NIGERIA:

COUNTRY REPORT TO THE FAO INTERNATIONAL TECHNICAL CONFERENCE ON PLANT GENETIC RESOURCES

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CHAPTER 1
Introduction and Agricultural Sector

1.1 INTRODUCTION

Nigeria is one of the most populous countries in Africa. It has a land mass of over 942,000 square kilometres enclosed within longitudes 3° and 14° East of the Greenwich Meridian and Latitudes 4° and 14°North of the Equator. It lies on the West Coast of Africa and it is bounded on the West by the Republic of Benin, on the East by the Cameroon and Chad Republics, on the North by the Republic of Niger and on the South by the Atlantic Ocean. The country has a population of more than 88.0 million people (1991 census) and this is predicted to increase substantially by year 2000, at an estimated annual growth rate of 3% World Bank (1987) predicts a human density of over 500 people per sq. km, by this time. This will be a tremendous pressure (human) on the natural resources of the Country thus the need for adequate care and proper management including the conservation of natural resources particularly plant life. Most of Nigeria has two marked seasons. The dry season lasting from November to March and the rainy season from April to October. For most of the areas, the wet season constitute the main agricultural period.

The country comprises of 30 states (see Fig. 1) including the Federal Capital territory, Abuja and has physical (see Fig. 2) and climatic features that have resulted in more or less parallel vegetation and ecological zones (Fig. 3) from Sahel in the extreme North through Savannah in the middle zone to tropical rain forest in the south (see below for details). A diversity of crops are grown including roots and tubers in the tropical rain forests; crops of the semi arid areas such as sorghum and millet; and Sub tropical crops such as potatoes and vegetables (see Appendix 1). The crops are produced principally in mixed cropping system which consist of various species both on the field and home gardens. Variation also occur within the species. Specifically, the general relief of Nigeria is of three highland blocks separated by the Niger/Benue river system.

Lowlands below the 100 m contour accompany the Niger inland for 400 km to its confluence with the Benue and from there divide following the path of the two rivers. The lower Niger system forms a Y shape, the delta at the base and the Niger River forming the stem and left branch.

The Benue River forms the right branch. The river is navigable to ocean-going vessels for 10 months of the year. The Jos Plateau (1,200 m) lies between the arms of the Y and continues north to the Funtua Plateau, while to the east are the mountains bordering Cameroun, rising to 2,419 m at Chappel Wade, the highest point in Nigeria. To the West are the Yoruba highlands.

In the last two decades, environmentalists in Nigeria have demonstrated the essential link between environment, economic and social development. This agrees with the conclusions at the 1992 global meeting on biodiversity in Rio de Janeiro (Brazil). With this, plants are thus, well recognised to constitute an important aspect of our environment. They are also known to be valuable for other uses such as medicine and industrial raw materials. Unfortunately, there is presently substantial loss of these plant genetic resources as a result of deforestation and lack of sufficient emphasis on land-use. We have further started to see degradation of protected areas and conflicts of interest in the forest estate and these particularly need policy changes and efforts at utilizing substantially available indigenous knowledge to arrest these changes. The situation in Nigeria probably mirrors the changes prevailing in other African countries (IUCN 1986).

National self sufficiency will be impossible to achieve, if we do not protect and conserve the remaining valuable genetic resources for posterity. Plant genetic resources form the basis of dynamic, diverse and adaptable agriculture; they are fundamental to national food security thus conservating and using of our plant genetic resources must be part of our developmental strategy.

Similarly the field of plant genetic resources has acquired global recognition, and World wide interest has been generated in the last two decades. As a result of this, many countries of the World have shown concern at the rate at which genetic erosion is occuring in the World.

1.2 PLANT DIVERSITY

Nigeria has a wide diversity of habitats, from arid areas to swamps through many types of forests. Associated with the varied zones is an array of plant and animal species.

There are over 4,600 plant species identified in Nigeria, ranking it eleventh in Africa for diversity. Of these, 205 are endemic, the ninth highest number among 42 African countries. The northern region, with mainly Sudanian affinities, has 39 endemic species, Western and central region 38, and the eastern region 128 endemic species. The eastern region is especially rich around Oban (Brenan, 1978). Table 1 shows a list of threatened Nigeria plants, by families. This was made up after the meeting of experts (18-19 April 1989) in Ibadan under the auspices of NACGRAB, the focal point for Nigeria activities on plant genetic resources conservation. The total of 496 species represents over 10 per cent of the total flora as stated in Appendix 2. This also includes some threatened wild fruit trees and horticultural crops.

Nigerian moist forest are rich in epiphytic ferns and orchids and contain over 560 species of trees which attain heights of at least 12 m and a girth of 60 cm. Ola-Adams (1977) considers there is a real threat of extinction through over-exploitation of certain trees (see Table 1).

Table 1: Threatened species of the Nigerian flora arranged by families

Family	No. of endangered plant species
Acanthaceae	26
Adiantaceae	5
Agavaceae	2
Amarantaceae	1
Anacardiaceae	7
Annonaceae	15
Apocynaceae	19
Araceae	3
Araliaceae	1
Aristolochiaceae	3
Asclepiadaceae	2
Aspidiaceae	7
Aspleniaceae	6
Atwyriaceae	2
Balsaminaceae	1
Begoniaceae	2
Boraginaceae	4
Burseraceae	1
Butomaceae	1
Caesalpiniaceae	13
Capparidaceae	2
Caryophycaceae	2
Celastraceae	6
Combretaceae	9
Commelinaceae	3
Compositae	36
Connaraceae	6
Convolvulaceae	3
Crucifereae	1
Cucurbitaceae	6
Cyaheaceae	1
Cyperaceae	21
Dennstaediaceae	1
Dichapetalaceae	11
Ebenaceae	7
Ericaceae	2
Eriocaulaceae	3
Euphorbiaceae	31

