

Evaluation of the Impact of Anthropogenic Activities on Woody Species Diversity and Distribution in Dakri and Girei 1 Wards of Girei Local Government Area, Adamawa State

Duru, C. E.*, Basiri, B., Sakiyo, D. C. & Reuben, M. M.

Department of Plant Science, Faculty of Sciences, Modibbo Adama University, Yola – Nigeria

*Corresponding author: emekachristianduru@gmail.com

ABSTRACT

Anthropogenic activities are key drivers of environmental degradation, especially in fragile ecosystems, leading to habitat loss and biodiversity decline. This study evaluated the impact of human activities on woody species distribution in Girei Local Government Area (LGA), Adamawa State, Nigeria. Vegetation data were collected from six hectares using the point-centered quarter (PCQ) method. A total of 51 woody species from 14 families were recorded, with Utility Classes 1 (timber/furniture) and 5 (shade/ornamental) being the most utilized. Fuelwood/charcoal collection and timber harvesting were identified as the primary anthropogenic pressures. Conservation assessment showed 45 species as Least Concern, two species (*Carica papaya* and *Mangifera indica*) as data deficient, *Eucalyptus camaldulensis* as near threatened, *Khaya senegalensis* and *Vitellaria paradoxa* as vulnerable, and *Tectona grandis* as endangered. Shannon diversity index ($H' = 3.49$) indicated high species diversity, while Simpson's index (0.96) reflected dominance by a few species, revealing uneven distribution due to exploitation. The study underscores the urgent need for sustainable land-use practices, reforestation of threatened species, and community-based conservation initiatives. Engaging local communities in awareness and sustainable forest management is critical to preserving woody species diversity. These findings provide essential baseline data to guide policy, environmental management, and the development of effective conservation strategies in Girei LGA.

Keywords: Anthropogenic activities, Girei LGA, Woody species, Point-centered quarter, Conservation

INTRODUCTION

Human activities significantly impact the environment, with anthropogenic effects including deforestation, species extinction, climate change, and desertification (Vuković and Domazet, 2022). Vegetation, comprising plant species and the ground cover they create, varies with climate, soil, and topography and forms the structural basis of terrestrial ecosystems (Kent, 2012). Flowering plants are essential for global biodiversity and primary productivity, providing food, medicine, fibers, oils, and habitats for numerous animals (Duru and Kulawe, 2023). Rapid population growth and unsustainable land use in many developing countries, including Nigeria, have accelerated vegetation loss, resulting in forest degradation, habitat destruction, and reduced ecosystem services (Okafor, 2023). While anthropogenic impacts on vegetation

have been widely studied, few investigations have focused on specific local areas, particularly in Girei Local Government Area, Adamawa State.

This study evaluated the impact of anthropogenic activities on woody species distribution and utilization in Girei 1 and Dakri wards. Findings aim to provide insights into local vegetation dynamics, highlight species threatened by human activities, and inform sustainable management and conservation strategies in the area.

