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ECOTAXONOMIC BASELINE EVALUATION OF THE PLANT SPECIES IN A SEASONALLY FLOODED FOREST LAND PROPOSED FOR A RIVGAS REFINERY PROJECT IN ASE-NDONI, RIVERS STATE, NIGERIA

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ABSTRACT

The survey of the flora composition of an ecosystem is important in several environmental baseline studies. An ecotaxonomic assessment was carried out in Ase-Ndoni proposed Rivgas Refinery project site in other to find out the plant species of medicinal and other economic values. The investigation was carried out to establish a baseline data for imminent environmental vicissitudes and envisaged ecological vagaries as could be the case with the Rivgas Refinery Project. A simple random sampling based on standard procedure for ecological assessment was employed in this study. Results of the enumeration show seasonal variation in species frequency of occurrence. A total of 41 and 24 representative species of medicinal and other economic plants were recorded in the wet and in the dry seasons. These reflect a rich flora diversity of ethnobotanical values in the project site. Hence the envisaged event of uncontrolled and accidental hydrocarbon and effluent discharge, a preconceived knowledge of the vegetation could be helpful in the determination of the long and short term effects of such ecological problem.

KEYWORDS: Environment, project area, vegetation sampling, species abundance, and medicinal / economic species.

INTRODUCTION

Baseline studies usually refer to a collection of background information and data on the physical environment and socio-economic setting of a proposed site for development. As a *sin-qua-non* in environmental management, it is done prior to impact assessment of the given area. It seek to strike a balance between obtaining sufficient information to describe existing features, their inter-relationship and overall environmental status or quality, while obtaining detailed data on the current status and trends of the vegetation to enable specific impacts be predicted. (Nwafor, 2006).

Socio ecological changes are always enshrined in every developmental activity (Aus AID, 2003). A good monitoring and evaluation system will indicate any probable changes and results of the activities, including eventual impacts and the extent of the desired results achieved and their sustainability (Aus AID, 2003; Collin, 2005; Minteer and Collins, 2005). On a parallel maxim, baseline study ensures that the proposed activities of Rivgas project are executed in accordance with statutory requirements, without much damaging effects on the environment. Baseline studies may involve the collection of existing information or may require the acquisition of new data through field sampling. It is an aid to obtaining new data through ethnobotanical interviews, which are relevant for obtaining baseline information on the economic importance of the biota in the proposed site.

Ethnobotany is a study of plants used by the aboriginal people. (Jain, 1989). It involves the use of plants in the early societies for economic purposes. Ethnobotany includes economic botany, sustainable harvesting (ethical wildcrafting), ethics and intellectual property right (IPR) and as a representational voice for the cultures where the field works is done (Ethnogarden, 2003). It entails human evaluation and manipulation of plant materials, and phenomenon, including relevant concepts in primitive or unlettered societies (Victor and Haberta, 1991). Man's survival has been linked to his innate curiosity to examine by trial and error all aspects of his environment. Every society tries to make meaning out of the natural environment surrounding her (Victor and Haberta, 1991). This means that members of every society respond to their environment by assessing the varieties of the environmental imparts on its life, e.g. ill-health, death and other threats to their basic survival and social existence (Victor and Haberta, 1991). In the Rivers State rapid developmental projects have resulted in the loss of flora biodiversity. The escalating clearing of vegetation for infrastructural development and other capital project have resulted in a drastic decline in the supply of biophyto-resources of great importance. Besides, the demands for most forest products have increased following population increase. These two factors; growing demand and dwindling resources implied that many useful plant species are at risk of extinction hence most of the original forests have either been completely lost or severely