Family	No. of endangered plant species
Flacourtiaceae	7
Gentianaceae	2
Geraniaceae	1
Gnetaceae	1
Goodeniaceae	1
Gramineae	19
Guttiferae	4
Hypmenophylaceae	4
Hypericaceae	3
Iccinaceae	2
Guttiferae	4
Iridaceae	1
Labiatae	6
Lauraceae	2
Lecythidaceae	2
Lemnaceae	1
Lentibulariaceae	1
Liliaceae	2
Lobeliaceae	3
Loganiaceae	4
Lomariopsidaceae	2
Loranthaceae	1
Lycopodiaceae	1
Malvaceae	1
Marantaceae	1
Melastomataceae	10
Menispermaceae	2
Mimosaceae	3
Monimiaceae	2
Moraceae	9
Myristicaceae	2
Mrytaceae	1
Najadaceae	1
Ochnaceae	1
Obtoknemataceae	1
Olacaceae	1
Oleaceae	1
Onagraceae	1
Opiliaceae	1
Orchidaceae	23
Orobanchaceae	1
Oxalidaceae	2

Family	No. of endangered plant species
Papilionaceae	8
Pedaliaceae	1
Pittosporaceae	2
Plantaginaceae	1
Podostemaceae	2
Protaceae	1
Ranunculaceae	2
Rosaceae	3
Rubiaceae	16
Rutaceae	3
Salvadoraceae	1
Santalaceae	1
Sapindaceae	8
Sapotaceae	2
Scrophulariaceae	2
Scytopetalaceae	1
Selaginellaceae	1
Simargoubaceae	2
Solanaceae	1
Sterculiaceae	4
Thelypteriodaceae	2
Thymelaeaceae	3
Tiliaceae	2
Ulmaceae	1
Umbelliferae	3
Urticaceae	2
Verbenaceae	2
Violaceae	2
Vittariaceae	1
Vochysiaceae	1
Xyridaceae	1
Zingiberaceae	2

Source: Aftern Gile et al. 1978, 1981 and National Conservation Strategy for Nigeria.

1.3 MAJOR VEGETATIONAL ZONES

The need for a detailed description of Nigerian vegetation cannot be over emphasised considering that the vegetation of Nigeria is particularly rich as it falls within five broad biogeographical units, or phytochoria, as described by White (1983). These are shown on Fig. 4.

The zones include: the Sahel, Sudan Savanna (Northern and Southern types and the forest zones however, a detailed vegetation analysis reveals a clear picture of the vegetation of Nigeria. The zones include:

- Guinea-Congolian regional centre of endomism
- Guinea-Congolia/Sudania regional transition zone
- Sudanian regional centre of endomism
- Sahel regional transition zone
- Afromontane archipelago-like regional centre of endomism

In general the vegetation zones correspond to climatic zones, with adjustments for edaphic conditions (particularly drainage) and biotic factors The distribution of vegetation depends chiefly on the fact that the climate becomes drier with increasing distance from the sea The operative factors affecting the distribution of vegetation are the duration and severity of the dry seasons.

The major vegetation formations are lowland rain forest, a mosaic of lowland rain forest, woodland and secondary grassland, Sudanian woodlands, plateau and montane vegetation. Sahel vegetation, herbaceous, swamp and aquatic vegetation and mangroves. Four-fifths of the land area is savanna and wooded savanna, the remainder being mainly forest in origin (Ola-Adams and Iyamabo, 1977). Most of Nigeria's rain forests, which fall within the Congolian sub-unit of the Guinea-Congolian biogeographic zone, have now been cleared, and forest remains only in small isolated reserves. All the major vegetation types have been extensively modified.

Lowland rain forests

Inland from the coast the lowland rain forest zone prevails for 96 km northwards. The forest covers an area of 103,600 sq. km. There is no single-canopy layer; crowns exist at all levels giving a completely irregular structure. The families Leguminosae (e.g. Brachystegia), Meliaceae (Guarea, Khaya),

Sapotaceae (Chrysophyllum, Mimusops), Sterculiacene (Cola, Mansonia, Sterculia), and Ulmaceae (Celtis, Holoptelae), are particularly well represented in this forest area.

Freshwater swamp forests

These forests are the most extensive edaphic forest type, and, since other forests are being degraded, will soon become the most extensive forest type in Nigeria with more than 1,900,000 ha. They are bordering inland mangrove forest, and the largest concentration is in the Niger delta. Main species are *Oxystigma mannii*, *Symphonia globulifera*, and communities of moncotyledons like *Pandanus candelabrum* and *Raphia* spp.

In the freshwater swamps for example in Mamu Forest Reserve, the main canopy is rather open and in the gaps dense tangles of shrubs and Lianes form an almost impenetrable undergrowth.

Mosaic of lowland rain forest, Isoberlinia woodland and grassland

This vegetation mosaic of forest and forest-derived Savanna stretches across Nigeria from east to West. Derived Savanna vegetation has been induced by the activities of farms in clearing forest land, thereby admitting a grassy ground-layer which encourages fire. The evidence that the derived savanna zone once was originally rain forest and would revert to it if protected against fires and cultivation is given by certain relictual and indicator species, and by the survival of patches of a rain forest type on areas distant from streams. Oil palms *(Elaeis guineensis)* are a characteristic relict in this zone. The common woody species are *Daniellia oliveri, Diallum guineense, Albizia adianthifoliam, Lophira lanceolata,* and *Hymnocardia acida.* Characteristic trees of the relict forest are *Celtis zenkeri, Anthonotha macrophylla,* and *Ireculia africana.* The common grasses in this zone are species of Andropogon and Loudetia arundinacea. The dry season is about 3 months, mean annual rainfall is 1,440 mm-1,780 mm.

Sudanian woodlands

North of the valleys of the Niger and Benue Rivers, woodland savanna predominates. Undisturbed woodland savanna is characterised by low and open woodland and by a ground-cover of coarse grasses which are burnt annually. Fringing forests occur in the river valleys. White's (1983) Sudanian woodland zone is often subdivided by other authors into the Guinea savanna zone (with north and south facies) and the Sudan zone (Maps). Some of the

common woody species in the southern Guinea savanna are *Daniella oliveri, Diospyros elliotti, Ceiba pentandra, Prosopis africana* and *Nauclea latifolia.* The dry season lasts 4 to 5 months and rainfall is 1,140 mm-1,520 mm.

