



Research Paper

**CHECKLIST AND CONSERVATION STATUS OF WOODY TREE SPECIES
ON SOME SELECTED LANDSCAPES IN OLD SOKOTO STATE, NORTH-
WEST, NIGERIA**

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Abstract

A study titled checklist and conservation status of native tree species on two selected study areas was conducted to provide checklist and determine the diversity, evenness and richness indices of woody species in the area. Data on diversity, evenness, and richness indices were also computed. From the results 1286 individuals from 31 species of woody plants were found, belonging to 20 families. The results also showed that the ratio between species with higher diversity and that with least diversity index determine the most diverse species. Thus, the most dominant species were the richest species. The highest species recorded were *Azadirachta indica* (471) and *Acacia nilotica* (65), while the number of occurrence 3 - 8 was for the least species. Similarly, it was observed that some species were either lost completely or endangered. Therefore, for sustainable development of woody species in the study area, there is the need for the restoration of lost species, through raising of seedlings of lost and endangered species and distributing them to the farmers for reforestation or enrichment as the case may be.

Key words: Checklist, Landscape, Species richness, evenness and diversity indices.

INTRODUCTION

A tree is a perennial woody plant and is often defined as a woody plant that has many secondary branches supported clear of the ground on a single main stem or trunk with clear apical dominance (Huxley, 1992). The importance of trees cannot be over emphasized. Trees release oxygen into the air for animals to breath, provide homes and food for many animals; provide a number of locally important goods and services such as cheap food supplements, poles, timber, fuel wood, fibres, herbal medicines, animal fodder, erosion control, etc. (Okafor, 1980 and Arnold, 1990).

On the urban landscape trees play a crucial role in the survival of man on earth and they provide an array of wood and non-wood products, which are significant in sustaining the nation's economy and 'its overall socio-economic well being. But these trees and their important functions have long been overlooked, and ignored by policy and are absent from public debate. Instead, more attention has always been focused on trees in forest which are viewed as resource and as a store of biological diversity (FAO 2001).

Tree conservation is playing a significant role in the stabilization of climate through preservation of quality environment, ameliorating the micro climate, maintenance of water

supply through protection of the watershed, reduction of surface run-off and filtration of water as well as serving as habitat for wildlife species. The environmental menace that the world is experiencing today - global warming, flooding (due to destruction of shelter belts and ocean wave tides), stormy winds leading to destruction of houses and valuable properties can all be addressed by encouraging sound conservation of the natural forest. Native tree species are species that evolve in a given area without human involvement or have arrived there without human intervention. Today, as a result of increasing deforestation, most of these trees are either endangered, or vulnerable (Davison, 2008).

A checklist is a complete compilation of the native tree species. In such a large list, there are bound to be some errors and omissions. Additionally the native tree species continue to be in flux, with continual introduction and neutralization of exotics as well as decline and extinction of native species. Argungu and Dundaye are districts in Argungu and Wamakko Local Governments of Kebbi and Sokoto States-Nigeria respectively. The two districts are blessed with rich natural vegetation of tree species particularly *Acacia nilotica*, *Balanites aegyptiaca*, *Adansonia digitata* etc. However these natural resources are fast disappearing as a result of the rapid population growth and the concomitant increase in the demand for land for farming, grazing, industrialization, urbanization, etc. These practices if allowed to continue unchecked have the potential to scuttle all efforts aimed at ensuring a sustainable environment that can support the growing population as well as environmental needs. This therefore calls for the need to evolve conservation strategies that would avert severe encroachment and illegal exploitation of tree resources, so as to guarantee the sustainable management of the balance of our remaining resources while also creating a means and ways by which the resources could be conserved and developed to meet the ever increasing demands. The objective of this study is to enumerate and assess the conservation status of native tree species and to determine the diversity of the tree species in the selected areas.

