (21) families were recorded. Family *Fabaceae* had the highest number of species. From the results of the study invasive tree species are the most dominat. The Shannon-Weiner diversity index (H) were 2.74 for total site, 2.18 for site A, 2.10 for site B, 2.24 for site C and 2.29 for site D. The Margalef species richness index (D) values for the species were; total site = 4.89, site A = 2.66, Site B = 2.60, Site C = 2.28 and Site D = 2.50. The result of the status showed that 19.44% of tree species were abundant, 5.55% of the species were occasional, 27.77% of the trees species were rare, and 47.22% were threaten or endanger. In conclusion tree species diversity ranging 1.5-3.5 is in line with standard. The tree species richness is low. Majority of the species were either rare or endanger. The study recommended that, there should be legislation against felling or cutting down of any tree that is ≥ 10cm in diameter be it local or invasive species in the study area. Annual enrichment planting of trees species should be adopted. Awareness on the potential ecological benefits of tree stands on farmlands to the people within and surrounding the study area will play a vital role in conserving the tree species.

Keywords: Tree Species, Diversity, Richness, Status.

INTRODUCTION

Forest is a large area of woody vegetation either growing wild or planted for some purposes. It can be further explain as a biological community of plant and animals existing in a complex interaction with the non-living environment factors, such as soil, climate, and physiographic (Thomas and Diana, 2003). The diversity and status of tree species in any given geographical location depends on environmental elements, such as temperature, sunlight, moistness, nutrition, topography, bedrock geology, canopy structure, soil characteristics, land use history (Saka, *et al.*, 2018), and human activities such as illegal logging, livestock ranching, over grazing, bush burning, agricultural activities, soil erosion, and urbanization respectively (Usman *et al.*, 2022). Forest resources provides habitat for organisms that make up earth biodiversity, different kind of animals uses trees as shelter and protection from their predators (Amonum *et al.*, 2016).

Trees are important to humankind not only economically, environmentally, and industrially but also spiritually, historically, and aesthetically for they sustain human life through direct and indirect gain by providing a wide range of products for survival and

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prosperity (Asif *et al*., 2007). There are several uses of trees to man in Africa, people traditionally planted trees around their houses for fruits, nuts, leaves, fuel wood, folder, building materials, windbreaks among others (Fuwape and Onyekwelu 2011). It was common to plant trees in village square to provide shade during meetings, ceremonies, education, recreation, worship and so on. The immense biodiversity generates a variety of natural resources which help to sustain the livelihood of the local communities (Agbelade, 2013).

There are contemporaneous confirmation that anthropogenic activities have change notable parts of the earth land surface (Vitousek *et al.,* 1997). The process of development of mankind necessitate utilization of natural resource with the purpose of converting it into usable form (Obayelu, 2014). Rapidly increasing human populations and expanding agricultural activities have brought about extensive land use changes throughout the world (Cunningham *et al.*, 2005). Urbanization and agricultural activities are generally associated with many developmental activities, lands are cleared and trees are felled, in some situations trees are felled without taking into consideration their importance. It might not be surprising if endangered trees have been cleared in the course of these developments (Wakawa *et al.,* 2017)**.** Despite the fact, deforestation occurs world-wide, it is particularly a critical issue in Faculty of Agriculture Shabu-Lafia Nasarawa State University Keffi. Based on botanical rambling observation in the study area, many trees species were felled down for building structure, cassava farming, rice and beans farming among others. These kind of trembling actions could surely lead to the plants becoming extinct (Hayatu, and Abba, 2021).

The need for regular assessment of trees species for management and conservation purposes is imperative (Wakawa *et al.,* 2017). The Assessment is critical, because evidence has shown that the multiple threats to biodiversity have intensified, and that the sustainable use of nature will be vital for adapting to and mitigating dangerous anthropogenic interference with the climate system, as well as achieving many important development goals (Díaz, *et al.,* 2019).

Knowing the status of tree species composition and diversity can help in making recommendations for the restoration and future management of Trees species in the study area. The objective of this study was to assess Trees species diversity, richness, and investigate their Status in Faculty of Agriculture Shabu – Lafia Campus Nasarawa State University Keffi, with a view to ensuring their sustainable management.

MATERIAL AND METHOD

Study Area

The study was carried out at the Faculty of Agriculture Shabu-Lafia Campus, Nasarawa State University Keffi. Lafia is located in the Guinea Savannah Zone of North Central Nigeria and found on latitude 08° 35'N, longitude 08° 32'E, altitude 181.53m above sea level with a mean temperature of 34°C, relative humidity of 40-86% and average day light of 9-12hours.