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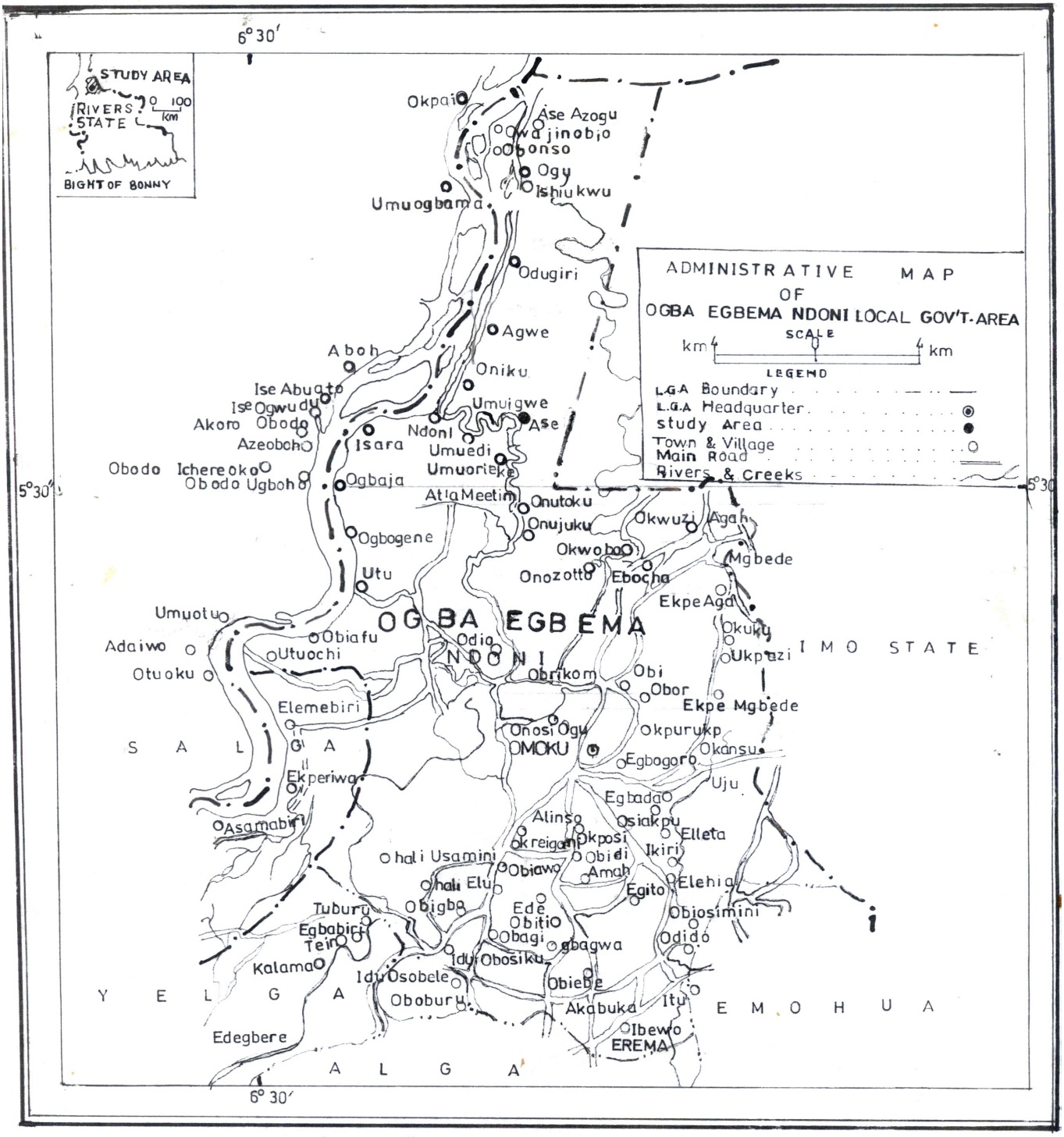
degraded. There is urgent need to protect the remaining forests. The desire to provide baseline information on the importance of the indigenous plant resources of of Ase in Onelga Rivers State, excited this study.

The aim of the study are to identify the plant species used for ethnobotanical purposes, document their uses and recommend mitigation measures for the envisioned adverse impacts on both the ecosystem and humanity.

MATERIALS AND METHODS

The Project area:

The project area is a portion of the marshy tropical rainforest, sandwiched between Rivers Orashi and Niger, in Ase, Ogba Egbema Ndoni Local Government Area, located between latitude $5^{o}25^{1}$N and $5^{o}35^{1}$N and longitude $6^{o}30^{1}$E and $6^{o}40^{1}$E (Fig.1). The project area is characterized by high rainfall, high relative humidity and moderate temperature. The area is in the centre of one of the agricultural zones of Rivers State. The edaphic and topographic status, show that the site is ecologically characterized by silty-clay soil, with narrow strips and pockets of fresh water ponds among the vegetation array. The vegetation is a typical virgin rainforest and contained woody tall shrubs, trees, herbs, woody climbers' (lianers), mainly members of the Poaceae, Cyperacae, and Fabaceae families. The vegetation is a typical water forest zone with prevalence of aquatic flora like *Nymphaea maculata* Schum and Thonn, *Nymphaea lotus* Linn, *Nymphaea odorata* Ait. *Eichhornea crassipes* and associated pteridophyte (ferns) of the wetland habitat. Though originally a virgin forest of various floral strata, the effects of various forms of anthropogenic activities such as farming, logging and
domestic fire wood fetching have consequently reduced it to a lowland secondary mosaic forest (Hopkin, 1968). Despite such ecological succession seen to be engendered by anthropogenic influences, the vegetation can be described as rainforest vegetation in relation to similar view of vegetation analysis by SAF (1954).