MATERIALS AND METHODS

Study Area

The study was conducted in Dundaye and Argungu districts of Wamakko and Argungu local government areas of Sokoto and Kebbi States respectively. Sokoto state is located in Sudan Savannah Zone in extreme North-Western part of Nigeria between longitude 4°8' and 6°54'E and latitude 12°0' and 13°58'N (Mamman *et al.*, 2000), it shares common border with Niger Republic in the North, Kebbi State to the South West and Zamfara to the East while Argungu is the headquarters of Argungu local government area in Kebbi State, situated along the Sokoto River. As of 2007 Argungu has an estimated population of 47,064. The city is the seat of the Argungu Emirate (Ayo, 2010). The city is a major Agricultural centre for the area, with key crops including tobacco, peanuts, rice millet and sorghum. The city also hosts an annual international fishing festival. It lies between latitude 12°44'N and longitude 4°31'E. The city fall within Sudan Savanna zone of West Africa and is located 23km above sea level with average temperature of 30 - 35°C. The climate is characterized by long dry season from (November –April/May and short raining season from April-September. The dry season consist of cold dry spell (Hammatan) from February to April. The annual rainfall is about 760mm per annum and is unevenly distributed (Ojanuga, 2004). Rainfall starts in late May and ends September/October, with temperature ranges of 20°C – 39°C and 19°C respectively with the relative humidity of about 52% to 56% (Senchi, 2005). The vegetation is generally sudan savanna type characterized by open woodlands, short tender grasslands and stunted shrubs. The trees are deciduous and among the dominant species are *Adonsania digitata*, *Acacia nilotica*, *Borassus spp*, *Vitex doniana*, *Parkia biglobosa*, *Azadirachta indica*, *Ziziphus spp* etc. In recent times, the impact of human activities on soil erosion is greatly felt. The long dry season has a relatively negative impact on both the vegetation and human activities. Among the environmental challenges is illegal felling of trees which is used by most of the people as fuel wood for domestic and industrial energy requirements and conversion of forest area for agricultural and house projects which lead to serious environmental problems, increase in desertification and global warming (Annon, 2011).

Soils in the study area are predominantly sandy to loamy with low level of fertility, particularly poor in primary nutrients like nitrogen, phosphorous, and Potassium (Fatubarin, 2004).

Sampling techniques

Sampling was done on the two landscapes using point centered quarter method as described by Mueller and Ellenburg 1974. Ten transects distributed using stratified sampling method (Adegeye and Sittoh, 1985) were adopted. Sampling plots measuring 50 x 50m were randomized along transect to collect information on the trees existing on the two locations. Thirty farmers were randomly selected and interviewed to generate information on the native tree species availability, ecological and conservation status and extinction or threat in the last ten years.

Data Collection

Data was collected to find out the importance, availability, conservation status of native species in the area in line with method described by Kayode and Omotoyinbo, 2008. Moreover, sample plot survey was carried out as per Aju and Utazi, 2008.

Data Analysis

The data collected were analyzed by descriptive statistics into percentage, frequencies and mean.

Diversity index or Shannon Weiner index (H)

This was computed using the following formula.

$$H = \sum_{i=1}^s p_i \ln p_i$$

Where S = total number of species in the community

P_i = proportion of s made up of the ith species

Evenness Index (E)

$$EH = \frac{H}{H_{\max}} \frac{H}{\ln s}$$

Where EH = equitability (evenness)

H = shannon weiner diversity index

Species richness or variety index (S) was computed using;

$$d = \frac{S-1}{\log N} \text{ Where } S = \text{total number of species in the community.}$$

Materials

The materials that were used for the conduct of this study include the following:
Pegs for plots demarcation, field sheets for data recording and tape for plotting.

RESULTS AND DISCUSSION

Twenty nine tree species producing various economically valued products were assessed in the two study locations. 17 tree species were identified to be "Abundant" while fourteen (14) were 'Rare' the economic products that are harvested or collected from these plant species vary from leaves, edible fruits, medicinal, bark, stem, fodder, timber and fuel wood. Reckless exploration and utter conversion of forest lands to other forms of land use have resulted in extinction of many valuable plant species.