Sampling Method

The study area was divided into four site (Site A, Site B, Site C and Site D) this was done because of irregular shape of the study area (Fig.1) and intense deforested area in some part of the study area. A line transect of 1000M were established at each site by passing through the center of the site along which 10 temporary Sample plots of 50m × 50m in size were established in alternate position as adopted by Wakawa *et al.,* (2017), along each transect at 80m interval. Site A start from the main school gate by the left up to behind old admin block down to the central mosque across the brook that pass through the school up to the fence just opposite to Shabu Development Area Secretariat. Site B was contiguous to site A up to New Faculty Laboratory down across the brook to the fence just by the road leading to Lafia Isolation Centre. Site C was from the fish ponds behind the library up to the end of the faculty fence just before Akorba village. While Site D was from the main school get by right to the new faculty lecture down to college fence.

METHODS OF DATA COLLECTION

Field data form for floral data collection was used. All tree species measured ≥ 10cm in diameter be it indigenous or invasive species were identified and recorded. The identification was done with the aid of the following; knowledgeable local people who have been working in the area long enough to have the ability to identify tree species using local names and plant identify apps was also used to make an approximate identification of unfamiliar species, thereby minimizing the amount of plant collection required for later identification.

Data Analysis

From each site, diversity indices were determined using the following:

i. Shannon-Weiner index (H), which is the measure of diversity within a site according to Shannon and Wiener (1949): $H = -\Sigma Pi \text{ in } Pi$

Where Pi = S / N, S = number of individuals of one species; N = total number of all individuals in the site and in = logarithm to base

ii. Margalef species richness index (d), was use as a simple measure of species richness according to Margalef (1958): $D = (S - 1) / \text{In } N$

Where S = total number of species; N = total number of individuals in the site and Ln = natural logarithm.

iii. Relative abundance of species (RA) $RA = \frac{Number\ of\ individual\ Species}{Total\ Number\ of\ Trees}$

iv. Relative density of species (RD)

$$RD = \frac{Number\ of\ Individual\ Species}{Total\ Number\ of\ Trees} \times 100$$

The tree species were classified based on the relative densities (RD) using the methods in Edet *et al.*, (2011) and Adeyemi *et al.*, (2015) as follows:
Abundant = RD ≥ 5.00, Frequent = 4.00 ≤ RD ≤ 4.99, Occasional = 3.00 ≤ RD ≤ 3.99, Rare = 1.00 ≤ RD ≤ 2.99 and Threatened/Endangered = RD < 1.00.

