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Distribution and Perception of Open Grown Trees (OGTs) on Farmlands in Oyo State, Nigeria

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Abstract
The study investigated the distribution of tree species, usefulness and perception of farmers on retention of open grown trees (OGTs) on their farmlands in Oyo State. OGTs are tree species located outside the designated forest reserves. Three stage sampling design was adopted in the selection of 80 farmers from Ibadan and Saki zones of Agricultural Development Programme of Oyo State (OYSADEP). Through field observation and questionnaire sampling, information collected were level of awareness of trees on farmlands, retention of trees during land preparation, farm size, type of farming system and tree species growing of farmlands. The result of the descriptive and inferential test statistics indicated that there are variations in farmers' perceptions towards the usefulness of trees on their farmlands. In Ibadan Zone, 77.5% of farmers do use and collect products from the trees on their farmlands, while 22.5% do not. In Saki zone, 50% of the farmers were aware of the usefulness of trees growing on their farmlands. Chi-square test of statistics revealed that some socio-economic characteristics of the farmers were significant when tested at $\alpha_{0.05}$, indicating that they do have influence over retention of trees on farmland. *Gmelina arborea* Roxb and *Terminalia superba* Engl. and Diels were the most species identified in Ibadan and Shaki agricultural Zones respectively. The existing forest management regimes will be more significant if trees on farm landscape are also put on board by being given a strong support both politically and financially to reduce over burden of illegal removal of trees from the reserves.

Keywords: Agro-ecological distribution, agro-forestry, farmers, trees outside forest, Ibadan agricultural zone, OGTs, Saki agricultural zone

Introduction

Trees are one of the most important components of the biosphere, which directly influence the global atmosphere cycles and human wellbeing. Trees are not just confined to forests but exist outside the forests also. Trees outside forests are of significant importance and perform a number of ecological, economic and socio-cultural functions (Onilude *et al*. 2018). These tree species that are located outside the gazetted Forest Reserve are also known as Open Grown Trees (OGTs). There are many ambiguities in the definition of Open grown trees because its definition depends on the definition of forest and other wooded land (Kleinn, 2000) and the definition of forest and other wooded land vary from country to country and also the boundary between what is forest and what is outside is not always clear (Kleinn, 2000; Bellefontaine *et al*., 2002). However, for the purpose of clarity, open grown trees can be viewed as tree species available on agricultural lands, along roads, railways, canal, ponds, orchards, parks, gardens and homestead outside the officially designated forest areas or reserves (Onilude *et al*. 2018). Over the years, within the context of achieving the participatory conservation of indigenous forest trees, farmers have tried to retain, protect, plant and manage trees on their farmlands. These trees and their important functions have been overlooked and ignored. Instead, more attention has always been focused on trees in forests which are viewed as resources and as a store of biological diversity (FAO, 2001). For this study, focus was on open grown trees that are located on agricultural land or farmlands.

Open grown trees on farmland form an integral part of the farm landscape and are critical for sustainable land management, carbon storage and organic matter, conservation of above and below biodiversity and informing food security interventions (Endale *et al*., 2017). Looking first at the scale of the open grown tree resources, recent data has shown that globally, 46% of agricultural land (over one billion hectares) has more than 10% tree cover (Zomer *et al*., 2007), while 17% of

farming land has more than 30% tree cover. This land with more than 10% tree cover is occupied by 31% of the people living in agricultural land (558 million) (Zomer *et al*., 2007). The products from these on-farm trees are important to the local people and the wider population for fuelwood, and many food and medicinal products. They can contribute to ecological and economic functions of an ecosystem. It can provide wood fuel, promote dry seasonal flow, stabilize soils, and ameliorate the micro-environment, making it more conducive for enhanced biodiversity of flora and fauna in an area or/and farmlands (Endale *et al*., 2017). Furthermore, there is an increasing population pressure that has led to virtual disappearance of economic trees in the gazetted forest reserves, hence, people are increasingly relying on trees species on free areas, mainly in the form of agroforestry, fallow and on-farm trees for the continued provision of forest goods and services. This study is part of a response to the concern over lack of data on tree species on agricultural landscape in the state expressed by experts at a FAN consultation tour to Charcoal producers in the State in 2019.