MATERIALS AND METHODS

Study Area

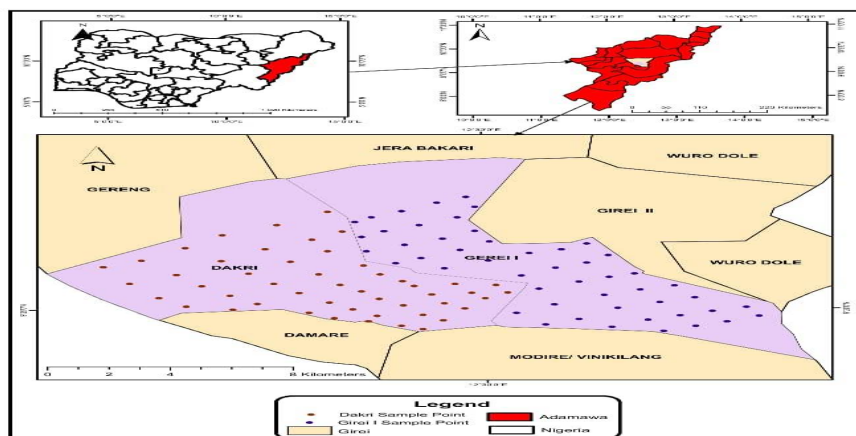


Figure 1: Map of Girei Local Government Area and Sampled Areas

Source: Department of Geography, Modibbo Adama University

The study was conducted in Girei Local Government Area, Adamawa state (Fig. 1). Girei LGA is at latitude $9^{\circ}35'N - 9^{\circ}55'N$ and longitude $12^{\circ}05'E - 12^{\circ}25'E$, covering $1,151.64\text{km}^2$ (Alkasim *et al.*, 2018). It is in the Sudan savannah zone with annual rainfall of 900-1100mm for 4-5 months. Average temperatures range from 25 to 35°C , ideal for tropical plants (Ibrahim *et al.*, 2020). Data were collected in two sites: Girei 1 ward (Sangere, Modibbo Adama University- MAU and Girei) and Dakri ward (Federal housing, Bakalchi and Dakri). The 2020 population was estimated at 150,000-200,000, with density of 100-150 persons/ km^2 ; major ethnic groups are Fulani, Hausa, and Bachama. Borders of Girei: Song (north), Shelleng and Demsa (west), Yola North and South (south), Fufore (east) (Alkasim *et al.*, 2018). Girei LGA is rich in biodiversity, especially plants, with many medicinal and economic trees. Vegetation in Dakri and Girei 1 wards is Sudan Savannah type, featuring short trees and tall grasses with wet and dry seasons (Adebayo, 1999). The area has scattered trees, shrubs, and grasslands, with thicker vegetation in hilly areas like Girei forest reserve and Bagale Hills. Common tree species include *Acacia* spp, *Adansonia* spp, *Parkia biglobosa*, *Tamarindus indica*, and *Vitellaria paradoxa*.

Sampling Technique

The Point Centered Quarter (PCQ) method was used for vegetation sampling. In each study site, a 1000 m transect was established with sampling points at 200 m intervals. Perpendicular lines at each point formed four quarters. Distances to the nearest tree or shrub in each quarter were measured, and diameter at breast height (DBH) was

recorded at 1.32 m above ground. All woody plants encountered were identified to species level.

Data Collection

A pilot survey was conducted before data collection. Sampling points were randomly selected and marked using a steel pole and colour tape, following the PCQ method (Bukar and Abba, 2022) and the approach of Johnson *et al.* (2006). A total of 10 hectares was sampled (5 ha per site). Each hectare contained 10 sampling points, resulting in 50 sampling points and 200 quarters per ward. Trees and shrubs up to 5 m tall and ≥ 10 cm DBH were measured, identified, and recorded. Plant habit and status were also documented.

Socio-economic Data Collection

Socio-economic data were collected using structured questionnaires administered to 100 respondents in Girei LGA, Adamawa State. The questionnaire addressed respondents' socio-economic character

istics, anthropogenic activities, and the utilization of tree species in the area

Classifying Plants According to Utilization

Plant species identified were classified according to utilization as used by Abdurrasheed and Okoh (2022). Utilization was based on utility classes and these classes were grouped into five (5). They are:

Utility 1: Timber production and Furniture

Utility 2: Fuelwood and Charcoal production

Utility 3: Food and Fruit

Utility 4: Medicinal purpose

Utility 5: Shade, Ornamental and Other uses

Classification According to impact of Human Activities in the Study Site

Structured questionnaires were issued to residents in the study area. Results from the questionnaires and PCQ were used to assess the impact of human activities on plants species in the study area; and the result presented based on reasons for cutting down the plant, which was grouped into four (4) categories. They are: Cutting for timber production, cutting for Charcoal production and fuelwood, cutting for Animal feed and cutting for Agricultural activities

Classification According to International Union for Conservation of Nature (IUCN) Data Base

Reference was made to IUCN red book, which is usually updated regularly to assess the conservation status of the identified plant species encountered in the study area and result was presented according to IUCN categorization, which are: Extinct (EX), Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD) and Not Evaluated (NE)

Data Analysis

Data collected using PCQ sampling method was subjected to calculations and result generated from the calculations and questionnaire was inputted into Microsoft excel (version 10) and Q-GIS for further analysis. The following parameters were calculated: Mean distance, Mean area per plant, Total density, abundance, relative abundance, frequency, relative frequency, Dominance, relative dominance, Important value index, relative IVI, Similarity index (Sørensen, 1948), Shannon- Weiner Diversity index, Simpson's index (D) (Simpson, 1949)

RESULTS AND DISCUSSION

The results of the study on the impact of anthropogenic activities on plant species diversity in two wards of Girei LGA, assessed using the Point Centered Quarter method, are presented in tables and charts. Dakri ward recorded higher plant density, indicating closer tree spacing. A total of 51 plant species belonging to 14 families were identified, with Fabaceae being the most dominant family. *Azadirachta indica* was the dominant species in Dakri ward, while *Adansonia digitata* and *Azadirachta indica* were dominant in Girei 1 ward.