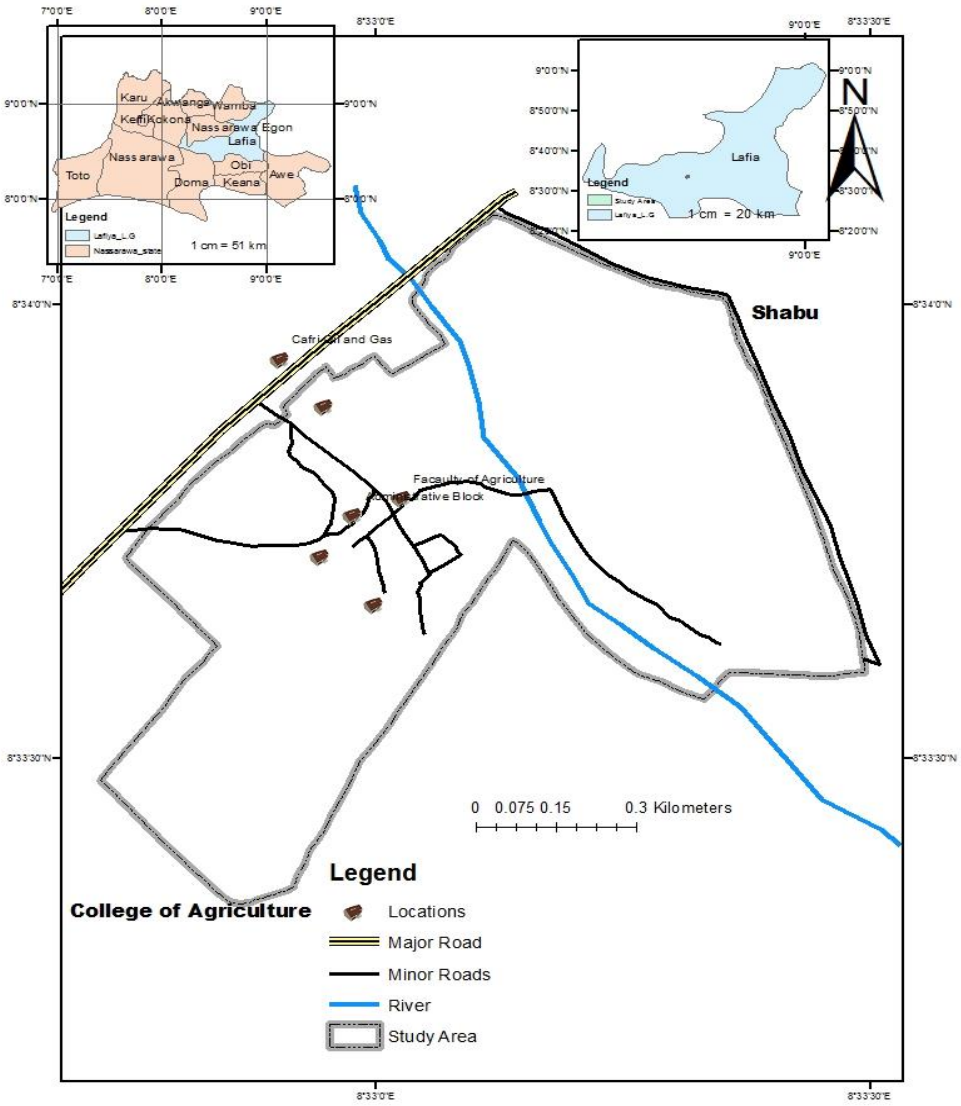

Fig. 1: Map of Nasarawa State showing the Study Area

RESULTS AND DISCUSSION

Distribution and Status of Tree Species across the Study Area

The Families, number of species, species names, species frequency, relative abundance, relative density and status are presented in table 1, 2, 3, 4 and 5. In site A, a total of twelve (12) families and twenty one (21) species were recorded. The family *Fabaceae* had the highest number of species (05), followed by *Lamiaceae* (03), *Meliaceae* (02), *Anacardiaceae* (02), *Combretaceae* (02) while all the other families recorded one (01). 14.28% tree species were abundant, 4.77% tree species were frequent, 9.52% tree species were occasional, 38.09% tree species were rare while 33.33% trees species were threatened/endangered. The abundant tree species were *G. arborea*, *T. grandis* and *K. senegalensis* which were all planted by the Department of Forestry and Wildlife. The known savanna tree species like *P. biglobosa*, *V. donia*, and *S. setigera* among others were represented by few individual, this implies the anthropogenic activities had caused declination in the population of tree species in the study

site, especially the native indigenous one. The careless attitude of the populace and high rate of poverty in the country might have resulted to this heavy loss (Ayodele and Yang, 2012).

Table 1: Alpha Tree Species of Site A

S/N	Family	No. Species	Species	No Occurrence	R. A	R. D (%)	Status
1	Fabaceae	05	*Leucaena leucocephala*	36	0.040956	4.095563	Frequent
2			*Daniellia oliveri*	25	0.028441	2.844141	Rare
3			*Senna siamea*	18	0.020478	2.047782	Rare
4			*Entada abyssinica*	15	0.017065	1.706485	Rare
5			*Pakia biglobosa*	7	0.007964	0.796359	Threatened/Endangered
6	Lamiaceae	03	*Gmelina arborea*	139	0.158134	15.81342	Abundant
7			*Tectona grandis*	269	0.30603	30.60296	Abundant
8			*Vitex doniana*	15	0.017065	1.706485	Rare
9	Meliaceae	02	*Khaya senegalensis*	196	0.222981	22.29807	Abundant
10			*Azadirachta indica*	22	0.025028	2.502844	Rare
11	Anacardiaceae	02	*Anacadium occidentale*	27	0.030717	3.071672	Occasional
12			*Mangifera indica*	11	0.012514	1.251422	Rare
13	Combretaceae	02	*Terminalia mantaly*	25	0.028441	2.844141	Rare
14			*Terminalia macroptera*	20	0.022753	2.275313	Rare
15	Moringaceae	01	*Moringa olifera*	29	0.032992	3.299204	Occasional
16	Sapotoideae	01	*Vitellaria paradoxa*	8	0.009101	0.910125	Threatened/Endangered
17	Bignoniaceae	01	*Newbouldia laevis*	5	0.005688	0.568828	Threatened/Endangered
18	Malvaceae	01	*Sterculia setigera*	5	0.005688	0.568828	Threatened/Endangered
19	Salicaceae	01	*Oncoba spinosa*	3	0.003413	0.341297	Threatened/Endangered
20	Simaroubaceae	01	*Ailanthus altissima*	3	0.003413	0.341297	Threatened/Endangered
21	Elaeagnaceae	01	*Elaeagnus pugens*	1	0.001138	0.113766	Threatened/Endangered

At the Site B (table 2) a total of eighteen (18) tree species belonging to ten (10) families were recorded. The family *Fabaceae* had the highest number of species (05), followed by *Lamiaceae* (02), *Meliaceae* (02), *Anacardiaceae* (02), *Arecaceae* (02) while the five (05) other families recorded one (01) species each. 22.22% tree species were abundant, 11.11% were frequent, 5.55% were occasional, 33.33% were rare, while 27.77% were said to be threatened. The abundance species were those of *D. oliveri*, *K. senegalensis*, *M. indica* and *C. sinensis.* The abundance of *D. oliveri* in this Site signify the adoption of park land agroforestry practice at Site B which is an operational base of Agronomy Department in most cases. Abdullahi (2021) in an assessment of species diversity and abundance across three agroecological zones of northern Nigeria reported *M. indica* among the most abundant invasive tree species in Nigeria, which is in conformity with the present result.

