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Assessment ofthe floristic composition ofwoody tree species inKwari-Kwasa forest reserve, Kebbi State, Nigeria

Ambursa A. S.[1], Bello A. G.[2] and Mansur Muhammad A.[1&3]

[1.] *(Department of Forestry, Kebbi State University of Science and Technology, Aliero, Nigeria)*
[2.] *(Department of Forestry, Usmanu Danfodiyo University, Sokoto, Nigeria)*
[3.] *(Department of Forest Production, Universiti Putra Malaysia, Malaysia)*
Corresponding Author: Ambursa A. S.

Abstract:*Nigeria's forest reserves are in the phase of permanent flux at varying scale by force such as overgrazing, fuelwood extraction and expanding farmlands for agriculture etc. Information on tree species abundance in the forest reserve is required for not only effective but also efficient management. This study aimed to assesses the floristic composition of woody tree species in the Kwari-Kwasa forest reserve of Kebbi state, Nigeria; in order, for sustainable forest management and livelihood options in the area, employ the use of Point Centre Quarter (PCQ) method, a plots of 30m x 30m and it was replicated three times. Eighteen (18) woody tree species were identified in the reserve, While species Combretumnigricans and Guierasenegalensis dominates the reserve, accounting for thearea (0.7956m^2) representing 50.1% and (0.0426m^2) representing 40.3% of the woody trees species in the reserve respectively. Species Crossopteryxspp and Vitellariaparadoxum are less dominance with 0.1% each. Species diversity index of 1.5-2.9 and species richness of 2.210 was documented in the reserve with evenness values ranges from 1.27 to 2.31. There was severe and excessive overexploitation of woody tree species in the reserve. This is evident that rapid Forest degradation ensues mainly due to fuelwood extraction, land conversion for farming and multiple anthropogenic factors. A sound regeneration effort involving enrichment planting, education of local populace, strong law enforcement and forest guards are necessary so as to limit the further tree destruction and sustainable management of the reserve.*

Keywords:*Forest Degradation;Point Centre Quarter (PCQ) method; Kwari-Kwasa' woody trees; dominance and Kebbi state*

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I. Introduction

The world's forest ecosystems are in a state of permanent flux at a variety of spatial and temporal scales (Coppin *et al* 1996). Causes of these changes can be natural (disasters such as diseases, insects, wildfire, flood and drought) as well as anthropogenic (deforestation, logging, burning, and clear-cutting) or may be a combination of the two. It is estimated that129 million ha of Forest,are lost from 1990 to 2015, at anannual rate of –0.13 percent (FAO, 2015). Forest degradation is a problem with severe environmental, socio-economic consequences, especially in developing countries. Forest degradation has adverse impacts on forest ecosystems and on the goods and services they provide.

The fact that sustainability has become a prime objective in ecosystem management has its mainconcernson the constantrequirement for not only accurate but also up-to-date resource data. An in-depth understanding of these changes has to be built on an precise monitoring and observation of land features overa long period of time(Coppin *et al*, 2004). Efficient management of forest resources requires reliable and timely information on not only the statusbut also the trends of forest resources.

Nigeria had a total of 1,160 constituted forest reserves, with about 10,752,702 ha of land (FORMECU, 1996). Unfortunately, most of these reserves are degraded due to indiscriminate deforestation, improper agriculture and climate change which culminated in different land cover and desert-like form.*Kwari-Kwasa* forest reserve was established in 1952, primarily for forest production and environmental protection. Recently, it is reported to have been degraded (CERAD, 2009) mainly due to anthropogenic influences such as deforestation, improper-agriculture and over-grazing, among others. Consequently, the Reserve has failed in its functions (forest production and environmental protection). However, the extent of the forest reserve exploitation is unknown, whereas such evidence is useful for effective forest management (Daniel *et al.*, 2001).

