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Background

In 2000, the then Faculty of Forestry and Nature Conservation (now college of Forestry, Wildlife and Tourism) of the Sokoine University of Agriculture in Morogoro, Tanzania, inaugurated the *Tanzania Journal of Forestry and Nature Conservation*. This development was taken in order to elevate the former publication of the then Faculty of Forestry, *Faculty of Forestry Records*, to a status of an International Journal. The last issue of the *Faculty of Forestry Records* was volume 72 and this Journal took over beginning with volume 73. The list of the 'Records' is given in the last pages of this issue and can be ordered from the office of the Principal, using the address given under the sub-heading 'Subscription' at the bottom of this page.

Scope

The *Tanzania Journal of Forestry and Nature Conservation* accommodates the current diverse and multidisciplinary approaches towards ecosystem conservation, at national and global levels. The journal is published biannually and accepts research and review papers covering technological, physical, biological, social and economic aspects of management and conservation of tropical flora and fauna.

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ABOUT THE COLLEGE OF FORESTRY, WILDLIFE AND TOURISM

The College of Forestry, Wildlife and Tourism of the Sokoine University of Agriculture (SUA) attained its present status in July 2017. It started in 1973 as a Division of Forestry in the Faculty of Agriculture of the University of Dar es Salaam. Thereafter, it was elevated to a Faculty of Forestry in 1984 when SUA was established. SUA is located 3 km from the centre of Morogoro Municipality, which is 200km west of Dar es Salaam, along the Tanzania-Zambia highway.

There are six departments in the College formed on the basis of specialisation: Departments of ecosystems and Conservation, Forest Engineering, Forest Economics, Forest Mensuration and Management, Forest Products and Technology and Wildlife Management.

The Faculty maintains three training forests., The first, covering 848 ha is located at Olmotonyi, on the slopes of Mount Meru near Arusha and is devoted to plantation forest management. The second with 320 ha is a fully protected virgin rain forest located at Mazumbai in the west Usambara Mountains devoted to mountain rain forest management. The third is Kitulangh'alo forest reserve with 500 ha located near Morogoro and devoted to the management of Miombo woodlands. These forests offer practical and research venues for both students and staff.

The College offers three three-year undergraduate degrees, i.e. B.Sc. (Forestry), B.Sc. (Wildlife Management) and Bachelor of Tourism Management. So far, these programmes have attracted students from many African countries. Post-graduate programmes: (MSc) both in Forestry and in Management of Natural Resources for Sustainable Agriculture (MNRSA) and PhD in Forestry, are also offered. These degree programmes are tailored to produce personnel for higher professional positions in forestry, wildlife, natural resource management, tourism management and administration including teaching and research. Graduates find employment in Forestry, wildlife, tourism other environmental services in government institutions, private or non-government organizations and companies.

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Species composition and diversity in IITA Forest Reserve, Ibadan, Oyo State, Nigeria

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ABSTRACT

Assessment of plant species composition and diversity of International Institute of Tropical Agriculture (IITA) Forest Reserve, Ibadan, Nigeria was carried out to facilitate forest conservation and restoration. Two transects, each measuring 500m long were laid systematically for the study. Next, ten 25m x 25m sampling plots were demarcated on each transect for enumeration and identification of trees, shrubs and climbers. Further, 1m x1m subplots were demarcated for enumeration and identification of herbs and lianas. Shannon-Wiener diversity and Simpson indexes were used to assess species diversity, evenness indices and richness. Species richness in the Reserve was: trees (58), shrubs (26), climbers (15), herbs (6) and lianas (4). Species diversity (H') and species evenness (E) were: trees (3.18, 0.41), shrubs (2.97, 0.72), climbers (2.31, 0.67), herbs (1.36, 0.78), and lianas (0.73, 0.69), respectively. Stand density was 1255 trees/ha while basal area was 23.10m^2ha^{-1}. There was a decrease in the number of individual trees in various diameter classes as size increased. The Forest Reserve was dominated by Malvaceae, Leguminosae, Apocynaceae, Euphorbiaceae, and Moraceae families. *Newbouldia laevis*, *Sphenocentrum jollyanum*, *Acacia ataxacantha*, *Chromolaena odorata*, and *Cnestis ferruginea* were the most abundant trees, shrubs, climbers, herb and lianas, respectively. Species population structure indicated high species diversity; therefore, management plan should be put in place for species conservation.