Table 1: Mean Distance, Mean Area Per Plant and Absolute Density

Parameters/location	Dakri ward	Girei 1 ward	Girei LGA
Total distance (m)	795.2	1066.1	1861.3
Total quarters	200	200	400
Mean Distance (m)	3.976	5.3245	4.65
Mean Area Per Plant (m ²)	15.808	28.35	21.623
Total area sampled (m ²)	50,000	50,000	100,000
Absolute Density (plant/m ²)	3163	1764	4625

Table 2: Names of Plant Species Identified in Girei I and Dakri Wards

S/n	Family name	Species	Common name	Hausa name
1	Anacardiaceae	<i>Anacardium occidentale</i>	Cashew tree	Kandami or Kanwu
2	Anacardiaceae	<i>Magnifera indica</i>	Mango	Mangwaro
3	Anacardiaceae	<i>Spondias mombin</i>	Hog Plum	Tsadar maji
4	Annonaceae	<i>Hexalobus monopetalus</i>	Six petaled strawberry	Jan kunu

5	Annonaceae	<i>Polyalthia longifolia</i>	Ashoka tree	Shuka
6	Apocynaceae	<i>Calotropis procera</i>	Apple of Sedom	Biri or Bururu
7	Apocynaceae	<i>Rauwolfia caffra</i>	White Rauwolfia	Kunini or Rauwolfia
8	Arecaceae	<i>Borassus aethiopum</i>	Africian fan palm	Dabinu
9	Arecaceae	<i>Hyphaene thebaica</i>	Doum palm	Kurmi
10	Caricaceae	<i>Carica papaya</i>	Pawpaw	Gwanda
11	Combretaceae	<i>Combretum mole</i>	Velvet bush	Molsi or Molse
12	Combretaceae	<i>Terminelia catapa</i>	Tropical Almond	Kwanta-almonds
13	Combretaceae	<i>Terminelia leiocarpa</i>	Africian Walnut	Idu-almond
14	Combretaceae	<i>Terminelia mentalis</i>	Black afara	Afara or Afara doki
15	Euphorbiaceae	<i>Jatropha curcas</i>	Physic nut	Tsa
16	Fabaceae	<i>Acacia albida</i>	White Acacia	Gawo
17	Fabaceae	<i>Acacia sieberiana</i>	Paperbark thorn	Majjinjira
18	Fabaceae	<i>Albizia zygia</i>	West African Albizia	Sami or Samilan Goro
19	Fabaceae	<i>Burkea Africana</i>	Africian Greenheart	Kuruku
20	Fabaceae	<i>Cassia fistula</i>	Golden shower tree	Kundu
21	Fabaceae	<i>Daniellia oliveri</i>	Nigerian Copalwood	Kuka
22	Fabaceae	<i>Delonix regia</i>	Royal Ponicians	Sharen shani
23	Fabaceae	<i>Detarium macrocarpum</i>	Sweet Detarium	Tsure
24	Fabaceae	<i>Parkia biglobosa</i>	African locust bean	Dorawa or Dorowi
25	Fabaceae	<i>Pongamia pinnata</i>	indian beech	Kawnta or Rini
26	Fabaceae	<i>Prosopis Africana</i>	african ironwood	Kiriya or Mara
27	Fabaceae	<i>Senna siamea</i>	yellow cassia	Tsintsiya or Tsinaci
28	Fabaceae	<i>Tamarindus indica</i>	Tamarind	Tsamiya
29	Fabaceae	<i>Vachellia nilotica</i>	Thorny Acacia	Bagaruwa
30	Lamiaceae	<i>Gmelina arborea</i>	white teak	Maganin duma
31	Lamiaceae	<i>Tectona grandis</i>	Teak	Durumi or Itsi
32	Lamiaceae	<i>Vitex doniana</i>	Black plum	Dinya or Dinya- nku
33	Malvaceae	<i>Adansonia digitate</i>	Baobab Tree	Kuka
34	Malvaceae	<i>Crateva adansonii</i>	African capok tree	Duru or Doro
35	Malvaceae	<i>Sterculia stiger</i>	African Chestnut	Turuwa or Kwarkwaro
36	Meliaceae	<i>Azadirachta indica</i>	Neem tree	Dogonyaro
37	Meliaceae	<i>Khaya senegalensis</i>	african mahogany	Madaci

38	Meliaceae	<i>Melia azedarach</i>	White cedar	Daneja
39	Moraceae	<i>Ficus cordata</i>	Heart leaf fig	Kwandon
40	Moraceae	<i>Ficus lutea</i>	Yellow fig	Kwandon masu
41	Moraceae	<i>Ficus nymphaeifolia</i>	Figwood	Kwando bango
42	Moraceae	<i>Ficus platyphylla</i>	Broad leaved fig	Kwandon fadi
43	Moraceae	<i>Ficus sycomorus</i>	Mulberry fig	Kwandon mai ce
44	Moraceae	<i>Ficus thonningii</i>	wild fig	Kwandon tsuntsu
45	Myrtaceae	<i>Eucalyptus camaldulensis</i>	River red gum	Kwari or Mara
46	Myrtaceae	<i>Psidium guajava</i>	Guava	Gwaba
47	Myrtaceae	<i>Syzygium jambos</i>	Jambos	Udara or Dara
48	Myrtaceae	<i>Syzygium guineense</i>	Waterberry	Udara ba'uci
49	Phyllanthaceae	<i>Phyllanthus emblica</i>	Indian gooseberry	Amalakuru
50	Rutaceae	<i>Citrus senensis</i>	Sweet Orange	Lemu
51	Sapotaceae	<i>Vitellaria paradoxa</i>	Shea tree	Kadanya or Karite