MAP OF OGBA/EGBEMA/NDONI LOCAL GOV'T. AREA SHOWING ASE – STUDY AREA.

Vegetation sampling and analysis

This study was carried out in the rainy and dry seasons respectively. The sampling method used in the study was simple random sampling, based on standard procedures (Kinako, 1988) for ecological assessment. Sampling was along specific transect of 1200m distance at 100m interval, involving a total of 15 sampling locations for 5 transect directions. Representative specimens were collected from the study transect, using shears. Important plant species sampled were identified in the field as far as possible. Some voucher samples were immediately placed in-between absorbent papers and wooden press to remove any form of moisture prior to their transfer to the drier in the herbarium for preservation. Other voucher samples were stored in labelled polythene bags, until they were pressed and treated using the standard herbarium methods of Kershaw (1975). The specimen were identified and confirmed following Hutchinson *et al,* (1986). The frequency of distribution and abundance was estimated using the method described by Kershaw (1975) and Austin and Greigsmith (1968). The vegetation was described in semi-quantitative terms (Pryor, 1981), and species with a wide frequency of distribution with many stands was described as *very abundant* (++++). Some species with similarly wide frequency of distribution but with few stands are seen to be *less frequent, abundant, restricted* or *occasional* (+++), the species of limited geographical distribution and with few stands were termed *scarce* (++) and *very scarce* (+). The species designated (++) and (+) are often envisaged as being endangered because of their limited occurrence. Ethnobotanical interview were carried out among key informant in the local community around the project site, to obtain information in the traditional uses of the representative sampled species. A randomized sampling group of 8 people (key informant, representative of the people in the community) was employed and their response used to ascertain the various uses of the plants within the area.

RESULT

Tables 1 and 2 show the species sampled in the wet and dry seasons respectively. A total of 21 and 18 families containing 41 and 24 plant species sampled in wet and dry season respectively were identified, with their distribution and their quantitative level of occurrence. Among the various woody and non-woody species, 12, 14, and 15 species sampled in the wet season were of medicinal, economic and economic / medicinal purposes (multiplier effect) while in the dry season 6, 8 and 10 species have potential for medicine, economic and economic / medicinal purposes respectively. Also result has indicated variation in species frequency of occurrence with the wet season recording greater species abundance. Five and eight species in the wet season were very abundant and abundant respectively while none was recorded in dry season, which however had low species diversity or amplitude. Result has also indicated some species with multiplier effect in terms of having both economic and medicinal values.

DISCUSSION

Local knowledge of plants in true traditional practice is recognized all over the world. Many species have long been used in human and animal medicine. These products and their industrial or synthetic equivalents continue to serve our need. As presented in Tables 1 and 2 (reflecting the wet and dry season sampling) a total of 39 plant families consisting 65 representative plant species of important ethnobotanical values were recorded on the vegetation study of the site. This corroborate with the fact that ethnobotany is increasingly becoming an important aspect of plant research emanating from the global drive towards the documentation of customary use, the need for bioconservation and knowledge of plants (Cunningham 1994). There is a significant variation in the frequency of species occurrence or abundance in both seasons. Limited number of species shows dominance throughout the dry season sampling period when compared to the wet season. While the wet season sampling had a representative sample of 41 species in 21 families, the dry season had 24 representatives in 18 families, which means a decline in percentage frequency of occurrence and species amplitude in dry season. There is wide ecological amplitude of species dominance and diversity in the wet season. Several factors are known to contribute to changes in species diversity and composition at any given time and place. Such variation in amplitude of species in both seasons could possibly be due to the fact that the environment has witnessed some pronounced form of anthropogenic activities such as incessant massive logging activities for both domestic and financial earnings by the local communities. Other activities culminated into fields of plantation farms such as *Musa paradisiaca* Linn. *Manihot esculenta* Crantz, *Citrus sineensis* Linn (Osbeck) and *Dacryodes edulis* (G. Don) H. J.Lam. Thus contributed to reduction in the ethnobotanical flora diversity of the area. This also corroborate with the observation by Ahmed *et al* (2004) that vegetation in an anthropogenic influenced habitat are linked to ever increasing synanthropisation, which Koran (1983) has attributed to a number of processes, which ensues totality of changes in plant cover as result of direct or indirect human activities. There has been evidence that human activity as early as "*Iron Age*" in France had an important influence on plant biodiversity (Cubizollel *et al,* 2003). This argument is further supported by the fact that landscapes are never static, their elements are in permanent temporal and spatial flux (Stemier and Koliler, 2003, Brown and Laband, 2006). Similar effect has been recorded in a tropical Brazilian rainforest on pteridophyte as a result of fragmentation and other habitat alteration by human dynamics (Paciencia and Prado, 2005). Nai-Bregaglio *et al,* (2002) observed grazing effect on the floristic and structural diversity in mountain grasslands in Central Argentina. Similar studies were also carried out by Said (2002) on the Mediterranean Island of Corsica, while Luoto *et al,* (2003) reported the loss of plant species richness and habitat connectivity in grass land due to agricultural changes in Finland.

