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Full Length Research Paper

# Diversity complex of plant species spread in Nasarawa State, Nigeria

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This research was carried out to assess the plant species diversity in Nasarawa State, Nigeria with a view to obtain an accurate database and inventory of the naturally occurring plant species in the state for reference and research purposes. This preliminary report covers a total of nine local government areas in the state. The work involved intensive survey and visits to the sample sites for this exercise. The diversity status of each plant and the distribution across the state were also determined using standard method. A total of number of 244 plant species belonging to 57 plant families were identified out of which the families, *Asteraceae, Poaceae, Combretaceae, Euphorbiaceae, Moraceae* and *Papilionaceae* were the most highly distributed across the entire study area. There was great extent of diversity in the distribution of plants across all the areas sampled with the highest in Wamba LGA. The most predominant food crop across the state was *Sorgum* spp. followed by *Sesame indica* and then *Zea mays.* The total percentage occurrence of herbs, shrubs and trees in the study area are 31.19, 16.29 and 47.91%, respectively. This preliminary work has provided a baseline data and reference point for future taxonomical stratagem in Nasarawa State.

Key words: Herbarium, conservation, Nasarawa, plant diversity.

# INTRODUCTION

Biological diversity or biodiversity refers to the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. It encompasses the variety of all forms of life on earth, which provides the building blocks for human existence and ability to adapt to environmental changes in the future (FEPA, 2003). Biological diversity involves genetic, species and ecosystem diversity. Estimates of the total number of species range from 5 million to 100 million globally; though less than 1.7 million have actually been described (FEPA, 2003). Species diversity remains central to the evaluation of diversity at other levels, and is a constant point of reference in biodiversity conservation. Conservation is the planned management of natural resources, to retain the natural balance, diversity and evolutionary change in the environment. It is a protective measure taken; to prevent the loss of genetic diversity of a species; to save a species from becoming extinct and to protect an ecosystem from damage so as to promote

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Figure 1. Showing the map of Nasarawa state as it borders with other states (source: www.google.com)

its sustained utilization. Plant germplasm is a nonrenewable natural resource indispensable for the sustenance of human life on this earth (Borokini et al., 2010).

Nigeria is one of the most populous countries in Africa and has a landmass of over 923,768 squ km including about 13,000 sq km of water (NBS, 2007). There is an array of flora and fauna species associated with the varied ecological zones in Nigeria. There are 7,895 plant species from 338 families and 2,215 genera that have been identified in Nigeria (FGN, 2006). According to the FAO Forest Resources Assessment Report, Nigeria has the highest rate of deforestation of primary forests between 2000 and 2005 (FAO, 2005). The great diversity of plant species found in Nigeria cannot be unconnected with the diversity of ecosystems and habitats as well as the tropical climate in the country (FEPA, 1992). Nasarawa State is one of the states in the North-Central geo-political zones in Nigeria. It is bounded in the north by Kaduna State, in the west by the Abuja Federal Capital Territory, in the south by Kogi and Benue States and in the east by Taraba and Plateau States. It has a total land area of 27,137.8 sqkm (NPC, 2006). Nasarawa's main economic activity is agriculture. Production of minerals such as salt is also another major economic activity in the state. It lies within the guinea Savannah region and has tropical climate with moderate rainfall (annual mean rainfall of 1311:75 cm) (Nyagba, 1995). The state is made up of plain lands and hills and has some of the most beautiful sites and landscapes in the country.

There is still a lack of quantitative information on naturalized plants for major regions of the world,

especially for those of Asia and Africa. Floras of these regions are either not existent or are incomplete, making it difficult to assess the native plant diversity populations. It is very true that many of our valuable plant generic resources are fast disappearing due to afore mentioned reasons and there is a careful need to document current plant diversity status so as to guide in the conservation plans to salvage the residual diversity. This study provides specific and comprehensive information on the species enumeration, diversity and conservation status of the plants in Nasarawa State, Nigeria.

#### MATERIALS AND METHODS

#### Sampling areas

Nine out of thirteen local government areas of Nasarawa State were selected at random and sampled for this study namely: Akwanga, Awe, Keffi, Kokona, Nasarawa, Nasarawa Eggon, Toto, Obi and Wamba (Figure 1).

#### Sample collection

This study involved intensive survey and several visits to the sample sites for plant identification and enumeration exercise.

Surveys and direct field observation were carried out as done in previous works (Lipp, 1989; Kayode et al., 1997). In each of the selected local government area, two rural communities, with plant richness and still far from urban influence were sampled. The Origin, life form and habitats colonized by each species were identified as far as possible. Life samples were collected and preserved using plant presses. The identification of the plants was done on the spot and with the aid of published floral and taxonomic books (NNMDA, 2006; 2008). A few unidentified plants were sent to standard herbaria for proper identification.

 Table 1. Diversity status of plants in all the nine local governments.