Table 3: Important Value Index for Dakri Ward

Species	Rel. density	Rel. dom.	Rel. frequency	IVI	IVI rank
<i>Acacia albida</i>	0.5	0.27674	0.62893081 8	1.40567	39
<i>Acacia sieberiana</i>	1	0.2915	1.257861635	2.54936	32
<i>Adansonia digitate</i>	3	5.99822	2.51572327	11.5139	7
<i>Anacardium occidentale</i>	0.5	0.58759	0.62893081 8	1.71652	36
<i>Azadirachta indica</i>	17.5	18.0939	13.8364779 9	49.4304	1
<i>Borassus aethiolum</i>	3.5	2.16658	3.14465408 8	8.81123	10
<i>Burkea africana</i>	0.5	0.49339	0.62893081 8	1.62232	37
<i>Calotropis procera</i>	2.5	0.75654	2.51572327	5.77226	18
<i>Carica papaya</i>	1.5	0.29573	1.88679245 3	3.68252	26
<i>Cassia fistula</i>	0.5	0.07872	0.62893081 8	1.20765	42
<i>Citrus sienensis</i>	2	0.80292	2.51572327	5.31864	20
<i>Combretum</i>	0.5	0.23472	0.62893081	1.36365	40

<i>mole</i>			8		
<i>Crateva adansonii</i>	1	0.50403	1.257861635	2.76189	31
<i>Daniellia oliveri</i>	5.5	6.84453	4.40251572 3	16.747	3
<i>Delonix regia</i>	0.5	0.36146	0.62893081 8	1.49039	38
<i>Eucalyptus camaldulensis</i>	3	2.21353	2.51572327	7.72925	15
<i>Ficus cordata</i>	0.5	0.64259	0.62893081 8	1.77152	35
<i>Ficus lutea</i>	4.5	6.39888	4.40251572 3	15.3014	5
<i>Ficus nymphaeifolia</i>	1.5	1.29096	1.88679245 3	4.67775	21
<i>Ficus playtyphylla</i>	2.5	5.47802	3.14465408 8	11.1227	9
<i>Ficus sycomorus</i>	1	1.43044	1.257861635	3.6883	25
<i>Ficus thonningii</i>	1	1.32729	1.257861635	3.58515	27
<i>Gmelina arborea</i>	0.5	0.21246	0.62893081 8	1.34139	41
<i>Hyphaene thebaica</i>	3.5	1.50015	3.14465408 8	8.1448	13
<i>Jatropha curcas</i>	2	0.31234	1.88679245 3	4.19913	22
<i>Khaya senegalensis</i>	1	1.23901	1.257861635	3.49687	28
<i>Magnifera indica</i>	4.5	9.31568	3.14465408 8	16.9603	2
<i>Melia azedarach</i>	1.5	0.69882	1.88679245 3	4.08561	23
<i>Parkia biglobosa</i>	2	4.26077	2.51572327	8.77649	11
<i>Phyllanthus emblica</i>	3	1.61075	3.14465408 8	7.7554	14
<i>Polyalthia longifolia</i>	1	0.28503	1.257861635	2.54289	33
<i>Prosopis africana</i>	1	0.77565	1.257861635	3.03351	30
<i>Psidium guajava</i>	1.5	0.49001	1.88679245 3	3.8768	24
<i>Senna siamea</i>	2.5	1.14464	2.51572327	6.16036	16
<i>Spondias mombin</i>	5.5	5.57318	5.03144654 1	16.1046	4
<i>Syzygium guineense</i>	3	2.56487	3.14465408 8	8.70952	12
<i>Tamarindus</i>	4	4.70301	4.40251572	13.1055	6

<i>indica</i>				3	
<i>Terminalia catapa</i>	1	1.03378	1.257861635	3.29164	29
<i>Terminalia mentalis</i>	1.5	2.11104	1.88679245	3	19
<i>Vachellia nilotica</i>	1	0.04639	1.257861635	2.30425	34
<i>Vitellaria paradoxa</i>	3.5	3.96773	3.77358490	6	8
<i>Vitex doniana</i>	2	1.58644	2.51572327	6.10216	17
Total	100	100	100	300	

