
STATUS OF INDIGENOUS TREE SPECIES IN GIREI FOREST RESERVE OF ADAMAWA STATE

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ABSTRACT

Quantitative assessment of indigenous tree species was carried out in Girei Forest Reserve. To achieve the objectives, five plots of 50m x 50m in size were randomly laid in the reserve and number of trees in each plot was enumerated. The highest frequency of 26.7% was observed in the second plots, while the fourth plot exhibit a lower frequency of 15.0%. The result also revealed that almost 53.3% of the tree species in the reserve are being endangered (tree with frequency less than 5). It was observed that most of the indigenous trees are rare in the area and this could be as a result of the following agents such as bush burning, animal grazers, farmers and saw millers. The results of Shannon and Evenness Indices indicated the high uncertainty and rareness of the indigenous species in the study area. Also, Analysis of variance result revealed that there was no significant relationship among the sampled plot ($p > 0.05$). At this point of endangerment of the indigenous tree species, there is therefore a need for conservation strategies for future use of these indigenous trees and to reduce the effect of global warming on the earth surface.

Key words: Quantitative assessment, Global warming, Indigenous, Conservation, Rare.

INTRODUCTION

Forests actively contribute to the sustenance of the global environment of the earth. Apart from this, they are also utilized as economic resources to produce subsistence and

industrial forest products. They have cultural and recreational values and perform functions such as prevention of erosion and degradation of soil, watersheds protection and stabilization of mountainous areas.

Despite the immense importance of the forest, agencies and organizations have reported great losses of the ecosystems due to unfavourable forestry practices all over the World (FAO, 1997).

The dynamics structure of the Nigerian vegetation can be attributed to the anthropogenic activities, which has a negative impact on the forests. Adelusi *et al.* (2002) noted that urban forest reserves and enclaves have suffered more and undue depletion and degradation with loss of biodiversity and renewable resources as a result of urbanization and encroachment on areas originally perceived as forest reserves and estate. This has a significant adverse effect on conservation and sustainable use of plant diversity. Bodeker (1997), also reported that, the reduction in the availability of plants, which supposed to be the first and last resort by the populace needed to be protected for the usage of future generations is depleting.

Statistics had shown that forest reserves occupy about 10 million hectares in Nigeria, which accounts for about ten percent (10%) of the total land, approximately 96.2 million hactare (NPC, 2006). Land areas once identified as forest lands have been decreasing steadily, due to industrial and social development which competes for the same pieces of land on which forest stands exists. Deforestation has global consequences, is primarily due to the influence of carbon exchange in the vegetation which in the dry zones averages about 30 tons per hectare declines when the vegetation is depleted (Alamu, 2011). Carbon rich soils are found in dry zones, hence the destruction of these trees has a very powerful effect on the carbon cycle and the increase in greenhouse effect.

Over exploitation, exploration and other conversion of forest ecosystems or other land use normally result in the decimation of biodiversity as well as in extinction of many

valuable indigenous plant species and animals (Agbogidi, 2002, Iroko *et al* 2008). Deforestation for various reasons are equally evident for the disappearance of many economically valued trees and shrubs species across Nigeria (Adeyoju, 2001; Adeyemo and Jegeda, 2002; Omotoyinbo and Kayode, 2008; Oguntade and Awokila, 2010). The various roles associated with forest would be lost, if they are indiscriminately depleted. For instance this may lead to food insecurity and environmental problems would be on the increase as there will be heightened climate change resulting in reduced immunity and outbreak of various diseases leading to eventually death of organisms including man. Deforestation is a contributor to global warming and is often cited as one of the major causes of the enhanced greenhouse effect. Tropical deforestation is responsible for approximately twenty percent (20%) of world greenhouse gas emissions. According

to the intergovernmental panel on climate change, deforestation mainly in tropical areas could account for up to one-third of total anthropogenic carbon dioxide emissions. It also reduces the content of water in the soil and groundwater as well as atmospheric moisture.

The practice of residents in the study area on the use of indigenous trees as construction materials, fuel wood etc., has led to destruction and loss of important indigenous tree species in the area. This study aims to identify the status and potentials of indigenous trees in Girei Forest Reserve.