Also the reduction in dry season species richness of the area could be due to loss of annual species that

may not be environmentally adapted to the decline in moisture content (dry habitat) in the dry season and consequently causing irregular mosaic vegetation features with reduction in species diversity. This has contributed to the decline and changes in ethnobotanical flora diversity of the project site in the dry season prior to the actual refinery operation. This assertion could be reaffirmed by a macro scale study, which has attributed species diversity richness to be a product of water energy dynamics (O' Brien *et al,* 1988). Tropical studies have correlated the importance of moisture and related factors to species richness (Brown, 1988). Similarly changes in the gradient of species richness pattern have also been commonly explained by factors such as climate, productivity and other energy – related factors (Currie, 1991; Rohde, 1992; Wright *etal,* 1993; Grytness *et al,* 1999), while Lomolino (2001) had pointed out that many components of climate and local environments such as temperature, precipitation, seasonality and disturbance regimes vary along species amplitudinal gradient, which ultimately create variation in their richness.

Habitat alteration (including habitat loss, degradation and fragmentation) is now among the major cause of ecosystem degradation by human activities (Whitfield *et al*, 2002). Accordingly this has been receiving a lot of interest against the background of germplasm erosion because of synthetic alternative and the need for bioconservation of sacred medicine vegetation. (Anderson *et al,* 2005).

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CONCLUSION AND RECOMMENDATION

In the present study the ethnobotanical enumeration of the vegetation reveals a number of points that may be concluded in relation to the objectives of the study. In accordance with the major objectives of this baseline study, the assessment been carried out had shown that the project site is richly endowed with floras of ethnobotanical values. On the whole, the flora is quite rich in species, despite the 65 representative species recorded. An investigation and understanding of the ethnobotanical flora of our ecosystem is important in several environmental baseline and impact studies. Such investigation is carried out in order to establish the degree of imminent environmental vicissitudes and recovery of such envisaged ecological vagaries as could be the case with the Rivgas Refinery Project.

In the event of uncontrolled and accidental hydrocarbon and effluent discharge, a preconceived knowledge of the vegetation is helpful in the determination of long and short-term effects of such spillage on major ecological habitats of the affected area. It will also facilitate the identification of associated environmental problems that may arise as a result of the incident. This exploration also supports the calling for the recognition and documentation of ethnobotanical importance of the species in the study area, thus giving adequate support to the assessment of socio-economic implications of ecological predicament. This is buttressed by the fact that natural habitats are under the influence of anthropogenic dynamics on daily basis.

While it is important for science and nature to embrace with the aim and objectives of integrating global and local perspective on the use of plants, and biodiversity information economic development should not come at the expense of cultural and biological diversity (Martin *et al*, 2002). It is important to vitalize biological cultural diversity by focusing on community based ethnobotanical research and action. Community flora diversity inventories can contribute to improving people's standard of living by encouraging the: Maintenance of traditional tree species of ethnobotanical values and related use of non-cultivated plants in traditional systems, sustainability of critical species of economic and medicinal values, continuity in knowledge and subsistence systems based on a wide range of plant resources, abatement of fire outbreak in the area and surrounding vegetation, establishment of contingency plan, which addresses the identification and protection of vulnerable and sensitive areas including surrounding vegetation of ethnobotanical values, creation and development of buffer zone for flora that may have been displaced or lost their natural habitation as a result of such a project, routine inspection of refinery structure and other facilities as to ensure facility integrity and guide against pollutant release on vegetation of the area, protection of forest, wetlands and other habitats for water catchment protection, ecotourism and other benefits.

Above all, conserving our natural resources and information on the traditional use of these resources will go a long way to improving our way of life. One of the ways of doing this is by creating a community register. This is the baseline documentation of the resources and indigenous knowledge at the local, regional and global levels by the people themselves for the purpose of sustainable rejuvenation of ecological basis of life so that generations to come will still benefit from nature's bounty to man.