Table 1: Checklist of the Species in the Study Areas

S/No	BOTANICAL	COMMON NAME	Uses	Status
1.	<i>Acacia nilotica</i>	Bagaruwa	Stem and Fruit	Abundant
2.	<i>Acacia seyal</i>	Farar kaya	Fuel wood	Abundant
3.	<i>Adansonia digitata</i>	Kuka	Fruits and Leaves	Rare
4.	<i>Annona senegalensis</i>	Gwaddar daji	Stem and Fruit	Rare
5.	<i>Azadirachta indica</i>	Dogon yaro	Stem and Leaves	Abundant
6.	<i>Balanites aegyptiaca</i>	Aduwa	Fruits	Abundant
7.	<i>Bauhinia rufescens</i>	Jirga	Stem and Leaves	Abundant
8.	<i>Borassus aethiopum</i>	Giginya	Stem	Abundant
9.	<i>Boscia senegalensis</i>	Anza	Stem and Leaves	Abundant
10.	<i>Butyrospermum Parkii</i>	Kade	Fruit and Fodder	Rare
11.	<i>Celtis integrifolia</i>	Dukki	Fodder and Fuel wood	Abundant
12.	<i>Combretum micrantum</i>	Geza	Fuel wood	Abundant
13.	<i>Combretum nigricans</i>	Tsiriri	Fuel wood	Rare
14.	<i>Delonix regia</i>	Flamboyant	Fuel wood	Rare
15.	<i>Eucalyptus</i>	Turare	Timber	Rare
16.	<i>Euphorbia balsamifera</i>	Aguwa	Fodder	Abundant
17.	<i>Ficus gnaphalocarpa</i>	Cediya	Fodder	Abundant
18.	<i>Guiera senegalensis</i>	Sabara	Firewood	Abundant
19.	<i>Lannea microcarpa</i>	Malga	Leaves	Abundant
20.	<i>Mangifera indica</i>	Mangwaro	Fruits, Bark and Leaves	Rare
21.	<i>Parkia biglobosa</i>	Doruwa	Fruits	Rare
22.	<i>Piliostigma reticulatum</i>	Kalgo	Fruits and Fuel wood	Abundant
23.	<i>Prosopis africana</i>	Kirya	Firewood	Abundant
24.	<i>Rogeria adenophylla</i>	Loda	Fruit and Fodder	Rare
25.	<i>Tamarindus indica</i>	Tsamiya	Fruits, Bark Leaves and Fuel wood	Rare
26.	<i>Terminalia catappa</i>	Umbrella	Fuel wood	Rare
27.	<i>Vitex doniana</i>	Dunya	Fruits and Fuel wood	Rare
28.	<i>Ziziphus mauritiana</i>	Magariya	Fruits and Leaves	Rare
29.	<i>Ziziphus spina-christi</i>	kurna	Fruits and Leaves	Abundant

Source: Field Survey, 2011.

Species Dominance in Dundaye and Argungu Districts

Fifty one (51) different species belonging to sixteen different families were identified. Table 2 revealed Mimosaceae as dominant family in Dundaye district with Eleven species having 21.56%, followed by Combretaceae with 11.76%, Fabaceae with 11.7%, the lowest family were Annonaceae, Anacardiaceae, Cappariaceae, and Leguminaceae, the use of native species around them. In Argungu, the result showed that Caesalpiniaceae family were the most dominant with 20.59% followed by Combretaceae (10.29%), Mimosaceae (8.82%), Meliaceae and Rhamnaceae with 4% each while the rest recorded the least (2%), this is contrary to what Shinkafi (1990) (12 woody plant family) and Fatubarin (1985) (14 plant family) independently recorded in their studies. However, Agunsaya and Ajala (2002) noted that fuel wood accounts for a large proportion of all energy consumption in many developing countries. Fuel wood forms about 80% of the total wood required and more than 60% of the energy consumed in Tropical Africa. Man has for long relied on wood as the oldest fuel available to him (Ogbonna, 1982). This has calls for urgent conservation strategy as well as enlightens population order to save the number of endangered species that have been for long cleared around farmland either for fuel, agricultural expansion or those that died naturally. The level of inadequacy of some native

species is referred in the rate at which deforestation is taking place as a result of man's attempt to have a regular supply of wood energy and vegetal resources (Enabor, 1986). It must also be suggested that the need to enlighten about the importance of conservation must be taken to urgent action.

