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IMPACT OF FARMING ACTIVITIES ON VEGETATION IN OLOKEMEJI FOREST RESERVE, NIGERIA

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ABSTRACT
An investigation was carried out in Olokemeji Forest Reserve (Nigeria) to examine the impact of farming activities on the vegetation of the reserve. The 5,888 hectare forest reserve was divided into three zones for the purpose of this study. They are natural forest (zone 1), plantation (zone 2) and the fallow area (zone 3). Ten plots of 40m x 50m were randomly selected from each zone for enumeration. In addition 100 questionnaires were administered to elicit information on the effects of farming activities on the plant resources of the Olokemeji forest reserve. The inverse of Simpson diversity indices of the three zones showed that zone 1 had 43.5, zone 2, 2.1 and zone 3, 11.8. The very low diversity indices recorded in zones 2 and 3 resulted from the extensive and intensive farming activities as most species in the zones had been cut down during farm clearing.
Farming activities in the reserve have resulted in large hectares of impoverished secondary forest, bare and degraded lands, grasslands and plantation of exotic species. About 25 plants useful to the respondents have also been lost due to farming activities.

KEYWORDS: farming activities, forest reserve, plantation, fallow land, and natural forest.

INTRODUCTION

Forest clearing has been identified as one of the most significant causes of deforestation in different parts of the world. Detailed scientific studies illustrate the apparent effect of farming activities resulting in modification of the original vegetation. The rate of forest destruction is alarming in West Africa due to rapid population growth and land use (Myers, 1988). For example, recent estimates indicate that over 350,000 ha of forest and natural vegetation are being lost annually due to farming (NEST, 1991). Ola Adams (1996) also lamented over 11,300 hectares of forest being cleared annually in Omo forest reserve in Nigeria for the establishment of monoculture plantation of indigenous and exotic tree species. These evidences present a significant and direct role of forest clearing for farming in forest loss. It has been established that the highest rates of forest modification have occurred in areas with heavy dependence on forest lands for subsistence and shifting agriculture largely found in developing countries (Allen and Barnes, 1985).

The global drive towards sustainable environments provides critical need for studies involving impact of farming activities on forest vegetation. Opportunities to be derived from such studies include prediction of stability and/changes to be expected as caused by different farming types of the different zones, possible ecological effects of changes and form and type of vegetation occurring in different zones. An adequate and reliable information base necessary for better decision making in the forestry sector for sustainable environment is obtained.

Generally, this paper aims at providing a critical examination of the impact of farming activities on vegetation. It is hoped to provide useful information to planners and resource managers.

Habitat loss usually precipitates species extinction. In many states of Nigeria, relatively little natural vegetation remain untouched by human hands (Myers, 1989). Rates of forest loss are accelerating due to subsistence agriculture and shifting cultivation.

Olokemeji forest reserve was a high forest from which more than 47 forest produce were derived (Hopkins, 1972). The area has witnessed a series of transformation over the years. A large part of the reserve which was a good repository of plant and animal species was dereserved for the establishment of monoculture plantations of *Gmelina arborea* and *Tectona grandis*. The continual demand of the shifting cultivators for the release of forest land for farming activities is also alarming.

Olokemeji forest reserve is among the forest reserves in the country where relics of tropical rain forest could be found. Already forest plantation establishment, bush burning, shifting cultivation and other development features have occurred in the reserve resulting in loss of biodiversity. The economic implication of loss of biodiversity on the local communities and on the national economy in general calls for a joint effort by all stakeholders. This paper therefore aims at highlighting some of the environmental impact of farming in Olokemeji forest reserve.

MATERIALS AND METHODS

The study area

Olokemeji forest reserve occupies a total land area of 58.88 km^2 .The reserve, which was established in 1899 is the second forest reserve in Nigeria. The forest reserve is situated between latitude 7^0 25N to 7^0 39N and Longitude 3^0 32E to 3^0 44E. The site lies approximately 32km west of Ibadan, and 35km north-east of Abeokuta.