Table 1: Wet Season List of Tree Species of Economic & Medicinal Values Recorded at the Project Site

S/N	SPECIES	%F	FAMILY	COMMON NAME	PARTS USED	NOTE/REMARK
1	*Musanga cecropoides* R.Br.	53.3	Cecropiaceae	Umbrella tree	(R); (B); (T), Sap	For economic wood works craft, shelter in farm land etc.
2	*Elaeis guineensis* Jacq.	80	Arecaceae	Oil palm tree	(F), (T), frond	Most economic tree, for cooking, industrial local soap productions, rachis for building, trunk for road bonbs etc
3	*Hallea ciliata* Aubr. & Pelleger	80	Rubiaceae	Abura	(T);	Economic use, for building
4	*Anthoclesita nobilis* G. Don	60	Loganniaceae	Cabbage tree palm	(B); (R); (L); shoot	Medicinal, for veneral disease treatment.
5	*Irvingia gabonensis* (Aubry Lecomte)Baill.	53.4	Ixonanthaceae	Bush mango	(F);	Domestic use- as soup thickener in cooking, and enhance labour in traditional child birth medicine.
6	*Ficus sur* Forssk	26.6	Moraceae	Ficus	(B); (R); (L);	Medicine for diabetic patient
7	*Ficus exasperata* Vahl.	13.4	Moraceae	Sandpaper plant	(B); (L);	Medicine for eczema and ringworm treatment.
8	*Cleistopholis patens* (Benth) Engl & Diels	60	Annonanceae	Salt & oil tree	(B);	Medicinal purpose for nursing mother that has cough after local child birth.
9	*Rauvolfia vomitoria* Afzel	40	Apocynaceae	Swizzle stick	(R)	Medicinal purpose for measles and rashes after boiling the root.
10	*Terminalia superba* Engl & Diels	26.6	Combretaceae	White Afara	(T)	Economic use for building
11	*Milicia excelsa* (Welw) C.C. Berg	26.6	Moraceae	Iroko tree	(T)	Economic use for building
12	*Harungana madagascariensis* Lam.Expoir	80	Guttiferae	Dragoon's blood	(B); (L); Gum/sap	Economic use in drying fish and medicinal for skin rashes.
13	*Alchornea cordifolia* (Schum. & Thonn.) Mull-Arg	53.4	Euphorbiaceae	Christmas bush	(L); (R);	Medicinal use as mouth washes for toothache and also chewed as appetizer.
14	*Alchornea laxiflora* (Benth.) Pax & K. Hoffm	53.4	Euphorbiaceae	Christmas bush	(L); (R);	Medicinal use as mouth washes for toothache and also chewed as appetizer.
15	*Mallotus oppositifolius* (Geisel.) Mull-Arg.	26.6	Euphorbiaceae	Kamala-tree	Seeds	Medicinal use for dysentery and sore eyes.
16	*Mallotus subulatus* Mull-Arg	40	Euphorbiaceae	Kamala tree	Seeds	Medicinal use as antidote
17	*Triplochiton scleroxylon* K. Schum	80	Sterculiaceae	Obeche	Trunk	Economic/domestic for building
18	*Khaya ivorensis* A.Chev	80	Meliaceae	Mahogany	Trunk	Economic/domestic for building purpose
19	*Diospyros ebenum* Hiern.	26.6	Ebenenaceae	Ebony	Trunk	Economic/domestic for building purpose
20	*Raphia hookeri* Mann & Wendl	40	Arecaceae	Palm wine tree	Sap, (L); (T),	Medicinal for skin rashes and economic use for wine production.
21	*Anthoclieista vogelii* Planch;	13.4	Loganiaceae	Cabbage tree	(L); (R); (B); shoot	Medicinal use, veneral diseases.
22	*Voacanga africana* Stapf.	53.4	Apocynaceae	N.A	(L); (R); (B);	Medicinal use for washing of sores, and hernia and diarrhoea treatment.
23	*Dialium guineense* Willd	13.4	Fabaceae-Caesal	Velvet tamarind	(S); (F); (L);	Medicinal for tumour & Economic use as food.
24	*Funtumia africana* (Benth.) Stapf.	26.6	Apocynaceae	False rubber tree	Whole	Medicinal for kidney problem &