Table 2: Alpha Tree Species of Site B

S/N	Family	No. Species	Species	No. Occurrence	R. A	R. D (%)	Status
1	Fabaceae	05	*Daniellia oliveri*	28	0.086957	8.695652	Abundant
2			*Pakia biglobosa*	13	0.040373	4.037267	Frequent
3			*Acacia nilotica*	02	0.006211	0.621118	Threatened/Endangered
4			*Tamarindus indica*	1	0.003106	0.310559	Threatened/Endangered
5			*Ditarium macrocarpum*	1	0.003106	0.310559	Threatened/Endangered
6	Meliaceae	02	*Khaya senegalensis*	78	0.242236	24.2236	Abundant
7			*Azadirachta indica*	8	0.024845	2.484472	Rare
8	Anacardiaceae	02	*Mangifera indica*	38	0.118012	11.80124	Abundant
9			*Anacardium occidentale*	13	0.040373	4.037267	Frequent
10	Lamiaceae	02	*Gmelina arborea*	11	0.034161	3.416149	Occasional
11			*Vitex doniana*	5	0.015528	1.552795	Rare
12	Arecaceae	02	*Elaeis guineensis*	6	0.018634	1.863354	Rare
13			*Raphia farinifera*	5	0.015528	1.552795	Rare
14	Rutaceae	01	*Citrus sinensis*	98	0.304348	30.43478	Abundant
15	Annonaceae	01	*Anona senegalensis*	7	0.021739	2.173913	Rare
16	Myrtaceae	01	*Syzygium guineense*	6	0.018634	1.863354	Rare
17	Ebenaceae	01	*Diospyros lotus*	1	0.003106	0.310559	Threatened/Endangered
18	Moraceae	01	*Ficus exasperate*	1	0.003106	0.310559	Threatened/Endangered

At site C (Table 3) fifteen (15) tree species belong to ten (10) families were identified and documented. Family Fabaceae had four (04), Anacardiaceae (02), Combretaceae (02), while seven (07) families have 1 species each. *D. oliveri*, *P. biglobosa*, *A. occidentale*, *T. mantaly*, *A. senegalensis* and *S. guineense* were abundant representing (40%), 20% of the tree species were frequent, 26.66% were rare trees species while *T. indica* and *V. thouarsii* were threatened (13.33%). From this result it can be deduced that at site C which is dominated by the activities of fisheries and aquaculture department there were less exploitation there considering the percentage of endangered species. This may be explain by the nature of land use and the perfect practice of aqua silviculture in the site. Forest trees provide many ecosystem services such as species conservation, prevention of soil erosion, and preservation of habitat for plants and animals (Armenteras *et al.*, 2009). This was observed in the study site.

Table 3: Alpha Species of Site C

S/N	Family	No. Species	Species	No. Occurrence	R. A	R. D (%)	Status
1	Fabaceae	04	*Daniellia oliveri*	37	0.19171	19.17098	Abundant
2			*Parkia biglobosa*	16	0.082902	8.290155	Abundant
3			*Piliostigma reticulatum*	8	0.041451	4.145078	Frequent
4			*Tamarindus indica*	1	0.005181	0.518135	Threatened
5	Anacardiaceae	02	*Anacardium occidentale*	52	0.26943	26.94301	Abundant
6			*Mangifera indica*	8	0.041451	4.145078	Frequent
7	Combretaceae	02	*Terminalia mantaly*	16	0.082902	8.290155	Abundant
8			*Terminalia macroptera*	5	0.025907	2.590674	Rare
9	Annonaceae	01	*Anona senegalensis*	20	0.103627	10.36269	Abundant
10	Myrtaceae	01	*Syzygium guineense*	10	0.051813	5.181347	Abundant
11	Malvaceae	01	*Sterculia setijera*	9	0.046632	4.663212	Frequent
12	Meliaceae	01	*Azadirachta indica*	4	0.020725	2.072539	Rare
13	Lamiaceae	01	*Vitex doniana*	3	0.015544	1.554404	Rare
14	Arecaceae	01	*Borassus aethiopum*	3	0.015544	1.554404	Rare
15	Apocyaceae	01	*Voacanga thouarsii*	1	0.005181	0.518135	Threatened

At Site D (table 4), a total of fifteen (15) tree species belonging to eleven (11) families were inventoried and recorded. The family *Fabaceae* was slightly leading with three (03) species followed by *Anacardiaceae* (02), *Combretaceae* (02), while eight (08) other families were represented by one (01) spp each. The trees species of *D. oliveri*, *A. occidentale*, *M. indica* and *T. macroptera* were abundantly present representing (26.66%), 20% were frequent, 13.33 % were found to be occasional, five tree species were rare representing (33.33%) while one tree species was threatened (6.66%). It was observed that this site is always been grazed by the university livestock. The trees species were fairly represented in the site, their presence may be attributed to the peculiarity in land management. In most cases trees are allowed not be cleared for animals to browse in form of fodder during the dry season. However, many tropical savanna trees were not found. Plant conservation is greatly under resourced in comparison with animal conservation (Havens *et al.*, 2014). Yet plants are much more important to us. Animals can provide meat, leather, fur and other products, but none of these are necessities for human survival and well-being, while many plant products are essential. Plants provide food for us and our livestock, as well as a huge diversity of other products and services, from timber and fibers to clean water and erosion control (Corlett, 2016).