Studies has shown that farmers can balance the reduction in crop yields with the various products and services that they get from the open grown trees (Garrity *et al*., 2010; Ataa-Asantewaa, 2013; Tanga *et al*., 2014). In addition, like other areas of land, removal of trees species is being carried out without knowledge of volume being removed and the specie type. Scientific information on stocks of trees outside the forest in the study area is scanty. It is therefore prudent to have a reliable inventory of open grown trees on farmlands to facilitate productive and sustainable management of the tree species. However, the main objective of this study was to examine tree species on farmlands with the view to determining the perception of farmers towards the retention of these tree species on farmlands, and also bring out relevant and adequate information for policy development and managerial purposes.

Materials and Methods

Study area

The study area is Oyo State, and lies in the South-West geographical zone of Nigeria. The State is bounded by Benin Republic in the West, in the North and East by Kwara and Osun States respectively and Ogun State in the South (Adeola *et al*., 2012). Oyo State covers a land area of 27,140,000sqkm. The State lies between latitude 6°55'N and 8°45'N of the equator and between longitude 2°50'E and 3°56'E of the prime meridian. The State has a vegetation pattern of rain forest in the South and Guinea Savannah in the North. The climate is tropical seasonally; characterized by two peaks wet season in the South and one peak wet season in the North. The mean annual temperature is 21°C, while the annual rainfall ranges between 1000-1500mm. Oyo State has a population size of 3,489,000. Average daily temperature ranges between 25°C and 35°C almost throughout the year (Adeola *et al*., 2012).

Method of data collection

To ensure a more representative sampling, a three stage sampling technique was adopted based on the Oyo State Agricultural Development Programme (OYSADEP) administrative zoning arrangement. There are four agricultural zones; Ibadan, Ogbomoso, Oyo and Saki. Multi-stage sampling technique was designed for selecting the farmers for this study. The first stage involved purposive selection of two agricultural zones namely: Ibadan (Rainforest) and Saki (Guinea savannah) representing different agro-ecological zones (Fig. 2). The second stage involved random selection of two Local Government Areas (LGAs) from each of the OYSADEP Zones, since LGAs represent an agricultural extension block of the OYSADEP, making a total of four (4) blocks (Ibarapa-East, Ido, Atisbo and Saki-East blocks), while sampling procedure for the third stage involved purposive selection of two cells from each of the blocks making a total of eight (8) cells for the study. It is from these cells, eighty (80) farmers who have trees on their farmlands were systematically interviewed. The distribution of the questionnaire to farmers was done during their fortnightly meetings with extension agents of the OYSADEP. Also, a ground base survey to the farmlands was carried out. This was done to identify the different trees available on the farmlands. However, this was done with the help of a taxonomist and any trees that could not be identify on the field, its parts (leaves, fruits, roots etc.) were taken to the Forestry Herbarium Ibadan for correct identification.

Data Analysis

Descriptive and inferential statistics were used to describe the data collected. Descriptive statistics were applied to generate the percentages and the charts. Chi-square test of statistics was used to assess the relationship between selected socio-economic characteristics and the farmers' perception on the usefulness of trees on their farmlands. All these analyses were done using Microsoft Excel 2007 (Microsoft Corp., Redmond, WA, USA) and Statistical Package for Social Sciences (SPSS) version 23 (IBM Corp., Armonk, NY,USA).

Results and Discussion

The results in Table 1 show the socio-economic characteristics of the respondents. Considering the overall, 77.5% of the total farmers sampled in the study were male, while 23.5% were female. However, in Ibadan zone, 72.5% of the farmers were male, while 27.5% were female, while in Saki zone, 82.5% were male, while 17.5% were female. Majority of the farmers attained primary level of education with 37.5% and 32.5% both for Ibadan and Saki zones respectively. Overall, 16.25% of the total farmers have secondary education, while 13.75% have tertiary education. Considering the zones, the highest age group category in Ibadan and Saki zones were in age group 51-60years with 42.5% and 35% respectively. The analysis of the socio-economic characteristics of the farmers show that majority of the farmers with 38.75% of the total population were in the age group 51-60years with mean

age of 54.9 years. Most of the farmers from these zones were above their active age group (40+) and according to Ringe-metzer and Deihl, (1993); they can be referred to as adults. This is similar to the report of Aju (2012), in his study of trees outside forest and peoples' wellbeing in Imo State, Nigeria. More so, this result shows the predominant roles of males in farming activities, although females have more trees retained on their farmland compared to their male counterparts. This is also similar to the findings of Aju (2012) and Ajake (2012) who reported dominating roles of male gender in farming activities in their studies. Furthermore, the high level of literacy observed from the study is likely to aid the farmers in understanding the benefits of cultivating or retaining forest trees on their farmlands.