						economic use for stools and door carving.
25	*Ficus mucuso* Welw *ex.* Ficalho	13.4	Moraceae	Fig tree	(L); (B);(R);	Medicinal use, high blood pressure
26	*Ceiba pentandra* (Linn.) Gaertn	26.6	Bombacaceae	White silk-cotton cotton tree	Whole	Economic use for building and canoe carving.
27	*Treculia africana* Decne	26.6	Moraceae	African bread fruit	Fruit (B);	Economic as food and medicinal for rheumatism.
28	*Spondias mombin* Linn.	13.4	Anacardiaceae	Hog Ashanit	Fruit (L); (R)	Economic as food and medicinal use in fungal infection of the feet.
29	*Docryodes edulis* (G. Don) H.J	53.4	Burseaaceae	Native pear	(B); (L); (R);	Economic use as food
30	*Dennetttia tripetala* Bak. F	13.4	Annonaceae	Peper fruit	Frui; (L); (R);	Economic/domestic use as food.
31	*Millettia aboensis* (Hook. F) Bak	26.4	Fabaceae-Papi	N.A	(L); (R);	Economic use for cassava fermentation.
32	*Citrus reticulata* Blanco	26.6	Rutaceae	Tangerine	Fruit; (L);(B);(R)	Medicinal for dysentary and Economic use as food.
33	*Psidium guajava* Linn	40	Myrtaceae	Guava	Fruit; (L);(R);(B)	Medicinal for running stomach and Economic use as food.
34	*Cola accuminata* (P. Beauv) Schott & Endl	13.4	Sterculiaceae	Native cola	Fruit; (B); (R);(L)	Medicinal as stimulant and Economic use as edible, and carving images.
35	*Citrus sineensis* Linn. (Osbeck).	13.4	Rutaceae	Sweet orange	Fruit (B); (R);(L)	Medicinal for constipation and Economic use as edible.
36	*Newbouldia laevis* Seem	13.4	Bignoniaceae	Man's tree	(B); (L); (R);	Economic use as hedge plant for boundary location fencing and medicinal use as eye wash in conjuctivity, massaging and skin infection.
37	*Pentachlethra macrophylla* Benth.	26.6	Fabaceae	Oil bean tree	(B); (L); (R); seed	Economic use as food and medicinal use as anti -helmintic.
38	*Cresenta cujete* Linn	13.4	Bignoniaceae	Calabash tree	Fruit; (L); (B);(R)	Economic use as in water and grain storage and medicinal use as purgative.
39	*Pterocarpus santalinoides* L'her. Ex. Dc.	13.4	Fabaceae-Papi	Forest ground nut	Fruit; (L);(B);(R);	Economic use , edible leaves as vegetable
40	*Antidesma vogelianum* Mull-Arg	13.4	Euphorbiaceae	N.A	(L); (F); (R);	Economic as domestic fire wood and medicinal use as aphrodisiac.
41	*Bambusa vulgaris* Schrad	13.4	Poaceae	Indian bamboo	Trunk,	Economic use for building and traditional drum dancing.

NOTE:
S – Seed, B – Bark , **L – Leaf, R – Root,** **T – Trunk, F – Fruit,** **NA = Not available.**
+ (15 – 19) very scarce ++ (20 – 49) scarce +++ (50 – 79) abundant
++++ (80 - ∝) very abundant.

Table 2: Dry Season List of Tree Species of Economic & Medicinal Values Recorded at the Project Site

S/N	SPECIES	%F	FAMILY	COMMON NAME	PARTS USED	NOTE/REMARK
1	*Musanga cecropoides* R.Br	20	Cecropiaceae	Umbrella tree	(R); (B); (T), Sap	For economic wood works craft, shelter in farm land etc.
2	*Elaeis guineensis* Jacq.	40	Arecaceae	Oil palm tree	(F), (T), frond	Most economic tree, for cooking, industrial local soap productions, rachis for building, trunk for road bombs etc