In the northern part of the Guinea zone the common woody species are *Isoberlinia doka, Albizia zygia, Cola hispida, Ecythrophleum sauveolens, Annona senegalensis,* and *Ficus exasperata*. The common grasses are species of *Schizachyrlum, Loudetla, Ctenium* and *Andropogon*. The dry season lasts 5 to 6 months and mean annual rainfall is 1,020 mm - 1,140 mm.

Mangrove swamp forests

These extend over 970,000 ha approximately, stretching along the sandy beaches, creeks and lagoons from the Cameroon to Benin coast. They are characterised by three species of *Rhizophora: R. racemosa,* the most common species, *R. harrisonil* and *R. mangle.*

Wetlands

In Nigeria the coastal wetlands are the most extensive. In the west there are large lagoonal systems with mangrove swamps, palm-pandan swamps and reed swamps, of which the Lagos and Lekki lagoons are the best known and most important (Burgis and Symoens, 1984). In the east, the Niger Delta and Cross Estuary both have large areas of mangrove forest and both have permanent and seasonal inundated freshwater swamp forest. Inland there are flood plains on many rivers as a consequence of the increasing seasonality of the rainfall in passing north. In the Sudanian zone, forest on the levees is inundated at the time of flooding, as are the broad grasslands behind them. Elsewhere in the north, away from rivers, there are other seasonal wetlands. These are mainly clay based pans and ponds which fill with water in most years.

1.4 THE NEED TO CONSERVE

Over the years, increased awareness of the importance and potential value of plant genetic resources in Nigeria has led to the establishment of the National Centre for Genetic Resources and Biotechnology (NACGRAB) in Nigeria.

There have been increasing rate of disturbance of the Nation's fragile ecosystem due to various land use problems. Prominent among the factors identified was deforestation through timber exploitation, over grazing, bush burning, forest monoculture (plantation), construction of new towns, roads, airport etc. All these have contributed to climatic changes and likewise advance of the Sahara desert. Further, the introduction and wide spread use of genetically improved crops varieties has resulted in the neglect of traditional varieties or land races of our important food crops. This situation is continuing with more forest exploitation by local and foreign exploiters. A number of indigenous species occuring in restricted major vegetational zones habitats spread all over the country are further facing threat of extinction. Investigation revealed that a total of four hundred and ninety individual species representing one hundred and twelve families are currently involved. Other species may be detected in future, as various NGO's continue to work actively in the field. The need to conserve and protect our valuable plant genetic resources for the improvement of our agricultural programmes, the ultimate of which is to have enough food for local use can not be over emphasized.

According to the Federal Office of Statistics, between 1970-1981, production of the seven principal commodities, Sorghum, Millet, Maize, Rice, Cassava, Yam, and Cocoyam declined at an average annual rate of 1%. The aggregate decline of the three main root crops during this period reached 50%. The situation is even more serious with the disappearance from market of important indigenous food crops.

During the oil boom, production of all crops declined by two thirds and agricultural exports of some commodities diminished considerably. So also, many crops especially legumes, cereals, tuber crops and others suffered immensely from pest and disease attacks in the last decade. These disease attacks include cassava moisaic (CMV), black sigatoka of Musa spp.; blast of rice; rice stem borer, rust and downy mildew of maize among others. This disease of maize and indeed of other crops have become so important that research efforts within the National Agricultural Research systems (NARS), and International Research Centres now concentrate on them. The need for a diverse plant genetic resources including wild relatives become crucial to the development of improved and resistant plant types.

With the exception of a few tree crops plantations and some large scale irrigation schemes that were developed in the 1970's, the agricultural cropping systems have been restricted to traditional small holdings. About 55% of the farms in Nigeria are thus below one hectare and about 90% are below four hectares. Farms are smaller in the Southern States, where 80% of the farms are below on hectare. In the middle belt and Northern States of the country,

71% and 49% of the farms are below one hectare respectively. Yester years the seed production at the National level was somehow erratic and the involvement and introduction of hybrid maize by the International Institute for Tropical Agriculture (I.I.T.A.) triggered the formation of the first Nigerian private seed company, thus heralding private sector participation. It is envisaged that the seed supply system would be improved, more so with the advent of the National seed/plant quarantine improvement project (NSPQ).

CHAPTER 2
Indigenous Plant Genetic Resources

2.1 FOREST GENETIC RESOURCES AND MANAGEMENT

The high forest zone of the country occupies 14% of the total land area and account for 2.1 million hectares of forest reserves. The Savanna zones of the country occupy 86.0% of the total land area and has 7.5 million hectares of forest reserve.

Moist evergreen forest which becomes deciduous towards the north provide most of the country's timber and is rich in such species like *Triplochiton scleroxylon, Terminalia ivorensis; Terminalia superba, Kyaya grandifoliola, Kyaya ivorensis; Entandrophragma spp; Milicia* (Syn *Chlorophora*) *excelsa; Naucles diderrichi, Loyoa trichilioides, Terrieta utillis, Tieghemella heckelii, Pericopsis eleta, Mansonia altissima.*

The rest of the country's forest is in the Northern Savanna comprises of Derived Savanna, Guinea Savanna, Sudan Savanna and Sahel Savanna and Species such as *Parkia biglobosa, Prosopis africana* and *Vitellaria parkia.*

Conservation backed by legislation of Natural Vegetation and modified ecosystems started in 1937. However, there are currently a total of 12 plant Conservation legislation in force in Nigeria (see Appendix 3). The latest of this effort however is the 1992 Environmental impact assessment decree (86) which is geared towards minimising the effect of Nigerian diverse structural development on the ecosystem and its diversity.

The first of the 12 existing strict Natural Reserves (SNRs) was established as far back as 1919. These SNRs which are part of the States forest reserve are the responsibility of the Forestry Research Institute of Nigeria (FRIN).

Artificial forest regeneration with exotic and indigenous tree species was embarked upon to augment forest wood supply (FAO/UNDP 1981).

The first plantations were established in southern Nigeria with exotic species like *Tectona grandis, Gmelina arborea, Pinus* spp and indigenous species like *Nauclea diderrichii, Terminalia* spp (Table 1). Later afforestation went up North with species useful for environmental protection in sand dune fixation

and shelterbelts as well as fuel woods, poles, pulp and paper, these include: *Acacia* spp; *Dalbergia* spp; *Gmelina arborea; Pinus* spp and *Eucalyptus* spp.