Table 2 showed that the majority of the farmers are aware of the usefulness of the tree species on their farmlands as 70% of the farmers in Ibadan zone indicated they met trees on the farmland, while 57.5% of the farmers in Saki zone also indicated they met trees on their farmlands. However, majority of farmers do not retain trees species they met on their farmland as 70% of the farmers in Ibadan zone and 77.5% in Saki zone indicated that they cut down tree species during land preparation for their farming activities. In addition, a total of 92.5% and 95% of the farmers from Ibadan and Saki zones respectively indicated that they could identify and give the local name of trees growing on their farmlands. Many people retain tree species on farmlands (Ibadan zone- 30.0%; Saki zone- 25.5%) for diverse reasons during clearing of forest for farming activities. The result also revealed that the farmers obtained products from the trees and they do harvest the trees (Barrios *et al.*, 2018). This also corroborates the work of Ajake (2012) in his study of the role of forest trees in indigenous farming systems as a catalyst for forest resources management in the rural villages of Cross River State, Nigeria. Majority of farmers from the two zones do not retain trees species they met on their farmland (Ibadan 70% and Saki 77.5%) as they usually engaged in cutting down tree species during land preparation for their farming activities. This result negates the report of Ajake (2012), where he found that majority of the farmers in his study did not remove tree species during land clearing for farming activities in cross river state, Nigeria. However, the reasons given for clearing the land is the competition for the little space between the agricultural crops and the forest trees and also, the issue of trees shading the agricultural crops, thereby reducing the photosynthetic rate of the agricultural crops. The income farmers do obtained from the trees on their farmland influenced the perception of farmers on the trees growing on their farmlands. This is in agreement with the findings of Adeola *et al*. (2012) in his study of Climate change and cropping technique among farmers in Oyo State. The income encouraged farmers to continue sustaining the anticipating benefits from their farmlands. A larger household size will encourage and influence the perception of farmers on adopting and retaining trees growing on their farmlands because they attach greater importance to food security than smaller households hence, will likely to be interested in getting additional source of income (Aju, 2012).

Figure 3 revealed that majority of the farmers in Ibadan zone used less than 1 ha of land (50.0%) with mean of 3.63ha and standard deviation of 6.29, while in Saki zone of the State, less than 1 ha of land had 12 farmers (30%) of the total respondents in the zone. Also, 35% and 45% of the farmers used between 1to 2ha of land as observed in Ibadan and Saki zones respectively. The percentage distribution of farming systems employed by the farmers revealed that majority of the food staples obtained from these study zones came from manual system of farming as 80.0% of the farmers in Ibadan zone still carry out their farming activities manually, while 85% were found in Saki zone. However, in general, the least farmland sizes across the two zones were observed for land size greater than 2ha (20%). This is an indication that majority of the farmers sampled across the two zones were small-holder farmers. In addition, discussion with the farmers revealed that the majority have not been able to make use of their total land area. That is, in some cases, portion of their lands are being put in to farming, while the remaining parts remain bushy. Also, the farmers revealed that land fragmentation has been one of their problems as their farmlands are being inherited and shared among the children. The results showed that majority of the farmers sampled in these zones are poor to acquire or rent machines to use on their farmlands.

The results in Table 3 show the type of farming systems farmers in the study area engaged in their agricultural activities. In Ibadan agricultural zone, 20% of the farmers were involved in mechanized farming, while majority of the farmers used manual system of farming (i.e. the use of hoe and cutlass). On the other hand, Saki agricultural zone also had the majority still using manual system of farming (85%), while the mechanized farming system had 25% of the total farmers. This is in agreement with the result of Ajake (2012) who reported that majority of rural populace still used old implements for their agricultural practices.