Table 4: Alpha Tree Species of Site D

S/N	Family	No. Species	Species	No. Occurrence	R. A	R. D (%)	Status
1	Fabaceae	03	*Daniellia oliveri*	41	0.224043716	22.40437	Abundant
2			*Entada abyssinica*	8	0.043715847	4.371585	Frequent
3			*Parkia biglobosa*	5	0.027322404	2.73224	Rare
4	Anacardiaceae	02	*Anacadium occidentale*	30	0.163934426	16.39344	Abundant
5			*Mangifera indica*	28	0.153005464	15.30055	Abundant
6	Combretaceae	02	*Terminalia macroptera*	25	0.136612022	13.6612	Abundant
7			*Terminalia mantaly*	7	0.038251366	3.825137	Occasional
8	Ebenaceae	01	*Diospyros lotus*	8	0.043715847	4.371585	Frequent
9	Sapotoideae	01	*Vitellaria paradoxa*	8	0.043715847	4.371585	Frequent
10	Annonaceae	01	*Anona senegalensis*	7	0.038251366	3.825137	Occasional
11	Arecaceae	01	*Elaeis guineensis*	5	0.027322404	2.73224	Rare
12	Salicaceae	01	*Oncoba spinosa*	4	0.021857923	2.185792	Rare
13	Chrysobalanaceae	01	*Maranthes plolyandra*	3	0.016393443	1.639344	Rare
14	Meliaceae	01	*Khaya senegalensis*	3	0.016393443	1.639344	Rare

15	Rubiaceae	01	*Nauclea diderrichii*	1	0.005464481	0.546448	Threatened

The Gamma tree species in the study area is presented in Table 5. There were a total of 36 tree species belonging to 21 families identified. The family *Fabaceae* had the highest number of tree species (09). The second largest families were *Lamiaceae* and *Arecaceae* with each having a total of three (03), families of *Meliaceae, Anacardiaceae* and *Combretaceae* two (02) different species were identified for each. Families with least tree species (one) for each were *Malvaceae, Myrtaceae, Rutaceae, Annonaceae, Sapotoideae, Moringaceae, Ebenaceae, Salicaceae, Bignoniaceae, Simaroubaceae, Chrysobalanaceae, Elaeagnaceae, Apocyaceae, Rubiaceae, and Moraceae* . The result of the status of tree species indicated that, out of 36 species that were identified, only seven (07) species were abundant (19.44 %), two (02) species were occasional (5.55%), ten (10) species were rare (27.77%), and seventeen (17) were threaten or endanger (47.22%).

The family Fabaceae is represented by many species in the study area. Suggesting that they have a very good regenerations potentials, couple with symbiotic characteristic enabling them to established a niche in a habitat (Abdullahi, 2021). A higher number of tree species increases the number of ecological niches and as well as the number of associated species (Wunderle, 1997; Kanowski *et al*., 2003).

The finding of this study is in conformity to the studies of Wakawa *et al*., (2017), Soba (2019), and Abdullahi (2021) on Northern Nigeria trees species. The result further indicated that, out of the 36 tree species present, about 47.22% were endangered suggesting that human anthropogenic activities are highly taking place even in the university campuses. In fact at the Faculty of Agriculture that is known for cultivation of crops, orchard and permanent tree crops among others for that matter. The overexploitation has resulted in the rapid loss of tree diversity and is recognized as a major environmental and economic problem around the world (Mani and Parthasarathy, 2006).

Table 5: Gamma Species of the Study Area

S\N	**Family**	**No. Species**	***Species***	**No. Occurrence**	**R. A**	**R. D (%)**	**Status**
1	Fabaceae	09	*Daniellia oliveri*	131	0.083069	*8.30691*	Abundant
2			*Pakia biglobosa*	41	0.025999	*2.59987*	Rare
3			*Leucaena leucocephala*	36	0.022828	*2.28282*	Rare
4			*Entada abyssinica*	23	0.014585	*1.45847*	Rare
5			*Senna siamea*	18	0.011414	*1.14141*	Rare
6			*Piliostigma reticulatum*	08	0.005073	*0.50729*	Threatened/ Endangered
7			*Tamarindus indica*	02	0.001268	*0.12682*	Threatened/ Endangered
8			*Acacia nilotica*	02	0.001268	*0.12682*	Threatened/ Endangered
9			*Ditarium macrocarpum*	01	0.000634	*0.06341*	Threatened/ Endangered
10	Lamiaceae	03	*Gmelina arborea*	150	0.095117	*9.51173*	Abundant
11			*Tectona grandis*	269	0.170577	*17.0577*	Abundant
12			*Vitex doniana*	23	0.014585	*1.45847*	Rare
13	Arecaceae	03	*Elaeis guineensis*	11	0.006975	*0.69753*	Threatened/ Endangered
14			*Raphia farinifera*	5	0.003171	*0.31706*	Threatened/ Endangered
15			*Borassus aethiopum*	3	0.001902	*0.19023*	Threatened/ Endangered