		Common				Presence in	local governm	ent areas				Overall
S/N	Name of plant	name	Akwanga	Awe	Keffi	Kokona	Nasarawa	Nasarawa eggon	Obi	Toto	Wamba	diversity status
1	<i>Uvaria chamae</i> Vahl ex DC.	Hausa: rukuti	$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	х	Х	$\checkmark$	Very abundant
2	<i>Crossopteryx febrifuga</i> (Afzel. Ex G. Don) Benth.	Hausa: kashin akuya	$\checkmark$	х	$\checkmark$	$\checkmark$	Х	Х	Х	$\checkmark$	$\checkmark$	Abundant
3	<i>Holarrhena floribunda</i> (G. Don) Schinz.	Conessi	$\checkmark$	Х	х	х	х	$\checkmark$	Х	Х	$\checkmark$	Occasional
4	<i>Lophira lanceolata</i> Tiegh. Ex. Keay		$\checkmark$	х	х	х	$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	Abundant
5	<i>Parkia biglobosa</i> (Jacq) G. Don	African locust beans	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Abundant
6	<i>Vitellaria paradoxa</i> C.F. Gaertn.	Shea butter tree	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Abundant
7	<i>Pericopsis laxiflora</i> (Baker) Hams.	African Teak	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	Х	Х	х	$\checkmark$	Frequent
8	<i>Detarium microcarpum</i> (Guill.) Perr.	Detar	х	$\checkmark$	$\checkmark$	х	х	Х	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
9	<i>Gmelina arborea</i> Roxb.	Gmelina	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Abundant
10	Sarcocephalus latifolius (Sm.) Bruce	African Peach	$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Abundant
11	<i>Prosopis africana</i> (Guill.) Perr.	Iron wood	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	Х	х	$\checkmark$	$\checkmark$	Frequent
12	Bridelia ferruginea Benth.		$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Abundant
13	<i>Hymenocardia acida</i> Tul.		$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	Х	$\checkmark$	Frequent
14	<i>Viscum album</i> Linn.	Mistletoe	Х	Х	Х	$\checkmark$	Х	Х	Х	Х	$\checkmark$	Occasional
15	<i>Cissus populnea</i> (Guill.) Perr.		Х	Х	Х	х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	Frequent
16	<i>Vernonia perrottetii</i> Sch. Bip.		х	х	$\checkmark$	$\checkmark$	х	Х	$\checkmark$	х	$\checkmark$	Frequent
17	<i>Eriosema griseum</i> Baker		$\checkmark$	Х	$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Abundant
18	<i>Pavetta crassipes</i> K. Schum		х	х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	х	$\checkmark$	Abundant
19	<i>Dioscorea esculenta</i> (Lour.) Burkill.		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	Abundant
20	Dioscorea bulbifera Linn.	Air potatoe	$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Abundant
21	Dioscorea rotundata Poir.	Guinea white vam	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Abundant

22	<i>Panicum baumannii</i> K. Schum.		$\checkmark$	Very abundant								
23	<i>Chromolaena odorata</i> (L.) R.M. King	Siam weed	$\checkmark$	Abundant								
24	Mangifera indica Linn.	Mangoe	$\checkmark$	Abundant								
25	<i>Andropogon gayanus</i> (Hochst.) Hack.		$\checkmark$	Х	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
26	Uacapa togoensis Pax	Togo Uacapa	Х	Х	Х	х	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Occasional
27	<i>Pennisetum pedicellatum</i> Trin.	Desho grass	$\checkmark$	Very abundant								
28	<i>Piliostigma thonningii</i> (Schum.) Milne-Redh.	Camel's foot	$\checkmark$	Very abundant								
29	<i>Parinari curatellifolia</i> Planch. Ex Benth	Cork tree, Hissing tree	$\checkmark$	Х	$\checkmark$	Very abundant						
30	<i>Musa paradisiaca</i> Linn.	Plantain	$\checkmark$	Х	$\checkmark$	Abundant						
31	<i>Elaeis guineensis</i> Jacq.	Oil palm tree	$\checkmark$	Abundant								
32	Zingiber officinales Rosc.	Ginger	$\checkmark$	Х	Х	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
33	Abelmoschus esculentus (L.) Moench.	Okro	$\checkmark$	$\checkmark$	$\checkmark$	х	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Abundant
34	Achyranthes aspera Linn.		$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	Х	$\checkmark$	Frequent
35	<i>Synedrella nodiflora</i> (L.) Gaertn.		$\checkmark$	Х	Х	$\checkmark$	х	Х	$\checkmark$	Х	Х	Frequent
36	<i>Ipomoea batatas</i> Linn.	sweet potatoe	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	Frequent
37	<i>lpomea involucrata</i> P. Beauv.	potatoe	$\checkmark$	Х	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	Frequent
38	Echiopta spp		$\checkmark$	Х	Х	Х	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
39	Ageratum conyzoides Linn.	Billy goat weed	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	Х	$\checkmark$	Frequent
40	<i>Achyranthes atollensis</i> H.St. John.		$\checkmark$	х	Х	х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	Frequent
41	Sida acuta Burm. F.	Wire weed	$\checkmark$	Very abundant								
42	<i>Cissampelos mucronata</i> A. Rich		$\checkmark$	х	х	х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Frequent
43	Vernonia amygdalina Del.		$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Frequent
44	Ocimum gratissimum Linn.	Scent tree	$\checkmark$	Abundant								
45	<i>Eragrostis cilianensis</i> (All.) Vignolo ex J.	Love grasses	Х	$\checkmark$	Х	х	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent

46	Chloris pilosa Schum		$\checkmark$	$\checkmark$	Х	Х	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
47	Eleusine indica (L.) Gaertn.	Fowl-foot grass Hausa: Tuji	$\checkmark$	$\checkmark$	Х	х	х	х	х	х	$\checkmark$	Occasional
48	<i>Psidum guajava</i> Linn.	Guava	$\checkmark$	Х	Х	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
49	<i>Colocasia esculenta</i> (L.) Schott.	Cocoyam	х	Х	Х	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
50	Citrus sinensis (L.) Osbeck	Sweet orange	$\checkmark$	Abundant								
51	<i>Thevetia neriifolia</i> (Linn.) Lippolt		$\checkmark$	Х	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
52	Solanum tuberosum L.		$\checkmark$	Frequent								
53	Phyllanthus floribunda Lam.		Х	$\checkmark$	$\checkmark$	х	х	Х	Х	х	$\checkmark$	Occasional
54	Anogeissus leiocarpus (DC.) Guill. And Perr.	Chew stick	х	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	Occasional
55	Manihot esculenta Crantz	Cassava	$\checkmark$	Х	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
56	Andropogon tectorum Schum.	Blue stem	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
57	Pennisetum polystachion Linn.		$\checkmark$		Very abundant	Very abundant						
58	<i>Tephrosia linearis</i> (Willd.) Pers.		$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	Х	х		$\checkmark$	Frequent
59	<i>Acacia seya</i> (Linn.) Willd.	Hausa: Farin kaya	х	Х	х	Х	х	$\checkmark$	х	х	$\checkmark$	Occasional
60	<i>Cajanus cajan</i> (L.) Millsp.	Pigeon pea	Х	Х	$\checkmark$	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
61	<i>Lippia javanica</i> (Burm. F.) Spreng.		х	$\checkmark$	$\checkmark$	$\checkmark$	х	х	Х	Х	$\checkmark$	Frequent
62	<i>Gardenia aqualla</i> Stapf and Hutch.	Hausa: Gaude	$\checkmark$	Х	$\checkmark$	Frequent						
63	Grewia mollis Juss.		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	Х	Х	$\checkmark$	Frequent
64	Sorghum bicolor (L.) Moench	Guinea corn	$\checkmark$	Very abundant								
65	Annona senegalensis Pers.	Wild custard apple	$\checkmark$	Х	х	х	Х	Х	х	Х	$\checkmark$	Occasional
66	<i>Combretum indicum</i> (L.) DeFilipps		$\checkmark$	Х	$\checkmark$	х	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
67	<i>Mitracarpus villosus</i> (Swartz) Cham. and Schltdl		$\checkmark$	Abundant								