Relationship between farmers' perception of OGTs on farmlands and some selected socio-economic characteristics

Chi-square analysis was conducted to examine the association between the open grown trees and the farmers' demographic characteristics (Table 4). This was carried out to get a better knowledge of whether the farmers' socio-economic attributes are dependent or independent of the OGTs growing on the farmlands. The result of the chi-square analysis conducted on gender, level of education, income and household size showed a significant relationship between selected socio-economic variables of the respondents and their perception about the usefulness of trees on their farmlands in the study area

Conclusion

The study shows that removal of forest tree species on farmlands is a major activity among the farmers of these zones, as majority of them engaged in cutting down of these open grown tree species during land preparation for their farming activities. These farmers in Ibadan and Saki agricultural zones are mainly smallholders having or managing small area of land for their farming. The role of trees on farm landscape in farmers' livelihood was also found to be of benefit to the farmers as many of them get valuable resources from the tree on their farmlands. However, the act of retaining trees on farm landscape has the capacity to reduce the pressure which human population is mounting on the primary forest especially in the remaining natural forest ecosystem of Nigeria. This study however, recommends the need for increase in intensification on the awareness of the benefits and usefulness of the tree species growing on farm landscape. The act by farmers to selectively keep trees of significance alive and integrate them into farming systems should be promoted as part of the alternative in managing forest resources. This can go a long way to reduce the rate of illegal felling and removal of trees from the natural forest.

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Fig. 1a: Parkia biglobosa Benth. growing on Maize farmland in Ibadan agricultural zone

Fig. 1b: Farm landscape showing stumps of felled trees during opening for farm activities in Saki agricultural zone