Key words: Species diversity, species dominance, IITA Forest Reserve, Shannon Weiner index, Simpson index

INTRODUCTION

Tropical forests are among the richest and most multifaceted terrestrial ecosystems supporting numerous forms of diverse species on earth (Onyekwelu *et al*. 2007; Schmitt *et al*. 2009; FAO 2010). Nigeria embraces a very wide range of habitats and ecosystems with varying degrees of species diversity within them. Species diversities within habitats vary greatly and are higher in lowland equatorial rainforests. In general, species diversity is well correlated with the amount of annual rainfall with the wetter areas tending to be richer in species diversity in the southern parts of Nigeria (Ayodele and Lameed 1999).

Scientists opined that forests have been recently affected by large scale human activities and natural changes and better understanding of the ecological changes in natural forest depends on progress in monitoring network of tropical forest plots (ITTO 2011). According to the report, Nigeria's forest estates comprised of open

tree savanna, mangrove and coastal forests, fresh water swamp and lowland wet forest shave been heavily degraded. These forest estates from which wood and other products are obtained have been subjected to severe encroachments, vegetation degradation and de-reservation for agriculture, industrial development, urbanisation etc (FAO 2010).

In the global forest resources assessment reported by FRA (2010), Nigeria and four other countries in the world had the highest annual rate of deforestation between 2000 – 2010. Since 1995, Nigeria has lost over 56% of its rainforests coverage and deforestation was at the rate of 3.5% per annum. According to Bown (2014), only 9.6 million hectares (ha), which is less than 10% of the total land area remain in Nigeria.

Deforestation and conversion of forest lands to agricultural land is the primary cause for dwindling tropical biodiversity. Reduction in forest cover has several other consequences including soil erosion, reduction capacity for carbon sequestration, instability of ecosystems and reduced availability of various wood and non-wood forest products and services (Alemu and Bluffstone 2007). In Nigeria, biodiversity is under serious threat because of lack of implementation of policies and law of conservation (Salami and Akinyele 2017). The degradation, fragmentation and conversion of the forests to other forms of land uses are currently progressing at alarming rates, which is a threat to sustainable biodiversity conservation in. Nigeria. The need to provide adequate quantitative and qualitative ecological data to guide forest owners and managers in designing realistic and effective management strategies is imperative. This study was therefore carried out to investigate species composition, species diversity, important value index, basal area and diameter distribution of trees in IITA Forest Reserve, Oyo State, Nigeria.

MATERIALS AND METHODS

Description of the study area

International Institute of Tropical Agriculture (IITA) forest is located in Ibadan, Oyo State, Nigeria (Figure 1). The study site is located between Latitude 07°30′8″ and 07°29′0″N and Longitude 03°55′0″ and 03°54′0″E and 243 metres above sea level (Tenkouano and Baiyeri 2007). The IITA secondary forest covers 350 ha of land. It has well-drained soil with an undulating topography which slopes gently in the West–East direction. The annual rainfall is 1301.6mm with average monthly rainfall being lowest in January (3-4mm) and highest in September (217.9mm). Based on IITA meteorological data for a 20-year period, the average daily temperature ranges between 21^0C and 23^0C while the maximum is between 28^0C and 34^0C and the mean relative humidity is in the range of 64% to 83% (Tenkouano and Baiyeri 2007).