Table 4: Important Value for Girei 1 Ward

Species	Rel. density	Rel. dom.	Rel. frequency	IVI	IVI rank
<i>Acacia sieberiana</i>	0.5	0.07018	0.578034682	1.14821	40
<i>Adansonia digitate</i>	7.5	18.8844	6.936416185	33.3208	1
<i>Albizia zygia</i>	1	0.72442	1.156069364	2.88049	27
<i>Anacardium occidentale</i>	0.5	0.05265	0.578034682	1.13068	41
<i>Azadirachta indica</i>	11.5	8.43331	12.13872832	32.072	2
<i>Borassus aethiopum</i>	3	0.83605	4.046242775	7.88229	11
<i>Burkea Africana</i>	2	2.35361	2.312138728	6.66575	14
<i>Calotropis pocera</i>	1	0.02924	1.156069364	2.18531	32
<i>Cassia fistula</i>	0.5	0.00739	0.578034682	1.08542	42
<i>Citrus senensis</i>	1	0.58039	1.156069364	2.73646	30
<i>Combretum mole</i>	2	0.09218	2.312138728	4.40432	21
<i>Daniellia oliveri</i>	3.5	4.42903	2.89017341	10.8192	9
<i>Delonix regia</i>	0.5	0.65838	0.578034682	1.73641	36
<i>Detarium</i>	2.5	0.70058	2.89017341	6.09075	17
<i>Macrocarpum Eucalyptus camaldulensis</i>	6	5.6697	4.624277457	16.294	6
<i>Ficus lutea</i>	1	0.96102	1.156069364	3.11709	23
<i>Ficus platyphylla</i>	1	1.31676	1.156069364	3.47283	22
<i>Ficus thonningii</i>	0.5	0.54196	0.578034682	1.61999	37
<i>Gmelina arborea</i>	2.5	3.45967	1.734104046	7.69377	12
<i>Hexalobus monopetalus</i>	1	0.23286	0.578034682	1.81089	33
<i>Hyphaene thebaica</i>	1.5	0.18865	1.156069364	2.84472	28
<i>Khaya senegalensis</i>	4.5	3.40899	4.624277457	12.5333	8
<i>Magnifera indica</i>	3	1.50112	2.89017341	7.39129	13

<i>Parkia biglobosa</i>	1.5	3.20224	1.734104046	6.43634	16
<i>Phyllanthus emblica</i>	0.5	0.8843	0.578034682	1.96233	34
<i>Polyalthia longifolia</i>	1.5	0.14092	1.156069364	2.79699	29
<i>Pongamia pinnata</i>	1	0.42464	0.578034682	2.00267	33
<i>Prosopis africana</i>	6.5	6.20872	6.936416185	19.6451	3
<i>Psidium guajava</i>	0.5	0.09381	0.578034682	1.17184	39
<i>Raurolfia caffra</i>	1	0.93145	1.156069364	3.08752	25
<i>Senna siamea</i>	5.5	8.33381	5.780346821	19.6142	4
<i>Spondias mombin</i>	2.5	1.27787	1.734104046	5.51197	18
<i>Sterculia stiger</i>	1	0.3586	1.156069364	2.51467	31
<i>Syzgium jambos</i>	0.5	0.66801	0.578034682	1.74604	35
<i>Syzygium guineense</i>	4	2.41512	4.046242775	10.4614	10
<i>Tamarindus indica</i>	5	8.74824	4.046242775	17.7945	5
<i>Tectona grandis</i>	2.5	1.77436	2.312138728	6.5865	15
<i>Terminalia catapa</i>	1	0.80411	1.156069364	2.96018	26
<i>Terminalia leiocarpa</i>	0.5	0.38387	0.578034682	1.4619	37
<i>Terminalia mentalis</i>	2	0.65272	2.312138728	4.96486	19
<i>Vitellaria paradoxa</i>	3.5	6.38559	4.046242775	13.9318	7
<i>Vitex doniana</i>	1.5	1.17907	1.734104046	4.41317	20
Total	100	100	100	300	