The topography of the study area is generally undulating, lying at altitude between 90m and 140m above sea level, except for a quartzite ridge near the western side, which rises steeply to over 240m.

Olokemeji forest reserve is in the lowland rain forest of south-western Nigeria. The annual rainfall ranges between 1200mm to 1300mm spreading over March to November (Mackay, 1956). The dry season is severe and the relative humidity is low.

The soils of the area are derived from the dissected plain of the precambian basement complex rocks (Wilson, 1922). It is composed of banded biotite gneisses with granitoid intrusions. The soils are derived mainly from these old crystalline rocks which are buried beneath alluvial sands.

The forest reserve lies on the margin of the lowland rain forest and derived savanna zones (Keay, 1952). Moist forest of several types covers the reserve, except for the areas of plantation. Along the eastern side of the reserve is a dry type of lowland rain forest rich in Sterculiaceae, Ulmaceae and Moraceae (Keay, 1953).

On the alluvial soils are found a flouristically distinct vegetation type dominated by an abundance of *Manilkara multinervis, Diospyros mespiliformis* and *Nesogordonia papaverifera*. The derived savanna found north and west of the reserve, consists of species such as *Danellia oliveri, Vitellaria paradoxa, Parkia biglobosa, Lophira lanceolata* and *Pterocarpus erinaceous.*

Data collection

The 5,888 hectare forest reserve was divided into three major zones. These are; natural forest (zone 1), plantation (zone 2), and the fallow area (zone 3). The 3 major zones were used as basis for the selection of sample plots.

In each of the three major study zones, a 1000 metre long transect was cut. Along each transect, 25 (40m x 50m) sample plots were laid with the aid of a compass and pegs from where ten plots were randomly selected for enumeration.

Data were collected in the 30 sample plots from the three transects representing 0.102 percent sampling intensity of the whole forest reserve. Within each plot the girth and height of all trees, shrubs and climbers $\geq$ 5cm Diameter at breast height (DBH) were measured.

In addition 100 questionnaires were administered to nine villages within the forest. The questionnaires, were distributed proportionally to the size of the villages and were administered through the village heads, farmers and forestry workers.

All plant species ($\geq$ 5cm DBH) encountered during the study, were recorded. The plants were classified into tree, shrub and climber while their families were also identified. The following statistical analyses were carried out for each of the three zones. Frequency of occurrence of species, number of species per hectare and basal area (B.A) of each species. In order to investigate the extent of plant diversity within the forest reserve, diversity indices were calculated for each zone using the inverse of Simpson's (1949) diversity index (1). Species diversity is a measure of heterogeneity of a site taking into consideration the number and the density of individual species. It is expressed as:

$$I = \frac{\sum\{ni(ni-1)\}}{N\{N-1\}} \quad (1)$$

Where I = Simpson's diversity index
N = Total number of species enumerated
ni = Number of individuals of ith species enumerated.

The value in the original Simpson diversity index ranges from 0 to 1 implying that the lower the value calculated the higher the diversity. With the inverse form, the higher the value, the higher the diversity.

The inversed Simpson diversity index is given as follows:

$$I = \frac{N\{N-1\}}{\sum\{ni(ni-1)\}} \quad (2)$$

Similarities between zones was calculated as a measure of beta diversity (β). The differences between habitats are referred to as (β) diversity. Thus an area with a wide range of dissimilar habitats will have a high β – diversity (World Conservation Monitoring Centre, 1992). Wolda (1983) and Jansen and Vegelius (1981) had earlier suggested that of the many similarity indices only three (the Ochai; the Jaccard and the Sorensen's) are worth considering. Sorensen's similarity indices (SI) was therefore used to calculate similarity between paired zones in the study area. It is expressed as:

$$SI = a/\{a+b+c\} \times 100\% \quad (3)$$

Where SI = Sorensen similarity index
a = Number of species common to both zones
b = Number of species present in zone 1, but not in zone 2.
c = Number of species present in zone 2, but not in zone 1.