16	Meliaceae	02	*Khaya senegalensis*	277	0.17565	*17.565*	Abundant
17			*Azadirachta indica*	11	0.02156	*2.15599*	Rare
18	Anacardiaceae	02	*Mangifera indica*	85	0.0539	*5.38998*	Abundant
19			*Anacardium occidentale*	122	0.077362	*7.73621*	Abundant
20	Combretaceae	02	*Terminalia mantaly*	48	0.030438	*3.04375*	Occasional
21			*Terminalia macroptera*	50	0.031706	*3.17058*	Occasional
22	Malvaceae	01	*Sterculia setigera*	14	0.008878	*0.88776*	Threatened/ Endangered
23	Myrtaceae	01	*Syzygium guineense*	16	0.010146	*1.01458*	Rare
24	Rutaceae	01	*Citrus sinensis*	98	0.062143	*6.21433*	Abundant
25	Annonaceae	01	*Anona senegalensis*	34	0.02156	*2.15599*	Rare
26	Sapotoideae	01	*Vitellaria paradoxa*	16	0.010146	*1.01458*	Rare
27	Moringaceae	01	*Moringa olifera*	29	0.018389	*1.83893*	Rare
28	Ebenaceae	01	*Diospyros lotus*	9	0.005707	*0.5707*	Threatened/ Endangered
29	Salicaceae	01	*Oncoba spinosa*	7	0.004439	*0.44388*	Threatened/ Endangered
30	Bignoniaceae	01	*Newbouldia laevis*	5	0.003171	*0.31706*	Threatened/ Endangered
31	Simaroubaceae	01	*Ailanthus altissima*	3	0.001902	*0.19023*	Threatened/ Endangered
32	Chrysobalanaceae	01	*Maranthes plolyandra*	3	0.001902	*0.19023*	Threatened/ Endangered
33	Elaeagnaceae	01	*Elaeagnus pugens*	1	0.000634	*0.06341*	Threatened/ Endangered
34	Apocyaceae	01	*Voacanga thouarsii*	1	0.000634	*0.06341*	Threatened/ Endangered
35	Rubiaceae	01	*Nauclea diderrichii*	1	0.000634	*0.06341*	Threatened/ Endangered
36	Moraceae	01	*Ficus exasperate*	1	0.000634	*0.06341*	Threatened/ Endangered

The results of various diversity indices for the study areas are presented in table 6. The species richness indices (D) computed were; total site = 4.89, site A = 2.66, Site B = 2.60, Site C = 2.28 and Site D = 2.50. The results indicated that total site has higher tree species richness, which was followed by Site A, Site B, Site D and Site C with slightly variation. The 4.89 richness values observed for the total species was due to increase in sample sizes. According to Akosim *et al.*, (2016) in vegetation assessment, increase in sample size can result to increase in precision of the researcher estimate. The result of the study indicated low species richness when compared with the studies of Ikyaagba *et al., (2015)* in University of Agriculture Markurdi where they recorded species richness of 6.091, Aigbe and Odulami 2016 in Ehor Tropical Rainforest Reserve in Edo State, Nigeria reported species richness values of 6.92, 8.64 and 8.19 across different three sites of the reserve.

This may be attribute by the dominant present of fruit trees and timber trees in the study area. Differences in some abiotic factors such as topography, climates, edaphic and their interaction, and sampling strength used might also be reasons for the noted variation across the study area Wakawa *et al.*, (2017). The implication of less species richness in the study area is that the forest environments are not stable, therefore, the forests are not well managed for sustainability.

Table 6: Shannon-Weiner index (H) and Margalef species richness index (D)

Location	H	D	No. of Family	No. Of Specie	Total No. Trees Observed
Gamma Species of the study site	2.74	4.89	**21**	**36**	1577
Alpha species of Site A	2.18	2.66	**12**	**21**	879
Alpha species of Site B	2.10	2.60	**10**	**18**	322
Alpha species of Site C	2.24	2.28	**10**	**15**	193
Alpha species of Site D	2.29	2.50	**11**	**15**	183

