Tree Species Diversity, Richness and Status in some Selected Market in Obi Local Government Area of Nasarawa State, Nigeria

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ABSTRACT

The study was carried out to assess the abundances, richness, diversity and status of tree species across five markets vicinities in Obi Local Government Area of Nasarawa State Nigeria. The five markets randomly selected included Daddere, Obi, Tudun Adabu, Agyragu and Adudu markets with all selected tree species identified at species level and the number of individuals enumerated. The result revealed the presence of 196 trees species belonging to 10 families in 19 deferent tree species. Daddare market recorded the highest diversity index of 1.798, while Obi, Adudu, Agyeragu and Tudun Adabu markets was 1.573, 1.407, 1.340, and 1.214 respectively. The Gamma diversity value was 2.209 for the tree species with the tree species richness for the Gamma tree species highest for Margaleaf value (3.40), Daddare market (1.780), Obi (1.763), Adudu (1.698) while, TudunAdabu recorded Margaleaf value (1.365) and Agyeragu recorded the least value (1.202). The status of tree species is relatively stable with only few tree species endangered and Azahdracta indica was the only trees species found across all the markets. Consequently, the tree species diversity and richness were relatively low which can be improved by shops owners in the markets by planting at least a tree in their shop environ..

INTRODUCTION

Trees and forest resources play crucial roles in the lives of human populace through numerous benefits derived from the trees such as foods, shading, medicines, fodder, fibers and fuel wood, and other uses such as building constructions, fencing and furniture making (FAO, 2010). The abundance and status of tree species in a given location basically depend on climatic and edaphic factors such as sunlight, humidity, moistness, temperature, nature of canopy, nutrient availability, topography, land used history, characteristic of soil and bedrock geology (Saka *et al.,* 2018). Tropical forest has the highest degree of species richness compared to temperate land ecosystem on the earth surfaces which made it to be home to more than half of the total number of species globally and they are suffering from high level of deforestation and destructions due to industrialization, infrastructural development and agricultural expansion among others (Thomas and Baltzer, 2002: Abdullahi and Abba, 2021). The human population in Nigeria has increased resulting in increased exploitation of forest resources (Wakawa *et al*., 2018).

Trees species destruction can result to undermining the natural ecosystem and leading to environmental imbalance. Over one-tenth of known tree species of the earth are under threat (IUCN, 1994) with deforestation accounting for 5 to 15 percent of the world tree species between 1990 and 2020(UNDP, 2004). It is evidence that the diversity and density of tree species threatened by climate change, huge population pressure, deforestation, pest and diseases, drought, fires, acid rain among others (LEISA,2008). The diversity of trees is principal to add up to tropical woodland biodiversity, since trees give asset and environment for nearly all other timberland species (Cannon *et al.*,1998). Tree species diversity in tropical forest varies significantly from place to place mainly due to variety in biogeography, environment and unsettling influence (Whitmore, 1998).

Tree species diversity, richness and distribution are the most important characteristics of tropical rain forest ecosystem. Regardless of plot size, studies have shown that the number of tree species is far greater in tropical rain forest than in any other forest community (Adekunle, 2006), except in a situation where deforestation and encroachment have eaten deep into the forest reserves. In the recent years, forests have received priority in many multilateral agreements and global biodiversity conservation initiatives (IUCN, 2010; Swamy *et al*., 2010). Despite the numerous benefits and contributions of forest resources to human well-being, these resources have been subjected to varying degrees of anthropogenic disturbances for several centuries (Valentini *et al.*, 2014; Fischer *et al.*, 2016), which have led to substantial losses and degradation. Many communities and towns are located close to land natural resources and their central business areas known as market serve both the visitors and the residents which equally have the potentials of exploiting floral resources (Wolf, 2005). The vegetation of Obi local Government Area of Nasarawa State is not excepted from exploitation for various uses hence the need to investigate the tree species diversity, richness and status in some selected market in Obi communities in order to evaluate the status of forest trees stands and diversity.