Detrended Correspondence Analysis (DCA) was carried out using CANOCO (Ter Braak, 1988) program to ascertain floristic gradient and continuity within the forest reserve thereby arranging the plots and the plant species in such a way that similar plots in terms of species composition and density are arranged close together and dissimilar plots are arranged far apart. The 100 questionnaires administered were subjected to descriptive statistics.

RESULTS

One hundred and seven plant species were recorded in all the 30 sample plots during the study (Appendix 1). In terms of species richness, natural forest (zone 1) had the highest number of species per hectare (46), followed by the fallow area (zone 3) with 16 species per hectare and plantation (zone 2) had the lowest number of species per hectare (6) (Table 1). The enumerated plant species are made up of two thousand four hundred and twenty nine (2,429) trees representing 91.4%, 224 shrubs (8.4%) and 5 climbers (0.19%) (Table 1).

Plantation species came out as the most abundant of the 107 species encountered during the study. They are *Tectona* grandis, *Gmelina arborea* and *Sena siamea.*

Table 1. The summary of enumerated plant characteristics at the study site

S/NO	ZONES	AREA (Ha)	NO OF SAMPLES (Ha)	B. AREA PER Ha	NO. OF TREES /ZONE	NO. OF SHRUBS/ZONE	NO OF CLIMBERS/ZONE	DIVERSITY INDEX
1	NATURAL FOREST	847	2	116.29	459	189	2	43.5
2	PLANTATION	1788	2	439.25	1887	1	0	2.1
3	FALLOW LAND	1088	2	2.32	83	34	3	11.8