METHODOLOGY

Study site

The study was carried out in Girei Forest Reserve of Adamawa State which is located between Latitude 8° N and 11° N and Longitude 11.5° E and 13.5° E. The gross area of the State is 3.90 million hectares, out of which 2.87 million hectares are arable, in

which two percent (2%) of the arable lands were cropped, while eighty percent (80%) were under-utilized. The local government is boarded by Song Local government area in the North, Furore Local Government area in the east, while River Benue acts as a physical boundary between the local government area, and Yola North and Demsa local government areas. (Figure. 1) (Adebayo & Tukur, 1999).

Girei local government area falls under the Sudan Savannah type of vegetation and it experiences distinct dry and wet seasons with temperature and humidity varying with seasons.

The wet or rainy season fall between April and November, which is characterized by single maxima in August. During this season, the moisture laden south west trade wind from the Atlantic Ocean blow over the area. Seventy percent of the total rainfall in the area happens to fall within four months

of May – August. The area has an average of 62 rainy days, while average amount of rainfall recorded in the area is 972mm. The dry season which is the harmattan period is between Decembers to March. The period is characterized by dry, dusty and hazy Northern trade wind that blows over the area from Sahara desert.

Temperature within the area varies with season. Although the temperatures are relatively high almost all the year round, temperature of the area ranges from 27⁰C - 40⁰C. December and January is the coldest months with an average temperature of 34⁰C. The natural vegetation of the area is Sudan Savannah type which is characterized by thick vegetation around hills and mountain ranges. The vegetation has a wide variety of Savannah tree species among which are; *Acacia* spp, *Cabretun* spp, *Adansonia* spp, *Anogeissius* spp, (Adebayo & Tukur, 1999).