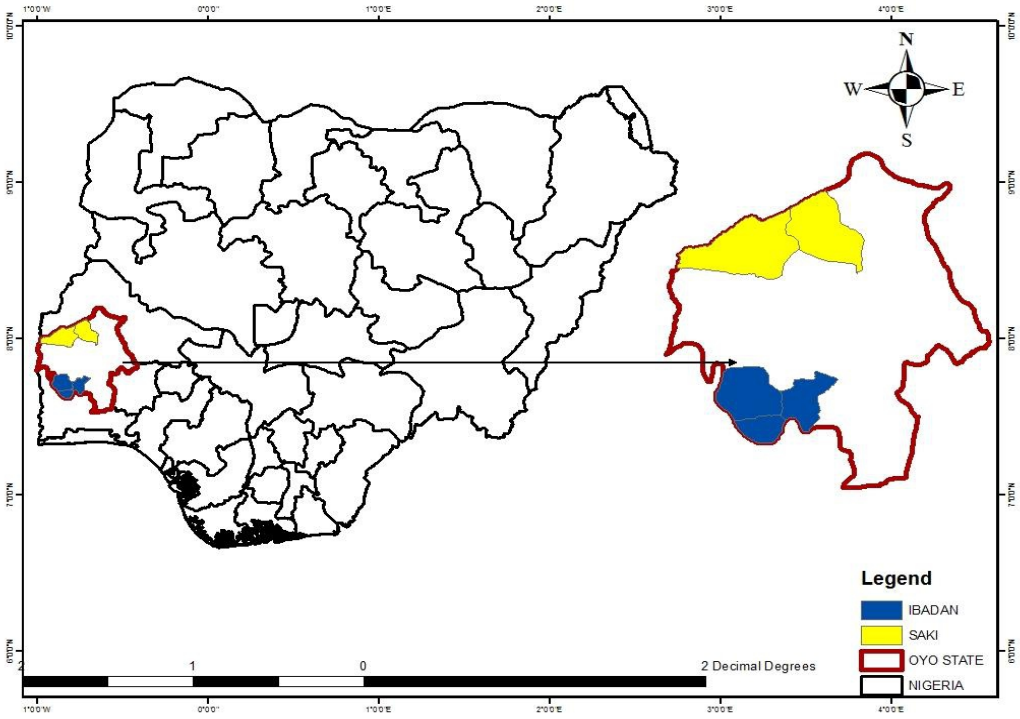

Fig. 2: Map of Nigeria and Oyo State showing the study areas

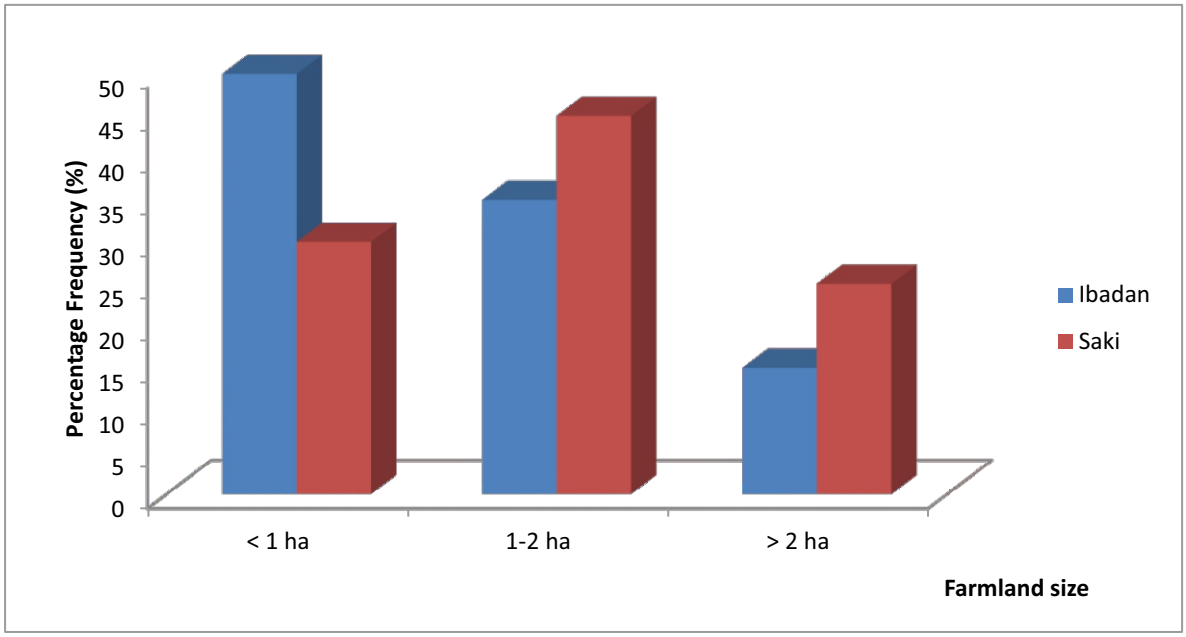

Fig 3: Farmland size utilized by farmers in Ibadan and Saki zones

Table 1: Socio-demographic characteristics of the respondents in Ibadan and Saki Zones

Variables	OYSADEP Zones		Total
Gender	**Ibadan**	**Saki**	
Male	29(72.5%)	33(82.5%)	62(77.5%)
Female	11(27.5%)	7(17.5%)	18(22.5%)
Marital Status			
Married	30(75%)	25(62.5%)	55(68.75%)
Divorced	4(10%)	6(15%)	10(12.5%)
Widowed	6(15%)	9(22.5%)	15(18.75%)
Household size			
0 – 4	9(22.5%)	12(30%)	21(26.25%)
5 – 9	24(60%)	23(57.5%)	47(58.75%)
10 – 15	7(17.5%)	5(12.5%)	12(15%)
Educational status			
No formal education	11(27.5%)	16(40%)	27(33.75%)
Primary education	15(37.5%)	13(32.5%)	28(35%)
Secondary education	8(20%)	5(12.5%)	13(16.25%)
Tertiary education	5(12.5%)	6(15%)	11(13.75%)
Others	1(2.5%)	-	1(1.25%)
Age (years)			
21-30	0(0%)	2(5%)	2(2.5%)
31-40	2(5%)	3(7.5%)	5(6.25%)
41-50	10(25%)	6(15%)	16(20%)
51-60	17(42.5%)	14(35%)	31(38.75%)
Above 60	11(27.5%)	15(37.5%)	26(32.5%)

Table 2: Awareness on the usefulness of the open grown trees on farmlands among the farmers in Ibadan and Saki Zones

Variables	OYSADEP Zones			
Awareness of OGTs on farmlands	**Ibadan**		**Saki**	
	Yes	No	Yes	No
Trees on farmland at inception of farming activities	28(70%)	12(30%)	23(57.5%)	17(42.5%)
Retaining trees on farmland	12(30.0%)	28(70.0%)	9(22.5%)	31(77.5%)
Identifying trees on farm landscape	37(92.5%)	3(7.5%)	38(95%)	2(5%)
Do you collect any products from these trees?	31(77.5%)	9(22.5%)	20(50%)	20(50%)
Have you harvested these tree species?	27(67.5%)	13(32.5%)	25(62.5%)	15(37.5%)