Source: Field data

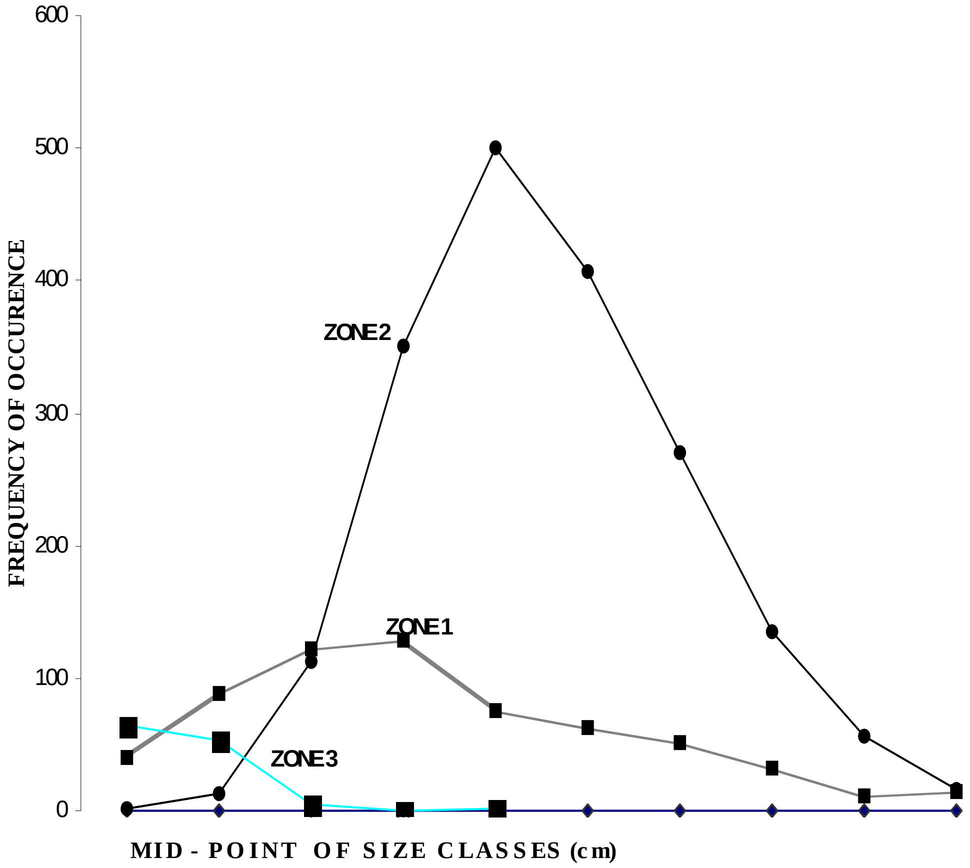

Figure 1. Density of species by zones

Each of these three genera accounts for more than 20% of the total plants encountered. The plant occurrence curve of the study zones is shown (Figure 1). The curve reveals the growth characteristics by zones for all the plant enumerated. Inverse of Simpson's diversity indices of all the plants encountered in the study are presented (Table 1). The values for natural forest (zone 1), plantation (zone 2) and fallow land (zone 3) are 43.5; 2.1 and 11.8 respectively. This trend is not surprising because the plantation contain fewer species.

Results of similarity indices in terms of Sorensen's similarity index reveal the variability between the zones. The Sorensen's indices are 9.68%, 17.14% and 13.16% for zones 1 and 2, 1 and 3 and 2 and 3 respectively. The study site ordination (Figure 2) showed that some species of the plantation are arranged much closer together than the species of the other 2 zones, while the species of the fallow area are arranged far apart.The analysis of the questionnaires administered shows most of the inhabitants engaged in farming activities. Other occupations are hunting, fishing, fuelwood collection, and timber extraction. Sixty seven percent of the inhabitants possess small farm sizes ranging between 0.1 and 2 ha, 14 percent owned between 2 and 4 ha, while 19 percent owned more than 4 ha. Mixed cropping dominates the farming systems of the study area. Forty five percent of the villagers were involved in mixed cropping of different arable crops. Thirty eight percent practiced shifting cultivation, while 18 percent practiced mono cropping. The study reveals that some plant species are either rare or absent from the study area due to farming activities especially shifting cultivation (Table 2). Among the people interviewed 52% percent agreed that some 13 plant species are rare in the reserve while 48 percent listed 12 plants that are absent in the forest reserve.

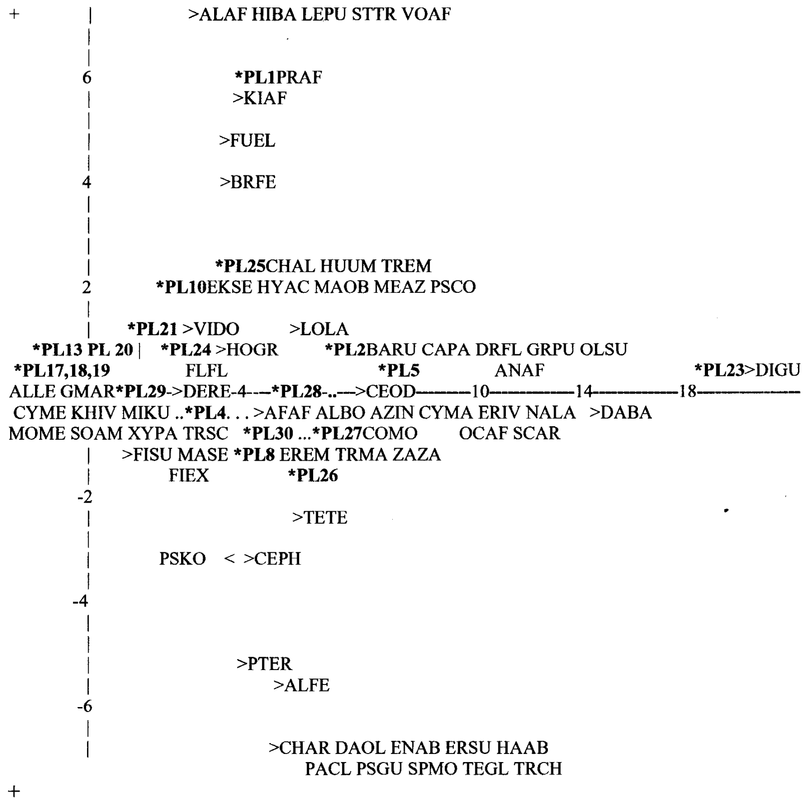

Figure 2. Species ordination by Detrended Correspondence Analysis (DCA) showing superimposition of species and plots. The full names of species are provided in Table 1