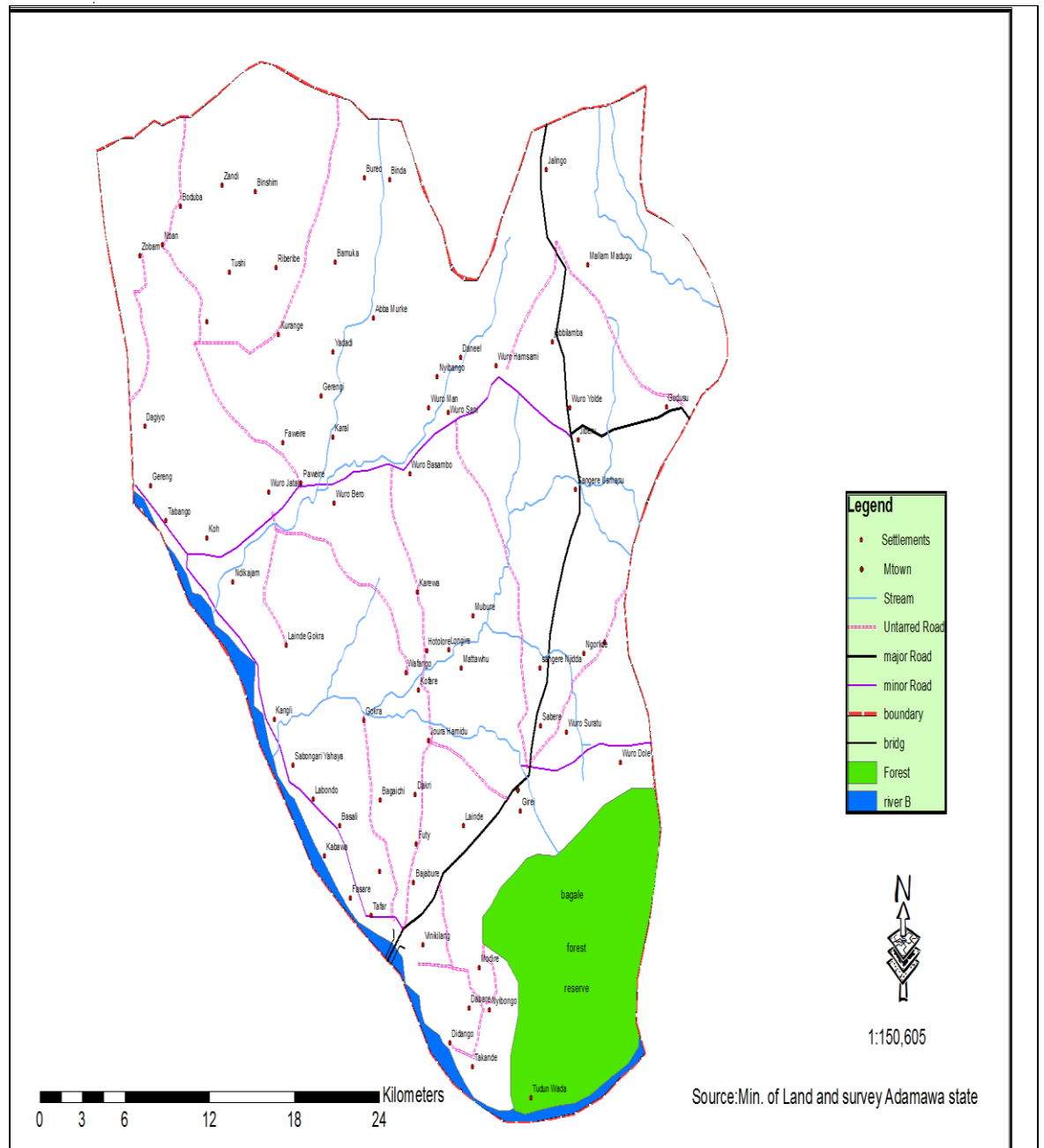


Figure 1: Map of Girei Local Government Area showing the Study area.

Data Collection

Data were collected on five plots, which were randomly distributed within the Study

area. Plot sizes of 50m x 50 m were laid across the entire reserve in order to identify the status of indigenous tree species in the

study area. Total number of individual tree species in each plot were counted and recorded. Density of the enumerated tree species was estimated as number of trees per hectare. (Frequency of tree multiply by 4, since plot size equals to 0.25 per hectare) (See appendix 1), while species diversity and Evenness (equation 1 and 2) was estimated by using Shannon and Evenness indices. Analysis of variance was also used to test for the variation among the species plots.

Shannon Index Weiner (H') = $-\sum_{i=1}^s (p_i)(\ln p_i) - - 1$

Where:

Pi = proportion of Species

Lnpi = natural logarithm of species proportion

Evenness index (E)

= $H'/H'_{MAX} - - - - - 2$

Where:

H' = Shannon Index

H'_{MAX} = Natural logarithm of total number of Species

RESULTS AND DISCUSSIONS

A total of sixty (60) trees were enumerated in all the five sampled plots. The identified trees belong to sixteen different species. The result also revealed that *Acacia polyacantha* has the highest frequency of ten (10), while *Terminalia glaucescens*, *Parkia biglobosa* had frequencies of seven (7) and one (1) respectively. The relative density of the identified tree species were also estimated (Table.1). It was revealed that, *Lannea acida* has the highest relative density of (0.042), this was followed by *Terminalia glaucescens* and *Prosopis africana* with relative density of (0.029) and (0.025) respectively, while *Philiostigma thunningii*, the least occurring tree species among the sampled trees, has a relative density of 0.004

Table 1: Status of Indigenous Species in Girei Forest Reserve.

S/N	Tree species	Frequency	Relative Density
1	<i>Prosopis africana</i>	6	0.025
2	<i>Daniella oliveria</i>	5	0.002
3	<i>Acacia polyacantha</i>	4	0.017
4	<i>Citrus aurantium</i>	3	0.012
5	<i>Philiostigma thunningii</i>	1	0.004
6	<i>Parkia biglobosa</i>	2	0.008
7	<i>Anona senegalensis</i>	2	0.008
8	<i>Lannea acida</i>	10	0.042
9	<i>Tarmarindus indica</i>	4	0.017
10	<i>Adansonia digitata</i>	3	0.012
11	<i>Andira enermis</i>	2	0.008
12	<i>Balanite aegyptica</i>	4	0.007
13	<i>Detarium macrocarpum</i>	2	0.008
14	<i>Xymenia americana</i>	3	0.012
15	<i>Anogeisus leocarpus</i>	2	0.008
16	<i>Terminalia glaucescens</i>	7	0.029

Table 1 revealed that almost 53.3 % of the indigenous trees in the study area had relative density less than 0.002 (tree with frequency below 5), indicating the percentage of rear species in the reserve. These species were: *Parkia biglobosa*, *Lannea acida*, *Andira enermis*, *Detarium macrocarpum*, *Xymenia Americana*,

Philiostigma thunningii and *Anona senegalensis*. The trees with highest number of species was observed in plot 3, with a mean value of 1.33 and standard deviation of 0.707, while the least plot, (plot 4) has a mean value of 1.80 and standard deviation of 0.837 respectively (Table 2). The analysis of variance result revealed shows no

significant relationship among the sampled plot ($p > 0.05$) (See Appendix 3).