MATERIAL AND METHOD

Study Area

The study was carried out in some selected community market in Obi Local Government Area of Nasarawa State Nigeria which has the total land area of 967km² with a human population of 148,874 reported during 2006 census. Obi town market is situated on longitude $008^0$46’ 29.3” east and latitude $08^0$21’ 50.7” north with altitude of 177m asl. Agyeragu market is located at longitude $008^0$32’ 46.3”east and latitude $08^0$24’ 53.1” north with altitude of 231masl.Daddaremarket is situated at longitude $008^0$42’ 49.5”east and latitude $08^0$26’26.1” north with altitude of 217m above sea level (asl). Adudumarket is located at longitude $009^0$00’28.8”east and latitude $08^0$17’33.2” north with altitude of 183m asl and TudunAdabu market which is the last and itis situated at longitude $008^0$48’ 49.6”east and latitude $08^0$25’ 20.4” north with altitude of 226m asl. It has a mean temperature range between 26^0C and 30^0C, mean rainfall of 1150mm to 1550mm, relative humidity of 60 – 80% and falls within the Guinea Savanna vegetation (Metrological Department, 2009).

Sampling techniques

The list of markets in Obi Local Government Area was used to select five markets randomly and includes Daddere, Obi, Tudun Adabu, Agyragu and Adudu markets in North Central Nigeria. A reconnaissance survey was carried out across the five selected markets in order to have an idea of the site conditions, to gather basic information on the accessibility, nature of the habitat among others.

Method of Data collection

A field data form was used to collect the data in each of the study market for all trees enumerated. Each of the tree species encountered were identified to species level and the number of individuals were counted and recorded as adopted by Soba *et al*., (2023). Only trees that are up to 6m in height were enumerated.

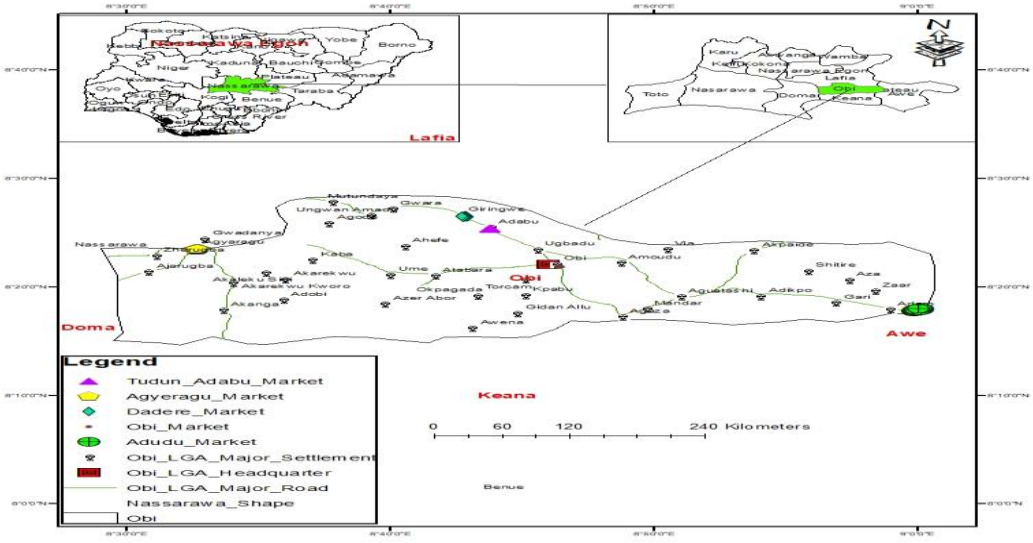

Figure 1: Map of Obi Local Government Showing the Market places

Data analyses

The diversity indices from each market place were used to determine the following trees species indices.

Shannon-Weiner diversity index (H)= $-\Sigma$ Pi In P.....…….....…… 1

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

Species richness index (d), were used as a simple measure of species richness according to Margalef (1958):$D = \frac{S-1}{lnN}$……..……..…2

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

Relative Abundance of species (RA)

$$RA = \frac{Number\ of\ individual\ Species}{Total\ Number\ of\ Trees}$$……..…….……..3

Relative density of species (RD)

$$RD = \frac{Number\ of\ Individual\ Species}{Total\ Number\ of\ Trees} \times 100$$…..…….....……4

The determination status of each tree species was conducted by classification based on the relative densities (RD) as adopted by 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.