68	<i>Terminalia avicennoides</i> Guill and Perr.		$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	х	$\checkmark$	Frequent
69	<i>Trichilia emetica</i> (Forsskal) Vahl.		х	х	Х	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Occasional
70	<i>Calopogonium mucunoides</i> (Bentham) Hem.	Calopo	$\checkmark$	Frequent								
71	Brachiaria jubata Stapf.		$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	Occasional
72	<i>Justicia schimperi</i> (Hochst.) Dandy.		Х	х	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Х	$\checkmark$	Occasional
73	Panicum maximum Jacq.	Forage grass	$\checkmark$	Frequent								
74	Rottboellia cochinchinensis (Lour.) Clayton	Itch grass	Х	Х	$\checkmark$	Frequent						
75	Cleistopholis patens (Benth.) Engl. and Diels.	none	Х	х	Х	$\checkmark$	х	х	Х	Х	$\checkmark$	Occasional
76	Ficus carica Linn.		Х	Х	Х	Х	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional
77	Alchornea cordifolia (Schum. and Thonn.) Mull.	Chrismas bush	$\checkmark$	Frequent								
78	<i>Erythrophleum suaveolens</i> Guill. and Perr.	Red water tree	$\checkmark$	х	Х	$\checkmark$	х	х	Х	$\checkmark$	$\checkmark$	Occasional
79	<i>Hyperrhenia rufa</i> (Nees) Stapf.	Zebra grass, Hausa: Chiyawan zana	х	$\checkmark$	Frequent							
80	Dioscorea alata Linn.	Cultivated water yam	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	х	х	$\checkmark$	$\checkmark$	Occasional
81	Aspilia africana Perrs.	Haemorrhag e plant	$\checkmark$	Х	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
82	Tamarindus indica Linn.	Tamarind, Indian date	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	Х	$\checkmark$	Occasional
83	<i>Desmodium velutinum</i> (Willd.) DC.		$\checkmark$	Х	$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	Occasional
84	Dachrostachys cinerea (Linn.) Wight and Arn.		$\checkmark$	х	$\checkmark$	Frequent						
85	Urena lobata Linn.	Ramarama	$\checkmark$	Very abundant								
86	Borreria radiata DC.		Х	Х	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	Occasional
87	<i>Combretum molle</i> R.Br. ex G. Don.		Х	х	Х	Х	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional
88	<i>Combretu collinum</i> (SIDA) Storrs AEG.		Х	х	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional

89	Entada africana Guill.	Entada, Monkey's sandal	$\checkmark$	$\checkmark$	Х	Х	Х	$\checkmark$	$\checkmark$	х	$\checkmark$	Frequent
90	Indigofera pulchra Willd.		$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	Х	х	Х	$\checkmark$	Frequent
91	Syzygium guineense Willd.		Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
92	Waltheria americana Linn.		$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	Х	$\checkmark$	Frequent
93	<i>Phyllanthus muellerianus</i> Schum. and Thonn.	Hausa: Dandami	$\checkmark$	Х	$\checkmark$	х	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
94	<i>Crotalaria ledermannii</i> Baker F.		$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	Occasional
95	<i>Tephrosia candida</i> (Roxb.) DC.		$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	х	$\checkmark$	Frequent
96	<i>Mucuna sloanei</i> Fawc. and Rendle	Horse eye bean	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	х	$\checkmark$	Frequent
97	<i>Emilia praetermissa</i> Milne- Redh		Х	Х	х	х	х	х	Х	х	$\checkmark$	Rare
98	Cissus petiolata Hook. F.		$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
99	Hyptis suaveolens (L,) Poit.	Bush tea- bush	$\checkmark$	Very abundant								
100	Cassia tora L.	Foetid cassia	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
101	Costus afer Ker. Gawl.	Common ginger lily	$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	х	$\checkmark$	$\checkmark$	Occasional
102	Zea mays L.	Maize	$\checkmark$	Frequent								
103	Vitex doniana Sw.	Black plum	$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
104	<i>lsoberlinia doka</i> Craib and Stapf.		$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
105	<i>Adenodolichos paniculata</i> (Hua) Hutch.		Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	Х	Х	$\checkmark$	Occasional
106	<i>Daniella oliveri</i> (Rolfe) Hutch.	African Copuba balsam	$\checkmark$	Х	$\checkmark$	Frequent						
107	<i>Nelsonia canescens</i> (Lam.) Spreng	Blue pussyleaf	$\checkmark$	Х	$\checkmark$	Х	х	х	х	Х	$\checkmark$	Occasional
108	<i>Hyperrhenia hirta</i> (Linn.) Stapf		$\checkmark$	Х	$\checkmark$	Frequent						
109	<i>Mimosa pigra</i> Linn.		$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	Occasional
110	<i>Paullinia pinnata</i> Linn.		Х	Х	$\checkmark$	Х	Х	Х	Х	$\checkmark$	$\checkmark$	Occasional
111	<i>Vigna unguiculata</i> (L.) Walp.	Cowpea, bean	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent

Table 1, Contd.