The listed plants were those reported to occur in the forest reserve before this study but were not recorded in the course of the field plant enumeration. Information on them was collected during the administration of the questionnaires.

DISCUSSION

One of the most fundamental and known characteristics of tropical forests is the great species richness, or large number of plant species per unit area (Peters, 1996). This point is illustrated in this study by the difference between the number of species per site between the natural forest and plantation and fallow area. The natural forest is most diverse, and contained an average of 59 plant stems in a single plot of 0.2ha. The negative impact of farming on plant species was observed in zone 2 and zone 3 with an average of 189 and 12 stems per 0.2 ha plot respectively.

The study showed that the values of inverse of Simpson's diversity indices for plantation, the fallow and the natural forest zones are 2.1, 11.8 and 43.5 respectively. These varying values may be attributed to the intensive farming in the plantation and fallow sites, which result from land shortages and short fallows. Continuous clearing of vegetation for arable and tree crops has caused loss of natural plant diversity. Clean weeding of farmlands also reduces the natural regeneration of woody plants thereby causing reduction in plant diversity of the zone 3. Also, the dominant plant families recorded in zone 1 (Caesalpinioideae, Mimosoideae and Meliaceae) have characteristics for easy dispersal by wind which would as well enhance their spread in the

Table 2. List of plant species that are rare or absent in the study site

N/S	SPECIES NAME	FAMILY NAME	HABIT	ABUNDANCE
1	*Afzelia africana*	Caesalpiniodeae	Tree	Rare
2	*Antiaris toxicaria*	Moraceae	Tree	Rare
3	*Blighia sapida*	Sapindaceae	Tree	Rare
4	*Burkea africana*	Caesalpiniodeae	Shrub	Rare
5	*Cassipourea barteri*	Rhizophoraceae	Shrub	Absent
6	*Ceiba pentandra*	Bombacaceae	Tree	Rare
7	*Dalbergia latifolia*	Papilionoideae	Climber	Rare
8	*Entada abyssinica*	Mimosoideae	Shrub	Rare
9	*Ficus polita*	Moraceae	Shrub	Absent
10	*Garcinia smeathmanii*	Guttifereae	Tree	Absent
11	*Harrisonia abyssinica*	Simaroubaceae	Shrub	Rare
12	*Khaya ivorensis*	Meliaceae	Tree	Rare
13	*Lophira alata*	Ochnaceae	Tree	Absent
14	*Mansonia altissima*	Sterculiaceae	Tree	Absent
15	*Milicia excelsa*	Moraceae	Tree	Rare
16	*Nauclea pabeguinii*	Rubiaceae	Tree	Absent
17	*Nauclea diderrichii*	Rubiaceae	Tree	Absent
18	*Olax subscorpioidea*	Olacaceae	Shrub	Rare
19	*Pachyelasma tessmannii*	Mimosoideae	Shrub	Absent
20	*Santalum album*	Santalaceae	Tree	Absent
21	*Schrebera arborea*	Oleaceae	Tree	Rare
22	*Sterculia setigera*	Sterculiaceae	Shrub	Absent
23	*Strophanthus hispidus*	Apocynaceae	Shrub	Absent
24	*Terminalia ivorensis*	Combretaceae	Tree	Rare
25	*Trema orientalis*	Ulmaceae	Shrub	Absent

Source: Field survey, 2002.
Rare = 13
Absent = 12

study location. The shade effect of plantation species does not encourage undergrowth regeneration. This also caused reduction of plant diversity in the plantation zone. The natural forest (zone 1) has a dense growth of trees and shrubs with no grass while in the other two zones tall exotic species of *Gmelina arborea* and *Tectona grandis* (zone 2) are major features. Scattered trees, shrubs, grasses and agricultural crops characterized the fallow area. Zones 1 and 2 showed characteristics of normal curve while zone 3 showed a negative trend. Zone 3 portrays the extent of farming impact on the vegetation of the forest reserve.