Under the fourth National Development Plan, affore-station was proposed with the use of indigenous forest tree species like *Nauclea diderrichii, Kyaya ivorensis, Lovoa trichilioides, Triplochiton scleroxylon, Milicia* (Syn. Chlorophora) *excelsa, Terimnalia ivorensis* and *Terminalia superba.* However, biological problems such as inadequate seeds supply and insect pest problems like *Hypsipyla robusta* (Moore) on the *Kyaya* species, and the *Dhytolema lata* on the *Milicia* (syn. Chlorophora) *excelsa* prevented the use of the indigenous species.

2.2 WILD SPECIES AND WILD RELATIVES OF CROP PLANTS

Genetic variability is the basic tool used by plant breeder in Crop improvement. The basic source of such variability exists both in the advance and primitive cultivars as well as in the wild and weedy relatives of the cultivated species.

Out of six species of the genus *Oryza* that are known to occur in Nigeria, *O. sativa* L. the white rice, is perhaps the most familiar, *O. glabberima* which is indigenous to Nigeria and West Africa is now growing wild and appears to have disappeared. In much the same manner, an upland variety of *O. sativa* widely cultivated in the Western part of Nigeria some decades ago appears to have disappeared from the farms and are only found in government experimental stations. *Oryza perennis. O. longistaminata, O. puntata* and *O. tissenantus* represents the wild rice of Nigeria. These at present are considered to have no economic value but constitute part of the genetic diversity in the genus *Oryza* in Nigeria.

With regard to the edible yams, six species of the genus *Dioscorea* namely *D. alata, D. bulbifera, D. cayensis, D. dumentorum*, *D. esculenta* and *D. rotundata* occur naturally in Nigeria. Each of these has wild types and show considerable genetic diversity. But only *D. cayensis, D. esculenta,* and *D. rotundata* are popularly cultivated and received more attention from both the research scientists and the farmers.

Most of the fruits and vegetables in regular cultivation in Nigeria are exotic species. The indigenous species are still under-exploited and exist as wild in the forests. There are over 20 such under utilized vegetables and fruits species (Appendix 4).

Such local vegetable are thus classified as follows:

- Wild but harvested mainly in times of scarcity of the non common ones
- Wild but usually harvested from the Wild as a regular practice
- Semi wild or protected on farm and fallow land

Cocoa

The cacao tree *(Theobroma cacao)* belongs to the family Sterculiacene and about 22 species are known in this genus. It is a cash crop produced largely by peasant farmers for export in order to earn foreign exchange. It is an important industrial raw material.

Cocoa was first introduced into West Africa in 1822 by the Portuguese. The earliest introduced cacao type was the amelonado. This population still accounts for more than 60% of all planting in Nigeria (Williams, 1986). The amelonado populations are rather uniform genetically and were susceptible to the Cocoa Swollen Sheet virus.

Several species of the genus *Theobroma* e.g. *T. bicolor, T. Grandiflora, T. speciosum, T. subincana.* Herrains are maintained in live gene bank of the Cocoa Research Institute of Nigeria (CRIN). Some of these possess some desirable qualities like high butter fat content and thick pod wall that cannot be penetrated by phytophthora pod rot which can be incorporated into commercial cocoa.

Cola

Only two species of *Cola, C. acuminata* and *C. nitida* are presently of major economic importance in Nigeria. These two species are closely related and are separated mainly on the basis of their leaf spices, external features of the pod and number of seed cotyledons.

Apart from the two species mentioned above, other species of the genus Cola maintained by CRIN at present are:

- *C. verticillata* (Thonn) (Stapf and A. Chev)
- *C. millenni (*K. Schunn)
- *C. interitia* (K. Schun)
- *C. gigantea* (A. Chev)
- *C. vallanyi* (Cernu)

Coffee

The cultivated coffee species belong to the genus *Coffenin* the family Rubiaceae. There are about 90-100 species in the genus but the cultivated ones are *C. arabica. C. canephora, C. liberica, C. stenophyilla* and *C. Excelsa, C. arabica* is the most important Coffee in World trade but it is a minor crop in Nigeria. Most of the coffee produced in Nigeria is the *C. canephora.*

Other species of coffee being maintained by CRIN at present are, *C. liberice, C. stenophylla* and *C. excelsa.* Also interspecific hybrids (between *C. arabica* and *C. canephora*) are being maintained to assess their performance for quality and disease resistance/tolerance.

Cashew

The Cashew plant (*Anacardium occidentals* L.) belongs to the family Anacardiaceae. The local germplasm of the crop covers a wide range of genetic diversity owing to the out crossing potential inherent in the crop. Apart from the local germplasm, exotic materials were also introduced from India and Brazil. The germplasm (both local and exotic) are now being used as breeding materials at CRIN.

Tea

The tea plant *(Gmellia sinensis)* is native to South East Asia, with the leaves being the economic part. All earlier introduced germplasm of the crop has been collected and cuttings raised from them. Later introductions were made from major Tea growing countries in Africa especially Kenya. There are 23†clones of tea imported by CRIN from the Kisumu tea genepool in Kenya.

Wild fruits and Food trees are well known values of the forests. They provide fruits and their associated nutritional values which enhances rural and urban health, while the food trees, particularly leafy - vegetables (plant proteins) serve as coup condiments. These species are more common in the high forests, especially in the wetter areas, but various other species are also known in the savanna or even in the drier Sahel savannas (see Appendix 4) for their values.

For germplasm conservation, particularly in the case of the wild relatives of cultivated crops research efforts is crucial. An inventory of the flora as now constituted will indicate critical areas to be conserved *in situ*. Only recently the Forestry Research Institute of Nigeria cooperated with the National Centre for germplasm conservation (NACGRAB) on evaluating the problems of endangered plants. It is envisaged that a "Red Data Book" will be kept at

NACGRAB and at the FRIN Herbarium to help conservation work, especially as it relates to the needs and requirements of breeders in all areas of agricultural research. Lack of adequate knowledge of the variations in taxonomic status of Nigerian flora poses additional complications for effective genetic conservation, and utilization. However, the preparation of a comprehensive flora will adequately bridge this gap.