Note: OGTs – Open Grown Trees

Table 3: Classification of respondents by farming system in Ibadan and Saki zones

Farming System	OYSADEP ZONES		Total
	Ibadan	Saki	
Mechanized	8 (20%)	6 (25%)	14(17.5%)
Manual	32 (80%)	34 (85%)	66 (82.5%)
Total	**40**	**40**	**80**

Table 4: Test of Statistics (Chi-Square)

Variables	Chi-square Value	DF	Asymptotic Sig
Gender	48.210	1	0.000*
Level of Education	51.439	4	0.000*
Household size	50.510	2	0.001*
Income	44.621	4	0.000*

DF- Degree of Freedom, **- Significant at 0.05 level of probability*

Table 5: Distribution of tree species on farmlands in the agricultural zones

Ibadan zone		Saki zone	
Species	**Freq**	**Species**	**Freq**
Albizia ferruginea (Guill. & Perr.) Benth	9	*Afrormosia laxiflora* Benth	1
Albizia lebbeck (L.) Benth	1	*Afzelia africana* Sm. Ex. Pers.	2
Albizia zygia (DC.)JF Macbride	9	*Albizia zygia* (DC.)JF Macbride	2
Hymenocardia acida Tul.	8	*Alstonia boonei* De wild	1
Annona senegalensis Pers.	1	*Hymenocardia acida* Tul.	2
Azadirachta indica A. Juss	2	*Annona senegalasis* Pers.	1
Blighia sapida L.	1	*Anthocleista procea* Lepr. Ex Bureau.	3
Bombax bounoposense P.Beauv	11	*Anthocleista vogelii* Planch	3
Bridelia ferruginea Benth	1	*Antiaris africana* Engl.	2
Cola gigantea A. Chev.	3	*Azadiracta indica* A. Juss	1
Cola millenii K. Schum	1	*Bombax bounoposense* P.Beauv	6
Ekerbergia senegalensis A. Juss	1	*Ceiba pentranda* (L.) Gaertn	1
Ficus exasperate Vahl.	12	*Cordia millenii* Chudnoff. Martin	5
Ficus mocuso Welw. ex Ficalho	1	*Dalbergia welwitechii* (Hiern) Engl.	4
Funtumia elastica (Pressus)	1	*Daniella olivera* (Rolfe) Hutch. & Dalziel	6
Gmelina arborea Roxb.	11	*Ekebergia senegalensis* A. Juss	1
Lecaniodiscus copanioides Planch. ex Benth	1	*Ficus capensis* Thunb	2
Lonchocarpus sericeus (Poir.)	8	*Ficus exasperate* Vahl.	3
Magaritaria discoidea (Baill.)	12	*Gmelina arborea* Roxb.	14
Milicia excelsa Welw. CC Berg	8	*Khaya senegalensis* (Desr.) A. Juss	1
Myrianthus arboreus P. Beauv.	3	*Lophira lanceolata* Tiegh. ex Keay	4
Nauclea diderrichii (De Wild. & Th. Dur.)	2	*Mansonia altissima* A. Chev.	6
Nuclea latifolia Smith	7	*Margaritaria discoides* (Baill.)	3
Parkia biglobosa Jacq. Benth	4	*Milicia excelsa* Welw. CC Berg	5
Pycnatus angolensis (Welw.)Warb	6	*Nauclea diderrichii* (De Wild. & Th. Dur.)	3
Senna fistula (Lam.) Irwin & Barneby	2	*Parinary congensis* F. Didr	1
Strombosia pustulata Oliv	3	*Parkia biglobosa* Jacq. Benth	2
Tectona grandis L. f	24	*Pericopsis laxiflora* Baker	5
Terminalia glacosense	1	*Prosopis africana* (Guill.et Perr)	1
Treculia Africana Decne	4	*Pseudocedra Kotschyii* Schweint. Harms	3
		Tectona grandis L. f	11
		Terminalia ivorensis A. Chev	13
		Terminalia superba Engl.& Diels	14
		Triplochiton scleroxylon K. Schum	6
Total	**158**		**138**

Note: Freq – Frequency, RD- Relative density