The total number of species recorded in the enumeration (107) also showed a general marked decrease in plant species compared to 308 species reported by MacGregor (1937), and 50 – 100 plant species per hectare reported by Lowe (1993). The large decrease was due to several human activities that had taken place in the forest reserve between 1937 and year 2002. Many of the villagers derived their livelihood from the forest reserve through collection of plant parts as herbal materials. Such plant parts include plant roots, leaves, twigs and barks. The collection of these parts could be injurious to the living plants thereby leading to the death of such plant. Other activities such as firewood collection, illegal felling operation, regular bush burning during game hunting are prominent in the forest reserve. These activities over a long period of time could lead to reduction of plant diversity especially within the natural forest zone of the forest of forest reserve. The factors of plant diversity, complexity, and closed nutrient cycle that sustain the tropical forest ecosystems in an undisturbed setting cause its fragility when in contact with man in accordance with Goudie (1984) and FAO (1991).

The low percentage similarity between any two is further corroborated by the ordination diagrams which has a distances of –2 to + 20 (22SD) on the X - axis, and –7 to +7 (14SD) on the Y – axis indicating heterogeneity in the species composition of the three zones. This may be attributed to the removal of the original vegetation during plantation establishment and farming in zones 2 and 3 respectively.

CONCLUSION AND RECOMMENDATIONS

Loss of plant diversity due to farming activities is rapidly increasing in Olokemeji forest reserve. Agricultural expansion and plantation establishment contribute to plant loss in the reserve. These had been aggravated due to population growth and rural poverty. Human interaction with the environment is influenced by economic factors, ignorance of the farmers concerning values and functions of the biodiversity and the severity of farming activities.

The rational use of zone 1 has brought a marked difference between it and the other two zones in the reserve. Therefore efforts to reconcile farming pressures with forest reservation are a joint responsibility of the forest managers and the land users. The adoption of meaningful environment friendly systems of farming such as agroforestry will allow for sound resource management policies to be evolved while at the same time government forest resource managers should keep tract of pressures on resources.

To address these problems of farming pressures on the resources of this forest, the following recommendations are made: there is need for more concerted efforts on biodiversity monitoring studies in the reserve to update earlier reports e.g Macgregor (1937) and others. This calls for team research work in the reserve involving research scientists from research institutes, universities and conservation agencies. Also, any plan to reduce further pressures of farming on the forest reserve must include programmes such as poverty alleviation as well as inculcation of good farming methods that will make farmers less dependent on extensive farming practices. Integrated farming systems should be adopted whereby farming practices are incorporated in tree planting.

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APPENDIX 1. List Of Plant Species Encountered In The Forest Reserve