There is astrong need for information on forests degradation,its causes as well as the extent of ecosystem impacted for proper management. Information on the degradation process is also necessary to adjust national policies that may directly or indirectly control degradation of the environment. To combat these menaces, policymakers commonly require information on resources trends. An assessment of the floristic composition is very important as it will form an input into government's plans aimed at forest management and livelihood sustenance in the area.

II. Materials and Methods

Study Area

The study was conducted in *KwariKwasa* Forest Reserve, situated along *Kontagora–Jega* express Road. It is lied between Latitude 11^{o} 48'- 11^{o} 55'N and Longitude 4^{0} 24'- 4^{0} 32 E andoccupies about 10,723 ha of land. The area has two distinct seasons (rainy and dry). Annual rainfall varies between 500 – 750 mm, with over 60% of the rain falling during July and August (Mammane*t al.*, 2000). Potential evapotranspiration exceeds 1400mm per annum, and mean annual temperature is about 35^{0}C and 40^{0}C in rainy and dry seasons respectively while average relative humidity ranges from 51-79% during the rainy season and from 10-25% during the dry season (SERC, 2010).The vegetation is Sudan Savannah typedcharacterised by plentiful short grasses of about 1.5 -2m and scarce short shrubs/trees that are hardly above 10m tall. The texture of the topsoil is sandy clay loam; salinization is widespread, resulting in the concentration of mineral salts at or near the surface (Kowal and Kassam, 1978, CERAD, 2009).

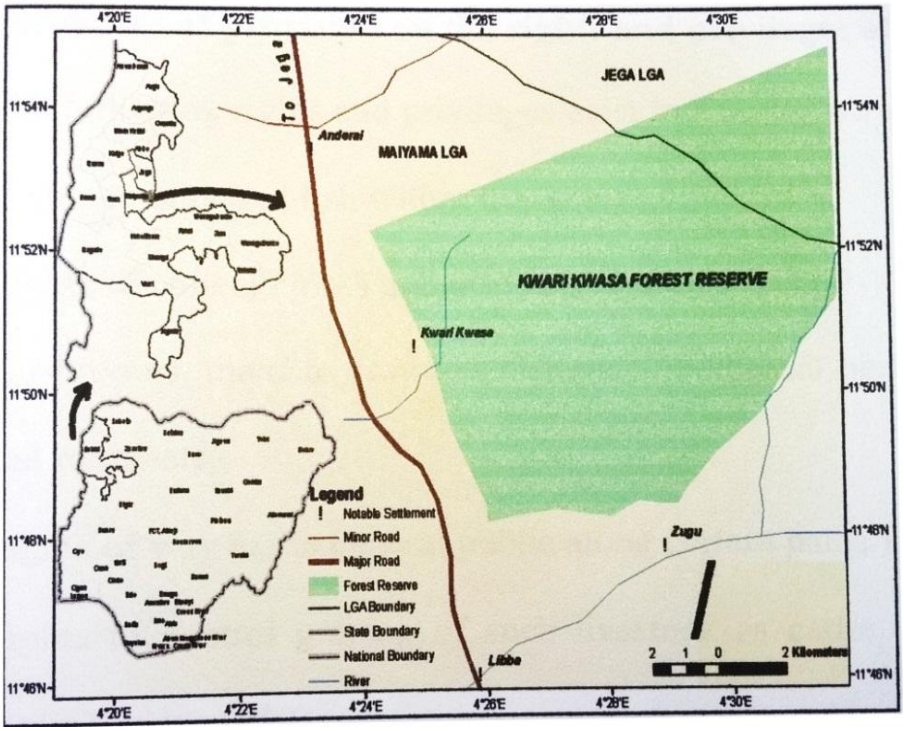

Fig: Map of Nigeria Showing the location of the study area

III. Experimental Procedures

Floristic composition of the forest reserve was assessed using randomly selected and established plotsof 30m x 30m each. The plot within each identified land cover type (farmland, scrubland, dense shrubland and grassland) is replicated three times. An inventory was carried out of the entire tree and shrub species within each sample plot. Tree species assessment was done using Point Centre Quarter (PCQ) method as described by Mueller and Ellenberg (1974).The parameters measured for assessing the floristic composition of the reserve include:

i. Trees distances from the centre point with the help of measuring tape.
ii. Tree Frequency -Number of occurrence of tree species
iii. Species Relative Density (RD) for each tree species was determined by the formula:

$$RD\ (\%) = \left(\frac{n_i}{N}\right) \times 100$$

n_i= number of individual species; N = Total number of species in the entire community Hopkins and

iv. Species Relative Dominance (RDo) was computed using the formula:

$$RDo = \frac{(\sum Ba_i \, x100)}{\sum Ba_n}$$

Ba_i = basal area of individual tree belonging to species i, Ba_n = stand basal area of all species, as adopted by Onyekwelu (2007).

Data were analysed using descriptive statistics

IV. Results and Discussion

Table 1 shows species frequency in Kwari-Kwasa Forest Reserve. A total of 18 species were encounteredinthereserve namely:*Combretumnigricans,Guierasenegalensis. Combretumgeiton, phylumPiliostigmareticulatum,CombretumlamprocarpumCombretum micranthum, Prosopisafricana, Azadirachtaindica,Combretummolle, Cissuspopulnea, Borassusaethiopum, Combretummolle, Sterculiasetigera, Crossopteryxfebrifuga, Gardenia erubecens, Pakiabigblobosa, Cassia sieberana and Vitellariaparadoxum. Species Combretumnigricans and Guierasenegalensis*are dominance in the reserve accounting for thearea ($0.7956m^2$) representing 50.1% and ($0.0426m^2$) representing 40.3% respectively.

Table 1: Species frequency in Kwari-kwasa forest reserve

Species	Farmland	Scrubland	Dense shrubland	Grassland	Total	%
Combretumnigricans	5	63	56	33	407	50.1
Guierasenegalensis	4	27	47	32	327	40.3
Combretummicranthum	2	2	1	-	5	0.6
Cissuspopulnea	1	-	-	-	1	0.2
Borassusaethiopum	3	-	-	-	3	0.3
Acacia macrostachya	5	3	1	-	9	1.1
Piliostigmareticulatum	4	-	1	1	6	1.6
Combretummolle	2	-	1	-	3	0.3
Prosopis Africana	1	-	-	2	3	0.6
Sterculiasetigera	1	1	-	-	2	0.2
Combretumgeitonophyllum	3	3	-	1	7	1.7
Combretumlamprocarpum	2	2	0	2	6	0.8
Azadirachtaindica	1	1	0	1	3	0.6
Crossopteryxfebrifuga	-	-	1	-	1	0.1
Gardenia erubecens	-	-	1		1	0.1
Pakiaspp	1	1	1	1	3	0.3
Cassia sieberana	1	1	0	0	2	0.3
Vitellariaparadoxum	0	1	0	0	1	0.1
Total					**811**	**100 %**

Source: Field survey

Both species were found in the entire sample plots enumerated, thus implying that they are widespread and most abundant within the reserve, this is indicated by their very high percentages of 50.1% and 40.3% respectively. The remaining sixteen (16) species were only encountered in few sample plots, which is indicated by their low frequency and richness values. Fatubarin (1985) in his work documented the higher value of twenty-four (24) different species against eighteen in this study. The number of species recorded also is less than what Shinkafi (1990) observed in Zamfara forest reserve and what Zaki (2005) observed in both Dogondaji and Dabagi forest reserves which translate the richness of the three forest reserves compared to *Kwari-Kwasa* forest reserve.