In the case of vegetation, studies have shown that some, particularly the wetlands, are ecologically fragile. They thus need special attention. Because of the present erosion of the resources of these vegetation however coastal vegetation, mangrove, swamp forest and ripalan forest, moist lowland forest and the highlands need stricter conservation. Recent work on the delineation of strict Nature Reserves (SNR) within the forest reserves is a welcome development. The problem of security in these SNR's however is great.

2.2.1 Some Nigerian Plants of Medicinal Value

In the early days, man confronted with various diseases had discovered by trial and error a wealth of useful the rapeutic agents in plants. Today over 300†chemical compounds have been extracted from West African trees. For instance, Gedulin, a beautiful crystalline compounds obtained from *Entandrophragma angolence* has been ascertained as a strong work expeller. Another compound extracted from *Rauvolfia vomitorra* has been proved very effective in sending most people to deep sleep. Some radio-active compounds had been monitored from *Carica papaya.* Apart from modern scientists, the herbalist treasures all plants in his garden. For example the obnoxious weeds *Chromolaena odorata (Eupatorium odoratum)* and *Ageratum conyzoides* have been found very effective in the treatment of fresh cuts. *Ageratum conyzoides* have been found very effective as anti-poison among the Yorubas, (Gbile 1950).

The use of herbs by the natives as anti-infective agents, anti-malaria drugs, anti-cancer, flavouring and sweetening agents, cardiovascular, and nervous systems, poteolytic ferments, steroidal alkaloids, and other ailments have been discussed (Gbile 1985; Gbile, Soladoye and Adesina 1989).

Gbile (1987) among others identified *Euphorbia hirta* used for diarrhoea, *Cassia alafa* as purgative, Talnum to prevent arbortion, flowers of *Ageratum conyzoides* pounded with local soap for sickle cell anaemia and the latex of *Ficus exaspirata* for boils.

In ethnomedicine, leaves of *Vernonia amygdalina* (Ewuro) taken as vegetable are recommended as anti-hypertensive. The leaves of *Persea americana, Ocimum gratissium* (Efinrin), *Fiscus platyphilla, Parkia biglobosa, Vitellaria*

paradoxa, Morinda lucida (oruwo), *Allium stivum* to mention but a few, are of great medicinal value.

For anti-diabetic, Pourat (1977) identified *Valcinium myrtrillis* leaves, *Andasonia digitata* and *Gladiolus psittacinus* as anti-asthmatic.

The seeds of *Ricinus cummunis* (laraa) could be used as anti-fertility. Gbile (1991) observed that a seed swallowed after menstrual flow is believed to have anti-fertility effect. Same is true of the powered extract of the fruit of *Lagenaria brevitlora* (tagiri).

Most of the mentioned species are not receiving effective attention by the people any more because of modern medicine. They are all existing in the wild. They have been forgotten. The onus of preserving our wild flora to make the local sourcing of pharmaceutical products a reality, rests not only on foresters but also on every one of us.

CHAPTER 3
Conservation Activities

3.1 *IN SITU* CONSERVATION ACTIVITIES

The country has 12 strict Natural Reserves (SNRs), the establishment and maintenance of which are backed by government legislation. Other form of *in situ* conservation e.g. botanical garden, arboreta etc. are maintained by Universities and tertiary institutions in the country. According to government regulation, there is total ban on exploitation of these in the *in situ* conserved areas. But because of problems involved in the implementation of the government legislation, illegal exploitation and felling of forest trees are carried out in the reserved areas.

While efforts are needed to ensure the protection and enforcement, it is desirable that other strict forest reserves are created.

3.2 *EX SITU* COLLECTIONS

Although a large number of Institutions in Nigeria maintain some forms of plant germplasm, it soon became clear that the System being operated had series of inadequacies, some of which are the following:

- Only a few of the research institutes had definite projects concerned specifically with the collection and maintenance of germplasm.
- The research institutes and a few universities based collectors tend to collect and maintain only those crop plants in which they had research interest, the genetic coverage was therefore usually narrow.
- Exploration for collection were conducted in isolation by the various interest groups without coordination giving rise to wasteful duplication of efforts.
- The originators of the genetic resource materials were invariably plant breeders working in problems solving, result oriented research establishments and who therefore had the tendency to regard germplasm as mere tools and not as resources to be salvaged from extinction. There was

therefore, the practice to select the "useful", materials and neglect the 'useless' ones thus exposing the latter to the danger of genetic erosion.

It was with these inadequacies in the background, coupled with the need to provide centralized facilities for long term storage of germplasm that the Nigerian Federal government in July 1986 set up the National Centre for Genetic resources and Biotechnology.

The Centre is expected among other things to:

- Collect, characterize, evaluate and maintain plant germplasm and foster its utilization.
- Organise and co-ordinate local germplasm explorations.
- Co-ordinate the maintenance and utilization of the existing plant germplasm in the research institutes.
- Co-ordinate and facilitate the exchange of plant genetic resources materials.
- Serve as the national authority for the validation, registration and release of new crop varieties and maintain a national register of all crop varieties in the country.
- Promote training opportunities to personnel connected with germplasm collection, maintenance and multiplication as well as others in the area of vegetation conservation.
- Operating as the Central organ of the country for liaison with International bodies such as the International Plant Genetic Resources Institute (IPGRI), FAO, UNDP, ICRAF, IITA, concerning Plant Genetic resources.
- Advise government on matters concerning plant genetic resources and Vegetation Conservation.

NACGRAB since its inception has a total collection of approximately 2,500 accessions consisting of both indigenous and exotic germplasm mainly of food crops, vegetables, tuber, fodder, industrial, medicinal and forest plants.

Most of our exotic materials were received from organisations like International Crops research institute for the Semi arid tropics (ICRISAT), the International Centre for Maize and Wheat Improvement (CMMYT), Centre for Agricultural Research in Dry Areas (ICARDA) and ICRAF which is now together with NACGRAB in the collection and conservation of *Irvingia* and *Vernonia amygdalina.*

These accessions are maintained both on the field as living collections and seeds in the storage rooms. Plant Genetic Resources Conservation activities at the Centre is being funded under the National Rolling Plan by the Federal government. However, there will be need for adequate funding of the programme for the realisation of the set objectives.