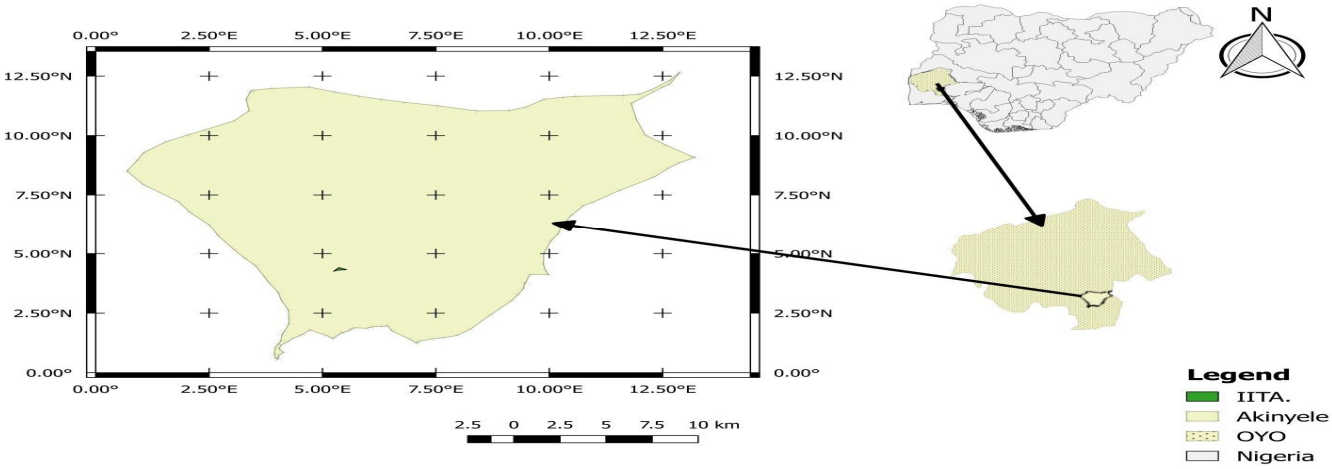

Figure 1: Map of IITA Forest Reserve, Nigeria

METHODS OF DATA COLLECTION

Sampling technique

Two 500m long transects were laid using systematic sampling. Ten 25m x 25m ($625m^2$) sampling plots were established on each transect and used for enumeration and identification of trees, shrubs and climbers. Trees were grouped into 0-10cm, 11-30cm, 31-60cm, 61-90cm, and >90cm diameter classes. Furthermore, 1m x 1m subplots were established and used for identification of herbs and lianas. The identification whilst in the forest was made possible using diagnostic factors such as growth habit; crown shape and tree bole; bark texture and its slash appearance, smell, taste and nature of exudates from the slashed bark; leaves; fruits; flowers and the root system. Samples of species that could not be identified in the field were brought to the herbarium of Forestry Research Institute of Nigeria and Department of Botany, University of Ibadan for identification.

Data Analysis

Species composition

The identified plant species were classified into their taxonomic families to determine composition. The number of tree species in each family was used to calculate species diversity classification. Frequency of occurrence was obtained for species richness.

Species diversity analysis

The species diversity is the combination of the species richness (the number of species in the sample plots) and evenness of species (abundance distribution among species). Shannon-Wiener's diversity index and Simpson index of species richness were used for species diversity analysis.

Shannon-Wiener's diversity index

Shannon Index (H) (Shannon 1948)

$$Shannon\ Index\ (H) = -\sum_{i=1}^{S} P_i \ln P_i \quad (1)$$

Where H is the Shannon-Wiener diversity index;
S is the total number of species in the community

P_i is the proportion of S made up of the ith species

ln is the natural logarithm

Simpson index of species richness

Simpson Index (D) (Simpson 1949)

$$Simpson\ Index\ (D) = \frac{1}{\sum_{i=1}^{S} P^2} \quad (2)$$

Where p is the proportion of (n/N) of individual of particular species found divided by the total number of species (N) found.

S is the number of species

Σ is the sum of the calculation

Important Value Index

The important value index (IVI) (Muller-Dombois and Ellengberg 1974).

$$IVI = Relative\ Density + Relative\ Dominance + Relative\ Frequency \quad (3)$$

$$Relative\ Density(RD) = \frac{n_i}{N} \times 100 \quad (4)$$

Where RD = relative density, ni = number of individual of species i and N = total number of individual of the entire population by taking the stock of individual tree species.

$$Relative\ Dominance\ (RD_o) = \frac{(BA_i \times 100)}{\sum BA_n} \quad (5)$$

Where RD_o= relative dominance, BA_i = Basal Area of all individual trees belonging to a particular species in i and BA_n = Standard Basal Area.

$$Relative\ Frequency\ (RF) = \frac{(\sum F_i \times 100)}{F_n} \quad (6)$$

WhereF_i = number of plots where species i was encountered and F_n = total frequency of all species.

