



International Journal of Botany

ISSN: 1811-9700

science
alert

ANSI*net*
an open access publisher
<http://ansinet.com>

Ethnobotany and Biodiversity Conservation in the Niger Delta, Nigeria

Rufus M. Ubom

Department of Botany and Ecological Studies, University of Uyo,
P.M.B. 1017, Uyo, Nigeria

Abstract: A complimentary ethnobotanical uses of forest and homestead garden plant species in the Niger Delta are presented. A total of 339 plant species were identified in the forests and homestead gardens belonging to 88 families; all the species have at least, one reported use. Species with more uses are *Elaeis guineensis* (12), *Raphia hookeri* (12), *Cocos nucifera* (11) *Irvingia gabonensis* (11), *Hevea brasiliensis* (9), *Lonchocarpus cyanescens* (9), *Pterocarpus santalinoides* (9) and *Dacryodes edulis* (8). Ethnobotanical uses with more species include medicine (178/52%), fuel (107/31.6%), food/condiment (199/29.4%), timber (72/21.2%), fooder/feed (70/20.6%), commercial (58/17.1%), furniture (55/16.2%), fibre/cordage (55/16.2%), hometool (45/13.2%) and fence (38/11.2%). The presence of commercial species (fruits, flavouring, beverages, thickeners, spices, timber) in the forests allows for the discussion of the importance of the lowland rainforests of Niger Delta and the suggestion that modern management technologies, if applied, could lead to cost effective conservation methods and sustainable production of animal food source, building materials for houses, economic and social benefits of the rural dwellers.

Key words: Biodiversity, conservation, ethnobotany, habitat diversity, Niger Delta, rural, communities

INTRODUCTION

Biodiversity is a concept that involves different facets of biological variety (Peters, 1991; Khan *et al.*, 2003; Duchelle, 2007) including inter alia, taxonomic richness, genetic differences in each taxon, communities, ecosystems, landscapes within which organisms inhabit and the indigenous knowledge of nature possessed by the natives living on the land (Kunwar *et al.*, 2009). Biodiversity is thus a prized variety of interwoven moral, aesthetic, utilitarian and economic reasons. The role of biodiversity for agriculture and medicine is often underestimated. Plant breeding often turns to wild relatives and increased genetic materials from them (Spellerberg, 1995; Abioye *et al.*, 2009). The biodiversity of the Niger Delta is intimately associated with the habitat diversity, each supporting diverse and distinctive plants and animals within their niches, some endemic to the region.

The Niger Delta region of Nigeria is particularly important for its oil exploitation. In addition, its vast plants and animal resources have also been immensely exploited. Niger Delta occupies 37700 km² of the 923700 km² land area of Nigeria (Fig. 1). It is situated in the Southern most part of Nigeria and bordered to the south by Atlantic Ocean. It comprises eight states of Nigeria: Akwa Ibom, Bayelsa, Cross-River, Delta, Edo, Imo, Ondo and Rivers. The area is essentially a lowland belt about 30 m below sea level. The area supports about 19.21

million people and various densities of live-stock. These exert pressure on the resources in addition to oil exploitation by numerous multinational companies. Plants and animal species of economic importance are threatened or endangered. Endemic species of ecological importance are also threatened and need be conserved.

Rural communities, in this region, depend on their interactions with plants for commercial values and thus exploit, albeit, sustainably their environment, including forests. Exploitation of these forests (can) jeopardize certain species existence or even lead them to extinction. Commercial values of the plants are the direct and indirect economic, aesthetic and ethical values. Emphasis on direct commercial value of forest products is placed on a small number of timber species and a short term profit derived from portions of forests for agricultural purposes. Multi-use exploitation and conservation of forest resources, as practiced by these rural communities, have not been adopted as a viable alternative to modern production schemes (Clay, 1998; Gorman *et al.*, 2006). From ecological perspective rural communities can achieve production in harmony with nature's laws that their production capacity tends to maintain the renewing capacity of the ecosystems, albeit, forests (Hamayun *et al.*, 2006). From this standpoint, the sum of empirical knowledge that the people in the Niger Delta region possess about plants, soils, climate and ecophysiological units serving their production strategy becomes important in unciphering and understanding

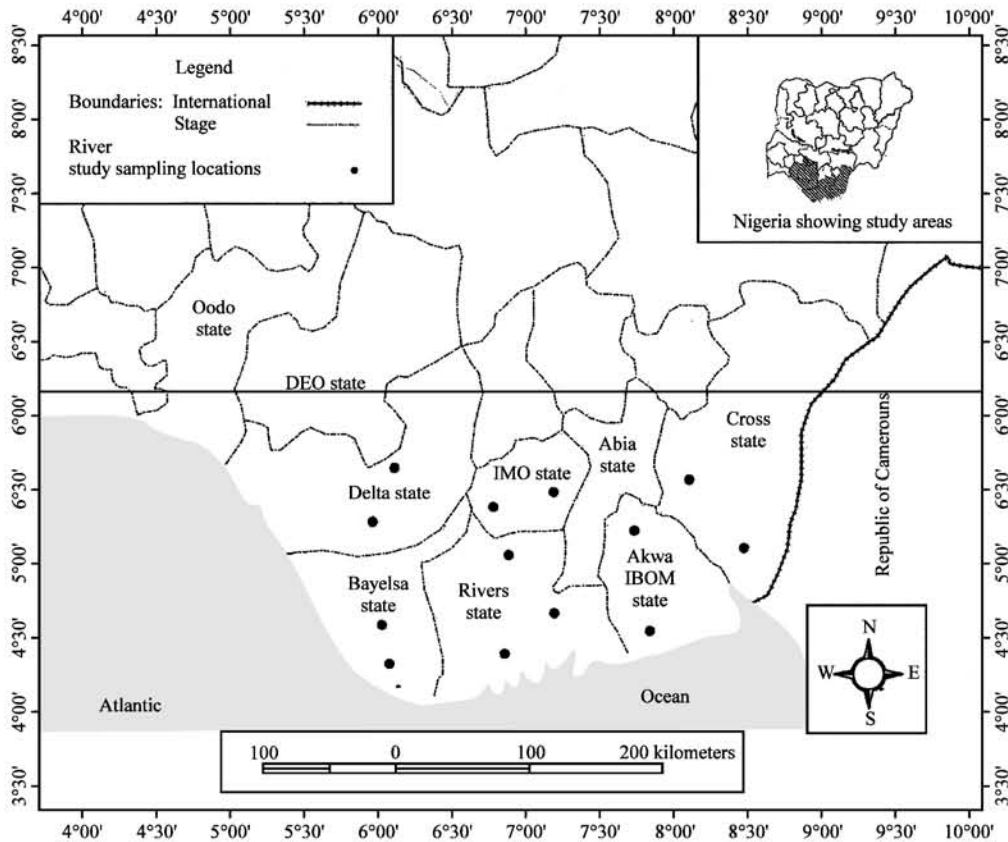


Fig. 1: land area of Nigeria Thirteen study sites

traditional economic rationality. Each method of production reveals a strategy of appropriation from nature, a mix of technologies, knowledge about the components of the ecosystems and its interrelations (Bussmann *et al.*, 2008). These depend upon forest compositions, species abundance, appreciation and usage of the species by the native (Sofidiya *et al.*, 2007; Vargas-Ponce *et al.*, 2007; Banzouzi *et al.*, 2008a, b). Due to exploration and exploitation of crude oil much of the area has been polluted and the needed medicinal plants and other useful non-timber species have been going extinct. Little attention has been paid to this seemingly unnoticed but important degradation and elimination of species much averred by the indigenous people of the Niger Delta. Thus, this study attempts to assess the values of forests and their species viz-a-viz the diversity of uses the plants species have been put to and marketed or traded by the natives. An attempt has also been made in eliciting and proffering conservation method(s) the natives should practice in order to protect and preserve these plants for posterity.

MATERIALS AND METHODS

Study sites: The Niger Delta, one of the world's largest wetlands in southern Nigeria, is a vast flood plain (over 2000 km²) built up by the accumulation of sedimentary materials washed down the Niger and Benue Rivers (Rangeley *et al.*, 1994). It comprises four ecological zones; coastal barrier islands, mangrove swamp forest, freshwater swamp forest and low land rainforests. The later two forests are the most extensive ecological zones in the region. However, anthropogenic activities (timber and fuelwood removal, cultivation, capital project development, oil exploration and exploitation) are fast degrading these and their biodiversity.

The region is located between latitudes 3° 45'E and 8°10'N and longitudes 3°50'E and 9°75'E. The area experiences two main seasons: wet and dry seasons. The wet season is about 7 months in duration from April to October. The dry season lasts about 5 months beginning from November and ending in March. The mean temperature for the area is 25°C; annual rainfall, 4921 mm and relative humidity, 85%. The main crops are cassava,

Manihot esculentus Krantz, Cocoyam, *Colocasia antiquorum* Schott, yam, *Dioscorea* sp. and oil palm, *Elaeis guineensis* Jacq.

Six out of eight states in the region were selected for the study: Akwa-Ibom, Bayelsa, Cross River, Delta, Imo and Rivers. Selection was based on previous knowledge, experience and cumulative work (unpublished) done in these areas by the author. Thirteen study sites (Fig. 1) were chosen for the study: two in each state except Rivers with three sites.

Field study was conducted for four years (2002, 2004, 2006, 2008) for both wet and dry seasons. The vegetation (freshwater swamp and lowland rainforests) was sampled systematically within 1×10 m quadrats along established transects and randomly throughout the sampling areas. Interviews with different informants were also conducted as to the type of species found in the areas, the use they are being put to and the methods used in conserving the species. The Shannon-Weiner species diversity was used to assess the species quantitatively (Sokal and Rohlf, 1995) according to the formula:

$$H^1 = \sum_{i=1}^s p_i \ln p_i$$

Where:

- H¹ = Shannon-Weiner index
- S = Number of species
- pi = Proportion of individuals or abundance of the ith species expressed as a proportion of the total number of individuals of all species
- In = log base₁₀

Endangered and endemic species were recorded; identification of species was accomplished by the assistance of Forestry Institute of Nigeria (FRIN) herbarium and texts (Hutchinson and Dalziel, 1954-72; Akobundu and Agyakwa, 1987). Classification of ethnobotanical uses of species involved interviews, complimented by literature (Sofowora, 1982; Kokwaro, 1995; Etukudo, 2000, 2003). Diversity of uses was calculated using Shannon-Weiner index ($H^1 = \sum p_i \log p_i$) where i = uses and pi = proportion of species for the ith use (Rico-Gray *et al.*, 1991). Sorensen index (S.I = $2a/a+b+c$) was used to calculate species similarity between sites; a = number of species common to sites compared, b = number of species in site 1 and c = number of species in site 2.