RESULTS AND DISCUSSIONS

The result of families, number of species, species common name, species scientific name, species occurrences/frequency, relative abundance, relative density and status were presented in Tables 1, 2, and 3 while the result for tree species diversity and richness are presented in Table 4. The gamma results revealed a total of 19 trees species belonging to 10 families identified. The family *Moraceae* had the highest number of trees species (04) were; *Ficus religiosa, Ficus microcarpa, Ficus virens,* and *Ficus benjammna.* The second largest families were *Meliaceae* and *Malvaceae* with each having a total of three different species, these were; *Azahdracta indica, Cedrela odorata, Cipadessabaccifera,* and *Firmiana simplex, Bombax ceiba,* and *Ceiba speciosa*respectively. In the families of *Anacardiaceae* and *Bignoniaceae* two different species were identified.

Table1: Gamma Species of the Study Area

Family	No. Spp.	Common name	Scientific name	No. Occurrence	R.A	R.D(%)	Status
Moraceae	04	*Sacred fig*	*Ficus religiosa*	38	0.19	19.39	Abundant
		Chenese Bayan	*Ficus macrocarpa*	06	0.03	3.06	Occasional
		White fig	*Ficus virens*	02	0.01	1.02	Rare
		Weeping fig	*Ficus benjammna*	01	0.01	0.51	Threatened/ Endangered
Meliaceae	*03*	*Neem*	*Azahdracta indica*	24	0.12	12.24	Abundant
		Spanish cedar	*Cedrela odorata*	03	0.02	1.53	Rare
		Rana bili	*Cipadessabaccifera*	01	0.01	0.51	Threatened/ Endangered
Malvaceae	*03*	Chinese parasol	*Firmiana simplex*	04	0.02	2.04	Rare
		Red silk cotton	*Bombax ceiba*	01	0.01	0.51	Threatened/ Endangered
		Silk floss	*Ceiba speciosa*	01	0.01	0.51	Threatened/ Endangered
Anacardiaceae	*02*	Mango	*Mangifera indica*	48	0.24	24.49	Abundant
		Cashew nut	*Anacardium occidental*	09	0.05	4.59	Frequent
Bignoniaceae	02	Boundary tree	*Newbouldialeavis*	34	0.17	17.35	Abundant
		Pink trumpet	*Handroanthusimpetiginosus*	05	0.03	2.55	Rare
Combretaceae	01	Tropical almond	*Terminalia catappa*	01	0.01	0.51	Threatened/ Endangered
Euphorbiaceae	01	Sand box tree	*Hura crepitans*	02	0.01	1.02	Rare
Sapindaceae	01	Soap berry	*Sapindussaponaria*	10	0.05	5.10	Abundant
Burseraceae	01	Gumbo lumbo	*Bursera simaruba*	05	0.03	2.55	Rare
Laminaceae	*01*	Beechwood	*Gmelina arborea*	01	0.01	0.51	Threatened/ Endangered

They were *Mangifera indica* and *Anacardium occidental, and Newbouldialeavis* and *Handroanthusimpetiginosus* respectively. The families with least tree s species (one) for each were *Combretaceae* (*Terminalia catappa), Euphorbiaceae* (*Hura crepitans*), *Sapindaceae* (*Sapindussaponaria*), *Burseraceae* (*Bursera simaruba*), and *Laminaceae (Gmelina arborea).* The result of status of trees species in the study area indicated that out of 19 species that were identified, only five (05) species were abundant, one (01) species was occasional, one (01) was frequent, six (06) species were rare, and six (06) were threaten or endanger. Soba *et al.,* (2023) reported higher number of families and trees species in in Lafia, which is the nearest local government from the study site. It is evidence from the result that many know indigenous trees species especially those of family Fabaceae that are basically found in the savannah region were not represented completely. The family *Moraceae* which is represented by the highest species could be attributed to its broad leave which provided total shading for the traders and external root formation for seating and displayed of product by the traders.