According to Alamu and Agbeja, (2011), a tree is rear, when it becomes low in quantity and genetic quality. Also, endangered tree species are further stressed in that, deforestation is highly severe on them as a

result of over exploitation within the reserve. International Union for Conservation of Nature (IUCN) also classified threatened species, as being endangered, vulnerable, rare, indeterminate or insufficiently known. (<http://www.data.worldbank.org>, 2011).

Table 2: Summary of the statistics of the indigenous tree species in the sampled plots

PLOT No	No of Species	Mean	Variance	Standard Deviation
1	7	1.857	0.809	0.899
2	6	2.666	5.066	2.250
3	9	1.333	0.500	0.707
4	5	1.800	0.700	0.836
5	6	1.666	0.666	0.816

Due to high population growth in the area, the demand for these trees products are high and some of these important plant are over harvested which have severely reduced the inventory of these wild resources. The need for human settlement, agricultural expansion, fuel wood, overgrazing, and sources of food as well as medicine had contributed to the shortage of these

indigenous tree species. The alarming rate of habitat alteration coupled with unsustainable mode of harvesting medicinal plants, where roots, stem and bark are most preferred is a threat to their survival (<http://www.arnjournals.com>).

Species Diversity and Evenness indices

Species Diversity and Evenness indices was also taken into account to determine the

richness and the relative abundance of each species in the study area for quantification, in order to see how well the species are represented within a community. One of the most commonly used diversity index is the Shannon-Wiener Index, which is used to determine the uncertainty that an individual picked at random will be of a given species. The estimated H' value (2.613) indicates average uncertainty as the species are relatively distributed within the area. This

requires urgent actions to curtail the fuel

gatherers and prevents deforestation, which may cause a less stable environments.

Biologically realistic, H' values range from 0 (no uncertainty as to what species each individual will be) to about 4.5 (high uncertainty as species are relatively evenly distributed, but, in theory, the H' value can be much higher than 4.5, although, most real world estimates of H' range from 1.5 to 3.5. the findings of this study lies within these range.

Table 3: Species Diversity and Evenness Indices

Species	Frequency	pi	lnpi	SHANNON INDEX (H')
<i>Prosopis fricana</i>	6	0.100	-2.302	0.230
<i>Daniella oliveria</i>	5	0.083	-2.484	0.207
<i>Citrus aurantium</i>	4	0.066	-2.708	0.180
<i>Philiostigma thunningii</i>	3	0.050	-2.995	0.149
<i>Parkia biglobosa</i>	1	0.016	-4.094	0.068
<i>Anona senegalensis</i>	2	0.033	-3.401	0.113
<i>Lannea acida</i>	2	0.033	-3.401	0.113
<i>Acacia polyacantha</i>	10	0.166	-1.791	0.298
<i>Tamarindus indica</i>	4	0.066	-2.708	0.180
<i>Adansonia digitata</i>	3	0.050	-2.995	0.149
<i>Andira enermis</i>	2	0.033	-3.401	0.113
<i>Balanite aegyptica</i>	4	0.066	-2.708	0.180
<i>Deterium macrocarpum</i>	2	0.033	-3.401	0.113
<i>Xymenia americana</i>	3	0.050	-2.995	0.149
<i>Anogeisus leocarpus</i>	2	0.033	-3.402	0.113
<i>Terminalia glaucescens</i>	7	0.116	-2.148	0.250
			H'	2.613

CONCLUSION

From the results, it was observed that the stocks of the forest has been depleted by anthropogenic agents due to their ill effects, such as fuel wood gatherers, farmers, animal grazing and bush burning. The rate at which Girei forest reserve is being exploited constitutes a high danger for sustainability. Also all our regeneration efforts are targeted toward planting of exotic species rather than these indigenous tree species. This also promotes the tree to be endangered. From the result of the research work it shows that

almost 53.3% of the tree species in the reserve are endangered (tree with frequency less than 5).