RESULTS AND DISCUSSION

Plant diversity: Three hundred and thirty nine plant species were encountered in the forests and homestead

gardens in the study area (Table 1, 2). Of these, 206 species were recorded for the forests and 79 species for the homestead gardens. All the 339 species belong to 88 families (44 families for forest, 44 for gardens) and 266 genera (205 for forests, 61 for gardens). Fabaceae has the highest number of species (45), followed by Euphorbiaceae (25), Rubiaceae (12) Apocynaceae (11), Asteraceae (11) and Cecropiaceae (10). The species diversity index between the forest and the homestead gardens is 4.89. Species similarity index among the forest is low (47.78%) where 147 species are common to all forests. Similarity index between the homestead gardens is high (49.5%) as 76 species are common to the gardens.

Diversity of uses of plant species: All plant species have at least one reported use. Two hundred and fifty nine forest species and eighty homestead garden species are used for at least a single purpose (Table 1, 2). Species with more uses include *Elaeis guineensis* (12), *Raphia hookeri* (12), *Cocos nucifera* (11), *Irvingia gabonensis* (11), *Hevea brasiliensis* (9), *Lonchocarpus cyanescens* (9), *Lovoa trichilioides* (9), *Pterocarpus santalinoides* (9), *Dacryodes edulis* (8), *Khaya grandifoliola* (8), *Lophira alata* (8), *Anthocleista vogelii* (8), *Pachystela brevipes* (8) and *Symphonia globulifera* (8). Ethnobotanical use with more species include Medicine (178/52.5%), Fuel (107/31.6%), Food/condiment (100/29.4%), Timber (72/21.2%), Food/feed (70/20.6%), Commercial (58/17.1%), Furniture (55/16.2%) Fibre/cordage) 55/16.2%), Homestool (45/13.2%) and Fence (38/11.2%). These figures are inappropriate for medicinal and fuel plants as almost every species is used in healing a disease or is used as fuelwood. Diversity index for species ethnobotanical use is high, 7.9 for forest species and 5.0 for homestead garden species. This is indicative of the multiple uses the species are put to.

There is an indication that people from rural areas within the study areas use more forest and homestead garden species than people in towns as the former places are more distant and isolated villages. The surplus forest produce is traded locally. The people in better-communicated towns buy and sell their produce in well-organized markets in and around the towns. Thus, the use of forest and homestead garden produce in the Niger Delta communities is affected by communication systems such as roads and transport.

Economic importance of the forests plants: The type, quality and quantity of resources from the Niger Delta forests have diverse uses (Etukudo, 2000). More important are the timber species (*Antiaris africana*, *Albizia zygia*, *Brachystegia enrycoma*, *Ceiba pentandra*, *Diospyros alboflavescens*, *Erythrophleum ivorense*,

Table 1: List of plant species encountered in the forests of study areas. Nomenclature follows Hutchinson and Dalziel (1954-72) and Akobundu and Agyakwa (1987)

Species	Habit	Family	Ethnobotanical uses	Plant parts used
<i>Abrus precatorius</i> Linn.	Climber	Fabaceae	17, 21, 25	Seeds
<i>Abutilon mauritianum</i> (Jacq.) Medic	Shrub	Malvaceae	7, 17	Seeds, bark, leaves
<i>Acanthus montanus</i> (Nees) T. Anders	Herb	Acanthaceae	17, 19	Leaves, whole plant
<i>Achyranthes aspera</i> Linn.	Herb	Amaranthaceae	10, 17	Leaves, whole plant
<i>Acioa barteri</i> (Hook f. ex Oliv) Engl.	Shrub	Rosaceae	1, 2, 3, 5	Stems, fruits
* <i>Aframomum melegueta</i> K. Schum.	Herb	Zingiberaceae	7, 17, 19, 21, 23, 24	Stems, seeds
* <i>A. sceptrum</i> (Oliv. and Hanb) K. Schum.	Herb	Zingiberaceae	7, 17, 19, 21, 24	Stem, seeds
* <i>A. strobilaceum</i> (Sm.) Hepper	Herb	Zingiberaceae	7, 17, 19, 21, 24	Stem, seeds, leaves
<i>Ageratum conyzoides</i> Linn.	Herb	Asteraceae	5, 17, 18	Leaves, flowers
<i>Albizia zygia</i> (DC.) J. F. Machr.	Tree	Fabaceae	9, 10, 12, 13, 15, 26, 29	Leaves, stems
<i>Albizia adianthifolia</i> (Schum) W. F. Wight	Tree	Fabaceae	9, 11, 17, 27	Leaves, stem, bark
<i>Alchornea cordifolia</i> (Schum. and Thonn.) Mull. Arg.	Shrub	Euphorbiaceae	3, 6, 7, 9, 11, 30	Stem, bark, leaves, shoots
<i>A. laxiflora</i> (Benth.) Pax and K. Hoffm	Shrub	Euphorbiaceae	3, 6, 7, 11, 17	Stem, bark, leaves
<i>Allanblackia floribunda</i> Oliv.	Tree	Clusiaceae	2, 4, 9, 11, 12, 27, 29	Stem, leaves, fruits
<i>Alostonia boonei</i> De Wild	Tree	Apocynaceae	2, 4, 11, 12, 14, 15, 27	Stem, leaves, bark
<i>A. congensis</i> Engl.	Tree	Apocynaceae	2, 4, 11, 12, 14, 15, 27	Stem, leaves, bark
<i>Alternanthera bettzickiana</i> (Regel) Voss	Herb	Amaranthaceae	9, 19	Leaves, shoots
<i>Alternanthera pungens</i> H. B. K.	Herb	Amaranthaceae	10, 17, 18, 19	Leaves, shoots, stems
<i>A. sessilis</i> (Linn.) R. Br. ex Roth	Herb	Amaranthaceae	10, 17	Leaves, shoots, stems
<i>Anchomanes difformis</i> (Bl.) Engl.	Herb	Araceae	1, 10, 17, 21	Stems, tubers, leaves, fruits
* <i>Ancistrophyllum secundiflorum</i> (P. Beau v.) Wendl.	Shrub	Palmaceae	4, 7, 14, 15, 30	Stems, shoots
<i>Aningeria robusta</i> (A. Chev.) Aubrev. and Pellegr.	Tree	Sapotaceae	4, 11, 12, 15, 27, 29	Bark, stems
<i>Anthocleista vogelii</i> Planch.	Tree	Loganiaceae	4, 9, 11, 12, 17, 27, 29, 30	Stems, bark, leaves
<i>A. dyalonensis</i> A. Chev.	Tree	Loganiaceae	2, 8, 11, 15, 17, 30	Leaves, stems
* <i>Anthostema cubryamum</i> Baill.	Tree	Euphorbiaceae	11, 15, 17, 27	Bark, leaves, stem
<i>Antiaris africana</i> Engl.	Tree	Moraceae	7, 11, 12, 27, 29	Bark, stems, leaves
<i>Antidesma vogelianum</i> Mull. Arg.	Tree	Euphorbiaceae	2, 12, 15, 27	Stems
** <i>Anthonatha macrophylla</i> P. Beauv.	Shrub	Fabaceae	6, 11, 13	Stems
<i>Araliopsis soyauxii</i> Engl.	Tree	Rutaceae	3, 11, 15, 27	Stems, roots
<i>Argemone mexicana</i> Linn.	Herb	Papaveraceae	17	Whole plant
<i>Aristolochia albida</i> Duchatre	Herb	Aristolochiaceae	1, 11, 12	Stems
<i>Aspilia africana</i> (Pers.) C. D. Adams	Herb	Asteraceae	5, 9, 17, 30	Leaves, shoots, flowers
<i>Asystacia gangetica</i> (Linn.) T. Anders	Herb	Acanthaceae	9, 17, 30	Leaves
<i>Bacopa creanata</i> (P. Beauv.) Hepper	Herb	Scrophulariaceae	10, 11, 17	Leaves, stem
<i>Bambusa vulgaris</i> Schrad. Ex Wendel	Shrub	Poaceae	2, 6, 9, 12, 14	Stem, shoots, leaves
<i>Baphia nitida</i> Lodd.	Shrub	Fabaceae	3, 5, 6, 7, 9, 21, 30	Leaves, stems, bark
<i>Barteria nigritiana</i> Hook. F.	Shrub	Passifloraceae	6, 9, 10, 11	Stems, leaves
<i>Begonia microcarpa</i> Warb	Herb	Begoniaceae	17, 21	Leaves, roots
<i>Berlinia grandiflora</i> (Vahl.) Hutch and Dalz.	Tree	Fabaceae	2, 6, 11, 13	Stems
<i>Bixa orellana</i> Linn.	Shrub	Bixaceae	5, 17, 19, 22, 30	Fruits, stems, leaves, whole plant
<i>Blighia sapida</i> Konig	Tree	Sapindaceae	17, 27	Leaves, seeds, stems
<i>Boerhavia erecta</i> Linn.	Herb	Nyctaginaceae	9, 17	Leaves, roots, shoots
<i>Bombax buonopozense</i> P. Beauv.	Tree	Bombacaceae	4, 7, 11, 12, 14, 15	Stems, fruits, leaves
<i>Bosqueia angolensis</i> Ficalho	Tree	Moraceae	11, 12, 14, 17	Stems
<i>Brachystegia eurycoma</i> Harms	Tree	Fabaceae	9, 10, 11, 27	Leaves, stems, seeds
<i>Bridelia grandis</i> Pierre ex Hutch	Tree	Euphorbiaceae	4, 12, 27	Stems
<i>B. micrantha</i> (Hochst.) Baill.	Tree	Euphorbiaceae	4, 12, 14, 27	Stems
<i>Bryophyllum pinnatum</i> (Lan.) Okon	Herb	Crassulaceae	17	Leaves, whole plant
<i>Calamus deerratus</i> Mann and Wendl.	Climber	Palmaceae	4, 7, 14, 15	Stems
<i>Calopogonium mucunoides</i> Desv.	Creeping	Fabaceae	9	Leaves, fruits
<i>Canarium schweinfurthii</i> Linn.	Tree	Burseraceae	4, 10, 11, 17, 24, 29	Stems, fruits, bark
<i>Carpolobia lutea</i> G. Don	Shrub	Polygalaceae	3, 15	Stems
<i>Cassytha filiformis</i> Linn.	Climber	Lauraceae	17	Whole plants
<i>Cathormion altissimum</i> (Hook. f.) Hutch and Dandy	Tree	Fabaceae	11, 12, 27	Stems
<i>Cedrella odorata</i> Linn.	Tree	Meliaceae	11, 12, 15, 27	Stems
<i>Ceiba pentandra</i> (L.) Gaertn.	Tree	Bombacaceae	4, 7, 11, 13, 17, 19, 27	Stems, fruits, roots
<i>Celtis zenkeri</i> Engl.	Tree	Ulmaceae	2, 4, 5, 6, 12	Stems
<i>Centrosoma pubescens</i> Benth.	Creeping	Fabaceae	9	Leaves, fruits
<i>Ceratophyllum demersum</i> Linn.	Herb	Ceratophyllaceae	17	Whole plant
<i>Chromolaena odorata</i> (L.) R. M. King and Robinson	Herb	Asteraceae	17, 30	Leaves, shoots
<i>Chrysobalanus ellipticus</i> Soland ex. Sabine	Shrub	Rosaceae	2, 14, 17	Bark, stems
<i>Cissus quadrangularis</i> Linn.	Climber	Ampelidaceae	10, 17	Leaves, stems, fruits
<i>Clappertonia ficifolia</i> (Willd.) Decne	Shrub	Tiliaceae	7, 17	Bark, leaves, flowers
<i>Cleistopholis patens</i> (Benth.) Engl. and Diels	Tree	Annonaceae	2, 11, 27, 29	Stems, leaves
<i>Cleome viscosa</i> Linn.	Herb	Capparidaceae	9, 17	Leaves, fruits
<i>Clerodendrum splendens</i> G. Don.	Climbing shrub	Verbenaceae	5, 17, 19	Leaves, fruits, whole plant