Basal Area

The basal area (BAm^2) of all the trees in the sample plots were calculated using equation.

$$BA = \frac{\pi D^2}{4} \quad (7)$$

Where BA= basal area (m^2)

π= 3.142 (a constant)

D= dbh (m)

Diameter Class Distribution

Diameter at breast height (dbh) was used for the description of vegetation structure. The trees were grouped into 0-10cm, 11-30cm, 31-60cm, 61-90cm, and>90cm dbh classes.

RESULTS

Plant species composition

A total of 109 plant species belonging to 42 families was identified in IITA Forest Reserve. This comprised of 58 trees species, 26 shrubs, 15 climbers, 6 herbs and 4 lianas. The dominant tree species was *Newbouldia laevis* with frequency of 267 species (Table 1) whereas *Nauclea diderrichii*, *Zanthoxylum zanthoxyloides, Bombax buonopozense* and *Albizia ferruginea* had the least occurrence with frequency of one species each (Appendix 1). The shrubs were dominated by *Sphenocentrum jollyanum, Mallotus oppositifolius, Microdesmis puberula* while climbers were dominated by *Acacia ataxacantha, Motandra guineensis.* The herbs that were predominant in the Forest were *Chromolaena odorata, Panicum maximum.* The dominating lianas in the Forest Reserve were *Cnestis ferruginea* and *Triclisia subcordata* (Table 1). The Shannon-Wiener diversity (*H´*) of the trees, shrubs, climbers, herbs and lianas layers were 3.18, 2.97, 2.31, 1.36 and 0.73, respectively and the evenness values were 0.41, 0.72, 0.67, 0.78, 0.69 respectively (Table 2).

Important value index (IVI)

The result of the index showed that the ten most important woody species with the highest IVI in descending order were *Antiaris africana* (50.11), *Newbouldia laevis* (23.91), *Holarrhena floribunda* (22.70), *Funtumia elastica* (21.87), *Lecaniodiscus cupanioides* (17.10), *Trichilia monadelpha* (16.70), *Albizia zygia* (14.60), *Bosqueia angolensis* (13.36), *Trichilia prieuriana* (10.55) and *Sterculia tragacantha* (9.97). Woody species with least contribution to the total IVI were *Cola nitida* and *Syzygium guineense* with 0.84 (Table 3).

Basal area

The five species that made the largest contribution to the basal area were *Antiaris africana* (9.94), *Bosqueia angolensis* (1.96), *Albizia zygia* (1.14), *Holarrhena floribunda* (0.94) and *Funtumia elastic* (0.87).

Diameter class distribution

The diameter at breast height (dbh) class distribution of the woody species in the forest followed an inverted J – shape. The majority of the species were found in the first two lower (0 – 10, 11-20 cm) dbh classes. The highest number of trees? were found in the 0 – 10 cm diameter class (Figure 2). Species predominant in the first two lower dbh classes were *Albizia zygia, Antiaris toxicaria, Antiaris africana, Celtis wightii, Chrysophyllum albidum, Cola gigantea, Celtis zenkeri, Cola millenii, Entandrophragma angolense* and *Funtumia africana.* Few species were found in the >90 cm diameter class. Species found in the > 90 cm class include; *Antiaris africana, Milicia excelsa* and *Triplochiton scleroxylon.*