112	Newbouldia laevis (P. Beauv ) Seem	Fertility plant, tree of	$\checkmark$	х	$\checkmark$	$\checkmark$						Frequent
113	Orvza sativa Linn	life Rice	N	x	N	2	N	N	N	2	N	Abundant
113	Adansonian digitata Linn.	Baobab	x	X	V	V V	J.	V	x	x	V	Occasional
	,	Asthma			,	•	·				,	Coodolonial
115	<i>Euphorbia hirta</i> Linn.	plant, hairy spurge	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	Occasional
116	Cassia sieberiana DC.		$\checkmark$	Abundant								
117	<i>Gardenia erubenscens</i> Stapf and Hutch.		$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	х	$\checkmark$	Frequent
118	Sterculia setigera Delile.		Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Occasional
119	<i>Byrsocarpus coccineus</i> Schum. and Thonn.		$\checkmark$	Х	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
120	<i>Tephrosia bracteolata</i> Guill. and Perr.		$\checkmark$	Х	$\checkmark$	х	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
121	<i>lpomoea involucrata</i> P. Beauv.		$\checkmark$	Х	$\checkmark$	х	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
122	Cochlospermum tinctorium Perr.		$\checkmark$	Х	$\checkmark$	Frequent						
123	Dialium guineense Willd.	Black or Velvet Lamarind	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
124	Allophyllus africanus P. Beauv.		$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	Frequent
125	Anchomanes difformis (Blume) Engl.	Aroids	$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional
126	Bidens pilosa Linn.	Black jack, Bur marigold	$\checkmark$	Х	$\checkmark$	х	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional
127	Smilax kraussiana Meisn.	West African sarsaparilla	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional
128	Desmodium canadense (Linn.) DC.	·	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
129	Landolphia owariensis P. Beauv.	White rubber vine	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	Frequent
130	<i>Cissus doeringii</i> Gilg and Brandt.		$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
131	Borassius aethiopium Mart.	Fan palm	$\checkmark$	Х	$\checkmark$	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional
132	Ficus exasperata Vahl	Sand paper tree		х		x	X	$\checkmark$	х	$\checkmark$		Occasional

133	Stereospermum kunthianum Cham.		$\checkmark$	Х	$\checkmark$	$\checkmark$	х	$\checkmark$	Х			Frequent
134	<i>Stylosanthes hamata</i> (L.) Taub.		$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	Х	$\checkmark$	х	$\checkmark$	Frequent
135	<i>Cassia rotundifolia</i> (SIDA) Kiepe		$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	х	$\checkmark$	$\checkmark$	Frequent
136	Cassia nigricans Vahl		$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
137	<i>Anacardium occidentalis</i> Linn.	cashew	$\checkmark$		Abundant							
138	Hibiscus asper Hook.		$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Occasional
139	<i>Desmodium spirale</i> (Sw.) DC.		$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
140	<i>Imperata cylindrica</i> (Linn.) Beauv.	Cogon grass	$\checkmark$	Abundant								
141	<i>Asparagus africanus</i> (Lam.) Oberm.		$\checkmark$	Х	$\checkmark$	х	х	$\checkmark$	Х	$\checkmark$	Х	Occasional
142	Strychnos spinosa Lam.		$\checkmark$	Х	$\checkmark$	Х	Х	$\checkmark$	Х	$\checkmark$	Х	Occasional
144	Scleria verrucosa Willd.	Suswam (tiv)	Х	Х	$\checkmark$	Х	х	$\checkmark$	$\checkmark$	$\checkmark$	Х	Occasional
145	Tephrosia densiflora Hook.		$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
146	Paspalum orbiculare Linn.		Х	Х	$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	Occasional
147	<i>Biophytum petersianum</i> Klotz.	Sensitive leg	Х	Х	$\checkmark$	х	х	$\checkmark$	$\checkmark$	$\checkmark$	Х	Occasional
148	<i>Alysicarpus vaginalis</i> (L.) DC.		Х	х	$\checkmark$	х	х	$\checkmark$	$\checkmark$	$\checkmark$	Х	Occasional
149	Cissus ivorens L.	Yaluyaka Tiv	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	Х			Frequent
150	Sporobolus pyramidalis (Beauv.) R. Br.		Х	х	$\checkmark$	х	х	$\checkmark$	$\checkmark$		Х	Occasional
151	Securidaca longepedunculata SIDA	Violet tree	х	х	$\checkmark$	х	х	$\checkmark$	$\checkmark$	$\checkmark$	Х	Occasional
152	<i>Kigelia africana</i> (Lam.) Benth.		$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	Frequent
153	<i>Tecoma stans</i> (Linn.) Juss.	Yellow trumpet tree	х	х	х	$\checkmark$	х	х	х	х	х	Rare
154	Solanum nigrum Linn.	Black nightshade	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	Frequent
155	Cyperus rotundus Linn.		$\checkmark$	Х	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$	Х		Frequent
156	Panicum effusum R. Br.		X	Х					X			Frequent
157	Cussonia barteri Seemann.		$\checkmark$	Х	$\checkmark$	$\checkmark$				$\checkmark$		Abundant