Table 1: Continued

Species	Habit	Family	Ethnobotanical uses	Plant parts used
<i>Clitoria ternatea</i> Linn.	Climber	Fabaceae	17, 18	Seeds, roots
<i>Cnestis ferruginea</i> DC.	Shrub	Connaraceae	5, 17	Leaves, fruits, roots
<i>Coelocaryon preusii</i> Warb.	Tree	Myristicaceae	3, 5, 6, 11, 15	Stems, leaves, bark, roots
<i>Coix lachrymal-jobi</i> Linn.	Herb	Poaceae	6, 7, 9	Whole plant
<i>Combretum hispidum</i> Laws	Shrub	Combretaceae	17, 19	Roots
<i>C. racemosum</i> P. Beauv.	Shrub	Combretaceae	17, 19	Twigs, shoots
** <i>C. zenkeri</i> Engl. and Diels	Shrub	Combretaceae	5, 7, 17	Leaves, stems
<i>Commelina africana</i> Linn.	Herb	Commelinaceae	17, 19	Whole plant
<i>C. diffusa</i> Burm. f.	Herb	Commelinaceae	17, 19	Whole plant
<i>C. erecta</i> Linn.	Herb	Commelinaceae	17, 19	Whole plant
** <i>Costus afer</i> Ker-Gawl.	Herb	Costaceae	3, 9, 17, 24	Stems, shoots, roots
<i>Costus lucanusianus</i> J. Braun and K. Schum.	Herb	Costaceae	7, 9, 12	Stems, leaves, roots
** <i>C. schlechteri</i> Winkler	Herb	Costaceae	9, 17, 24	Stems, roots
<i>Crassocephalum togoense</i> C. D. Adams	Herb	Asteraceae	9, 17	Leaves, stems
<i>Crassocephalum crepidinoides</i> S. Moore	Herb	Asteraceae	10, 17	Leaves
<i>Crotalaria retusa</i> Linn.	Herb	Fabaceae	7, 19	Whole plant, bark
<i>Crudia klainei</i> Pierre ex De Wild	Tree	Fabaceae	2, 11	Stems
<i>Cuscuta adstralis</i> R. Br.	Twinner	Cuscutaceae	1, 17	Whole plant
<i>Cynometra vogelii</i> Hook F.	Herb	Fabaceae	11, 29	Stems
<i>Cyperus difformis</i> Linn.	Herb	Cyperaceae	10, 17	Stems, leaves
<i>Cyperus esculentus</i> Linn.	Herb	Cyperaceae	7, 10, 17	Tubers, stems, leaves
<i>Daibergia latifolia</i> Roxb.	Tree	Fabaceae	12, 15, 29	Stems
<i>Daniellia ogea</i> (Harnes) Rolfe ex Holl.	Tree	Fabaceae	4, 9, 11, 12, 15, 27	Stem, leaves
<i>Datura stramonium</i> Linn.	Herb	Solanaceae	17, 24, 28	Leaves, seeds, fruit, flowers
<i>Desmodium turtuosum</i> (Sw.) DC.	Herb	Fabaceae	9, 17, 29	Whole plant, roots
<i>Dialium guineense</i> Wild	Shrub	Fabaceae	3, 5, 7, 9, 10, 11	Leaves, stems, bark
<i>Diodia sarmentosa</i> Sw.	Herb	Rubiaceae	17	Leaves
* <i>Diosphyros alboflavesens</i> (Gurke) F. White	Tree	Ebenaceae	4, 8, 11, 12, 15, 27, 29	Stems, leaves
<i>Diplazium sammatii</i> (Kuhn) C. Chr.	Herb	Athyriaceae	10	Shoots
* <i>Dracaena arborea</i> Link	Tree	Liliaceae	6, 19, 21	Leaves, whole plant
* <i>D. mannii</i> Bak.	Tree	Liliaceae	6, 19, 21	Leaves, whole plant
<i>Drypetes floribunda</i> (Mull. Arg.) Hutch	Shrub	Euphorbiaceae	1, 28	Fruits, leaves
<i>Emilia coccinea</i> (Sims) G. Don	Herb	Asteraceae	9, 17	Leaves, shoots
<i>E. sonchifolia</i> (Linn.) DC.	Herb	Asteraceae	9, 17	Leaves, Shoots
<i>Erythrina senegalensis</i> DC.	Tree	Fabaceae	6, 27	Stems
<i>Erythrophelem ivorensis</i> A. Chev.	Tree	Fabaceae	11, 27, 29	Leaves, stems
<i>Euphorbia heterophylla</i> Linn.	Herb	Euphorbiaceae	13, 17, 19	Leaves, stems, whole plant
<i>Fagara macrophylla</i> Engl.	Tree	Rutaceae	11, 17, 27	Stems, leaves, roots
<i>F. zanthoxyloides</i> Lam	Tree	Rutaceae	3, 6, 11, 17, 27	Stems, leaves, roots
<i>Ficus exasperata</i> Vahl.	Tree	Moraceae	6, 9, 13, 16, 17	Stems, fruits, shoots, leaves
<i>Ficus lepreuri</i> Miq.	Tree	Moraceae	13, 16, 17	Stems, fruits, shoots, leaves
<i>Fimbristylis ferruginea</i> (Linn.) Vahl.	Herb	Cyperaceae	17	Fruits
<i>Fimbristylis littoralis</i>	Herb	Cyperaceae	17	Fruits
<i>Fuirena umbellata</i> Rottb.	Herb	Cyperaceae	17	Fruits
<i>Funtumia elastica</i> (Preuss.) Stapf.	Tree	Apocynaceae	13, 16	Stems, leaves, bark
** <i>Garcinia mannii</i> Oliv.	Tree	Clusiaceae	3, 13	Stems
<i>Gloriosa superba</i> Linn.	Herb	Liliaceae	17	Whole plant
<i>Glyphaea brevis</i> (Spreng.) Monachino	Shrub	Tiliaceae	3, 5, 6, 7, 10, 11, 17	Stems, leaves, bark
<i>Guarea cedrata</i> (A. Chev.) Pellegr.	Tree	Meliaceae	2, 8, 11, 27, 29	Leaves, stems
<i>G. thompsonii</i> Gerague and Hutch.	Tree	Meliaceae	2, 8, 11, 27, 29	Leaves, stems
<i>Hallea ciliata</i> Aub and Pellegr.	Tree	Rubiaceae	4, 11, 12, 15, 17, 27	Stems, roots, bark
<i>Hallea stipulosa</i> (DC) J. F. Leroy	Tree	Rubiaceae	4, 11, 12, 15, 17, 27, 29	Stems, roots, bark
<i>Halopegia azurea</i> K. Schum	Herb	Marantaceae	7, 30	Leaves, stems
<i>Hannoa klaineana</i> Pierre and Engl.	Tree	Simaroubaceae	2, 4, 6, 11, 12, 27, 29	Leaves, stems
<i>Hanungana madagascariensis</i> Lam. ex. Poir	Shrub	Hypericaceae	5, 9, 11, 13, 17	Leaves, stems, bark
<i>Heteranthera callifolia</i> Rchb. ex. Kunth	Herb	Pontederiaceae	17	Leaves, roots
<i>Heterotis rotundifolia</i> (Sm.) Jac-fét	Herb	Melastomataceae	17	Leaves, fruits, flowers
<i>Hewittia sublobata</i> Linn.	Shrub	Convolvulaceae	17, 19	Flowers, whole plant
* <i>Hibiscus sabdarifa</i> Linn.	Shrub	Malvaceae	7, 10, 23	Bark, leaves, fruits, flowers
** <i>Hippocratea pallens</i> Planch. ex. Oliv.	Climbing shrub	Hippocrateaceae	11, 17, 25	Fruits, roots
<i>Homalium letestui</i> Pellegr.	Tree	Samydaceae	3, 6, 9	Leaves, stems
<i>Hylodendron gabunense</i> Taub.	Tree	Fabaceae	2, 6, 11, 27	Stems
<i>Icacina trichantha</i> Oliv.	Straggling shrub	Icacinaceae	17	Tubers
* <i>Ipomoea aquatica</i> Forsk.	Twinner	Convolvulaceae	9, 10, 19	Leaves, stems, whole plant