Table 1: Dominant Plant forms in IITA Forest Reserve, Nigeria

Species	Family	Frequency
Trees		
Newbouldia laevis (P. Beauv.) Seem.	Bignoniaceae	267
Holarrhena floribunda (G. Don) T. Dur. & Schinz.	Apocynaceae	107
Lecaniodiscus cupanioides Planch. ex. Benth.	Sapindaceae	79
Antiaris africana Engl.	Moraceae	73
Trichilia monadelpha (Thonn.) J. J. de Wilde	Meliaceae	62
Celtis wightii Planch	Ulmaceae	54
Trichilia prieureana A. Juss.	Meliaceae	50
Albizia zygia (DC) J. F. Macbr.	Leguminosae	45
Sterculia tragacantha Lindl.	Malvaceae	40
Bosqueia angolensis Ficalho	Moraceae	30
Shrubs		
Sphenocentrum jollyanum Pierre	Menispermaceae	19
Mallotus oppositifolius (Geiseler.) Müll. Arg.	Euphorbiaceae	18
Microdesmis puberula Hook.f. ex Planch	Pandaceae	17
Hippocratea indica Willd.	Celastraceae	15
Clausena anisata (Wild.) Hook. f. ex Benth.	Rutaceae	14
Alchornea cordifolia (Sch. & Thon.) Muell.Arg	Euphorbiaceae	12
Diospyros barteri Hiern	Ebenaceae	11
Deinbollia pinnata (Poir.) Schum. & Thonn.	Sapindaceae	10
Chassalia kolly (Schumach.) Hepper	Rubiaceae	7
Alchornea laxiflora (Benth.) Pax& K. Hoffm.	Euphorbiaceae	6
Climbers		
Acacia ataxacantha DC.	Leguminosae	24
Motandra guineensis (Thonn.) A. DC.	Apocynaceae	11
Byrsocarpus coccineus Schum. &Thonn.	Connaraceae	9
Combretum paniculatum Vent.	Combretaceae	7
Combretum zenkeri Engl. Diels	Combretaceae	6
Cyathula prostrata (L.) Blume	Amaranthaceae	6
Cissus arguta Hook. f.	Vitaceae	4
Piper guineense Schum. & Thonn.	Piperaceae	4
Culcasia saxatilis A. Chev.	Araceae	3
Gongronema latifolium Benth	Asclepiadaceae	3
Dalbergiella welwitschii (Bak.) Bak.f.	Leguminosae	2
Herbs		
Chromolaena odorata (L.) R. M. King& H. Rob	Compositae	10
Panicum maximum Jacq.	Poaceae	5
Anchomanes difformis (Blume)Engl.	Araceae	4
Mimosa pudica L.	Leguminosae	2
Indigofera spicata Forssk	Leguminosae	1
Thaumatococcus daniellii (Benn.) Benth.	Marantaceae	1
Lianas		
Cnestis ferruginea Vahl ex DC.	Connaraceae	15
Triclisia subcordata Oliv	Menispermaceae	5
Cissus quadrangularis L.	Vitaceae	3
Triclisia dictyophylla Diels	Menispermaceae	2

Table 2: Diversity indices of plant species composition in IITA Forest Reserve, Nigeria

Plant life forms	Shannon-Wiener (*H´*)	Evenness (E)
Tree	3.18	0.41
Shrub	2.97	0.72
Climber	2.31	0.67
Herb	1.36	0.78
Liana	0.73	0.69

Table 3: Basal area, Relative frequency, Relative density, Relative dominance and Important value index of tree species in IITA Forest Reserve, Nigeria