Routine activities of field genebank maintenance, seed processing and viability testing prior to storage are on-going activities at the Centre. Collaborative evaluation and characterization of some economic crops like Wheat and Barley with relevant research/Institutes are a continuous exercise. The Centre in Collaboration with International Centre for Research in Agroforestry (ICRAF) is engaged in collection of endangered indigenous forest species.

Materials collected are many and variable they include indigenous species and various number of regional and global collections of the country major and under-utilized crops. The National Genebank Centre collaborates with all the national institutional genebanks and maintains useful duplicates of material stored in institutional genebanks.

There are many materials which have been collected by the National genebank but so far, they are all treated equally without any preferential emphasis on any, yet. While the Centre Collection programme is still being intensified, the level of utilization of collected materials is still relatively low. This situation can be attributed to low level of Scientific support staff of the Centre and genetic improvement programme in general in the country. For example, the country has no commercial plant breeding companies, and the very few seed companies available carry out limited breeding activities.

The National genebank is still relatively young and he structure and function is not static and may continue to change within national policy and demand. In the main time, the present function appears appropriate but would like to collaborate with other international genebanks on long-term storage activities, if satisfactory conditions could be worked out. The national genebank centre does not at present maintain any botanical garden, or arboreta but recalcitrant plant species and forest trees are been maintained as live genebank and also used as environmental protection tools. While the government consider botanical gardens and arboreta as important but lack of adequate fund; trained manpower; equipment and materials make it impossible to embark on their establishment.

3.3 STORAGE FACILITIES/EQUIPMENT

Equipment received from UNDP/FAO/IPRI physically installed and being put to use include a prefabricated long term storage room maintained at -20°C and relative humidity of 15%. There is a modified room for short term storage which is maintained at 15°C and 30% RH. There are also a few freezers and refrigerators used for additional storage. The two storage facilities have in built dehumidifiers.

The long term storage room has our base collections whilst the short term storage room contains our active collections. All seeds are stored in hermetically scaled cans and air tight containers, at the appropriate moisture content level. Functional laboratories at the Centre include germplasm extraction room, threshing room viability/germination room. Processing equipment includes seed dusters, ovens, incubators, seed separators and balances. Nigeria being a member of ECOWAS would readily accommodate germplasm from the Sub-region for safe-keeping on terms agreeable to the parties.

Aside from the above mentioned storage facilities, botanical gardens, arboreta, field genebanks and other storage measures are employed but they are mainly for educational maintenance in tertiary institutions. A national botanical garden and arboretum is planned for Abuja. The Muritala Mohamed botanical garden in Lagos is another established botanical garden by an NGO in 1990.

3.4 DOCUMENTATION

Presently all our documentation is being done manually. All samples are supported with passport data reflecting source and all necessary information in respect of indigenous knowledge. Evaluation, characterization, breeders' record are entered separately in registers, which users can readily have access to.

There is no computer facility for documentation and evaluation exercises and we recognise the need for acquisition of computer and communication facilities for proper documentation and evaluation at this Centre.

All samples are accompanied with passport data, characterization data, evaluation data, indigenous and breeders' records in the process of

documentation. Also preliminary evaluation data are registered in the passport data and 80% of the samples are documented.

Although, Computer is not available for documentation, the users of germplasm collected have easy access to the samples through the passport data information.

The country genetic resources bank does not exchange any data with other genebank on regional or a crop basis. Also the national genebank has no *in situ* collections but those being currently maintained by research institutes are evaluated and described under the institutes' breeding programme.

In situ collections are being documented at the Forestry Research Institute of Nigeria, Ibadan in vouchers. It is adequate but it is still open to natural vagaries of paper degeneration etc. and loss of information (e.g. the 1969 Large Tree plot record is spoilt due to rain water). This could be overcome by the provision of software and hardware. This could be cost effective and it would be considered a priority.

Documentation as regards wild relative collections is not yet effected because there is lack of Scientific support staff.

Since there is no Computer, the documentation records are not duplicated.

3.5 EVALUATION AND CHARACTERIZATION

A clear distinction is made between the characterization and evaluation of germplasm samples while the national programme is engaged in the preliminary evaluation of germplasm samples, assistance in the area of detail characterization and evaluation according to international guideline is sought from relevant national sister organisations.

Farmers are involved in the evaluation of collections through request in respect of indigenous information.

A sizeable percentage of our germplasm samples are evaluated and characterized through the aid of International descriptors.

Most of our preliminary evaluation are done at the locality of the genebank. However, other evaluations such as biochemical, physiological responses, microbiological data, disease and pest susceptibility, nutritional aspect and

genetic finger printing are not being carried out, because of lack of equipment and personnel.

The international collaboration would help to achieve better result through dissemination and exchange of information and documentation at the regional level.

The genetic resources held *in situ* have never been evaluated. However, the Forestry Research Institute of Nigeria, and the Obafemi Awolowo University, Ile-Ife have plans to effect this. The approach is inadequate and greater emphasis is needed on the acquisition of outside assistance.

3.6 REGENERATION

The National genebank is in its infancy, consequently, regeneration of accession has not commenced, however, regeneration in the future will be conducted according to international recommended procedures by the IPGRI. To ensure the genetic purity and prevent genetic drift during regeneration, trained technical staff will be required.

The country will intend to go on storing materials that it cannot regenerate for the purpose of posterity. National genebank (NACGRAB) will be able to regeneration when fully on stream.

3.7 FOREST GENETIC RESOURCE

West African Hardwood Improvement Project (WAHIP) based at Forestry Research Institute of Nigeria (FRIN) in Ibadan is the programme aimed at exploration of the natural distribution of the main native forest species. Presently, WAHIP is working on *Triplochiton scleroxylon* (Obeche) and three other species. Also, *Irvingia* sp. and other lesser known forest species are not left out in this project. The above mentioned species of forest tree can be found in the forest transition zones. There are also programmes and activities on genetic conservation through combined *in situ* conservation area network and *ex situ* conservation measures such as seed storage and *ex situ* conservation stands.

There is no programme for characterization, evaluation, study of intra-specific diversity through provenance and progeny trials. Also there is no

genetic marker studies. Likewise, there is no national information system on forest genetic resources.