Table 1: Continued

Species	Habit	Family	Ethnobotanical uses	Plant parts used
<i>I. involuocrata</i> P. Beauv.	Creepers	Convolvulaceae	7, 17	Stems, leaves
<i>Irvingia gabonensis</i> Baill.	Tree	Irvingiaceae	9, 10, 11, 18, 23	Fruits, seeds, stems
<i>Justicia flava</i> (Forsk.) Vahl.	Herb	Acanthaceae	17	Whole plant
<i>Khaya grandifoliola</i> A. DC.	Tree	Meliaceae	2, 4, 8, 11, 12, 15, 27, 29	Leaves, stems
<i>K. ivorensis</i> A. Chev.	Tree	Meliaceae	2, 4, 11, 12, 15, 27, 29	Leaves, stems
<i>Klainedoxa gabonensis</i> Pierre ex Engl.	Tree	Irvingiaceae	2, 4, 11, 12, 15, 27, 29	Stems, leaves
<i>Landolphia heudelotii</i> A. DC.	Shrub	Apocynaceae	6, 11, 13, 15, 16	Stems, leaves
<i>Laportea aestuans</i> (Linn.) Chew.	Herb	Urticaceae	17, 28	Leaves, flowers
<i>L. ovalifolia</i> (Schum. and Thonn.) Dandy	Herb	Urticaceae	17	Fruits, roots
<i>L. owariensis</i> P. Beauv.	Liane/Shrub	Apocynaceae	6, 11, 13, 15, 16	Stems, leaves
<i>Lanmea acida</i> A. Rich	Tree	Anacardiaceae	10, 11, 17	Leaves, stems, fruits
* <i>Leea guineensis</i> G. Don	Shrub	Leeaceae	17, 19	Leaves, roots, bark
* <i>Lonchocarpus cyanescens</i> (Schum. and Thonn.) Benth.	Shrub	Fabaceae	2, 3, 5, 6, 9, 10, 11, 27, 29	Leaves, stems, roots, seeds
<i>L. griffoneanus</i> (Baill.) Dunn.	Shrub	Fabaceae	1, 2, 6, 11, 21, 27, 29	Leaves, stems, seeds
<i>Lophira alata</i> Barks ex Gaertn. f.	Tree	Ochnaceae	2, 4, 6, 8, 11, 12, 15, 27	Stems
<i>Loranthus aphyllus</i> Sprangue	Parasitic Shrub	Loranthaceae	17	Leaves, fruits
<i>Lovoa trichilioides</i> Harms	Tree	Meliaceae	2, 4, 8, 11, 12, 14, 15, 27, 29	Leaves, stems
<i>Ludwigia decurrens</i> Walt.	Herb	Onagraceae	17	Leaves, flowers
<i>Ludwigia hyssopifolia</i> (G. Don.) Exell	Herb	Onagraceae	17	Leaves, flowers
* <i>Macaranga barteri</i> Muell. Arg.	Tree	Euphorbiaceae	9, 11, 13, 14, 25	Leaves, stems, fruits, roots
* <i>Maesobotrya barteri</i> (Baill.) Hutch	Shrub	Euphorbiaceae	3, 9, 10, 11, 14	Stems, leaves, fruits
<i>Mallotus oppositifolius</i> (Geisel) Mull. Arg.	Shrub	Euphorbiaceae	5, 9, 11, 17	Leaves, stems, roots
<i>Manihot glaziovii</i> Mull. Arg.	Shrub	Euphorbiaceae	16, 19, 28	Leaves, tubers
<i>Manniophyton fulvum</i> Mull. Arg.	Shrub	Euphorbiaceae	9	Shoots
<i>Mansonia altissima</i> A. Chev.	Tree	Sterculiaceae	4, 11, 12, 27	Stems
<i>Massularia acuminata</i> (G. Don.) Bull. Ex Hoyle	Shrub	Rubiaceae	3, 6, 17	Stems
<i>Maranthochloa cuspidata</i> (Rosc.) Milne-Redh.	Herb	Marantaceae	2, 7, 30	Leaves, stems
<i>Melanthera scandens</i> (Schum. and Thonn.) Roberty	Herb	Asteraceae	17	Leaves, roots
<i>Melastomastrum capitatum</i> (Vahl.) A. and R. Fern.	Herb	Melastomataceae	17	Leaves, fruits, flowers
<i>Melochia corchorifolia</i> Linn.	Herb	Sterculiaceae	7, 10, 17	Bark, leaves, roots
* <i>Microdesmis puberula</i> Hook f. ex Planch.	Shrub	Euphorbiaceae	3, 9, 10	Stems, shoots, leaves
<i>Milicia excelsa</i> (Welw.) C. C. Berg.	Tree	Melastomataceae	4, 11, 12, 21, 27	Stems
<i>Millettia thomlingii</i> (Schum. and Thonn.) Bak	Shrub	Fabaceae	6, 8, 10, 11, 17, 29	Leaves, stems, roots
<i>Mimosa pigra</i> Linn.	Herb	Fabaceae	19, 27	Leaves, whole plant
<i>Mimosa peduca</i> Linn.	Herb	Fabaceae	19, 27	Whole plant
<i>Mimosa invisa</i> Mart.	Herb	Fabaceae	4, 11, 12, 17, 27, 29	Leaves, whole plant
<i>Momordica charantia</i> Linn.	Climber	Cucurbitaceae	10, 17	Fruits, leaves
<i>Momodora myristica</i> (Gaertn) Dunal	Climber	Ammonaceae	19, 23, 27	Leaves, fruits, whole plant
<i>Musanga cecropioides</i> R. Br.	Tree	Moraceae	9, 11, 16, 17, 30	Stems, leaves, bark, roots
** <i>Mussaenda isertiana</i> DC	Climbing shrub	Rubiaceae	19, 27	Leaves, whole plant
<i>Myrianthus arboreus</i> P. Beauv.	Tree	Moraceae	2, 11, 12, 15, 17, 27	Stems, leaves, bark, roots
* <i>Napoleona vogelii</i> Hook and Planch	Tree	Lecythidaceae	1, 3, 11, 30	Stems, leaves
<i>Naucllea diderichii</i> (De Wild. and th. Dur.) Merrill	Tree	Rubiaceae	6, 17, 27	Stems, fruits
<i>Naucllea latifolia</i> Sm.	Straggling shrub	Rubiaceae	2, 3, 5, 13, 27	Leaves, stems, roots, bark
<i>Naucllea vanderghuchtii</i> (De Wild) Petit.	Shrub	Rubiaceae	2, 3, 5, 13	Stems, roots
* <i>Newbouldia laevis</i> (P. Beauv.) Seemann ex Bureau	Tree	Bignoniaceae	6, 11, 19, 21	Stems, shoots
* <i>Oxystigma mannii</i> (Baill.) Harms	Tree	Fabaceae	2, 4, 11, 12, 15, 27, 29	Leaves, stems
<i>Pachystela brevipes</i> (Bak.) Baillon ex Engl.	Tree	Sapotaceae	2, 4, 8, 11, 12, 15, 27, 29	Stems
<i>Palisota hirsuta</i> Thunb.) K. Schum.	Herb	Commelinaceae	9, 17	Leaves, stems
* <i>Pandanus canelabrum</i> Beauv.	Tree	Pandanaceae	4, 6, 7, 12, 14, 21	Stems
<i>Parkia bicolor</i> A. Chev.	Tree	Fabaceae	4, 9, 10	Leaves, fruits, stems
<i>Parinari excelsa</i> Sabine	Shrub	Chrysobalanaceae	4, 11, 12	Stems
<i>Paspalum vaginatum</i> Sw.	Herb	Poaceae	9	Shoots
<i>Paullinia pinnata</i> Linn.	Climber	Sapindaceae	3, 17	Leaves, stems, roots
* <i>Pentachlethra macrophylla</i> Benth.	Tree	Fabaceae	4, 9, 10, 11, 18, 21, 23	Leaves, stems, seeds
<i>Pentadesma butyracea</i> Sabine	Tree	Clusiaceae	13, 14, 17	Bark, stems
<i>Peperomia pellucida</i> (L.) H. B. and K.	Herb	Piperaceae	17, 28	Whole plant, leaves
<i>Phyllanthus amarus</i> Schum and Thonn.	Herb	Euphorbiaceae	16, 17	Leaves, stems, fruits, flowers
<i>Phyllanthus muellerianus</i> (O. Kt.) Exell	Herb	Euphorbiaceae	17	Flowers, fruits
<i>Physalis angulata</i> Linn.	Herb	Solanaceae	17	Leaves
<i>Piper umbellatum</i> Linn.	Climber	Piperaceae	10, 17, 21	Leaves, roots, whole plant
<i>Plukenetia conophora</i> Mull. Arg.	Climbing	Euphorbiaceae	10, 11, 12, 14, 17, 18	Leaves, seeds, fruits, stems