It is important to mention that when a forest tree is endangered, it means such a tree becomes low in quantity and genetic quality. If at the point of being endangered and something is not done quickly, extinction will set in (Alamu and Agbeja, 2011). There is therefore a need for conservation strategies for future use of these indigenous trees and to reduce the effect of global warming on the earth surface.

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APPENDICES

Appendix 1.: Density of the indigenous tree species per plot

Plot No	Scientific Name	Local name	Density (N/ha)	
1	<i>Prosopis africana</i>	Kirya	12	
	<i>Terminalia glaucescens</i>	Baoshe	8	
	<i>Daniela oliveria</i>	Maje	12	
	<i>Citrus aurantium</i>	Lemon	4	
	<i>Philiostigma thunningii</i>	Kargo	4	
	<i>Anona senegalensis</i>	Gwandan daji	8	
	<i>Parkia biglobosa</i>	Dorowa	4	
	<i>Lannea acida</i>	Faru	8	
2	<i>Daniella oliveria</i>	Maje	4	
	<i>Acacia polyacantha</i>	Kantakara	8	
	<i>Tamarindus indica</i>	Samiya	4	
	<i>Prosopis africana</i>	Kirya	12	
	<i>Terminalia glaucescens</i>	Baoshe	8	
	<i>Adansonia digitata</i>	Kuka	8	
	<i>Andira enermis</i>	Madubia	4	
	<i>Balanite aegyptica</i>	Adowa	4	
3	<i>Citrus aurantium</i>	Lemon	4	
	<i>Tamarindus indica</i>	Samiya	4	
	<i>Detarium macrocarpum</i>	Taura	4	
	<i>Acacia polyacantha</i>	Kantakara	12	
	<i>Xymania americana</i>	Tsada	4	
	<i>Anogeisus leocarpus</i>	Marke	4	
	<i>Daniella oliveria</i>	Maje	4	
	4	<i>Tamarindus indica</i>	Samiya	8
<i>Philiostigma thunningii</i>		Kargo	8	
<i>Terminalia glaucescens</i>		Baoshe	12	
<i>Andira enermis</i>		Madubia	4	
<i>Balanite egyptica</i>		Adowa	12	
<i>Citrus aurantium</i>		Lemon	8	
5		<i>Adansonia digitata</i>	Kuka	8
		<i>Xymenia americana</i>	Tsada	12
	<i>Anogeisus leocarpus</i>	Marke	4	
	<i>Detarium macrocarpum</i>	Taura	4	

Appendix 2: Indigenous tree species in Girei Forest Reserve

S/N	Scientific name	Local name	Frequency (%)
1	<i>Prosopis africana</i>	Kiryá	6
2	<i>Daniella oliveria</i>	Maje	5
3	<i>Citrus aurantium</i>	Lemon	4
4	<i>Philiostigma thunningii</i>	Kargo	3
5	<i>Parkia biglobosa</i>	Dorowa	1
6	<i>Anona senegalensis</i>	Gwandan daji	2
7	<i>Lannea acida</i>	Faru	2
8	<i>Acacia polyacantha</i>	Kantakara	10
9	<i>Tarmarindus indica</i>	Samiya	4
10	<i>Adansonia digitata</i>	Kuka	3
11	<i>Andira enermis</i>	Madubia	2
12	<i>Balanite aegyptica</i>	Adowa	4
13	<i>Deterium macrocarpum</i>	Taura	2
14	<i>Xymenia americana</i>	Tsada	3
15	<i>Anogeisus leocarpus</i>	Marke	2
16	<i>Terminalia glaucescens</i>	Baoshe	7

Appendix 3: Analysis of variance

SOURCES OF VARIANCE	SUM OF SQUARE	DEGREE OF FREEDOM	MEAN SQUARE	COMPUTED F	TABULATED F
Plots	6.585	4	1.646	1.143	2.718
Error	40.323	28	1.440		
Total	46.909	32			