Table 2: Species Dominance in Dundaye and Argungu Districts

Family	Dundaye		Argungu	
	Frequency	Percentage	Frequency	Percentage
Anacardiaceae	1	1.96	4	5.88
Annonaceae	1	1.96	2	2.94
Asclepiadaceae	2	3.92	2	2.94
Balanitaceae	5	9.81	2	2.94
Bombacaceae	3	5.88	2	2.94
Caesalpiniaceae	-	-	14	20.59
Capparidaceae	1	1.96	3	4.41
Combretaceae	1	1.96	7	10.29
Euphorbiaceae	1	1.96	2	2.94
Fabaceae	6	11.76	-	-
Leguminosae	1	1.96	-	-
Mimosaceae	11	21.56	6	8.82
Moraceae	-	-	3	4.41
Myrtaceae	-	-	2	2.94
Palmae	2	3.92	2	2.94
Pedalicceae	3	5.88	2	2.94
Rhamnaceae	4	7.84	4	5.88
Sapotaceae	2	3.92	-	-
Verbanaceae	2	3.92	-	-

Source: Field Survey (2011)

Species Diversity, Evenness and Richness Indices in Dundaye and Argungu Districts

In terms of diversity, the ratio between *Butyrospermum parkii* and *Azadirachta indica* diversity index is 1.455664 that is *Azadirachta indica* and that of *Butyrospermum parkii* is 0.04794. Therefore, *Butyrospermum parkii* more diverse species for species richness, *Azadirachta* . species has the higher richness index. This is because the species are the most dominant in the area. Therefore, they recorded greater species richness as agreed by Knopf (1996). The finding confirms that species' richness mid diversity are two different measures of species distribution and each tells something different about a particular community (Odum, 1971). In terms of evenness, the ratio of *Azadirachta indica* is 0.504311. This shows that *Azadirachta* species has greater species evenness index. This may be due to relative abundance of individuals within a species (Kricher and Morison, 1998).

Table 3: Species Diversity, Evenness and Richness Indices in Dundaye District

Species name	No. of species	Div. index	Evenness	Richness
<i>Acacia nilotica</i>	65	0.519479	0.177341	31
<i>Acacia seyal</i>	41	0.299547	0.099627	31
<i>Adansonia digitata</i>	4	0.053779	0.018062	31
<i>Annona senegalensis</i>	8	0.106704	0.036505	31
<i>Azadirachta indica</i>	471	1.455664	0.504311	31
<i>Balanites aegyptiaca</i>	4	0.084895	0.030706	31
<i>Bauhinia rufescens</i>	50	0.471692	0.113371	31
<i>Borassus aethiopum</i>	30	0.363961	0.131603	31
<i>Boscia senegalensis</i>	51	0.464433	0.161225	31
<i>Butyrospermum Parkii</i>	3	0.040794	0.013855	31
<i>Calotropis procera</i>	10	0.0968	0.121998	31
<i>Cassia occidentals</i>	64	0.557184	0.201271	31
<i>Celtis integrifolia</i>	12	0.090981	0.029434	31
<i>Combretum micrantom</i>	10	0.0105814	0.34499	31
<i>Combretum nigricans</i>	19	0.16614	0.054872	31
<i>Delonix regia</i>	9	0.158617	0.056873	31
<i>Eucalyptus camaldulensis</i>	13	0.207231	0.075037	31
<i>Euphorbia balsamifera</i>	34	0.1436178	0.086025	31
<i>Ficus gnaphalocarpa</i>	33	0.246389	0.091238	31
<i>Guiera senegalensis</i>	59	0.5709773	0.198039	31
<i>Lannea microcarpa</i>	26	0.22059	0.073636	31
<i>Mangifera indica</i>	11	0.138166	0.048239	31
<i>Parkia biglobosa</i>	8	0.087654	0.029015	31
<i>Piliostigma reticulatum</i>	68	0.603101	0.208519	31
<i>Prosopis africana</i>	59	0.493173	0.168208	31
<i>Rogeria adenophylla</i>	23	0.193247	0.06391	31
<i>Tamarindus indica</i>	7	0.116654	0.040919	31
<i>Terminalia catapa</i>	30	0.259249	0.130524	31
<i>Vitex doniana</i>	12	0.139095	0.046786	31
<i>Ziziphus mauritiana</i>	24	0.19502	0.04352	31
<i>Ziziphus spina-christi</i>	28	0.22033	0.0702797	31

Source: Field survey, 2011

Species Diversity, Evenness and Richness Indices in Argungu District

The total diversity recorded from the study was 1.904996 and the total evenness was 0.150679 which indicated the fact that the area is low in species diversity. Therefore continues exploitation of the available native species in the area will result in the total disappearance of the native species hence, erosion, desert encroachment in the study area will increase. In terms of richness, *A. Nilotica* has recorded with the highest richness index followed by *B. aegyptiaca*, *p. Biglobosa*, *F. Albida*. This is because the species are the most dominant species in the study area. This was agreed by Knopf (1996).