Table 1: Continued

Species	Habit	Family	Ethnobotanical uses	Plant parts used
	Shrub			
<i>Poga oleosa</i> Pierre	Tree	Rhizophoraceae	4, 10, 11, 12, 27, 29	Leaves, stems
* <i>Psychotria nigerica</i> Hepper	Shrub	Rubiaceae	17, 24	Leaves
<i>Pterocarpus mildbraedii</i> Harms	Tree	Fabaceae	5, 6, 9, 11, 15, 17, 29	Leaves, bark, stems
<i>Pterocarpus santalinoides</i> L'her Ex DC.	Tree	Fabaceae	5, 6, 9, 10, 12, 14, 15, 17, 26	Bark, leaves, stems
<i>P. osun</i> Craib	Tree	Fabaceae	5, 6, 9, 11, 15, 17, 29	Leaves, bark, stems
<i>Pterygota macrocarpa</i> K. Schum	Tree	Sterculiaceae	12, 27	Stems
<i>Pupalia lappacea</i> (Linn.) Juss.	Herb	Amaranthaceae	17	Shoots
<i>Pycnanthus angolensis</i> (Welw.) Warb.	Tree	Myristicaceae	4, 11, 12, 15, 21, 27	Stems, twigs
** <i>Raphia vinifera</i> P. Beauv.	Tree	Palmaceae	2, 7, 11, 25	Leaves, fruits
<i>Rauwolfia vomitoria</i> Afzel	Shrub	Apocynaceae	9, 11, 16, 17, 28	Leaves, stems, roots
<i>Ricinodendron heudelottii</i> (Baill) Pierre ex Pax.	Tree	Euphorbiaceae	9, 10, 17, 18, 27	Bark, stems, seeds, leaves
<i>Rothmania hispida</i> (K. Schum.) Fager	Shrub	Rubiaceae	5, 17, 19	Leaves, fruits, whole plant
<i>Rhynchospora corymbosa</i> (Linn.) Britt.	Herb	Cyperaceae	17	Leaves, fruits
** <i>Sacoglottis gabonensis</i> (Baill.) Urb.	Tree	Humiriaceae	11, 12, 23, 25, 29	Bark, leaves, stems
* <i>Sarcophyllum brachystachys</i> (Benth.) K. Schum.	Herb	Marantaceae	17, 21	Leaves, whole plant
<i>Schrankia leptocarpa</i> DC	Straggling herb	Fabaceae	19	Whole plant
<i>Scleria naumanniana</i> Boeck	Herb	Cyperaceae	17	Fruits
<i>S. vorrucosa</i> Wild.	Herb	Cyperaceae	17	Fruits
<i>Scoparia dulcis</i> Linn.	Shrub	Scrophulariaceae	17	Whole plant
<i>Selaginella nyosurus</i> (Sw) Alston	Creeper	Selaginellaceae	17, 21	Whole plant
<i>S. scandens</i> (P. Beauv.) Spring	Creeper	Selaginellaceae	17, 21	Whole plant
<i>Setaria megaphylla</i> (Steud.) Dur. and Schinz.	Herb	Poaceae	21, 30	Leaves, roots
<i>Senna alata</i> (Linn.) Roxb.	Shrub	Fabaceae	5, 11, 17, 19	Leaves, roots, stems
<i>Senna hirsuta</i> (Linn.) Irwin and Barneby	Shrub	Fabaceae	17	Whole plant
<i>Senna obtusifolia</i> (Linn.) Irwin and Barneby	Shrub	Fabaceae	10, 17, 25	Whole plant
<i>Senna occidentalis</i> (Linn.) Link	Herb	Fabaceae	19	Whole plant
<i>Senna podocarpa</i> (Guill and Perr.) Lock	Shrub	Fabaceae	19	Bark
<i>S. rhombifolia</i> Linn.	Herb	Malvaceae	7, 17	Bark, leaves, stems, roots
<i>Smilax anceps</i> Wild.	Climbing herb	Smilacaceae	7, 17	Roots, tubers, whole plant
<i>Spigelia anthelmia</i> Linn.	Herb	Loganiaceae	28	Whole plant
<i>Spilentes filicaulis</i> (Schum and Thonn.) C.D. Adams	Creeping herb	Asteraceae	17	Flowers, whole plant
<i>Spondiathus presussii</i> Engl.	Tree	Euphorbiaceae	2, 11, 28	Leaves, stems
<i>Stachytarpheta cayenensis</i> (L.C. Rich) Schau.	Shrub	Verbanaceae	17	Whole plant
<i>S. indica</i> (Linn.) Vahl.	Shrub	Verbanaceae	17	Whole plant
<i>Staudia stipitata</i> Warb	Tree	Myristicaceae	2, 4, 11, 12, 16, 27	Stems, bark
<i>Sterculia tragacantha</i> Lind.	Tree	Sterculiaceae	7, 10, 13, 15, 17	Bark, leaves, stems
<i>Strophanthus sarmentosus</i> DC	Woody	Apocynaceae	7, 19	Bark, leaves, seeds
<i>Symphonia globulifera</i> Linn. F.	Climber tree	Clusiaceae	2, 3, 4, 11, 12, 15, 17, 27	Stems, leaves, roots
** <i>Synsepalum dulcificum</i> (Schum. and Thonn.) Daniell	Shrub	Sapotaceae	4, 10, 11, 25	Seeds, leaves, stems
<i>Terminalia ivorensis</i> A. Chev.	Tree	Combretaceae	12, 15, 17, 27	Bark, stems
* <i>Tetracera podotricha</i> Gilg	Shrub	Dilleniaceae	11, 17	Stems, bark
* <i>Tetrapleura tetraptera</i> (Schum. and Thonn.) Taub.	Tree	Fabaceae	4, 11, 15, 17, 23, 27	Stems, fruits, bark
<i>Thalia welwitschii</i> Ridl	Herb	Marantaceae	19, 30	Leaves, whole plant
<i>Thaumatococcus daniellii</i> (Benn.) Benth	Herb	Marantaceae	10, 25, 28, 30	Fruits, leaves
<i>Thevetia peruviana</i> Juss.	Shrub	Apocynaceae	6, 17, 28	Bark, stems, leaves, roots
<i>Treculia africana</i> Decne	Tree	Moraceae	10, 12, 17, 18, 21, 27	Fruits, seeds, stems
<i>Trichilia heudelottii</i> Planch ex Oliv.	Tree/shrub	Meliaceae	11, 12, 27	Stems
<i>Tridax procumbens</i> Linn.	Herb	Asteraceae	9, 17	Leaves, roots
<i>Tristemma incompletum</i> R. Br.	Herb	Melastomataceae	10	Fruits
<i>Triumpheta cordifolia</i> A. Rich	Herb	Tiliaceae	7, 30	Leaves, bark
<i>Uapaca standtii</i> Pax.	Tree	Euphorbiaceae	2, 4, 11, 17, 27, 30	Stems, leaves, roots
<i>U. togoensis</i> Pax	Tree	Euphorbiaceae	2, 4, 11, 17, 27, 30	Stems, leaves, roots
<i>Urena lobata</i> Linn.	Shrub	Malvaceae	7, 9, 17	Bark, roots, seeds
* <i>Uvaria chamae</i> P. Beauv.	Shrub	Annonaceae	11, 17, 28	Stems, fruits, roots
* <i>U. cristata</i> R. Br.	Shrub	Annonaceae	11, 17, 28	Stems, fruits, roots
<i>Voacanga africana</i> Stapf.	Tree	Apocynaceae	9, 11, 16, 28	Shoots, stems, leaves
<i>Vossia cuspidata</i> (Boxb.) Griff.	Herb	Poaceae	2, 7, 9	Stems, leaves
<i>Waltheria indica</i> Linn.	Herb	Steruliaceae	7, 21	Bark, whole plant
** <i>Xylopiya aethiopica</i> (Dunal) A. Rich.	Tree	Annonaceae	2, 4, 10, 17, 23, 27	Stems, fruits
** <i>Xylopiya villosa</i> Chipp.	Tree	Annonaceae	14, 15, 17, 27, 29	Stems, seeds

Ethnobotanical uses: 1: Bait, 2: Building, 3: Toothbrush, 4: Commercial, 5: Dyes, 6: Fence, 7: Fibre/Cordage, 8: Field-tool, 9: Fodder/Feed, 10: Food/Condiment, 11: Fuel, 12: Furniture, 13: Gum/Resins, 14: Handcrafts, 15: Home Tool, 16: Latex, 17: Medicine, 18: Oil, 19: Ornamental, 20: Plaiting/Weaving, 21: Religious/Cultural, 22: Soap, 23: Spice/Flavouring, 24: Stimulant, 25: Sweeteners, 26, 27: Timber, 28: Toxic, 29: Work tool, 30: Wraps/Packing. *Endangered species. **Endemic species

Table 2: List of plant species present in the homestead gardens in the study areas. Nomenclature and ethnobotanical uses of the species follow those in Table 1