3	*Hallea ciliata* Aubr. & Pellegr	33.3	Rebiaceae	Abura	(T);	Economic use, for building
4	*Anthocleista nobilis* G. Don	13.3	Loganniaceae	Cabbage tree palm	(B); (R); (L); shoot	Medicinal for veneral purpose
5	*Irvingia gabonensis* (Aubry Lecomte) Baill.	7	Ixonanthaceae	Bush mango	(F);	Domestic use- as soup thickener in cooking, and medicinal use for enhancing labour in traditional child birth.
6	*Ficus exasperata* Vahl	7	Moraceae	Sandpaper plant	(B); (L);	Medicine for eczema and ringworm treatment.
7	*Cleistopholis patens* (Benth) Engl & Diels	20	Anonnaceae	Salt & oil tree	(B);	Medicinal purpose for nursing mother that has cough after local child birth.
8	*Harrungana madagascareiensis* Lom Expoir	20	Guttiferae	Dragoon's blood	(B); (L); Gum/sap	Economic use in drying fish and medicinal for skin rashes.
9	*Alchornea cordifolia* (Schum. & Thonn.) Mull-Arg	26.6	Euphorbiaceae	Christmas bush	(L); (R);	Medicinal use as mouth washes for toothache and also chewed as appetizer
10	*Triplochiton scleroxylon* K. Schum	7	Sterculiaceae	Obeche	Trunk	Economic/domestic for building purpose
11	*Khaya ivorensis* A. Chev	7	Meliaceae	Mahogany	Trunk	Economic/domestic for building purpose
12	*Voacanga africana* Stapf.	13.3	Apocynaceae	N.A	(L); (R); (B);	Medicinal use for washing of sores, and hernia and diarrhoea treatment.
13	*Ceiba pentandra* (Linn.) Gaertn.	33.3	Bombacaceae	White silk-cotton cotton tree	Whole	Economic use for building and canoe carving.
14	*Treculia africana* (Linn.)	7	Moraceae	African bread fruit	Fruit, (B); (L); (R);	Economic as food and medicinal for rheumatism
15	*Dacryodes edulis* (G. Don) H.J. Lam	7	Burseraceae	Native pear	(B); (L); (R);	Economic use as food.
16	*Millettia aboensis* (Hook. F) Bak	7	Fabaceae – Papi	N.A	(L); (R);	Economic use, fermentation of cassava
17	*Psidium guajava* Linn	7	Myrtaceae	Guava	Fruit; (L);(R);(B);	Medicinal for running stomach and Economic use as food.
18	*Cola acuminata* (P.Beauv.) Schott & Endl.	7	Sterculiaceae	Native cola	Fruit; (B);(R);(L);	Medicinal as stimulant and Economic use as edible, and carving images.
19	*Cttrus sineensis* Linn.(Osbeck)	7	Rutaceae	Sweet orange	Fruit; (B);(R);(L);	Medicinal for constipation and Economic use as edible.
20	*Newbouldia laevis* Seem	7	Bignoniaceae	Man's tree	(B);(L);(R);	Economic use as hedge plant for boundary location fencing and medicinal use as eye wash in conjuctivity, massaging and skin infection.
21	*Pentaclethra macrophylla* Benth.	20	Fabaceae-Mimo	Oil bean tree	(B);(L);(R); seed	Economic use as food and medicinal use as anti -helmintic.
22	*Cresenta cujete* Linn.	7	Bignoniaceae	Calabash tree	Fruit;(L);(B);(R);	Economic use as in water and grain storage and medicinal use as purgative
23	*Morinda lucida* Benth.	7	Rebiaceae	Brimstone tree	(B);(L);(R);	Medicinal use for yellow fever treatment.
24	*Antidesma vogelianum* Mull-Arg	13.3	Euphorbiaceae	N.A	(L);(F);(R)	Economic as domestic fire wood and medicinal use as aphrodisiac.

NOTE:

S – Seed, B – Bark, L – Leaf, R – Root, T – Trunk, F – Fruit, NA – not available
+ (15 – 19) very scarce ++ (20 – 49) scarce +++ (50 – 79) abundant
++++ (80 - $\propto$) very abundant.

REFERENCES

Ahmad, S.S., Ahmad, T.; and Akbar, K. F., 2004 Baseline study of roadside vegetation of Lahore Islama bad motorway (m-2) and its fertility status. Journal of App. Sci. 4(2): 266-270.

Anderson, D.M., Salick, J., Moseley, R.K. and Du, X.K., 2005. Conserving the sacred medicine mountains: a vegetation analysis of Tibetem sacred sites in North West Yunnan. *Biodivers.* Conserve. 14(13): 3065-3091.

Aus AID, 2003. Baseline study guidelines. Australian AID knowledge Warehouse.

Austin, M.P. and Greg-smith, P., 1968. The application of quantitative method to vegetation survey. J.Ecol. 56:851-884.

Brown, J. H., 1988. Species diversity. Analytical biogeography (eds. A. A. Myers and P. S. Giller). Chapman and Hall, London.

Brown, R.M. and Laband, D.N., 2006. Species imperilment and spatial patterns of development in the United States. Conserv. Biol. 20(1): 239-244.

Collin, R., 2005. Ecological monitoring and biodiversity surveys at the Smithsonian Tropical Research Institutes Bocas Del Toro Research Station Caribbean J. Sci. 41(3): 367-373.

Cubizollel, H., Tourman, A., Argant, J., Porteret, J. Oberlin, C. and Serieyssol, K., 2003. Origins of European biodiversity palaeo-geogrpahic signification of Peat inception during the Holocecne in the granitic eastern massif Central (France) Landscape Ecol 7:211-227.