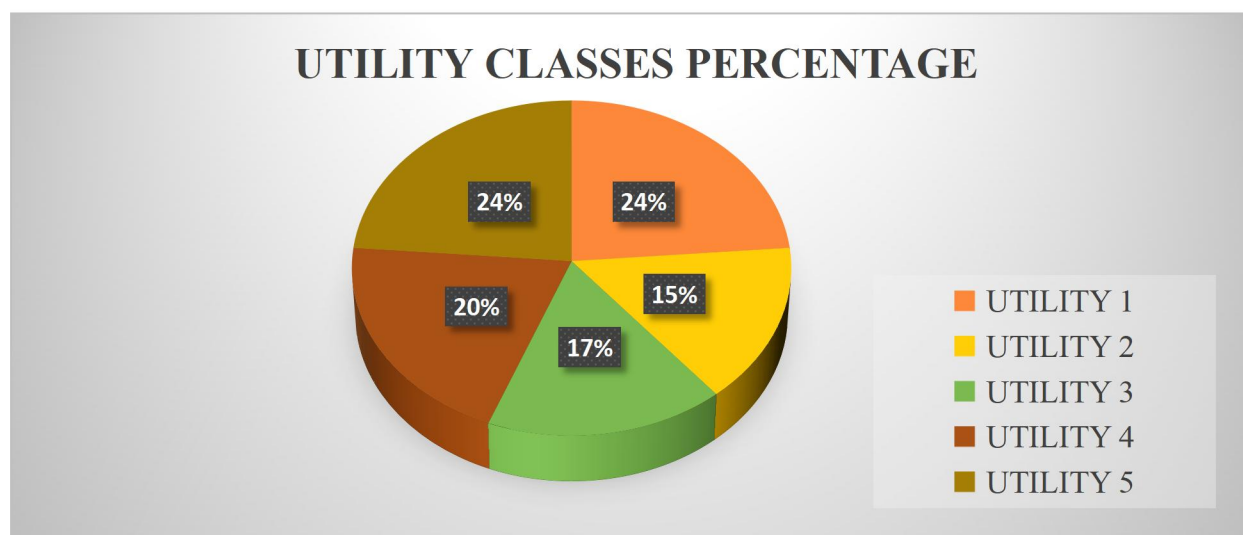


Figure 1: Utility Classes Percentage of Girei LGA

Table 5 Respondents on Anthropogenic Activities in Girei LGA

S/n	Item	Responds	Responds
1	Are you aware of the term Anthropogenic Activities?	Yes-37 (74%)	No-13 (26%)

2	Have you noticed any changes in the vegetation of Girei LGA?	Yes-46 (92%)	No-4 (8%)
3	What changes have you observed?		
	Increased in certain tree species	1 (2%)	
	Decreased in certain trees	34 (68%)	
	Introduction of new trees	4 (8%)	
	Disappearance of native tree species	11 (22%)	
4	Why do people cut down trees in this area?		
	Cutting for fuel wood/Charcoal production	24 (48%)	
	Cutting for Timber production	17 (34%)	
	Cutting for Animal feed/food/medicine	2 (4%)	
	Cutting for Agricultural activities	7 (14%)	
5	What is the common cutting method use for tree product collection in Girei LGA?		
	Branch cutting	19 (38%)	
	Whole tree cutting	29 (58%)	
	Others (Bark, leaves etc)	2 (4%)	
6	Which tree species are mostly use for timber/ fuelwood and charcoal production in the area?		
	<i>Vitellaria paradoxa</i>	18 (36%)	
	<i>Tectona grandis</i>	23 (46%)	
	<i>Daniellia oliveri</i>	3 (6%)	
	<i>Eucalyptus camaldulensis</i>	6 (12%)	
7	Which tree species are mostly use for food, fruits, animal feed and medicine in the area?		
	<i>Magnifera indica</i>	13 (26%)	
	<i>Azadirachta indica</i>	17 (34%)	
	<i>Carica papaya</i>	15 (30%)	
	<i>Citrus senensis</i>	5 (10%)	
8	Which tree species are mostly use for shade, beautification and windbreak		
	<i>Azadirachta indica</i>	33 (66%)	
	<i>Syzygium guineense</i>	11 (22%)	
	<i>Polyalthia longifolia</i>	6 (12%)	
9	Do you know of any conservation efforts in the area?	Yes- 9 (18%)	No-41 (82%)
10	have you participated in any conservation effort?	Yes-7 (14%)	No -43 (86%)
11	How important do you think it is to protect the vegetation of Girei LGA?		
	Not important	0	
	Important	36 (72%)	

	Very Important	14 (28%)	
12	Do you think there are adequate policies and regulations in place to protect the vegetation of Girei LGA?	Yes-23 (46%)	No-27 (56%)
13	Would you like to be informed about the result of this study?	Yes-48 (96%)	No-2 (4%)

Table 6: Conservation Status of Identified Plant Species in Girei LGA Based on IUCN Data Base