Species	Habit	Family	Ethnobotanical Uses	Plant parts used
<i>Abelmoschus esculentus</i> (Linn.) Moech.	Herb	Malvaceae	7, 10, 17, 23	Bark, leaves, seeds
<i>Amaranthus hybridus</i> Linn.	Herb	Amaranthaceae	7, 10	Bark, leaves
<i>Ananas comosus</i> (Linn.) Merril	Herb	Bromeliaceae	7, 10, 17	Fruits, stems
* <i>Ananas muricata</i> Linn.	Shrub	Amnonaceae	10, 14	Fruits, stems
<i>Arachis hypogea</i> Linn.	Herb	Fabaceae	9, 10, 18, 22, 23	Fruits
* <i>Artocarpus communis</i> Forest	Tree	Moraceae	10, 12, 13, 14, 30	Fruits, stems, leaves
** <i>A. heterophylla</i> Lam.	Tree	Moraceae	10, 12, 13, 14, 30	Fruits, stems, leaves
<i>Azadirachta indica</i> A. Juss	Tree	Meliaceae	3, 11, 17, 19	Bark, leaves, stems
<i>Caesalpinia pulcherima</i> Swartz.	Tree	Fabaceae	11, 12, 19, 27	Flowers, stems
<i>Capsicum annuum</i> Linn.	Shrub	Solanaceae	4, 10, 17, 23, 24, 28	Fruits, seeds
<i>C. frutescens</i> Linn.	Shrub	Solanaceae	4, 10, 17, 23, 24, 28	Fruits, seeds
<i>Carica papaya</i> Linn.	Herb	Caricaceae	10, 13, 17, 26	Bark, stems, leaves
* <i>Chrysophyllum albidum</i> G. Don.	Tree	Sapotaceae	10, 11, 13, 16, 27	Bark, fruits, stems
* <i>Citrullus colosynthis</i> Schrad.	Climber	Cucurbitaceae	10, 17	Fruits, roots
<i>C. vulgaris</i>	Climber	Cucurbitaceae	10, 17	Fruits, roots
<i>Citrus aurantifolia</i> (Christm.) Swing	Shrub	Rutaceae	17, 24	Fruits
<i>C. limon</i> (L.) Burm. f.	Shrub	Rutaceae	10, 17, 24	Fruits
<i>C. reticulata</i> Blanco	Shrub	Rutaceae	10, 17, 22, 24	Fruits
<i>C. sinensis</i> (Linn.) Osbeck	Shrub	Rutaceae	10, 17, 22, 24	Fruits
<i>Cocos nucifera</i> Linn.	Tree	Palmaceae	2, 4, 7, 10, 14, 15, 17, 18, 22, 24, 27	Fruits, seeds, leaves, whole plant
** <i>Cola argentea</i> Mast.	Tree	Sterculiaceae	2, 4, 11, 24, 27	Fruits, stems
<i>C. nitida</i> (Vent.) Schott and Endl.	Tree	Sterculiaceae	2, 4, 11, 12, 24, 27	Fruits, stems
** <i>Colocasia antiquorum</i> Schott.	Herb	Araceae	9, 10, 30	Leaves, corms
<i>C. esculenta</i> (Linn.) Schott.	Herb	Araceae	9, 10, 19, 23, 30	Leaves, corms, whole plant
<i>Corchorus olitorius</i> Linn.	Herb	Tiliaceae	7, 10	Bark, leaves
<i>Coula edulis</i> Baill.	Tree	Olacaceae	3, 8, 12, 17, 24, 27	Fruits, stems
<i>Crescentia cujete</i> Linn.	Tree	Bignoniaceae	11, 15, 19, 30	Fruits, stems, whole plant
<i>Cucumis melo</i>	Herb	Cucurbitaceae	9, 10, 18, 23	Fruits, seeds
<i>Cucumis sativus</i> Linn.	Herb	Cucurbitaceae	10	Fruits, seeds
** <i>Curcubita moschata</i> Linn.	Herb	Cucurbitaceae	9, 10, 15, 30	Fruits, leaves
<i>Cymbopogon citratus</i> (DC.) Stapf.	Herb	Poaceae	17, 24	Leaves, whole plant
** <i>Dacryodes edulis</i> (G. Don.) H. J. Lam.	Tree	Burseraceae	3, 9, 10, 11, 12, 13, 15, 18	Bark, fruits, leaves, stems
** <i>Dennettia tripetala</i> Bak. f.	Shrub	Amnonaceae	10, 11, 23, 24	Fruits, seeds, stems, leaves
<i>Dioscorea alata</i> Linn.	Climber	Dioscoreaceae	7, 10	Stems, tubers
<i>D. bulbifera</i> Linn.	Climber	Dioscoreaceae	7, 10	Stems, tubers
<i>D. cayenensis</i> Lam	Climber	Dioscoreaceae	7, 10	Stems, tubers
<i>D. dumentorum</i> (Kunth.) Pax	Climber	Dioscoreaceae	7, 9, 10	Stems, tubers
<i>D. esculenta</i> (Lour.) Burkin	Climber	Dioscoreaceae	7, 10	Stems, tubers
* <i>D. rotundata</i> Poir	Climber	Dioscoreaceae	7, 10, 23	Stems, tubers
<i>Elaeis guineensis</i> Jacq.	Tree	Palmaceae	2, 7, 9, 11, 12, 14, 15, 17, 18, 20, 22, 23	Fruits, seeds, leaves, bark, stems
<i>Eugenia owariensis</i> P. Beauv.	Tree	Myrtaceae	10, 11, 15	Fruits, stems
<i>Garcinia kola</i> Heckel	Tree	Guttiferae	3, 8, 11, 12, 17, 24	Fruits, seeds, stems
<i>Gmelina arborea</i> Roxb	Tree	Verbanaceae	4, 7, 11, 15, 29	Stems
** <i>Gnetum africanum</i> Welw.	Herb	Gnetaceae	4, 7, 10	Leaves, stems
** <i>Gongronema latifolium</i> Benth.	Climber	Asclepiadaceae	3, 7, 10, 21, 23	Leaves, stems, bark
** <i>Heinsia crinata</i> (Afzel.) G. Tayl.	Shrub	Rubiaceae	3, 4, 10, 15, 17	Leaves, stems
<i>Hevea braziliensis</i> (Kunth.) Muell. Arg.	Tree	Euphorbiaceae	2, 4, 6, 9, 11, 13, 14, 16, 18	Bark, fruits, stems, leaves, seeds
** <i>Hyptis suaveolens</i> Poit	Herb	Laminaceae	10, 17, 23, 24, 25	Leaves, fruits
* <i>Irvingia gabonensis</i> (Aubru-Lecomte ex O'Rorke) Baill	Tree	Irvingiaceae	2, 4, 8, 9, 10, 11, 12, 14, 15, 23, 27	Fruits, seeds, stems
<i>I. grandifolia</i> (Engl.) Engl.	Tree	Irvingiaceae	2, 4, 8, 10, 11, 12, 14, 27	Fruits, seeds, stems
** <i>Lasianthera africana</i> P. Beauv.	Shrub	Icacinaceae	3, 6, 10, 17	Leaves, stems
<i>Lycopersicon esculentum</i> Mill.	Herb	Solanaceae	4, 10	Fruits, seeds
<i>Mangifera indica</i> Linn.	Tree	Anacardiaceae	4, 10, 11, 12, 13, 17, 27, 30	Bark, fruits, stems, leaves
<i>Manihot esculentus</i> Krantz.	Shrub	Euphorbiaceae	1, 4, 9, 10, 13, 16, 19	Leaves, stems, tubers, whole plant
<i>Mucuna urens</i> Adans.	Herb	Fabaceae	7, 10, 23	Seeds, stems
<i>Musa paradisiaca</i> Linn.	Herb	Musaceae	7, 10, 17, 22, 30	Leaves, stems, fruits, whole plant
<i>M. paradisiaca</i> subsp. <i>sapiantum</i> Linn.	Herb	Musaceae	7, 10, 17, 22, 30	Leaves, stems, fruits, whole plant
** <i>Ocimum gratissimum</i> Linn	Shrub	Labiatae	9, 10, 17, 23, 24	Leaves, fruits
<i>Persea americana</i> Mill.	Tree	Lauraceae	5, 9, 10, 11, 18	Leaves, fruits, stems
<i>Phaseolus lunatus</i> Linn.	Herb	Fabaceae	10, 17	Seeds leaves, pods
** <i>Piper guineensis</i> Schum. and Thonn.	Climber	Pipereceae	10, 17, 23, 24	Leaves, seeds

Table 2: Continued

Species	Habit	Family	Ethnobotanical Uses	Plant parts used
<i>Plumeria alba</i> Linn.	Tree	Apocynaceae	16, 17, 19	Bark, stems, whole plant
<i>P. rubra</i> Linn.	Tree	Apocynaceae	16, 17, 19	Bark, stems, whole plant
<i>Psidium guajava</i> Linn.	Shrub	Myrtaceae	3, 9, 10, 11, 15, 17, 26	Fruits, bark, leaves
** <i>Raphia hookeri</i> Mann. and Wendl.	Tree	Palmaceae	2, 4, 6, 7, 11, 12, 13, 14, 16, 20, 24, 28	Fruits, leaves, stems, seeds, whole plant
<i>Ricinus communis</i> Linn.	Shrub	Euphorbiaceae	4, 7, 17, 18, 22	Fruits, seeds, stems, bark, leaves
<i>Saccharum officinarum</i> Linn.	Herb	Poaceae	4, 7, 10, 25	Stems
* <i>Sesamum indicum</i> Linn.	Herb	Pedaliaceae	10, 17, 18	Leaves, fruits, seeds
<i>Solanum macrocarpum</i> Linn.	Shrub	Solanaceae	9, 10	Fruits
* <i>Spondias mombin</i> Linn.	Tree	Anacardiaceae	6, 9, 10, 12, 27	Fruits, stems
<i>Talinum triangulare</i> (Jacq.) Wild	Herb	Portulacaceae	9, 10, 17	Leaves, whole plant
** <i>Telfairia occidentalis</i> Hook f.	Climber	Cucurbitaceae	9, 10, 17, 23	Fruits, leaves, seeds, roots
<i>Terminalia catappa</i> Linn.	Tree	Combretaceae	8, 9, 10, 17, 18, 19, 22, 26, 27	Fruits, seeds, stems, bark, leaves
<i>Theobroma cacao</i> Linn.	Tree	Sterculiaceae	11, 17, 24	Fruits, stems, seeds
<i>Trema guineensis</i> (Schum. and Thonn.) Ficalho	Tree	Ulmaceae	6, 11, 17	Stems, roots
<i>Vernonia amygdalina</i> Del.	Shrub	Asteraceae	3, 10, 17, 23	Leaves, stems, roots
* <i>Xanthosoma sagittifolium</i> Schott	Herb	Araceae	10, 23, 30	Leaves, corms, whole plant
<i>Zea mays</i> Linn.	Herb	Poaceae	4, 7, 9, 10, 17, 30	Fruits, stems
<i>Zingiber officinale</i> Rosc.	Herb	Zingiberaceae	4, 17, 18, 23, 24	Stems, rhizomes

Ethnobotanical uses: 1: Bait, 2: Building, 3: Toothbrush, 4: Commercial, 5: Dyes, 6: Fence, 7: Fibre/Cordage, 8: Field-tool, 9: Fodder/Feed, 10: Food/Condiment, 11: Fuel, 12: Furniture, 13: Gum/Resins, 14: Handcrafts, 15: Home Tool, 16: Latex, 17: Medicine, 18: Oil, 19: Ornamental, 20: Plaiting/Weaving, 21: Religious/Cultural, 22: Soap, 23: Spice/Flavouring, 24: Stimulant, 25: Sweeteners, 26, 27: Timber, 28: Toxic, 29: Work tool, 30: Wraps/Packing. *Endangered species. **Endemic species

Funtumia elastica, *Hallea stipulosa*, *Hannoa klaineana*, *Hylodendron gabunense*, *Khaya grandifoliola*, *Lannea welwitschii*, *Lovoa trichilioides*, *Nauclea diderrichii*, *Oxystigma mannii*, *Staudtia stipitata*, *Tripochiton scleroxylon* and *Uapaca togoensis*); the fruit species (*Canarium schweinfurthii*, *Dialium guineense*, *Irvingia gabonensis*, *Maesobotrya bateri*, *Microdesmis peberula*, *Momordica charantia*, *Pentaclethra macrophylla*, *Synsepalum dulcificum* and *Tetracarpidium conophorum*); the spices, flavouring and thickeners (*Aframomum melegueta*, *Irvingia gabonensis*, *Piper guineense*, *Tetrapleura tetraptera*, *Xylopia aethiopica*); the beverages (*Cocos nucifera*, *Elaeis guineensis*, *Ananas comosus*, *Annona muricata*, *Sacoglottis gabonensis* and *Synsepalum dulcificum*) and the medical species (Table 3). The homestead gardens contain a great number of these species (Table 2).

The forests and animal diets: The forests are natural habitats of various animal species, some endemic to Nigeria (*Cercopithecus sclateri*, *Cercocebus torquatus*, *Cercopithecus mona* and *C. nictitans*). Some of the animals are important bush meat source most appreciated by the people of the Niger Delta. The most important venison of these forest are *Cephalophus* sp. and *Thryonomys swinderianus*. The population sizes of these animals have been greatly reduced due to indiscriminate poaching, habitat fragmentation and loss to various forms of anthropogenic activities including oil exploration and exploitation. The plant species used by *Cephalophus* sp. and *T. swinderianus* as food sources include those cultivated in homestead gardens (e.g., *Colocasia* sp.,

Corchorus olitorius, *Curcubita moschata*, *Dioscorea dumentorium*, *Manihot esculentus*, *Solanum macrocarpum*, *Telfairia occidentalis* and *Zea mays*) as well as the fruits of *Elaeis guineensis*, *Irvingia gabonensis*, *Persea americana* and *Psidium guajava* and those found in the forests: *Alchornea cordifolia*, *Allanblackia floribunda*, *Centrosoma pubescens*, *Dialium guineense*, *Lonchocarpus cyanesens*, *Macaranga barteri*, *Maesobotrya barteri*, *Manniophyton fulvum*, *Microdesmis puberula*, *Pterocarpus* sp. and *Voacanga africana*. The monkeys (*Cercopithecus* sp. and *Cercocebus torquatus*) feed on the above fruits species.