Cunningham, A.B., 1994. The role of ethnobotany and customary knowledge in the conservation of plants. In: safeguarding the genetic basis of Africa's traditional crops. CTA. The Netherlands / IPGRI, Rome.

Currie, D. T., 1991. Energy and large – scale patterns of animal and plant – species richness. American Naturalist, 137, 27 – 49.

Ethnogarden, 2003. The role of plants in society March, 15.

Grytness, J. A.; Birks, H. J. B.; and Peglar, S. M., 1999. Plant species richness in Fennoscandia; evaluating relative importance of climate and history. *Nordie* Journal Botany 19, 489 – 503.

Hopkins, B., 1968. Vegetation of the Alakemeji Forest Reserve Nigeria J. Ecol. 56:97-115.

Hutchinson, J.; Dalziel, J.M.; and Keay, R.W.J., 1986. Flora of West Tropical Africa (2nd Ed.) Vol. 1 (part 1 & 2). Crown Agents, Millbank London.

Jain, S.K., 1989. Methods and approaches in ethnobotany. In: proceeding of the 2nd training course and workshop in ethnobotany held at Lucknow, March 1988.

Kershaw, K.A., 1975. Quantitative and dynamic Plant Ecology 2nd edition, Edward Arnold, Longman Pp. 305.

Kinako, P.D.S., 1988. Fundamental of quantitative and applied plant ecology Belk Publisher Port Harcourt. pp 37 – 40.

Koran, J., 1983. Man's impact upon the flora and vegetation in Central Europe. In Holzer, W. Werger M.J.A. Ikusima, I. (Eds). Man's impact on vegetation Hague, Dr. W. Junk Pp. 277-286.

Lomolino, M. V., 2001. Elevation gradient of species richness, historical and prospective views. Global Ecology and Biogeography, 10, 3-13.

Luoto, M.; Rekolianen, S.; Aakkula, J.; and Pykala, J., 2003. Loss of plant species richness and habitat connectivity in grasslands associated with agricultural change in Finland. *Anibio* 32 (7): 447 – 452.

Minteer, B.A. and Collins, J.P., 2005. Ecological ethics: building a new tool kit for ecologist and biodiversity managers Conserv. Biol. 19(6): 1803- 1812.

Nai- Bregalio, M.; Pucheta, E.; and Cabido, M., 2003. Grazing effects on the floristic and structural diversity in mountain grasslands from Central Argentina. Rev. Chil. Hist. Nat. 75(3): 613 – 623.

Nwafor, J.C., 2006. Environmental Impact assessment for sustainable development: The Nigerian perspective EDPCA Publications Enugu

O' Brien, E. M.; Whittaker, R. J. and Field, R., 1988. Climate and woody plant diversity in Southern Africa, relationships at species, genus and family levels. *Ecography,* 21, 495 – 509.

Paciencia, M.L.B. and Prado, J., 2005. Effects of forest fragmentation on pteridophyte diversity in a Tropical Rainforest in Brazil. Plant Ecol. 18(1):87- 104.

Pryor, L.D., 1981. Australian endangered species. Eucalyptus Australian National Parks and Wild life services special publication (5) Canberra 139 Pp.

Rohde, K., 1992. Latitudinal gradients in species diversity, the search for the primary cause. Oikos, 65, 514 – 527.

Said, S., 2002. Floristic and life from diversity in post – pasture succession on a Mediterranean Island (Corsica). Plant Ecology. 162 (1): 67 -76.

SAF, 1954. Forest Cover Types of North America. Society of American Foresters, Washington D.C.

Steiner, N.C. and Kohler, W., 2003. Effects of landscape pattern on species richness, a modeling approach. Agriculture, Ecosystem and Environment 93:353-361.

Victor, A.A. and Haberta, I.A., 1991. Attitude to alternate health care delivery system in Plateau State. African Journal of Pharmacology and Drug Research, 10: 131.

Whitfield, D. P.; McLeod, D.R. A.; Fielding, A. H.; Broad, R. A., Evans, R.J. and Haworth, P. F., 2002. The effect of forestry on golden eagles on the Island of Mull, Western Scotland. J. Applied Ecology. 38: 1208 – 1220.

Wright, D. H.; Currie, D. J. and Maurer, B. A., 1993. Energy supply and patterns of species richness on local and regional scales. Species diversity in ecological communities, historical and geographical perspectives (eds. R. E. Ricklefs and D. Schluter) pp 66 – 74. University of Chicago Press, Chicago.