S/n	Species name	Status
1	<i>Acacia albida</i>	Least Concern
2	<i>Acacia sieberiana</i>	Least Concern
3	<i>Adansonia digitata</i>	Least Concern
4	<i>Albizia zygia</i>	Least Concern
5	<i>Anacardium occidentale</i>	Least Concern
6	<i>Azadirachta indica</i>	Least Concern
7	<i>Borassus aethiopum</i>	Least Concern
8	<i>Burkea africana</i>	Least Concern
9	<i>Calotropis procera</i>	Least Concern
10	<i>Carica papaya</i>	Data Deficient
11	<i>Cassia fistula</i>	Least Concern
12	<i>Citrus senensis</i>	Least Concern
13	<i>Combretum mole</i>	Least Concern
14	<i>Crateva adansonii</i>	Least Concern
15	<i>Daniellia oliveri</i>	Least Concern
16	<i>Delonix regia</i>	Least Concern
17	<i>Detarium macrocarpum</i>	Least Concern
18	<i>Eucalyptus camaldulensis</i>	Near Threatened
19	<i>Ficus cordata</i>	Least Concern
20	<i>Ficus lutea</i>	Least Concern
21	<i>Ficus nymphaeifolia</i>	Least Concern
22	<i>Ficus platyphylla</i>	Least Concern
23	<i>Ficus sycomorus</i>	Least Concern
24	<i>Ficus thonningii</i>	Least Concern
25	<i>Gmelina arborea</i>	Least Concern
26	<i>Hexalobus monopetalus</i>	Least Concern
27	<i>Hyphaene thebaica</i>	Least Concern
28	<i>Jatropha curcas</i>	Least Concern
29	<i>Khaya senegalensis</i>	Vulnerable

30	<i>Magnifera indica</i>	Data Deficient
31	<i>Melia azedarach</i>	Least Concern
32	<i>Parkia biglobosa</i>	Least Concern
33	<i>Phyllanthus emblica</i>	Least Concern
34	<i>Polyalthia longifolia</i>	Least Concern
35	<i>Pongamia pinnata</i>	Least Concern
36	<i>Prosopis africana</i>	Least Concern
37	<i>Psidium guajava</i>	Least Concern
38	<i>Rauolfia caffra</i>	Least Concern
39	<i>Senna siamea</i>	Least Concern
40	<i>Spondias mombin</i>	Least Concern
41	<i>Sterculia stigera</i>	Least Concern
42	<i>Syzgium jambos</i>	Least Concern
43	<i>Syzygium guineense</i>	Least Concern
44	<i>Tamarindus indica</i>	Least Concern
45	<i>Tectona grandis</i>	Endangered
46	<i>Terminalia catapa</i>	Least Concern
47	<i>Terminalia leiocarpa</i>	Least Concern
48	<i>Terminalia mentalis</i>	Least Concern
49	<i>Vachellia nilotica</i>	Least Concern
50	<i>Vitellaria paradoxa</i>	Vulnerable
51	<i>Vitex doniana</i>	Least Concern

Table 7: Similarity Index of Dakri and Girei 1 Wards

Sorensen coefficient	
Number of species in Dakri (A)	42
Number of species in Girei 1 (B)	42
Common species in both sites C)	33
SORENSEN COFFICIENT (S) = $2C/A+B$ 0.7857	

Table 8: Shannon Wiener Diversity Index

S/N	Ward	H'
1	Girei 1	3.36668

2	Dakri	3.3357
----------	-------	---------------

Table 9: Simpson's Index

S/N	Ward	D
1	GIREI 1	0.96
2	DAKRI	0.95

Table 10: Evaluation of Reason for Tree Loss in Dakri and Girei 1 Wards

Categories	Percentage (%)
Cutting for Timber Production	34
Cutting for Charcoal Production and Fuelwood	48
Cutting for Animal feed	4
Cutting for Agricultural Activities	14

The socio-economic characteristics of respondents showed that most fell within the economically active age group of 31–50 years, with males constituting 84% of the respondents. Farming was the dominant occupation, and most respondents were literate, with over half having tertiary education. Farm sizes were generally small (1–5 ha), and land was mainly acquired through government allocation and inheritance, consistent with findings by Agbeje *et al.* (2021). These characteristics indicate strong dependence on land and vegetation resources for livelihoods in Girei LGA.

Vegetation assessment revealed that Girei LGA supports a relatively diverse plant community. A total of 51 plant species belonging to 14 families were recorded across the two wards. The Fabaceae family was the most dominant, accounting for 14 species, likely due to its ecological adaptability and effective seed dispersal mechanisms. Although the number of trees stands recorded was lower than that reported by Bello *et al.* (2013) in Kano State, this difference may be attributed to variations in sampling intensity and ecological zones.

The dominance of *Azadirachta indica* and *Eucalyptus camaldulensis*, which together accounted for over 19% of total tree stands, reflects deliberate planting due to their fast growth, adaptability, and usefulness in shade provision, fuelwood, and desertification control. Encouragingly, indigenous species such as *Adansonia digitata*, *Daniellia oliveri*,

and *Tamarindus indica* also recorded notable abundance. However, the very low occurrence of species such as *Terminalia leiocarpa*, *Ficus cordata*, and *Acacia albida* suggests a risk of local depletion if current exploitation trends continue.

Conservation status assessment using the IUCN Red List showed that most species (88%) were classified as least concern. Nevertheless, *Eucalyptus camaldulensis* was categorized as near threatened, *Khaya senegalensis* and *Vitellaria paradoxa* as Vulnerable, and *Tectona grandis* as endangered, mainly due to high demand for timber, fuelwood, and other products. Data deficient status recorded for *Carica papaya* and *Mangifera indica* suggests insufficient ecological monitoring.