The results of Shannon-Wiener diversity Index (H') computed were 2.74 for total site, 2.18 for site A, 2.10 for site B, 2.24 for site C and 2.29 for site D. The results of Shannon- Wiener diversity Index in the study area is higher compared to 0.02 value of Lede and Galumji in Wawa- Zange Forest Reserve, Gombe State, Nigeria (Hayatu and Abba, 2021), 0.86 and 0.675 values for (sites A and B) for accurate recording of different tree species respectively in the University of Benin, Benin City, Nigeria (Ogwu *et al.*, 2016), 1.35 value of the Orchard of Federal university Dutse, Jigawa State (Salami and Lawal, 2018), and 1.97 value of a Sahelien Ecosystem in North-East Nigeria (Wakawa *et al.*, 2017). Similar tree diversity values of 2.813 and 2.918 were recorded under less and highly disturbed area of Gashaka Gumti National Park Nigeria respectively (Saka *et al.*, 2018), 2.8 and 2.7 value in logged and relatively non-log areas areas of Shere Hills, North Central Nigeria (Francis *et al.*, 2017) and 2.43, 2.70 and 2.48 for Sudan Savanna, Northern Guinea Savana and Southern Guinea Savanna in Nigeria (Abdullahi, 2021). However, the tree species diversity value in Ehor tropical rainforest reserve in edo state, Nigeria were reported to be 3.19, 3.54, and 3.40 for highly undulated, flat topography and sloppy areas respectively (Aigbe and Odulami, 2016). Tree species diversity and composition in an area depends on environmental factors, such as temperature, humidity, nutrition, sunlight, topography, bedrock geology, soil characteristics, canopy structure and land use history (Saka *et al.*, 2018). Hence, the variation observed in this study may due to variation in climatic factors, edaphic factors and anthropogenic activities.

CONCLUSION AND RECOMMENDATIONS

The results revealed that family *Fabaceae* has the highest number of species. It is evident that from this study that D. *oliveri*, *M. indica*, *K. senegalensis*, *G. arboreal*, *T. grandis*, *C. sinensis*, and *A. occidentale* were the most occurrence species in the study area which suggest high dominant of invasive species. The status of most of the indigenous tree species mostly fall between Rare and Endangered suggesting that, they are about going to extinction with the exception of few that are either dominant, frequent or occasionally occurs. The tree species richness in the study area is not too good while the tree species diversity is relatively stable. From the result of this study, it is recommended that the management of Faculty of Agriculture should make it a law that no one should fell or cut down any tree that is ≥10cm in diameter be it local or invasive species. Enrichment plant of trees species annually can also do well in maintaining the floristic stability in the faculty. To enhance tree species conservation and maintain stability in their diversity, richness and status, there is need for an awareness on the potential ecological benefits of tree stands on farmlands to the people within and surrounding the faculty community.

REFERENCE

- Abdullahi, I. N. (2021). Parkland trees under severe drought: An assessment of species diversity and abundance across three agroecological zones of Northern Nigeria. *Open Journal of Forestry*, *11*(2), 117-134.
- Adeyemi, A. A., Ibe, A. E., & Okedimma, F. C. (2015). Tree structural and species diversities in Okwangwo forest, cross river state, Nigeria. *Journal of Research in Forestry, Wildlife and Environment*, *7*(2), 36-53.
- Agbelade, A. D., & Akindele, S. O. (2013). Land use mapping and tree species diversity of Federal University of Technology, Akure. *American International Journal of Contemporary Research*, *3*(2), 104-113.
- Aigbe, H. I., & Odulami, S. S. (2016). Tree diversity status and abundance in Ehor tropical rainforest reserve in Edo state, Nigeria. *Journal of Research in Forestry, Wildlife and Environment*, *8*(3), 97-107.
- Akosim C., Mbaya Y.P., & Yaduma Z.B. (2016). Fundamentals of Wildlife Resources Management and Related Attributes. Mike-B Publishers Kaduna – Nigeria. 42.
- Amonum, J. I., Dau, J. H., & Gbande, S. (2016). Composition and distribution of economic tree species in Nagi Forest Reserve, Benue State, Nigeria. *Journal of Research in Forestry, Wildlife and Environment*, *8*(4), 101-108.
- Armenteras, D., Rodríguez, N., & Retana, J. (2009). Are conservation strategies effective in avoiding the deforestation of the Colombian Guyana Shield?. *Biological Conservation*, *142*(7), 1411-1419.
- Corlett, R. T. (2016). Plant diversity in a changing world: status, trends, and conservation needs. *Plant diversity*, *38*(1), 10-16.
- Cunningham, W. P., Cunningham, M. A., & Saigo, B. W. (2001). *Environmental science: A global concern* (Vol. 412). New York: McGraw-Hill.
- Díaz S., Settele J., E., Brondízio E.S., H. T. Ngo, M. Guèze, J., Agard, A. Arneth, P. Balvanera, K. A. Brauman, S. H. M. Butchart, K. M. A. Chan, L.