The forests as sources of building materials: The traditional house in the Niger Delta is built from the materials obtained from the forests. This is obvious in the more isolated villages. Materials for the buildings come from species such as *Acioa barteri*, *Alstonia* sp., *Bambusa vulgaris*, *Berlinia grandiflora*, *Cocos nucifera*, *Elaeis guineensis*, *Klainedoxa gabonensis*, *Myrianthus arboreus*, *Uapaca* sp. and *Raphia hookeri* among others. These traditional houses are fast disappearing and are being replaced by modern ones because over-exploitation of the forests had brought about scarcity of these building materials, the regenerating forests do not contain materials old enough to be used in building; it takes more time to search for and obtain available and needed materials; and since the advent of oil exploration and exploitation some of the rural dwellers who are gainfully employed want to have same standards of living as city dwellers (Rico-Gray *et al.*, 1991). This has resulted in

Table 3: Some uncultivated plant species identified for medical use in the Niger delta region, Nigeria

Species	Family	Action	Usage
<i>Abrus precatorius</i> Linn.	Malvaceae	Nervous disorders treatment	Infusion of seeds
<i>Abutilon mauritianum</i> (Jacq.) Medic.	Malvaceae	Alleviates pectoral pains	Mucilage of leaves
<i>Achyranthes aspera</i> L.	Amaranthaceae	Diuretic, anti-pneumonia	Infusion, decoction of whole plant
<i>Aframomum melegueta</i> K. Schum.	Zingiberaceae	Bechic, expectorant, mucolytic	Fresh seeds
<i>Aframomum sceptrum</i> (Oliv. and Hanb) K. Schum.	Zingiberaceae	Anti-flatulent, calms nervous stomach spasms	Fresh fruits, essence
<i>Aframomum strobilaceum</i> (Sm.) Hepper	Zingiberaceae	Anthelmintic	Root decoction
<i>Ageratum conizoides</i> Linn.	Asteraceae	Wound healer, antiseptic	Poultice leaves
<i>Aichornia laxiflora</i> (Benth.) Pax. and K. Hoffm	Euphorbiaceae	Gonorrhoea treatment	Leaves and roots decoction
<i>Alternanthera pungens</i> H. B. K.	Amaranthaceae	Febrifuge	Infusion of leaves
<i>Alternanthera sessilis</i> (Linn.) R. Br. Ex Roth	Amaranthaceae	Febrifuge, snake bite	Infusion, decoction of stems and leaves
<i>Anthoantha macrophylla</i> P. Beauv	Fabaceae	Wound healer	Compress with sap of bark
<i>Argemone mexicana</i> Linn.	Papaveraceae	Skin mycosis, scabies	Lotions, latex
<i>Aspilia africana</i> (Pers.) C. D. Adams	Asteraceae	Alleviates asthma	Leaf decoction
<i>Asystasia gangetica</i> (Linn.) T. Anders	Acanthaceae	Anti-rheumatic, analgesic	Leaf juice and lotion
<i>Bryophyllum pinnatum</i> (Lam.) Oken	Crassulaceae	Coughs, boils treatment	Leaf juice, liniment
<i>Canarium schweinfurthii</i> Linn.	Burseraceae	Cough, piles treatment	Bark decoction
<i>Chromolaena odorata</i> (L.) R.M. King and Robinson	Asteraceae	Hepatitis, jaundice healing	Infusion of leaves, decoction of whole plant
<i>Cleome viscosa</i> Linn.	Capparidaceae	Ear troubles treatment	Juice, lotion of leaves, whole plant
<i>Cnestis ferruginea</i> D.C.	Connaraceae	Enema for dysentery, diarrhea, sinusitis, gonorrhoea	Root decoction and juice
<i>Combretum hispidum</i> Laws	Combretaceae	Jaundice treatment	Raw root chewed
<i>Combretum zenkeri</i> Engl. and Diels	Combretaceae	Depurative, diuretic, sudorific	Leaf extract, decoction
<i>Commelina africana</i> Linn.	Commelinaceae	Laxative, beneficial in leprosy	Infusion, decoction of whole plant
<i>Commelina diffusa</i> Burm. f.	Commelinaceae	Soothes skin itching, wound healer, abscess	Poultice plant, compress
<i>Costus afer</i> Ker-Gawl	Zingiberaceae	Rheumatism relief	Leaf decoction
<i>Costus schlechteri</i> Winkler	Zingiberaceae	Wound healer, earaches	Plant extract, decoction
<i>Coula edulis</i> Baill.	Olacaceae	Anaemia, dysentery alleviation	Powered bark decoction
<i>Datura stramonium</i> Linn.	Solanaceae	Anti-rheumatic, asthmatic, earache	Poultice of leaves with oil, flower juice
<i>Desmodium turuosium</i> (Slo.) DC	Fabaceae	Soothing, anti-inflammatory in haemorrhoids	Leaf extract in enema
<i>Diodia scandens</i> Sw.	Rubiaceae	Asthma treatment	Leaf extract as emetic
<i>Emilia coccinea</i> (Sims) G. Don.	Asteraceae	Antitussive, calms coughs	Infusion of plant
<i>Emilia sonchifolia</i> (Linn.) DC	Asteraceae	Antitussive, bechic, calms tonsillitis	Infusion of plant
<i>Eramomastox speciosa</i> (Hockst.) Cufod	Acanthaceae	Treatment of diabetes	Leaf juice, lotion
<i>Euphorbia heterophylla</i> Linn.	Euphorbiaceae	Laxative	Decoction of leaves
<i>Euphorbia hirta</i> Linn.	Euphorbiaceae	Sickle cell ailment treatment	Decoction of leaves, roots
<i>Fagara zanthoxyloides</i> Lam.	Rutaceae	Treatment of sickle cell ailment	Decoction, infusion of leaves, bark
<i>Ficus exasperate</i> Vahl.	Moraceae	Stops haemorrhage, eye sore	Leaf juice
<i>Gloriosa superba</i> Linn.	Liliaceae	Heals leprosy	Root decoction
<i>Glyphaea brevis</i> (Spreug.) Monachino	Tiliaceae	Antiseptic in venereal discharges	Decoction of leaves
<i>Hallea stipulosa</i> (DC) J. F. Lersy	Rubiaceae	Prevents stomach spasms	Boiled root chewed
<i>Heterotis rotundifolia</i> (Sm.) Jac-fet	Melastomataceae	Treatment of conjunctivitis	Leaf lotion
<i>Hippocratea palensis</i> Planch. Ex Oliv.	Hippocrateaceae	Calms stomach ache	Fruit pulp
<i>Icacina trichantha</i> Oliv.	Icacinaceae	Treatment of mumps	Tuber juice, lotion
<i>Ipomoea involucreate</i> P. Beauv.	Convolvulaceae	Laxative, analgesic	Leaf infusion
<i>Irvingia gabonensis</i> Bail.	Irvingiaceae	Useful for malaria	Bark decoction
<i>Justicia schimperii</i> (Hochst) Dandy	Acanthaceae	Enema for umbilical pains in children	Leaf decoction, infusion
<i>Laportea caestuans</i> (Linn.) Chew.	Urticaceae	Assuages asthma	Air-dried leaves
<i>Laportea ovalifolia</i> (Schum. and Thom.) Dandy	Urticaceae	Enema for epilepsy	Leaf decoction
<i>Loranthus asphyllus</i> Sprauge	Loranthaceae	Antidiabetic	Leaf decoction
<i>Mallotus oppositifolius</i> (Geisel) Mull. Arg.	Euphorbiaceae	Stops bleeding	Leaf juice
<i>Melanthera scandens</i> (Schum. and Thonn.) Roberty	Asteraceae	Wound healer, stops bleeding	Leaf juice
<i>Melochia cochorifolia</i> Linn.	Sterculiaceae	Prevents bronchial spasms	Root lotion
<i>Milletia thomningii</i> (Schum. and Thom.) Bak.	Fabaceae	Prevents abortion, miscarriage in goats	Raw leaves, young branches
<i>Momordica charantia</i> Linn.	Cucurbitaceae	Useful in piles, jaundice, as vermiguge	Fruits, leaves
<i>Musanga cecropioides</i> R. Br.	Cecropiaceae	Indigenous medicine for toothache	Bark infusion
<i>Myrianthus arboreus</i> P. Beauv.	Moraceae	Heals haematuria	Roots liquid
<i>Naucllea diderrichii</i> (De Wild and Dur.) Merrill	Rubiaceae	Enema for indigestion	Bark decoction
<i>Palisota hirsuta</i> (Thunb.) K. Schum.	Commelinaceae	Treatment of gonorrhoea	Pounded root decoction with lime juice
<i>Peperoma pellucida</i> (L.) H. B. K.	Piperaceae	Heals earache	Juice of leaf
<i>Phyllanthus amarus</i> Schum. and Thonn.	Euphorbiaceae	Eliminates fungi, heals ringworm, scabbies	Poultices of leaves
<i>Physalis angulata</i> Linn.	Solanaceae	Stomachic invigorator	Leaf infusion, decoction

Table 3: Continued

Species	Family	Action	Usage
<i>Piper guineense</i> Schum. and Thonn.	Piperaceae	Antirheumatic, carminative, insecticidal	Pulverized seeds and fruits
<i>Platostoma africanum</i> P. Beauv.	Lamiaceae	Insecticidal	Pulverized leaves
<i>Pupalia lappacea</i> (Linn.) Juss.	Amaranthaceae	Antitussive, eases cough	Leaf decoction
<i>Rauwolfia vomitoria</i> Afzel.	Apocynaceae	Reduces blood pressure	Root decoction, alkaloids
<i>Sida acuta</i> Burm. f.	Malvaceae	Astringent, useful in urinary diseases	Root decoction
<i>Stachytarpheta cayennensis</i> (L. C. Rich) Schau.	Verbenaceae	Demulcent, soothes inflammation	Poultice of leaves
<i>Stachytarpheta indica</i> (Linn.) Vahl.	Verbenaceae	Indigenous treatment for malaria	Root infusion, decoction

dwindling economic values of these natural materials and their turn-over rates. It is suggested that rather than abandoning (the use of) these materials, modern ideas should help improve the production, quality and sustainability of these natural materials, which will enhance their cost-benefit status and high turn-over rates. These could be used for alternative or different purposes.