Utilization patterns indicated that timber/furniture and shade/ornamental uses were the most dominant. Fuelwood and charcoal production also constituted major uses, particularly involving *Eucalyptus camaldulensis*, *Vitellaria paradoxa*, and *Acacia albida*. Questionnaire responses revealed that deforestation and overgrazing were the leading anthropogenic activities, with fuelwood and charcoal production ranked as the most significant drivers of vegetation loss.

Species similarity analysis showed a high Sorensen similarity index (78.57%) between the two wards, indicating comparable species composition. Shannon–Wiener diversity index values were high for both wards, reflecting rich species diversity. Conversely, high Simpson's index values revealed dominance by a few species, highlighting uneven species distribution and vulnerability to environmental disturbance. This unevenness was attributed to intensive exploitation and biological factors, consistent with Zankan *et al.* (2019).

CONCLUSION

This study revealed that Girei LGA has a relatively high plant species diversity, with 51 species belonging to 14 families, but the distribution of these species is uneven due to intense anthropogenic activities such as fuelwood and charcoal production, timber extraction, and agricultural expansion. Although most species are classified as least concern, several economically important species were found to be threatened, indicating increasing pressure on the vegetation resources of the area and the need for urgent conservation measures.

CONFLICT OF INTEREST

The authors declared no conflicts of interest

REFERENCES

- Abdurrasheed, N. and Okoh, M. T. (2022). Assessment Of Tree Species And Their Utilization In Kurfi Local Government Area Of Katsina State, Nigeria. *Journal of Research in Forestry, Wildlife & Environment*. Vol. **14**(2) 2141 – 1778.
- Adebayo, A.A and Tukur, A. L (Eds.) (1999). Adamawa State in Maps. Paraclete Publishers.

- Agbeje, M. A., Adesokan I. B., Isienyi, N. C., Asabia, L. O., Onilearo, S. K. and Odetola E. F. (2021). Preliminary study on composition and ecological distribution of small mammal species in Federal University, Gashua, Yobe State, Northeast Nigeria. *Journal of Research in Forestry, Wildlife and Environment*, **13**(4), 57-65
- Alkasim, A., Hayatu, A. A. and Salihu, M. K. (2018). Energy and Power Engineering. *International Journal of Research and Innovation in Applied Science (IJRIAS)*. **10**, 449-456.
- Bello, A. G., Isah, A. D., and Ahmad, B. (2013). Tree species diversity analysis of Kogo Forest Reserve in north-western Nigeria. *International Journal of Plant, Animal and Environmental Sciences*, **3**(3), 189–196.
- Bukar, S. M., and Abba, H. M. (2022). Vegetation Structure and Diversity in Northern Yobe, Nigeria. *Asian Journal of Plant Biology*, **4**(1), 36–42.
- Duru, C. and Kulawe, D. (2023). Diversity, Distribution and Abundance of Solanaceae Family Species at Ngel-Nyaki Forest Reserve, Taraba State, Nigeria. *Bima Journal Of Science And Technology (2536-6041)*, **7**(4), 38-45.
- Ibrahim, M. (2020). Climate and vegetation of the Sudan savannah zone, Nigeria. *Journal of Environmental Science and Water Resources*, **9**(2), 1-8.
- Johnson, S. E., Mudrak, E. L. and Waller, D. M. (2006). A Comparison of Sampling Methodologies for Long-term Monitoring of Forest Vegetation in the Great Lakes Network National Parks: Great Lakes Network Report GLKN/2006/03. Ashland, WI: National Park Service.
- Kent, M. (2012). Vegetation description and data analysis: a practical approach.
- Okafor, A. R., Onyeisi, O. S. and Ogbuagu, G. O. (2023). Impact of urbanization size and deforestation environmental degradation on economic growth in Nigeria. *World Journal of Advanced Research and Reviews*, **19**(3), 608-620.
- Simpson, E. H. (1949). Measurement of diversity. *Nature*, **163**(4148), 688.
- Sørensen, T. (1948). A method of establishing groups of equal amplitude in plant sociology based on similarity of species content. *Det Kongelige Danske Videnskabernes Selskab*, **5**(4), 1–34.
- Vuković, M. B. and Domazet, M. (2022). *Anthropocene Handbook of Critical Environmental Politics* (pp. 91-103): Edward Elgar Publishing.
- Zankan, J. A. A., Endas, L., Abubakar, Y. M., and Yakubu, I. B. (2019). Tree species density and diversity in Jema'a Local Government Area of Kaduna State, Nigeria. *FUDMA Journal of Sciences*, **3**(2), 302–311.