CHAPTER 4
In-Country Uses of Plant Genetic Resources

4.1 USE OF PGR COLLECTIONS

The use of plant genetic resources has been by National Research Institutes, and International Centres residing in Nigeria. Improvements with local germplasm include crops such as cowpea, maize, cassava, soyabean and rice.

The exploitation of genetic resources has over the years contributed significantly in the development of Nigerian Agriculture especially in the area of food crops. Through a process of selection from a large pool of cowpea. *(Vigna unguiculata)* a photo periodically insensitive, disease and pests resistant, high yielding variety, the Ife Brown has been developed in Nigeria. The cultivation of this variety is now widespread in the country. Several varieties of hybrid maize have also been developed locally through the combination of desirable characters of several maize varieties. Research in this area has advanced to the point that high yielding hybrid maize varieties which are resistant to some location, specific diseases as well as others adopted to diverse ecological conditions in Nigeria have been produced and are being used extensively. Extensive selection of cassava has also yielded varieties which are resistant or tolerant to the two major cassava diseases, namely: bacteria blight and cassava mosaic disease.

With regard to soybean, the cultivation of which was until the last decade or so, confined to the middle belt region of Nigeria, a large number of varieties which are non-shatering, sufficiently promiscuous photo periodically intensive and reasonably high yielding have been developed for cultivation in most parts of the country. In Forestry, the exploitation of clonal genetic variation has also been done in Obeche *(Triplochiton scleroxylon)* at FRIN.

The genetic resources of maize, beans, soyabeans, rice, sorghum and cassava are most frequently used in national projects. Most of the in-country users of materials are from national research institutes and universities e.g. National Cereals Research Institute (NCRI) - Rice; Institute of Agricultural Research and Training (IAR&T) - Cowpea; Maize; National Root Crop Research Institute (NCRI) - cassava; Institute of Agricultural Research (IAR) - Sorghum, millet; National Horticultural Research Institute (NIHORT) - vegetables etc. An average of four scientists/professionals from each institute

use the national genebank's germplasm for breeding and research programmes.
The national genebank is a service organisation, therefore, germplasm are not provided for commercial ventures. However, there is an indirect linkage between the national genebank and commercial organisations through the National Seed Service (NSS).

Most of our germplasm are under-utilized because there are not many active national breeding programmes and the existing ones are limited to their mandate crops due to dearth of personnel and inadequate funding.

The local farmers get their materials through the National Seed Service and the Agricultural Development Programmes (ADPs) e.g. cassava, maize, cowpea and sorghum. However, improved material of crops like yam, and most of the other staple crops are not available to farmers.

International Institute for Tropical Agriculture (IITA) which is an international organisation also assists the national programme in the area of supply of promising and high yielding crop varieties - for agricultural development and research programmes.

4.1.1 Utilization and Food Value of Some Forest Plants

Table 2 shows a list of some wild edible plants in Nigeria. They include trees or tree components, herbs, shrubs and clibers within the forest zone of Nigeria.

Edible wild plants which could be used as leafy vegetables, edible fruits and seeds and starch roots and tubers include the following:

1. Leafy vegetables e.g. *Boerhavia difusa, Portulaca oleraceae, Ceiba pendandra, Cyrtosperma senegalensis, Asgostasia Emilia sonchifoia, Moringa plerygosperma.*
2. Species e.g. *Piper guineensis, Monodora tennifolia, Aframomum melgueta.*
3. Fresh fruits and juices e.g. *Annonidium mannil, Antrocanyon kaneana, Canarium schweinfurthii, Carpolobia lutea, Chrysophyllum albidum, Chriysophyllum perpulchrum, Dialium guineensis, Saba florida, Landolphis owariensis, Antrocaryon micraster, Sorindea wamekel, Trichoscypha acuminata, Dissotis grandiflora.*
4. Soup Condiment e.g. *Pentacletnra macrophylia, Brachystegia spp. Irvinvia gabonensis var*, dukis, *Irvingia gabonensis var excelsa.*

5. Sweetners e.g. *Dissotis grandiflora, Dioscoreophyllum cumminisii and Syncepalum dufficum.*

Analyses of some of the edible wild plants show their nutritional importance. Most of the edible plants have high contents of protein fats, carbohydrates and minerals (Table 2).

The calcium and iron determinations of fresh samples of some edible wild vegetation obtained by Keshinro (1986) are as follows:

	% ca	Iron (mg/g dry sample)
Lactuca taraxacifolia (Yanrin)	0.736-0.00	0.436-0.05
Senecio biafrae (Woorowo)	0.619-0.28	0.479-0.08
Struchium sparganophora (Ewuro odo)	0.827-0.45	0.437-0.09
Solanum nigrum (Efo Odu)	0.788-0.33	0.443-0.19

Some of edible wild plants also contain high Beta carotene (in micrograms) - *Trianthema portulacastrum* leaves (6,160), *Moringa oleifera* leaves, raw (11,920), *Solanum nigrum* leaves (3,660) and *Spondias mombin,* fruit, raw (1,000).

Beta carotene, as a precursor of vitamin A is known to be important for both visual and reproductive integrity of animal species including man (Oguntona).

Table 2: Some wild edible plants in Nigeria and their uses

Name	Part used	How used
Aframomum danielii	Ripe fresh fruit pulp and seed	Fruit pulp and seed eaten seed raw
Aframomum baumannii	Ripe fresh fruit pulp only	Used as spice in food or chewed as stimulant
Aframomum sceptium	Fruit and seed	Ripe fruit pulp and seed eaten raw
Aframomum melegueta	Fruit pulp and seed	Spice for eating colanut (Peppery taste)
Anchomanes difformis	Rhizome	The rhizome is everywhere (BI) eaten in time of scarcity but only after special preparation
Ancistrophyllum secondiflorum	Fresh terminal bud	Fresh terminal bud is eaten raw
Annonidium mannii	Fruit	The fruit is well fleshed is edible and has a sweet sour taste