Homestead garden produce: A variety of produce is obtained from the homestead gardens: fruits, flavouring, oils, ornamentals, spices, vegetables and thickeners in quantities that are sold or traded locally. Their commercial values can be enhanced if production is co-ordinated and harnessed effectively from the different villages to towns where they are in high demand. These can advance the per capita income of the producers and in turn improve their living standards.

Medical plants from the forests: The Niger Delta forests harbour a large number of plant species known to be of importance in the medical and pharmaceutical industries. *Alchornea laxiflora*, *Cnestis ferruginea*, *Fagara zanthoxyloides*, *Icacina trichantha*, *Piper guineense* and *Uvaria cristata* are widely known and used as species of medicinal utility. *Aspilia africana* contains thiarubine -A in its root, a red oil that kills parasites, viruses, fungi and bacteria. *Smilax kraussiana* contains saponinic glycosides, resin and essential oil that promote elimination of urea, uric acid and other organic wastes as well as decreasing blood cholesterol level. *Strophanthus sarmentosus* is a source of drug called cortisone for the treatment of rheumatoid arthritis. Vernonioid -B₁, is a constituent of *Vernonia amygdalina* which has an antitumoral and antibacterial properties. It is used in treating schistosomiasis. The list of some plants occurring in the Niger Delta forest with their medicinal values is presented in Table 3. The information contained therein is based on indigenous knowledge of the local people. The usage of the plants has been, in the main, through extracts or in raw form for ages. However, there is need for scientific analyses of these plants for proven efficacies by biochemists, pharmacognosists, pharmacologists and pharmaceutical industries.

Endemic and endangered plants species: A number of plants species in the Niger Delta forest are endemic and endangered (Table 1 and 2). Endemism and a number of sub-species presence in the study area are evidenced in phylogenetic plasticity and the dynamics of ecological and environmental perturbations (Khan *et al.*, 2003).

The loss of plant biodiversity in the Niger Delta is precipitated by anthropogenic factors of over-extraction, unsustainable agriculture and forestry practices, pollution, land use changes, urbanization and probably global climate change. These culminate in biodiversity depletion and diminished productivity. Over extraction target species are those used as fuelwood, in medicine, in building, as timer and as fodder. Observations show that due to extensive use of plant species for these purpose, a large number of plants are endangered.

Conservation methods: An important element in the relationship between ethnobotany and conservation is the detailed knowledge of the components of biodiversity possessed by the natives over the years and the dynamics of the ecosystem. Through observations, assessments and experimentations, these natives have successfully adopted their production methods towards the characteristics of these biological resources. The possession of this biodiversity-related knowledge should be preserved through capacity building in order to compliment scientific knowledge and provide information on biological system (Singh *et al.*, 2008). This will also make it possible for the socio-cultural, economic and religious significance of many plants to be transferred from generation to generation. This requires education strategies that will raise the level of awareness of the natives in the conservation of biodiversity.

The indiscriminate over-exploitation of plants that impinges on food security and health care should be avoided and halted. No wild plant species should be endangered through international trade. There should be the promotion of *in situ* and *ex situ* cultivation of the endemic, medicinal and more obvious economic species (Rana, 2007). Conservation of the plants should also take the form of systematic protection through breeding. The protected areas in form of groves and nature reserves in the region should be preserved. All these could be

achieved through collaborative cooperation of governments, Non-governmental organizations (NGO's), community-based organizations (CBO's) the natives, schools, colleges and other higher institutions.

As biodiversity involves global environmental change, species extirpation or extinction and changes in societal values (Khan *et al.*, 2003), ethnobotany offers an effective approach to plant biodiversity conservation, since this provides a wealth of data on timber and non-timber products which can be rationally exploited. Thus, commodities can be extracted from plant communities with minimal environmental damage and hence provide incentive for conservation. Conservation for diversity and stability, aesthetic, ethical, scientific values and utilitarian purposes is rooted in ethnobotany, which is the most cost-effect method to be practiced.

CONCLUSION

The economic importance of the tropical lowland rainforests rural dwellers in Niger Delta is emphasized. Though the natural environments of these forests have been modified by activities of man (arable farming, animal and oil exploitation, capital development, forestry production), the establishment of management systems that are flexible, adaptive and experimental would allow for sustainable exploitation while conserving them (Sayer *et al.*, 2000). These management systems should involve immediate economic benefits by integrating components (e.g., agroforestry, agrosilviculture) that will promote and complement long-term economic benefits. In addition, enforcement of forests laws, improvement of forest policy and adoption of rules and regulations should be in practice (Li *et al.*, 1999). When these strategies are combined with other vegetation studies and effectively applied, they would provide sustainable means of utilizing the natural resources of these forests and probably bring about compatibility of conservation of nature.

ACKNOWLEDGMENTS

The author thanks the Akwa Ibom State Environmental Protection Agency, Uyo; Universal, Scientific and Industrial Company, Uyo and the Prodec-Fugro, Port Harcourt for their financial supports.

REFERENCES

Abioye, A., P. Hiernaux, M. Briejer, H. Udo and R. Tabo, 2009. Uses of local plant species by agropastoralists in South-Western Niger. *Ethnobot. Res. Appl.*, 7: 53-66.

Akobundu, I.O. and C.W. Agyakwa, 1987. Guide to West African Weeds. IITA, Ibadan, pp: 522.

Banzouzi, J.T., A. Prost, M. Rajemiarimiraho and P. Ongoka, 2008a. Traditional uses of the African *Millettia species* (Fabaceae). *Int. J. Bot.*, 4: 406-420.

Banzouzi, J.T., M.C. Makambila-Koubemba, A. Prost, B. Mbatchi and A.A. Abena, 2008b. Survey of analgesic plants used by tradipractitioners in Congo Brazzaville. *Int. J. Bot.*, 4: 176-185.

Bussmann, R.W., D. Sharon and J. Ly, 2008. From garden to market? The cultivation of native and introduced medicinal plant species in cajamarca, pera and implications for habitat conservation. *Ethnobot. Res. Appl.*, 6: 351-361.

Clay, J.W., 1988. Indigenous Peoples and Tropical Forest. Cultural Survival Inc., Cambridge, MA.

Duchelle, A.E., 2007. Observations on natural resource use and conservation by the shuar in ecuador's cordillera del condor. *Ethnobot. Res. Appl.*, 5: 5-23.

Etukudo, I., 2000. Forests our Divine Treasure. Dorand Publishers, Uyo, pp: 194.

Etukudo, J., 2003. Ethnobotany: Conventional and Traditional Uses of Plants. The Verdict Press, Uyo, Nigeria, ISBN-13: 978-001-625-2, pp: 191.

Gorman, J.T., A.D. Griffiths and P.J. Whitehead, 2006. An analysis of the use of plant products for commerce in remote aboriginal communities of northern Australia. *Econ. Bot.*, 60: 362-373.

Hamayun, M., S.A. Khan, H. Kim, C.I. Na and I. Lee, 2006. Traditional knowledge and *ex situ* conservation of some threatened medicinal plants of Swat Kohistan, Pakistan. *Int. J. Bot.*, 2: 205-209.

Hutchinson, J. and J.M. Dalziel, 1954-1972. Flora of West Tropical Africa. In: Crown Agents for Overseas, Keay, R.W.J. and F.N. Hepper (Eds.). Government and Administrations, London.

Khan, T.I., A.K. Dular and M.S. Deepika, 2003. Biodiversity conservation in the Thar Desert; with emphasis on endemic and medicinal plants. *Environmentalist*, 23: 137-144.

Kokwaro, J.O., 1995. Ethnobotany in Africa. In: Ethnobotany-Evolution of a Discipline. Schultes, R.E. and S. von Reis (Eds.). Chapman and Hall, London, ISBN-10: 0412722704, pp: 216-225.

Kunwar, R.M., Y. Uprety, C. Burlakoti, C.L. Chowdhary and R.W. Bussmann, 2009. Indigenous use and ethnopharmacology of medicinal plants in far-West Nepal. *Ethnobot. Res. Appl.*, 7: 5-28.

Li, C., J. Koskela and O. Luukkanen, 1999. Protective forest system-in China current status, problems and perspective. *Ambio*, 28: 341-345.

- Peters, R.H., 1991. *A Critique for Ecology*. Cambridge University Press, New York.
- Rana, S.V.S., 2007. *Essentials of Ecology and Environmental Science*. 3rd Edn., Prentice-Hall, New Delhi, pp: 536.
- Rangeley, R., B.M. Thiam, R.A. Andersen and C.A. Lyle, 1994. *International River Basin Organisation in Sub Saharan Africa*. Inor Publicaties, Washington DC.
- Rico-Gray, V., A. Chemas and S. Mandujano, 1991. Uses of tropical deciduous forest species by the Yacatecan Maya. *Agrofor. Syst.*, 14: 149-161.
- Sayer, J. N. Ishwaran, J. Thorsell and T. Sigaty, 2000. Tropical forest biodiversity and the world heritage convention. *Ambio*, 29: 302-309.
- Singh, J.S., S.P. Singh and S.R. Gupta, 2008. *Ecology, Environment and Resource Conservation*. Anamaya Publishers, New Delhi, pp: 688.
- Sofidiya, M.O., O.A. Odukoya, A.J. Afolayan and O.B. Familoni, 2007. Survey of anti-inflammatory plants sold on herb markets in Lagos, Nigeria. *Int. J. Bot.*, 3: 302-306.
- Sofowora, A., 1982. *Medicinal Plants and Traditional Medicine in Africa*. 1st Edn., John Wiley and Sons, Chichester, New York, ISBN-10: 0471103675, pp: 256.
- Sokal, R.R. and F.J. Rholf, 1995. *Biometry*. W.H. Freeman and Company, New York, pp: 887.
- Spellerberg, I.F., 1995. *Conserving Biological Diversity*. In: *Conservation Biology*, Spellerberg, I.F. (Ed.). Longman, USA.
- Vargas-Ponce, O., D. Zizumbo-Villarreal and P. Colunga-GarciaMarin, 2007. *In situ* diversity and maintenance of traditional *Agave* landraces used in spirits production in West-Central Mexico. *Econ. Bot.*, 61: 362-375.