Species	Family	BA/ha	RF	RD	RDo	IVI
Albizia zygia	Mimisoideae	1.14	5.14	4.52	4.93	14.60
Alstonia boonei	Apocynaceae	0.09	1.14	0.48	0.41	2.03
Antiaris africana	Moraceae	9.94	4.00	5.00	41.11	50.11
Antiaris toxicaria	Moraceae	0.26	3.43	2.14	1.15	6.72
Blighia sapida	Sapindaceae	0.29	2.29	0.71	1.26	4.26
Bosqueia angolensis	Moraceae	1.69	3.43	2.62	7.31	13.36
Cassia siamea	Fabaceae	0.18	0.57	0.48	0.77	1.82
Ceiba pentandra	Bombacaceae	0.48	1.71	0.71	2.07	4.50
Celtis wightii	Ulmaceae	0.12	4.00	2.14	0.53	6.67
Celtis zenkeri	Ulmaceae	0.49	3.43	2.14	2.14	7.71
Chrysophyllum albidum	Sapotaceae	0.13	1.71	0.95	0.57	3.24
Cola gigantea	Malvaceae	0.01	0.57	0.24	0.04	0.85
Cola millenii	Malvaceae	0.02	0.57	0.24	0.10	0.91
Cola nitida	Malvaceae	0.01	0.57	0.24	0.03	0.84
Dialium guinensis	Fabaceae	0.01	0.57	0.24	0.06	0.86
Elaeis guineensis	Palmae	0.32	1.71	0.71	1.41	3.83
Entandrophragma angolense	Meliaceae	0.07	2.29	0.95	0.30	3.54
Entandrophragma cylindricum	Meliaceae	0.01	0.57	0.24	0.06	0.86
Ficus mucuso	Moraceae	0.02	1.14	0.48	0.10	1.72
Funtumia africana	Apocynaceae	0.12	2.86	1.43	0.53	4.82
Funtumia elastica	Apocynaceae	0.87	5.71	12.38	3.77	21.87
Holarrhena floribunda	Apocynaceae	0.94	7.43	11.19	4.08	22.70
Irvingia gabonensis	Irvingiaceae	0.01	0.57	0.24	0.06	0.87
Lecaniodiscus cupanioides	Sapindaceae	0.55	6.86	7.86	2.39	17.10
Malacantha alnifolia	Sapotaceae	0.06	1.14	1.19	0.24	2.58
Milicia excelsa	Moraceae	0.78	1.71	0.48	3.38	5.57
Millettia thonningii	Leguminosae	0.35	2.86	2.86	1.53	7.25
Monodora tenuifolia	Annonaceae	0.07	1.14	0.71	0.29	2.15
Morinda lucida	Rubiaceae	0.02	0.57	0.48	0.09	1.14
Musanga cecropioides	Urticaceae	0.07	1.14	0.48	0.32	1.94
Nauclea diderrichii	Rubiaceae	0.19	0.57	0.24	0.84	1.65
Newbouldia laevis	Bignoniaceae	0.82	8.00	12.38	3.53	23.91
Picralima nitida	Apocynaceae	0.01	0.57	0.24	0.04	0.85
Pseudospondias microcarpa	Anacardiaceae	0.14	1.14	1.43	0.61	3.18
Pterocarpus osun	Leguminosae	0.03	0.57	0.48	0.11	1.16
Pycnanthus angolensis	Myristicaceae	0.31	1.14	0.48	1.33	2.95
Spondias mombin	Marantecea	0.08	1.71	1.91	0.45	4.07
Sterculia oblonga	Malvaceae	0.02	0.57	0.24	0.10	0.91
Sterculia tragacantha	Malvaceae	0.44	4.00	4.05	1.93	9.97
Tetrapleura tetraptera	Fabaceae	0.04	0.57	0.48	0.19	1.24
Syzygium guineense	Myrtaceae	0.01	0.57	0.24	0.04	0.84
Theobroma cacao	Malvaceae	0.02	1.14	0.48	0.08	1.70
Trichilia monadelpha	Meliaceae	0.81	6.29	6.90	3.50	16.70
Trichilia prieuriana	Meliaceae	0.72	1.71	5.71	3.13	10.55
Triplochiton scleroxylon	Malvaceae	0.72	0.57	0.24	3.10	3.91

BA= Basal area, RF = Relative frequency, RD = Relative density, RDo = Relative dominance, IVI = Important value index