158	Ficus capensis Thunb.			Х	$\checkmark$		Х					Frequent
159	, Boswellia dalzielii Hutch.	Frankincens	$\checkmark$	Х	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
160	<i>Lannea kerstingii</i> Engl. and Krause.		$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional
161	<i>Monechma ciliatum</i> (Jacq.) Mil.		$\checkmark$	Х	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
162	<i>Trema orientali</i> s (Linn.) Blume.		$\checkmark$	Х	$\checkmark$	$\checkmark$	х	$\checkmark$	Х	х	$\checkmark$	Occasional
163	Euphorbia poissonii Fax.	Tiv - Icheu	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
164	Sida cordifolia L.		$\checkmark$	Very abundant								
165	<i>Gynandropsis gynandra</i> (L.) Briq.	Cat whiskers	$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	х	$\checkmark$	$\checkmark$	Frequent
166	<i>Petrocarpus erinaceus</i> Poir.	African Kino	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
167	<i>Setaria pallidefusca</i> Stapf and Hubb.		х	х	$\checkmark$	$\checkmark$	х	$\checkmark$	Х	х	$\checkmark$	Occasional
168	Dactyloctenium aegyptium (Linn.) Willd.	Egyptian grass	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
169	Celosia argentea Linn.		$\checkmark$	Abundant								
170	<i>Brachiaria decumbens</i> Stapf.		х	Х	$\checkmark$	$\checkmark$	$\checkmark$	х	Х	$\checkmark$	$\checkmark$	Occasional
171	Azadiractha indica A. Juss.	Neem tree	$\checkmark$	Very abundant								
172	<i>Eragrostis gangetica</i> (Roxb.) Steud.		$\checkmark$	Abundant								
173	Citrullus vulgaris Schrad.	Melon, Agusi	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	Frequent
174	<i>Hygrophila spinosa</i> T. Ander.		$\checkmark$	Х	$\checkmark$	$\checkmark$	х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
175	Desmodium salicifolium (Poir.) DC.		х	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	Frequent
176	Panicum antidotale Retz.		$\checkmark$	Х	Abundant							
177	Amaranthus spinosus Linn.	Pricky amaranth	$\checkmark$	Х	$\checkmark$	Frequent						
178	Sanseviera liberica Ger. and Labr.		$\checkmark$	х	$\checkmark$	Abundant						
179	Lycopersicon esculentum Mill.	Tomatoe	х	$\checkmark$	х	$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	Occasional
180	Pennisetum typhoides (Burm. F.) Stapf.	Millet	$\checkmark$	$\checkmark$	$\checkmark$	Х	х	$\checkmark$	$\checkmark$	х	Х	Occasional

181	Physalis angulata Linn.	Tiv - Tampue		$\checkmark$	$\checkmark$	Х	х	$\checkmark$	$\checkmark$	х	$\checkmark$	Occasional
182	Eclipta alba (L.) Hassk.		$\checkmark$	$\checkmark$	$\checkmark$	Х	х	$\checkmark$	$\checkmark$	Х	Х	Occasional
183	Boerhavia diffusa Linn.		$\checkmark$	$\checkmark$	$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	Х	Х	Occasional
184	Cassia occidentalis Linn.	Negro coffee	$\checkmark$	$\checkmark$	$\checkmark$	х	Х	$\checkmark$	$\checkmark$	Х	$\checkmark$	Frequent
185	<i>Cynodon dactylon</i> (Linn.) Pers.	Carpet grass	х	$\checkmark$	$\checkmark$	х	х	$\checkmark$	$\checkmark$	х	$\checkmark$	Frequent
186	Luffa cylindrical Linn.	Smooth Ioafah	х	$\checkmark$	$\checkmark$	х	х	$\checkmark$	$\checkmark$	х	$\checkmark$	Occasional
187	Ocimum basilicum Linn.		Х	$\checkmark$	$\checkmark$	Х	х	$\checkmark$	$\checkmark$	Х	Х	Occasional
188	<i>Momordica charantia</i> Linn.	African cucumber, balsam peer	х	$\checkmark$	$\checkmark$	Х	Х	$\checkmark$	Х	Х	$\checkmark$	Occasional
189	Mitragyna inermis Linn.		$\checkmark$	$\checkmark$	$\checkmark$	Х	х	$\checkmark$	Х	Х	$\checkmark$	Occasional
190	<i>Khaya seneganlensis</i> (Desr.) Juss.	Dry zone mahogamy	$\checkmark$	$\checkmark$	$\checkmark$	х	х	$\checkmark$	$\checkmark$	х	$\checkmark$	Frequent
191	<i>Trianthema portulacastrum</i> Linn.		х	$\checkmark$	$\checkmark$	Х	Х	$\checkmark$	х	х	$\checkmark$	Occasional
192	Combretum platypterus Szys.		$\checkmark$	$\checkmark$	$\checkmark$	х	х	$\checkmark$	х	х	$\checkmark$	Frequent
193	Eucalyptus globulus Labill.	Eucalyptus leaf	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	Abundant
194	Burkea africana Hook.		$\checkmark$	$\checkmark$	$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	Х	Х	Frequent
195	<i>Striga hermonthica</i> (Del.) Benth.	Purple witchweed	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$		$\checkmark$	Frequent
196	Sesamum indicum Linn.	Beni seed	Х	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
197	Ricinus communis Linn.	Castor oil plant	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Х	$\checkmark$	Frequent
198	<i>Hibiscus sabdariffa</i> Linn.	Red roselle, Zobo	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Abundant
199	<i>Calotropis procera</i> (L.) Dryand.	Giant milkweed, Sodom apple	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$	Abundant
200	<i>Commelina benghalensis</i> Linn.		х	$\checkmark$	х	$\checkmark$	х	$\checkmark$	х	$\checkmark$	$\checkmark$	Occasional
201	Boerrhavia repens Linn.	Hog weed	Х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Х	Occasional
202	<i>Acanthospermum hispidum</i> (DC.) Kuntze.	Star bur	$\checkmark$	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent

203	Indigofera hirsuta Linn.		Х	$\checkmark$	Х		Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional
204	<i>Altenanthera sessili</i> s (Linn.) R. Br.		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
205	Corchorus tridens Mut.	Bush okra	Х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional
206	Ficus thonningi Blume		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Abundant
207	<i>Dracaena smithii</i> (Baker) Hook.		Х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional
208	Tridax procumbens Linn.		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
209	Ficus trichopoda Baker	Tiv – Po	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	Frequent
210	<i>Berlinia grandifolia</i> (Vahl) Hutch.	Berlinia tree	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	Х	$\checkmark$	$\checkmark$	Abundant
211	Senna alata (Linn.) Roxb.	Ringworm bush	Х	$\checkmark$	Х	$\checkmark$	х	$\checkmark$	Х	$\checkmark$	х	Occasional
212	Crotalaria juncea Linn.		Х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Х	Occasional
213	<i>Terminalia glaucescens</i> Planch.		$\checkmark$	х	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Frequent
214	<i>Andropogon verticilatus</i> Schum.		$\checkmark$	х	$\checkmark$	Frequent						
215	<i>Ficus polita</i> Vahl		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	х	$\checkmark$	$\checkmark$	$\checkmark$	Abundant
216	<i>Bambusa vulgaris</i> Schrad	Bamboo	Х	Х	Х	$\checkmark$	Х	$\checkmark$	Х	$\checkmark$	Х	Occasional
217	<i>Plumeria rubra</i> Linn.	Red frangipani	х	$\checkmark$	х	$\checkmark$	х	х	х	$\checkmark$	х	Occasional
218	Datura stramonium Linn.	Jimson weed	Х	Х	Х	$\checkmark$	х	$\checkmark$	х	$\checkmark$	Х	Occasional
219	<i>Lagenaria siceraria</i> (Molina) Standl.	Calabash tree	Х	$\checkmark$	Х	Х	х	$\checkmark$	Х	$\checkmark$	Х	Occasional
220	Gossypium barbadense Linn.	Cotton	Х	$\checkmark$	Х	Х	Х	$\checkmark$	Х	$\checkmark$	Х	Occasional
221	<i>Terminalia catappa</i> Linn.	Almond tree	$\checkmark$	$\checkmark$	Х	Х	Х	$\checkmark$	Х	$\checkmark$	Х	Occasional
222	Spondias monbin Linn.	Hog plum	Х	Х	Х	Х	Х	$\checkmark$	Х	$\checkmark$	Х	Occasional
223	Delonix regia (Hook.) Raf.	Flame of forest	Х	Х	Х	х	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	Occasional
224	Indigofera arrecta Hoch.		Х	Х	Х	Х	Х	$\checkmark$	Х	$\checkmark$	Х	Occasional
225	Jatropha gossypifolia Linn.		$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	Abundant
226	Sesbania sesban (Linn.) Merr.		$\checkmark$	х	Х	Х	Х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
227	<i>Albizia lebbeck</i> (Linn.) Benth.	Shade tree	$\checkmark$	х	Х	х	х	$\checkmark$	Х	$\checkmark$	Х	Occasional

228	<i>Desmodium gangeticum</i> Linn.		$\checkmark$	Х	х	$\checkmark$	х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional
229	<i>Balanites aegyptiaca</i> (Linn.) Del.	Soap berry tree	$\checkmark$	Х	$\checkmark$	$\checkmark$	х	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
230	<i>Setaria barbata</i> (Lam.) Kunth.		$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Occasional
236	<i>Phyllanthus amarus</i> Schum. and Thonn.		х	Х	х	Х	$\checkmark$	х	Х	х	х	Rare
231	<i>Ceiba pentandra</i> (Linn.) Gaertn.	Silk cotton	$\checkmark$	х	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	Х	Occasional
232	Digitaria horizontalis Willd.		$\checkmark$	Х	Х	$\checkmark$	$\checkmark$	Х	Х	$\checkmark$	Х	Occasional
233	<i>Euphorbia heterophylla</i> Linn.		$\checkmark$	х	Х	$\checkmark$	$\checkmark$	х	Х	$\checkmark$	Х	Occasional
234	Portulaca oleracea Linn.	Portulaca	Х	Х	Х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	Х	Occasional
235	<i>Desmodium uncinatum</i> (Jacq.) DC.		$\checkmark$	Х		$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	Х	Frequent
236	lpomoea aquatica Forssk.		$\checkmark$	Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Frequent
237	Ziziphus mucronata Willd.		Х	Х	Х	Х	$\checkmark$	Х	Х	$\checkmark$	Х	Occasional
238	<i>Terminalia superba</i> Engl. and Diels.		Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Abundant
239	<i>Stylosanthes mucronata</i> Willd.		Х	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	$\checkmark$	Abundant
240	Anthocleista djalonensis A. Chev.		х	Х	х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	Х	Occasional
241	<i>Borreria verticillata</i> (Linn.) Mey.		$\checkmark$	Х	х	$\checkmark$	$\checkmark$	$\checkmark$	Х	$\checkmark$	Х	Occasional
242	<i>Cassia siamea</i> Lam.		$\checkmark$	Х	$\checkmark$	Frequent						
243	Moringa oleifera Lam.	Moringa	$\checkmark$	Abundant								
244	<i>Carica papaya</i> Linn.	Pawpaw	$\checkmark$	Abundant								

 $\sqrt{M}$  Means present, X means absent.

#### **Species abundance**

The relative abundance of the identified botanicals within 2 km radius from each of the sampling centers were determined according to Bongers et al. (1988) and Kayode (1999) as: Less than 5 individuals as rare, 5 to 10 as occasional, 11 to 30 as frequent, 31 to 100 as abundant and over 100 individuals as very abundant.

## RESULTS

A total number of 244 plant species of different families were identified. There was great diversity in the distribution of plants across all the local governments sampled. However, the highest plant diversity in terms of different species was recorded in Wamba local government area (Table 1).

Three plants have been identified as rare species namely *Emilia praetermissa, Tecoma stans* and *Phyllanthus amarus.* The total percentage occurrence of herbs, shrubs and trees in the 9 local governments are 31.19, 16.29 and 47.91%, respectively (Table 2). A total of 57 plant families Table 2. Percentage distribution of the life forms of plants in Nasarawa State.