Table 4: Species Diversity, Evenness and Richness Indices in Argungu District

Species name	No. of species	Div. Index	Evenness	Richness
<i>A. nilotica</i>	31	0.366847	0.030570	12
<i>B. aegyptiaca</i>	20	0.332995	0.027749	12
<i>f. albida</i>	9	0.228821	0.019060	12
<i>T. indica</i>	3	0.112492	0.009374	12
<i>P. bigloboso</i>	11	0.255413	0.021228	12
<i>A digitata</i>	8	0.213751	0.017812	12
<i>Z. Mauritania</i>	1	0.04957	0.004130	12
<i>Z. spina-christii</i>	1	0.04957	0.004130	12
<i>C. procera</i>	1	0.04957	0.004130	12
<i>A. seyal</i>	3	0.112492	0.009374	12
<i>V. doniana</i>	1	0.04957	0.004130	12
<i>E.gnaphallocarpa</i>	2	0.083906	0.006992	12
		1.904996	0.150679	

Source: Field survey, 2011

Conservation Status of Native Species

Conservation status of Native species in the study area from the results indicated that, 46% of the respondents believed to have collected the available native species around their farm land for fuel wood. It has been estimated that about 505 million of the world's population depends on wood energy for cooking and other domestic uses, with a daily per capital consumption of about 0.5kg to 1.0kg of dry biomass (Enabor, 1986). 26.67% of the respondents admitted cutting these woody native species to expand their agricultural production. This is because majority of the respondents are made up of middle aged and adults who would be only after maximum harvest without considering the environmental needs to conserve naturally growing species around them. Enabor (1986) reported that farming accounts for over 80% of the total land area cleared annually in Nigeria.

According to Ashton-Jone (1991), Nigeria had already lost 90% of its forest, the economic cost of which is estimated at 20% of the country's GDP annually.

It was however, revealed that 30% of the respondents had native species that died naturally around their farmlands. This may be largely due to the fact that the soil in the study area is generally sandy. Therefore the soil have low water holding capacity. As such, vulnerable species could not resist the intensity of draught. This agreed with Fatubarin (2004). Only 6.67% of the respondents had revealed to have planted some tree species around their farm land. This is due to the fact that *A. Indica* provides shelter and is a good desert and erosion control. *M. indica* is also planted for commercial purposes.

Table 5: conservation status of Native Species in Dundaye and Argungu Districts

Species Status	Locations			
	Dundaye		Argungu	
	Frequency	Percentage	Frequency	Percentage
Species died naturally	6	20.10	8	29.63
Species cut for Agric. Exp	8	26.67	4	14.81
Species cut for fuel wood	14	46.67	12	44.44
Species planted by the farmers	2	6.67	3	11.11
Total	30	100	27	100

Source Field Survey (2011)

CONCLUSION AND RECOMMENDATIONS

The woody plants found within the study areas were mostly Caesalpiniaceae, Mimisaceae, Combretaceae, Fabaceae, Balanataceae, Rhammaceae and Meliaceae families respectively. The species were highly resistant to the agents of degradation. These could be categorized into environmental agents such as drought, desertification, human and animals in their drive to satisfy their daily needs. The finding shows that there is decrease in the number of tree species in the study area, and the decrease is as a result of anthropogenic factors. From diversity index determination, the ratio between the species with highest and lowest diversity index showed that the species with least diversity index is the more diverse species. And the most dominant species in the area was the richest species. Based on the findings of the Study, the following recommendations were made:-

1. Tree planting campaign should be given more emphasis, Trees should be planted for not only growing industrial wood demands, but also critical needs for fuel wood.
2. Trees should be planted all over the area for the protection and beautification of the area.
3. Recovery plans, blue prints for the restoration of lost species should be done with urgency. This should involve distribution of seedlings of lost and endangered species to the rural dwellers for plantation.
4. Government should expand and coordinate development assistance in the area of forest conservation, Open door policies towards international co-operation in conservation should be encouraged by the government at all levels.

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