Table2: Alpha Species of Obi and DaddareMarkets

Family	No Spp	Common names	Scientific name	No. Occurrences	R.A	R.D(%)	Status
Moraceae	*02*	Weeping fig	*Ficus benjammna*	*01*	0.019	1.89	Rare
		Chinese banyan	*Ficus microcarpa*	*06*	0.11	11.32	*Abundant*
Anacardiaceae	*02*	Mango	*Mangifera indica*	*23*	0.43	43.39	*Abundant*
		Cashew nut	*Annacardium occidental*	*09*	0.17	16.98	*Abundant*
Meliaceae	*02*	Neem	*Azahdracta indica*	*10*	0.19	18.87	*Abundant*
		Rana bill	*Cipadessabaccifera*	*01*	0.02	1.89	*Rare*
Euphorbiaceae	*01*	Sandbox tree	*Hura crepitans*	*02*	0.04	3.77	*Occasional*
Combretaceae	*01*	Tropical almond	*Terminalia catappa*	*01*	0.02	1.89	*Rare*
Alpha Species		of	Daddare	Market			
Moraceae	02	Sacred fig	*Ficus religiosa*	10	0.19	19.61	Abundant
		White fig	*Ficus exasperata*	01	0.02	1.96	Rare
Malvaceae	02	Chinese parasol	*Firmiana simplex*	04	0.08	7.84	Abundant
		Silk floss	*Ceiba speciosa*	01	0.02	1.96	Rare
Anacardiaceae	01	Mango	*Mangifera indica*	16	0.31	31.37	Abundant
Meliaceae	01	Neem	*Azahdracta indica*	05	0.09	9.80	Abundant
Sapindaceae	01	Soap berry	*Sapindussaponaria*	09	0.18	17.65	Abundant
Burseraceae	01	Gambo limbo	*Bursera simaruba*	05	0.09	9.80	Abundant

The Alpha trees species in Obi market is presented as shown Table 2. It revealed a total of eight (08) tree species belonging to five (05) families identified. The family *Moraceae (*Ficus benjammna and Ficus macrocarpa), *Anacardiaceae (*Mangifera indica and Annacardium occidental) *and Meliaceae (Azahdracta indica* and *Cipadessabaccifera*)had the highest number of tree species (02).The families with least tree species (one) for each were *Combretaceae*(*Terminalia catappa), Euphorbiaceae* (*Hura crepitans*), The result of the status of tree species in Obi indicated that, out of 08 species that were identified, only four (04) species were abundant, one (01) species was occasional, and three (03) species were rare. Akosim*et al*., (2016), noted that the size of the sample can influence the level of precision in a given research. The presence of few trees species in Obi town showed that market traders does not spare trees life ,instead they prepared clearing them for shop construction. The number recorded is far below the report of Adeniji *et al.,* (2021) in his study in New Bussa were he reported 41 species in 18 families. Similarly, Abdullahi and Abba (2021) in Kumo reported 27 tree species in 12 families which is by far higher than the report of this study.

The Alpha trees species of Daddare market (Table 2) showed a total of 8 tree species belonging to 06 families identified. The family *Moraceae had two species Ficus religiosa,* and*Ficus* exasperate. The family *Malvaceae* had two, these were; *Firmiana simplex*and *Ceiba speciosa*. In the families of *Anacardiaceae (Mangifera indica) Meliaceae* (Azahdracta indica), *Sapindaceae* (*SapindusSaponaria*), and *Burseraceae* (*Burserasimaruba*). The result of the status of tree species in the study area indicated that, out of 08 species that were identified, six (06) species were abundant, and two (02) species were rare. The study is not in conformity to the finding of Abba (2014) who reported 25 tree species in 14 families Kanawa forest reserve. Similarly, the result is not in lined with the findings ofIkyaaba*et al* (2015)noted 52 trees species in 22 families in Uni-Agric Markurdi.Family that had two species were the highest in Daddare market which implies that anthropogenic activities in the form of markets has the potentials to declined tree species population especially the native base species as noted by Soba *et al.*, (2023).

Table3: Alpha Species of Adudu, Agyeragu and TudunAdabuMarkets

Family	No Spp	Common names	Scientific name	No. Occurrences	R.A	R.D (%)	Status
Moraceae	02	Sacred fig	*Ficus religiosa*	09	0.47	47.37	Abundant
		White fig	*Ficus exasperata*	01	0.05	5.26	Abundant
Meliaceae	01	Neem	*Azahdracta indica*	02	0.11	10.53	Abundant
Malvaceae	01	Red silk cotton	*Bombax ceiba*	01	0.053	5.26	Abundant
Lamiaceae	01	Beechwood	*Gmelina arborea*	01	0.053	5.26	Abundant
Anacardiaceae	01	Mango		05	0.26	26.32	Abundant
Alpha		Species of	Agyeragu	Market			
Bignoniaceae	02	Pink trumpet	*Handroanthusimpetiginosus*	05	0.08	7.81	Abundant
		Boundary tree	*Newbouldia leavy*	33	0.52	51.56	Abundant
Moraceae	01	Sacred fig	*Ficus religiosa*	15	0.23	23.44	Abundant
Meliaceae	01	Neem	*Azahdracta indica*	06	0.09	9.38	Abundant
Sapindaceae	01	Soap berries	*Sapindussaponaria*	01	0.02	1.56	Rare
Anacardiaceae	01	Mango	*Mangifera indica*	04	0.06	6.25	Abundant
Alpha	Specie	ofTudun	Adabu	Market			
Meliaceae	02	Spanish cedar	*Cedrela odorata*	03	0.33	33.33	Abundant
		Neem	*Azahdracta indica*	01	0.11	11.11	Abundant
Moraceae	01	Sacred fig	*Ficus religiosa*	04	0.44	44.44	Abundant
Bignoniaceae	01	Boundary tree	*Newbouldia leavy*	01	0.11	11.11	Abundant