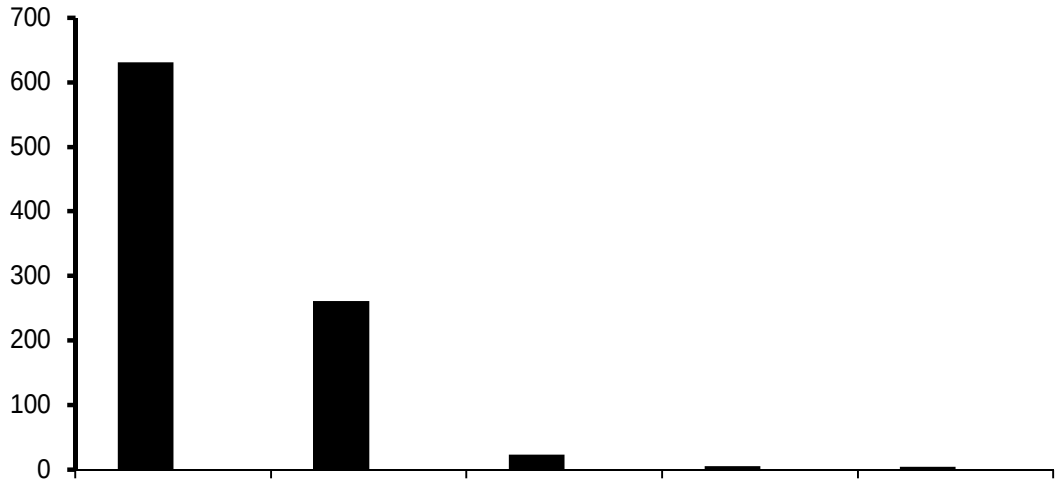

Figure 2: **C**lass sizes distribution of tree species in IITA forest reserve

DISCUSSION

Species composition

Most tropical forests in their undisturbed state usually appear massive, luxuriant and also uniform, however it is a storehouse of ecological diversity (Onokpise and Akinyele 2012). Floristic composition of a forest reserve is described in terms of its richness in species abundance, dominance, and frequency (Lamprecht 1989). In IITA forest reserve, trees had the largest proportion of the life forms. This is consistent with other forest studies (Vordzogbe *et al*. 2005; Anning *et al*. 2008; Addo-Fordjour *et al*. 2009a; Pappoe *et al*. 2010, Olajuyigbe and Adaja 2014). It also agrees with the fact that tree species are more abundant than other life forms in the rainforest whereas shrubs, herbs and grasses are the most abundant flora life forms in the savannah (Addo-Fordjour *et al.* 2009b, Okunlola and Akinyele 2011, Olajuyigbe *et al.* 2013, Okunlola and Akinyele 2014). The dominant species recorded in IITA Forest Reserve supports the studies of Awotoye and Adebola (2013), Salami *et al*. (2016) and Salami & Akinyele (2018), who reported the abundance of similar families in the lowland rainforest of south western Nigeria.

According to Cavalcanti and Larrazabal (2004), Shannon diversity index is high when it is above 3.0, medium when it is between 2.0 and 3.0, low when between 1.0 and 2.0 and very low when it is smaller than 1.0. This implies that the forest has high diversity and more or less even representation of individuals of mostly tree species. From the study, IITA Forest Reserve is rich in species diversity.Thehigh species richness of the IITA forest reserve means greater diversity and which leads to a higher community stability.

Important value index

Important value index (IVI) is a good index for summarizing vegetation characteristics, ranking species management and conservation practices. It reflects the degree of dominancy and abundance of a given species in relation to the other species in the

area (Kent and Coker 1992). The ten most important woody species with the highest IVI implied that these woody species are the most ecologically important woody species in the study area. Species with IVI rank less than 5.0 are highly threaten and needs immediate conservation measure.

Basal area

The woody species that had the largest contribution to the basal area in the IITA forest reserve indicated rapid growth rate that reflected that the prevailing environmental conditions of the study site may be favourable for their establishment.

Diameter class distribution

Diameter class distribution of all individuals in different size classes showed a reversed J-shape distribution. This is a general pattern of regular population structure where most of the species has the highest numbers of individuals at lower DBH classes with gradual reduction toward high DBH classes. This suggests good reproduction and recruitment potential of woody species. This finding agrees with studies by Senbeta and Denich (2006). Similar result was also reported by Lulekal *et al*. (2008) from Mana Angetu moist evergreen forest in Southeastern Ethiopia.

CONCLUSION

IITA Forest Reserve is considered an essential site for plant biodiversity. Ecologically important species such as *Entandrophragma angolense, Funtumia africana, Ceiba pentandra, Antiaris africana* and *Newbouldia laevis* were found. The Forest Reserve has high floristic composition and diversity with good distribution. The Shannon winner diversity index also indicated higher diversity value. The diameter class distribution patterns of woody plants species resemble an inverted-J shape, which is the reflection of a more or less good regeneration profile in the area. Thus, the Forest Reserve of IITA is more diverse in plant species and serves as pool of economic tree species. Therefore, there should be adequate protection and conservation of the Forest Reserve to prevent removal of plant species which may lead to loss of diversity.