A. Garibaldi, K. Ichii, J. Liu, S. M. Subramanian, G. F. Midgley, P. Miloslavich, Z. Molnár, D. Obura, A. Pfaff, S. Polasky, A. Purvis, J. Razzaque, B. Reyers, R. Roy Chowdhury, Y. J. Shin, I. J. Visseren-Hamakers, K. J. Willis, and C. N. Zayas (2019): Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. IPBES secretariat, Bonn, Germany.56

- Edet, D. I., Ijeomah, H. M., & Ogogo, A. U. (2012). Preliminary assessment of tree species diversity in Afi Mountain Wildlife Sanctuary, Southern Nigeria. *Agriculture and biology journal of North America*, *3*(12), 486-492.
- Francis, M. J., Kambai, C., Ombugadu, A., Dangtim, S., Mshelmbula, B. P. & Peter, M. K. (2017). Comparative study of Flora abundance and diversity in logged and relatively non logged areas of Shere Hills, North Central NIGERIA. International Journal of Applied Biological Research 2017. IJABR 8(2)
- Fuwape, J. A., & ONYEKWELU, J. C. (2011). Urban forest development in West Africa: benefits and challenges.
- Hanif, M. A., Bhatti, H. N., Nadeem, R., Zia, K. M., & Ali, M. A. (2007). Cassia fistula (Golden Shower): A multipurpose ornamental tree. *Floricult. Ornamental Biotechnol*, *1*(1), 21-26.
- Havens, K., Kramer, A. T., & Guerrant Jr, E. O. (2014). Getting plant conservation right (or not): the case of the United States. *International Journal of Plant Sciences*, *175*(1), 3-10.
- Hayatu, A., & Aba, H. M. (2021). A Study of Tree Species Composition and Diversity in Relation to Soils at Lede and Galumji in Wawa-Zange Forest Reserve, Gombe State, Nigerial. *Dutse Journal of Pure and Applied Science*, *7*, 250-259.
- Ikyaagba, T. E., Tee, T. N., Dagba, B. I., Ancha, U. P., Ngibo, K. D., & Tume, C. (2015). Tree composition and distribution in Federal University of Agriculturema Kurdi, Nigeria. *Journal of research in Forestry, Wildlife and Environment*, *7*(2), 147-157.
- Kanowski, J., Catterall, C. P., Wardell-Johnson, G. W., Proctor, H., & Reis, T. (2003). Development of forest structure on cleared rainforest land in eastern Australia under different styles of reforestation. *Forest ecology and Management*, *183*(1-3), 265-280.
- Mani, S., & Parthasarathy, N. (2006). Tree diversity and stand structure in inland and coastal tropical dry evergreen forests of peninsular India. *Current science*, 1238-1246.
- Obayelu, A. E. (2014). Assessment of land use dynamics and the status of biodiversity exploitation and preservation in Nigeria.
- Ogwu, M. C., Osawaru, M. E., & Obayuwana, O. K. (2016). Diversity and abundance of tree species in the University of Benin, Benin City, Nigeria. *Appl Trop Agric*, *21*(3), 46-54.
- Saka, M. G., Osho, J. S. A., & Nyiptem, E. I. (2018). Quantitative analysis of tree species composition and diversity in Gashaka Gumti National Park, Nigeria. *International Journal of Research in Agriculture and Forestry*, *5*(4), 17-23.
- Salami, K. D., & Lawal, A. A. (2018). Tree species diversity and composition in the orchard of Federal University Dutse, Jigawa State. *Journal of Forestry Research and Management*, *15*(2), 112-122.
- Soba TM, (2019). Comparative Studies of Plant Litter Quantity, Quality and Soil Microbial Abundances between Montane and High Forest Zones of Taraba State, Nigeria. MSc Thesis, University of Maiduguri, Maiduguri, Nigeria.
- Thomas M. B. & Diana M. B. (2003). Forest Policy Development in the United States. In: Raymond, A. Young & Ronald L. Giese (Editors). Introduction to Forest Ecosystem Science and Management, Third Edition. Pp 6.36.
- Usman D.D., Bababgana M., Soba T.M., Babanlungu Z. A., Ndagi H.I., Mairo Y., Hammanjoda S. A., Obadiah S.Y., & Kabir F. M. (2022). Assessment of the Influence of Human Activities on Biodiversity Conservaion: A Case Study of Gashaka Gumti National Park, Gashaka Local Government, Taraba State, Nigeria. International Journal of Agriculture,Environment & Bioresearch.Vol. 07, No. 03; 2022 Pp. 138 – 155. https://doi.org/10.35410/IJAEB.2022.5730
- Vitousek, P. M., Mooney, H. A., Lubchenco, J., & Melillo, J. M. (1997). Human domination of Earth's ecosystems. *Science*, *277*(5325), 494-499.
- Wakawa, L., Suleiman, A., IBRAHIM, Y., & Lawan, A. D. A. M. (2017). Tree species biodiversity of a sahelien ecosystem in North-East Nigeria. *Bartın Orman Fakültesi Dergisi*, *19*(2), 166-173. DOI: 10.24011/barofd.327669
- Wunderle Jr, J. M. (1997). The role of animal seed dispersal in accelerating native forest regeneration on degraded tropical lands. *Forest ecology and management*, *99*(1-2), 223-235.
- Yang, Y., & Ayodele, A. E. (2012). *Diversity and distribution of vascular plants in Nigeria*. Qingdao Publishing House.

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