S/N	SPECIES NAME	CODE	FAMILY	HABIT
1	Afzelia africana	AFAF	Caesalpiniodeae	Tree
2	*Albizia ferruginea*	ALFE	Mimosoideae	Tree
3	*Albizia gummifera*	ALGU	Mimosoideae	Tree
4	*Albizia lebbeck*	ALLE	Mimosoideae	Tree
5	*Albizia zygia*	ALZY	Mimosoideae	Tree
6	*Allophyllus africanus*	ALAF	Sapindaceae	Shrub
7	*Alstonia boonei*	ALBO	Apocynaceae	Tree
8	*Annogeissus leiocarpa*	ANLE	Combretaceae	Tree
9	*Annona senegalensis*	ANSE	Annonaceae	Shrub
10	*Antiaris toxicaria*	ANTO	Meliaceae	Tree
11	*Azadirachta indica*	AZIN	Meliaceae	Tree
12	*Bauhinia grandiflora*	BAGR	Caesalpiniodeae	Tree
13	*Bauhinia rufescens*	BARU	Caesalpiniodeae	Tree
14	*Blighia ferruginea*	BLFE	Sapindaceae	Shrub
15	*Bridelia ferruginea*	BRFE	Euphorbiaceae	Shrub
16	*Carica papaya*	CAPA	Caricaceae	Shrub
17	*Cassia siamea*	CASI	Caesalpiniodeae	Tree
18	*Cedrela odorata*	CEOD	Meliaceae	Tree
19	*Ceiba pentandra*	CEPA	Bombacaceae	Tree
20	*Celtis philipensis*	CEPH	Ulmaceae	Shrub
21	*Celtis zenkeri*	CEZE	Ulmaceae	Tree
22	*Chaetacme aristata*	CHAR	Ulmaceae	Shrub
23	*Chrysophyllum albidum*	CHAL	Sapotaceae	Tree
24	*Citrus species*	CISP	Rutaceae	Shrub
25	*Cola millenii*	COMI	Sterculiaceae	Tree
26	*Combretum molle*	COMO	Combretaceae	Tree
27	*Cussonia arborea*	CUAR	Araliaceae	Shrub
28	*Cynometra mannii*	CYMA	Caesalpiniodeae	Tree
29	*Cynometra megalophylla*	CYME	Caesalpiniodeae	Tree
30	*Dactyladenia barteri*	DABA	Chrysobalanaceae	Shrub
31	*Dalbergia latifolia*	DALA	Papilionoideae	Climber
32	*Danellia oliveri*	DAOL	Caesalpiniodeae	Tree
33	*Delonix regia*	DERE	Caesalpiniodeae	Tree
34	*Dialum guineense*	DIGU	Caesalpiniodeae	Tree
35	*Diosphyros mesphiliformis*	DIME	Ebeneceae	Tree
36	*Drypetes floribunda*	DRFL	Euphorbiaceae	Tree
37	*Ekebergia senegalensis*	EKSE	Meliaceae	Tree
38	*Elaeis guineese*	ELGU	Palmae	Tree
39	*Entada abyssinica*	ENAB	Mimosoideae	Tree
40	*Entada scelerata*	ENSC	Mimosoideae	Shrub