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Appendix 1: Other plant forms in IITA Forest Reserve, Nigeria

Species	Family	Frequency
Trees		
Albizia ferruginea (Guill. & Perr.) Benth	Leguminosae	1
Alstonia boonei De Wild	Apocynaceae	2
Antiaris toxicaria (Rumph. ex Pers.) Leschen.	Moraceae	16
Blighia sapida K.D.Konig	Sapindaceae	18
Blighia unijugata Bak.	Sapindaceae	5
Bombax buonopozense P. Beauv.	Malvaceae	1
Bridelia grandis Pierre ex Hutch.	Euphorbiaceae	3
Ceiba pentandra (L.) Gaertn.	Malvaceae	3
Celtis zenkeri Engl.	Ulmaceae	23
Theobroma cacao Linn.	Malvaceae	9
Trema orientalis (L.) Blume	Cannabaceae	3
Triplochiton scleroxylon K.Schum.	Malvaceae	2
Zanthoxylum zanthoxyloides (Lam.) Zepern. &T.	Rutaceae	1
Irvingia gabonensis (Aubry-Lec. O'Rorke) Baill.	Irvingiaceae	4
Leucaena leucocephala (Lam.) de Wit.	Leguminosae	4
Macaranga barteri Muell.-Arg.	Euphorbiaceae	2
Malacantha alnifolia Baker	Euphorbiaceae	9
Margaritaria discoidea (Baill.) G.L.Webster	Phyllanthaceae	9
Milicia excelsa C.C. Berg	Moraceae	6
Millettia thonningii (Schum. &Thonn.) Bak.	Leguminosae	21
Monodora tenuifolia Benth.	Annonaceae	15
Morinda lucida Benth.	Rubiaceae	3
Morus mesozygia Stapf.	Moraceae	5
Musanga cecropioides R.Br. ex Tedlie	Urticaceae	4
Nauclea diderrichii (De Wild.) Merrill	Rubiaceae	1
Picralima nitida (Stapf) T. Durand &H. Durand	Apocynaceae	12
Pycnanthus angolensis (Welw.) Warb.	Myristicaceae	4
Pseudospondias microcarpa (A.Rich.) Engl.	Anacardiaceae	7
Pterocarpus osun Craib	Leguminosae	2
Senna siamea Lam. H.S.Irvin & Barneby	Leguminosae	2
Spondias mombin Linn.	Anacardiaceae	11
Sterculia oblonga Mast.	Malvaceae	4
Syzygium guineense (Wild.) DC.	Myrtaceae	5
Tetrapleura tetraptera (Schun. &Thonn.) Taub.	Leguminosae	8
Shrubs		
Acalypha ciliata Forssk.	Euphorbiaceae	3
Allophylus africanus P. Beauv.	Sapindaceae	5
Bridelia micrantha (Hochst.) Baill.	Euphorbiaceae	2
Buchholzia coriacea Engl.	Capparaceae	4
*Caesalpinia benthamiana (*Baill.) Heren. &Zar.	Leguminosae	1
Canthium venosum (Oliv.) Hiern	Rubiaceae	2
Carpolobia lutea G. Don	Polygalaceae	2
Chassalia kolly (Schumach.) Hepper	Rubiaceae	7
Clerodendrum polycephalum Bak.	Labiatae	2
Dichapetalum barteri Engl.	Dichapetalaceae	1
Grewia carpinifolia Juss.	Malvaceae	4
Grewia pubescens P. Beauv	Malvaceae	7
Hedranthera barteri (Hook. f.) Pichon	Apocynaceae	4
Hippocratea pallens Planch. ex Oliv.	Celastraceae	1
Salacia pallescens Oliv.	Celastraceae	2
Sida acuta Burm.f.	Malvaceae	2
Climbers		
*Baissea axillaris (*Benth.)Hua.	Apocynaceae	1
Chasmanthera dependens Hochst	Menispermaceae	2
Cissus arguta Hook. f.	Vitaceae	4
Culcasia saxatilis A. Chev.	Araceae	3
Dalbergiella welwitschii (Bak.) Bak.f.	Leguminosae	2

Gongronema latifolium Benth	Asclepiadaceae	3
Mondia whitei (Hook. f.) Skeels	Apocynaceae	1
Piper guineense Schum. &Thonn.	Piperaceae	4
Tetracera alnifolia Wild.	Dilliniceae	1