Table 2: Tree/shrub relative dominance, Shannon- Wiener diversity, richness and evenness within *Kwari-Kwasa* forest reserve

Species	Number of species	Relative Dominance (RDo)	Shannon-Wiener Diversity Index	Evenness index	Richness index
Combretumnigricans	407	0.7965	1.599	1.274	139.6
Guierasenegalensis	327	0.0452	1.895	1.509	112.1

Combretummicranthum	5	0.0192	2.904	2.313	1.4
Cissuspopulnea	2	0.0036	2.908	2.317	0.3
Borassusaethiopum	3	0.0036	2.906	2.315	0.7
Acacia macrostachya	9	0.0033	2.898	2.308	2.8
Piliostigmareticulatum	13	0.0270	2.891	2.303	4.1
Combretummolle	3	0.0044	2.906	2.315	0.7
Prosopis Africana	5	0.0270	2.904	2.313	1.4
Sterculiasetigera	2	0.0011	2.908	2.317	0.3
Combretumgeitonophyllum	14	0.0328	2.882	2.295	4.5
Combretumlamprocarpum	7	0.0196	2.901	2.311	2.1
Azadirachtaindica	5	0.006	2.904	2.313	1.4
Crossopteryxfebrifuga	1	0.0013	2.909	2.317	2.9
Gardeniaerubecens	1	0.0035	2.909	2.317	2.9
ProsopisAfricana	3	0.0038	2.906	2.315	0.7
Cassia sieberana	3	0.0061	2.906	2.315	0.7
Vitellariaparadoxum	1	0.0038	2.909	2.317	2.9

Source: Field survey

*Combretum nigricans*recorded the highest relative dominance of 0.7965m^2 which is 50.2% of the absolute dominance of the species in the reserve followed by *Guiera senegalensis* (0.0452m^2) while *Sterculiasetigera, Crossopteryxspp*and *Vitellariaparadoxum* recorded the lowest values. *Combretumnigrican* recorded higher richness index (139.6) followed by *Guierasenegalensis* (112.1) and least value of 0.3 was recorded by *Cissuspopulnea*and*Sterculiasetigera*each. In terms of evenness *Sterculiasetigera, Crossopteryxspp*and*Vitellaria paradoxum*recorded the highest value (2.317) while the lowest value of 1.274 and 1.509 was recorded by *Combretum nigricans* and *Guiera senegalensis* respectively.

The forest reserve has, therefore, turn out to be a shrubland. The species present in the forest reserve are not evenly distributed as evident by the low species evenness value which range from1.27 to 2.31. (Table 2)This finding agreed with the earlier works of CERAD (2009) that describes the forest reserve as shrub vegetation and reported a similar evenness value of 2.31 and indicated that it is low. This indicated that the populace living around the forest reserve applies severe pressures on biodiversity of the forest reserve. Trees, many other plants and wildlife species are tremendously overexploited and the natural environment faces increased degradation from unsustainable agriculture expansion and a variety of other unsustainable anthropogenic causes, this situation conformed to the USAID/NIGERIA (2008) report on the general situation of Nigerian forest reserves. Sten (2001) and Sahney (2010) also attributed reduced biodiversity to thedestruction of forest cover. This is, however,directly or indirectly linked with thelack of solid conservation principles and execution of forest laws, corruption and extreme poverty among the forestry officials and fringe communities to the *Kwari-Kwasa* forest reserve which led to severe and extended encroachment and illicit exploitation of forest resources. In a related study, this type of situation was observed to result in depletion in biodiversity of the existing forests, reduced theproductivity of the tree species and at extreme cases extinction of many (Bello, *et al.,* 2010; Eniolorunda, 2010b and Sten, 2001).

V. Conclusion

Kwari-Kwasa forest reserve is being rapidly destroyed by resource pressure such as overgrazing, fuelwood extraction and expanding farmlands for agriculture etc. which turns the forestland into shrubland. *Combretumnigricans* (Tsiriri*)* and *Guierasenegalensis* (Sabara*)* were found being the most dominant and abundant, this is indicated by their very high percentages of 50.1% and 40.3% respectively. The remaining species were only encountered in few sample plots, which is indicated to by their low frequency and richness values. The species present in the forest reserve are not evenly distributed, as evidenced by the low species evenness value (2.210). A sound regeneration effort involving enrichment planting, education of local populace, strong law enforcement and forest guards are necessary so as to limit the further tree destruction and sustainable management of the reserve.

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