S/N	SPECIES NAME	CODE	FAMILY	HABIT
41	*Erythrina senegalensis*	ERSE	Papilionoideae	Shrub
42	*Erithrophleum ivorensis*	ERIV	Caesalpiniodeae	Tree
43	*Erythrophleum suaveolens*	ERSU	Caesalpiniodeae	Tree
44	*Erythroxylum emarginatun*	EREM	Erythroxylaceae	Shrub
45	*Ficus exasperata*	FIEX	Moraceae	Shrub
46	*Ficus sur*	FISU	Moraceae	Shrub
47	*Flacourta flavescens*	FLFL	Flacourtiaceae	Shrub
48	*Funtamia elestica*	FUEL	Apocynaceae	Tree
49	*Gliricidia sepium*	GLSE	Papilionoideae	Shrub
50	*Gmelina arborea*	GMAR	Verbenaceae	Tree
51	*Grewia pubescens*	GRPU	Tiliaceae	Tree
52	*Harrisonia abyssinica*	HAAB	Simarousbaceae	Shrub
53	*Hildegardia barteri*	HIBA	Sterculiaceae	Tree
54	*Hippocratea species*	HISP	Celastraceae	Shrub
55	*Holoptelea grandis*	HOGR	Ulmaceae	Tree
56	*Hunteria umbellate*	HUUM	Apocynaceae	Shrub
57	*Hymenocardia acida*	HYAC	Euphorbiaceae	Shrub
58	*Khaya ivorensis*	KHIV	Meliaceae	Tree
59	*Kigelia africana*	KIAF	Bignoniaceae	Tree
60	*Lannea egregia*	LAEG	Anacardiaceae	Shrub
61	*Leptonychia pubescens*	LEPU	Sterculiaceae	Shrub
62	*Lophira lanceolata*	LOLA	Ochnaceae	Shrub
63	*Maerus angolensis*	MAAN	Capparaceae	Shrub
64	*Malacantha alnifolia*	MAAL	Sapotaceae	Tree
65	*Mallotus oppositifolius*	MAOP	Euphorbiaceae	Shrub
66	*Manilkara multinervis*	MAMU	Sapotaceae	Tree
67	*Manilkara obovata*	MAOB	Sapotaceae	Tree
68	*Maranthes polyandra*	MAPO	Chrysobalanaceae	Tree
69	*Margaritaris discoidea*	MADI	Euphorbiaceae	Shrub
70	*Maytenus senegalensis*	MASE	Celastraceae	Shrub
71	*Melia azedarach*	MEAZ	Meliaceae	Tree
72	*Milicia excelsa*	MIEX	Moraceae	Tree
73	*Mimosop kummel*	MIKU	Sapotaceae	Shrub
74	*Morus mezozygia*	MOME	Moraceae	Tree
75	*Nauclea latifolia*	NALA	Rubiaceae	Shrub
76	*Nesogordonia papaverifera*	NEPA	Sterculiaceae	Tree
77	*Newbouldia laevis*	NELA	Bignoniaceae	Shrub
78	*Ochna afzelii*	OCAF	Ochnaceae	Tree
79	*Olax subscorpioidea*	OLSU	Olacaceae	Shrub
80	*Parikia biglobosa*	PABI	Mimosoideae	Tree
81	*Paullinia pinnata*	PAPI	Sapindaceae	Shrub
82	*Piliostigma thonningii*	PITH	Caesalpiniodeae	Tree
83	*Prosopis africana*	PRAF	Mimosoideae	Tree
84	*Pseudocedrela kotschyi*	PSKO	Meliaceae	Tree
85	*Psidium guajava*	PSGU	Mitraceae	Tree
86	*Psorospermum corymbiferum*	PSCO	Guttifereae	Shrub
87	*Pterocarpus erinaceus*	PTER	Papilionoideae	Tree
88	*Psychotria vogeliana*	PSVO	Rubiaceae	Tree
89	*Psydrax parviflora*	PSPA	Rubiaceae	Tree
90	*Samanea saman*	SAMA	Mimosoideae	Tree
91	*Schrebera arborea*	SCAR	Oleaceae	Tree
92	*Solanum americanum*	SOAM	Solanaceae	Shrub

S/N	SPECIES NAME	CODE	FAMILY	HABIT
93	*Spondia mombin*	SPMO	Anacardiaceae	Tree
94	*Sterculia tragacantha*	STTR	Sterculiaceae	Tree
95	*Tectona grandis*	TEGR	Verbenaceae	Tree
96	*Terminalia glaucescens*	TEGL	Combretaceae	Tree
97	*Tetrapleura tetraptera*	TETE	Mimosoideae	Tree
98	*Tricalysia chevalieri*	TRCH	Rubiaceae	Shrub
99	*Trilepisium madagascariensis*	TRMA	Moraceae	Tree
100	*Trichilia emetica*	TREM	Meliaceae	Tree
101	*Triplochiton scleraxylon*	TRSC	Sterculiaceae	Tree
102	*Uvaria chamae*	UVCH	Annonaceae	Climber
103	*Vitellaria paradoxa*	VIPA	Sapotaceae	Tree
104	*Vitex doniana*	VIDO	Verbenaceae	Tree
105	*Voacanga africana*	VOAF	Apocynaceae	Tree
106	*Xylopia parviflora*	XYPA	Annonaceae	Tree
107	*Zanthoxylum zanthoxyloides*	ZAZA	Rutaceae	Tree

Source: Field data.