				Loca	al Government	t Areas			
Habit	Akwanga	Awe	Keffi	Kokona	Nasarawa	Nasarawa eggon	Obi	Toto	Wamba
Percentage of herbs, climbers and grasses	25.71%	36.36%	16.67%	39.39%	31.25%	47.62%	44.44%	29.27%	45.98%
Percentage of shrubs	18.57%	18.18%	33.33%	9.09%	6.25%	4.76%	22.22%	14.63%	19.54%
Percentage of trees	55.71%	45.45%	50%	51.52%	62.5%	47.62%	27.78%	56.09%	34.48%

 Table 3. Percentage occurrence of plant families.

	Name of family	Percentage in local governement areas									Overell
S/N		Akwanga	Awe	Keffi	Kokona	Nasarawa	Nasarawa eggon	Obi	Toto	Wamba	percentage
1	Acanthaceae	0	0	0	0	0	3.33%	0	0	0.94%	0.47%
2	Agavaceae	0	5%	0	0	0	0	0	0	0	0.56%
3	Anonnaceae	2.5%	0	0	2.32%	2.85%	0	4%	3.03%	2.83%	1.95%
4	Ampelidaceae	0	0	0	0	0	0	0	0	1.89%	0.21%
5	Asteraceae	7.5%	10%	9.5%	2.32%	2.85%	3.33%	4%	3.03%	6.6%	5.46%
6	Apocynaceae	2.5%	0	0	4.65%	2.85%	0	0	3.03%	1.89%	1.66%
7	Araceae	2.5%	0	0	2.32%	2.85%	3.33%	4%	3.03%	0.94%	2.11%
8	Araliaceae	0	0	0	0	0	3.33%	0	0	0	0.37%
9	Arecaceae	7.5%	0	0	0	0	0	0	0	0.94%	0.94%
10	Asclepiadaceae	0	0	0	0	0	0	4%	0	0.94%	0.55%
11	Amaranthaceae	0	5%	0	2.32%	0	3.33%	0	0	1.89%	1.39%
12	Anacardiaceae	2.5%	0	0	4.65%	5.71%	3.33%	4%	6.06%	0.94%	3.02%
13	Balanitaceae	0	0	0	0	2.85%	0	0	0	0	0.32%
14	Bignoniaceae	0	0	4.8%	4.65%	0	0	0	0	0.94%	1.15%
15	Bombacaceae	0	0	0	0	2.85%	0	0	3.03%	0.94%	0.76%
16	Burseraceae	0	0	0	0	0	3.33%	0	0	0	0.37%
17	Caesalpiniaceae	7.5%	10%	4.8%	2.32%	2.85%	0	4%	9.09%	6.6%	5.24%
18	Capparidaceae	0	0	0	0	0	3.33%	0	0	0	0.37%
19	Cochlospermaceae	2.5%	0	0	0	0	0	0	0	0	0.28%
20	Combretaceae	0	0	4.8%	2.32%	2.85%	3.33%	4%	6.06%	1.89%	2.81%
21	Commelinaceae	0	0	0	2.32%	0	0	4%	0	0	0.7%
22	Connaraceae	2.5%	0	0	0	0	0	0	0	0.94%	0.38%
23	Convolvulaceae	2.5%	0	14.3%	4.65%	2.85%	3.33%	4%	3.03%	2.83%	4.17%
24	Cucurbitaceae	0	15%	4.8%	4.65%	2.85%	3.33%	0	3.03%	0	3.74%

Table 3, contd.

25	Cyperaceae	0	0	9.5%	6.98%	2.85%	6.67%	4%	3.03%	0.94%	3.77%
26	Dioscoreaceae	0	0	0	2.32%	2.85%	3.33%	4%	0	3.77%	1.81%
27	Euphorbiaceae	2.5%	0	4.8%	2.32%	8.57%	3.33%	4%	3.03%	5%	3.73%
28	Fabaceae	5%	5%	4.8%	2.32%	2.85%	3.33%	4%	3.03%	3.77%	3.79%
	Hymenocardiaceae	0	0	0	0	0	0	0	0	2.83%	0.31%
29	Lamiaceae	0	5%	0	0	0	0	0	0	1.89%	0.77%
30	Liliaceae	0	0	0	2.32%	0	0	0	0	0	0.26%
31	Loganiaceae	0	0	4.8%	0	0	0	0	0	0	0.53%
32	Loranthaceae	0	0	0	0	0	0	0	0	0.94%	0.1%
33	Malvaceae	7.5%	0	4.8%	4.65%	2.85%	10%	4%	6.06%	1.89%	4.64%
34	Meliaceae	2.5%	10%	0	2.32%	0	0	0	3.03%	0	1.98%
35	Menispermaceae	0	0	0	0	0	0	0	0	0.94%	0.1%
36	Mimosaceae	2.5%	0	4.8%	2.32%	2.85%	3.33%	4%	3.03%	2.83%	2.85%
37	Moraceae	2.5%	0	4.8%	2.32%	5.71%	3.33%	0	12.1%	1.89%	3.63%
38	Myrtaceae	0	0	0	2.32%	0	3.33%	4%	6.06%	1.89%	1.96%
39	Musaceae	0	0	0	4.65%	2.85%	3.33%	0	0	0.94%	1.31%
40	Nyctaginaceae	2.5%	0	0	0	0	0	8%	0	0.94%	1.27%
41	Ochnaceae	0	0	0	0	0	0	0	0	0.94%	0.1%
42	Papilionaceae	7.5%	0	4.8%	6.98%	2.85%	3.33%	4%	3.03%	8.49%	4.55%
43	Pedaliaceae	0	0	0	0	0	0	4%	0	0.94%	0.55%
44	Poaceae	7.5%	20%	9.5%	9.3%	5.71%	10%	4%	6.06%	14.2%	9.59%
45	Portulacaceae	0	0	0	0	2.85%	0	0	0	0	0.32%
46	Rhamnaceae	0	0	0	0	2.85%	0	0	0	0	0.32%
47	Rubiaceae	2.5%	0	0	0	0	0	0	0	3.77%	0.69%
48	Rutaceae	2.5%	0	0	2.32%	2.85%	3.33%	4%	0	0.94%	1.77%
49	Sapotaceae	2.5%	0	0	0	0	0	0	0	0.94%	0.38%
50	Sapindaceae	0	0	0	0	0	0	0	0	0.94%	0.1%
51	Smilaceae	2.5%	0	0	0	0	0	0	0	0	0.28%
52	Solanaceae	2.5%	10%	4.8%	2.32%	5.71%	3.33%	4%	3.03%	0.94%	4.07%
53	Sterculiaceae	2.5%	0	0	2.32%	2.85%	0	0	0	0.94%	0.96%
54	Tiliaceae	2.5%	5%	0	0	0	0	4%	0	0.94%	1.38%
55	Verbanaceae	5%	0	0	0	5.71%	3.33%	4%	6.06%	1.89%	2.89%
56	Vitaceae	0	0	0	2.32%	0	0	0	0	0	0.26%
57	Zingiberaceae	0	0	0	0	0	0	0	0	1.89%	0.21%