The alpha tree species of Adudu market is shown (Table 3).Total of 06 tree species belonging to 05 families identified. The family *Moraceae had two species Ficus religiosa* and *Ficus* exasperate. The family of *Meliaceae* (*Azahdractaindica*), *Malvaceae* (*Bombaxceiba*), *Lamiaceae* (*Gmelina arborea*) and *Anacardiaceae* (*Mangifer aindica*).The result of status of trees species in the study area indicated that out of 06 species that were identified, all were abundant. The tree species of Agyeragu market is presented in (Table 3). Six (06) trees species belonging to 05 families were identified. The family *Bignoniaceae had two species Handroanthusimpetiginosus* and *Newbouldia leavy*. The family of *Meliaceae* (*Azahdracta indica*), *Moraceae* (*Ficusreligiosa*), *Sapindaceae* (*Sapindussaponaria*) and *Anacardiaceae* (*Mangifera indica*). The result of the status of tree species in the study area indicated that, out of 06 species that were identified, five were abundant with one rare. The alpha trees species of Tudun-Adabu market revealed a total of 04 tree species belonging to 03 families identified. The family *Meliaceae* had two species *Cedrela* odorata and *Azahdracta indica.* The family of *Moraceae* (*Ficusreligiosa*), and *Bignoniaceae* (*Newbouldia leavy*). The result of the status of tree species in the study area indicated that, out of 04 species that were identified, all of them were abundant. The result of this study was contrary to finding of Shuaibu (2015) study of trees status and diversity in different forest of Idah in Kogi State where report almost the same trees species number and diversity across different forest of the same local government area. The differences observed in regards to number of tree species between these market places could be attributed the difference in infrastructural development, this is so because structural development always comes with a lot of unfavorable impacts on the forest trees species.

Table 4: Shannon-Weiner index (H) and Margalef species richness index (D)

Location	**H'**	**D**	**No. Family**	**No. Species**	**Total Observation**
Gamma Species of the study area	2.21	3.41	10	19	196
Obi Market	1.57	1.76	05	08	53
Daddare Market	1.79	1.78	06	08	51
Adudu Market	1.41	1.69	05	06	19
Agyeragu Market	1.34	1.20	05	06	64
TudunAdabu Market	1.21	1.37	03	04	9

The results of the species diversity and richness in selected markets is shown in Table 4. The species diversity indices (H') computed were; total site = 2.21, Obi Market =1.57, Daddare Market =1.79, Adudu market =1.41, Agyeragu Market = 1.34 and TudunAdabu Market 1.21. The results indicated that total site has higher tree species diversity, which was followed by Obi, Daddare and other communities with slightly variation. The 2.21 diversity value could be attributed to the increased in sample size as reported by Akosim*et al.*, (2016). The result indicated low species diversity value compared to the report of Soba *et al*., (2023) on ecological assessment of trees species diversity, richness and status in Shabu- Lafia Nasarawa State suggesting that marketers and traders careless in terms of trees conservation. Similarly, Abdullahi and Abba (2021), reported higher diversity values in a study of floristic composition and diversity of trees species in Kumo town and its environs.

CONCLUSION AND RECOMMENDATIONS

It can be concluded that the market places of Obi Local government area are dominated with trees species of family *Moraceae, Meliaceae,* and*Malvaceae.* Among the 19 tree species recorded *Azahdracta indica* was the only trees species that cut across all the markets and found in abundance. The trees species diversity and richness values were relative low compared to other studies conducted within the same agro-ecological zone. The finding of this investigation recommends that policies should be made to make its mandatory for all the traders in markets places of Obi Local Government to plant at least a trees species within a particular market environ to help in promoting afforestation .

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