S/N	Local Government Area	Predominant Food Crop
1	Akwanga	Sorghum bicolor
2	Awe	Sorghum bicolor
3	Keffi	Sorghum bicolor
4	Kokona	Sorghum bicolor
5	Nasarawa	Sorghum bicolor
6	Nasarawa Eggon	Curcubita spp. and Sorghum
7	Obi	Sorghum bicolor
8	Toto	Sorghum bicolor and Sesame indica.
9	Wamba	Musa sapientum and Zea mays
ฮ	wamba	wusa sapientum anu zea mays

**Table 4.** The predominant food crops in all the local governments.

were identified out of which the families Asteraceae, Poaceae, Combretaceae, Euphorbiaceae, Moraceae and Papilionaceae were the most highly distributed across the entire 9 local government areas (Table 3). Poaceae family has the highest overall percentage distribution across the entire nine local government areas. The predominant food crops in all the local governments are *Musa sapientum Zea mays, Sorghum bicolor, Curcubita* spp. and *Sesame indica* (Table 4). Trees have the highest percentage occurrence and spread across the entire areas sampled in the state. Awe local government area has the lesser diversity of plant species.

# DISCUSSION

The lower percentage distribution recorded in some of the identified plant families could be attributed to some of the factors affecting indigenous biodiversity in Nigeria. The destruction of natural habitats as observed by Imeht and Adebobola (2001) continues in Nigeria at a rapid rate in which about 65 of 560 species of trees are now faced with extinction, while many others are at different stages of risk; thereby, leading to the depletion of the country's biodiversity. Awe local government area which recorded the lowest diversity of plant species is suspected to be due to the effects of intensive salt mining activities in the area. However, the outcome of this research agrees with the report of Kutama et al. (2015) that Nigeria is so much blessed with almost uncountable number of plant species.

The massive rate of deforestation is a direct cause of biodiversity loss (Borokini et al., 2010) and Nigeria has been declared to have the highest rate of deforestation of primary forests in the world (FAO, 2005). Also, Eneobong (1997), reported that the rapid reducing rate of Africa's forests and bioresources is linked with civil war, conversion of land for agriculture, wild fires, poor management of available land, uncontrolled search for food, fuel wood, medicine, construction timber, overgrazing by cattle, displacement and loss of landraces, lower yielding varieties, pests and diseases, pollution (e.g. acid rain) and incomplete knowledge of the biology of many plants, especially the propagation genetics aspect and adaptability of many forest plants.

Furthermore, Nasarawa state has been described as an agrarian state with large percentage of the masses engaged in farming of crops such as sorghum, sesame, cassava and agro-allied activities (Abu et al., 2012). Farming and cultivation of food crops have dominated some of the local governments in the state such as Obi, Kokona, Akwanga, Nasarawa and Keffi leading to loss of some plants species.

This is similar to the report of Aliyu et al. (2013) on the impact of deforestation on the socio-economic activities of Akwanga, Nasarawa State that the area has been seriously affected negatively by erosion, bush-burning and fire-wood fetching activities. According to Uyoh et al. (2003), there has to be a balance between the uses of bioresources and their conservation thereby preserving an ecosystem, which although altered would still be rich in bioresources and at the same time would provide food and other needs as well as perform vital environmental functions on a long term basis.

The highest plant diversity distribution observed in Wamba Local Government Area could be attributed to lesser disturbances of the natural ecosystem. In addition. there is a large area of protected land by government in this local government. In line with the mandate of some governmental agencies and NGOs like Nigerian conservation foundation (NCF), the National Resources Council (NARECO) in collaboration with the United Nations Environmental Programme (UNEP) and the World Wide Fund (WWF) engaged in protecting and preserving the country's biodiversity, this research has provided a baseline account of the preponderance diversity status of some of the plants in Nasarawa State. Three plants Emilia praetermissa, Tecoma stans and Phyllanthus amarus were identified as rare species and deliberate conservation strategies need to be adopted appropriately to avoid total genetic erosion or extinction.

Of these valuable species. In addition, the loss of biodiversity due to deforestation should be minimized when it is necessary to utilize natural vegetation in order to create industrial development (Akinnibosun and Omatsola, 2011). This preliminary work has provided a baseline data and reference point for future taxonomical and biosystematics stratagem in Nasarawa State. It is thereby recommended that priority must be placed on creating protected areas across all the local government areas that will prevent indiscriminate exploitation of plant resources in Nasarawa State. Also, the use and implementation of the Environmental Impact Assessment (EIA) before embarking on any construction projects in the state must be encouraged.

#### **Conflict of interest**

The authors have not declared any conflict of interest

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