Name	Part used	How used
Annona senegalensis	Leaves	Leaves are good strengthening food for human and horse flowers are used for flavouring food. Ripe fruits is edible, has a pleasant flavour
Ancrocaryon waneanum	Fruit flesh	Fruit flesh edible with an acid taste, seed-oily and edible
Balanites algytiaca	Leaves	The leaves are eaten as a vegetable
Boerhavia diffusa	Leaves	The leaf is used occasionally as course kind of pot-herb in soup
Canarium schweinfurthii	Fruit pulp	Ripe fruit are soaked in hot water to soften the pulp which is eaten
Carpobia lutea	Fruit pulp	Ripe fruit pulp eaten raw
Ceiba pentandra	New leaves	Used as vegetable for soup by Igbo people
Cerototheca seasamoides	Leaves	Used as soup vegetable and used along with other food stuffs for the sake of its mucilaginous activity
Chrysophyllum albidum	Fruit & seed mucilage	Ripe fruit pup eaten raw
Chrysophylum perpulchrom	Fruit pulp	Sweet fruit pulp eaten raw
Coula edulis	Seed	Seed kernel ground and used as condiment
Crytosperma	Leaves	The leave are eaten as a senegalense vegetation in Gabon and young leaves are eaten in orlu area used as vegetable
Deiinbollia pinnata	Seed mucilage	Seed muciage is sucked
Detarium senegalen	Seed kernel	Seed kernel powder used as condiment in soup
Detarium microcarpa	Seed Kernel	Seed kernel powder used as condiment
Diaium guineensis	Seed kernel	Seed kernel powder used as condiment

Name	Part used	How used
Dissotis grandifora	Root stock	Mature (dry) fruit pulp is eaten raw. The tuber root contains sugar which is extracted as follows - The roots are washed and half dried in the sun beaten in a mortal & steamed. When cool they are squeezed by hand and the juice obtained is used as substitute for sugar, it also used to produce a fermented beverage
Emilia sonchifolca	Leaves	Leaves used as vegetable
Eribroma oblonga	Seed	Seed roasted and eaten
Garnicinia kola	Bitter seed	Seed chewed like kolanut
Gnetum africana	Leaves	The leaf is used as salad (eaten raw) and as vegetable for soup all over Nigeria. Leaves used as vegetable by Ifunkpa people in Cross River State of Nigeria
Clossocalpyx brevipes	Leaves	Leaves used as vegetable
Gongronema latifolium	Leaves	Leaves used as vegetable has slight bitter taste
Gymnema syvestris	Leaves	Leaves chewed as sugar-free diabetic diet
Heinsia crinita	Leaves	Leaves used as soup herb
Irvingia gabonensis	Fruit pulp, seed kernel	Ripe fruit pulp is eaten var dulcislike mango fruits seed kernel is ground & used as soup thicker. Ground seed kernel used as a soup thicker.
Irvingia gabonensis	Seed kernel only	Seed kernel powder used as var excelsa soup thicker - condiment
Lasinanthera africana	Leaves	Leaves are used as soup herb
Landolphia duicis	Fruit	Edible in vegetables taste
Landolphia hirsita	Fruit	Fruit occasionally eaten
Landophia owariensis	Fruit pulp	The fruit pulp is edible and is esteemed in all areas and is recorded as a source of vitamin in various areas. It is fermented to give an alcoholic drink.
Lannea acida	Young leaf, fruit pulp	Young leaves are eaten in W.Africa fruit pulp is edible
Lannea welwitshii	Fruit	Fruit pulp is eaten in Zaire
Leptadenia arborea	Fruit	Fruit eaten when ripe

Name	Part used	How used
Leptadenia hastata	Leaf, young shoots and flowers	The leaves, young short and flowers are eaten usually cooked and in soups
Monanthotaxis Laurentii	Fruit	Fruit is edible
Monathotaxs vogelli	Fruit	Fruit is edible
Monodora myristica	Seed	Seed roasted, ground and used as condiment in pepper soup
Monodora tenuifolia	Seed	Seed, roasted, ground and used as condiment in pepper soup preparation
Napoleona vogelli	Fruit pulp	Ripe fruit pulp & seed mucilage are sucked
Parkia biglobosa	Seed	Seed is roasted, ground, mixed with oil & pepper and used to eat boiled yam, cocoyam etc. (by ifunkpa people - Cross River State
Pergulaia daemia	Lead & Fruit	Leaves used as vegetable
Pentaclethra macrophylla	Seed kernel	Kernel of cooked seed is sliced, washed and allowed to ferment or a few days after which it is eaten as salad or used as condiment in other food preparation. The leaves and fruits are edible and used as spice in soup and other food all over Nigeria
Piper guineensis	Leaves & Fruit	The dried black berries and the fresh red fruits are used in flavouring soup, rice etc. The leaves taken with food are supposed to improve the chances of conception
Portulaca Olerace	Leaves	Used as vegetable
Saba florida	Fruit	Fruit pulp is eaten raw
Sclerocarpbirrea	Fruit	Fruit juice is boiled down to thick consistency used for sweetening guinea corn gruel only seed kernel is edible
Sroindela junglafidolia	Fruit	Ripe fruit is edible
Sorindela warneckii	Fruit	Ripe pulp sweet & edible

Name	Part used	How used
Spondias mombin	Fruit	Ripe fruit fresh edible and in the fruit is fermented into a kind of beer
Stereospermum kanthiamum	Fruit pod	
Trichosocypha acuminata	Fruit pulp	The fruit pulp in edible and the fruit is pleasant to drink and the fruit juice is pleasant to drink convalencents and anaemic persons use the fruit as tonic
Uraria chamae	Fruit pulp	Ripe fruit pulp is sweet and is widely eaten
Tranthema portulacastrum	Leaves	Used as vegetables

4.1.2 Plant Genetic Resources Conservation and Utilization Activities at IITA and Other International Centres in Nigeria

In 1975, the International Board for Plant Genetic Resources (IBPGR) now IPGRI established a Genetic Resources Unit at IITA. The Genetic Resources Unit (GRU) has global responsibility for the collection and conservation of cowpea and its wild relatives and regional responsibility for the collection and conservation of yams and their wild relatives, cassava and rice in Africa.

Recently the Italian government enhanced the capabilities of this unit to meet global needs. In supporting IITA's breeding programme, GRU maintains small collections of soyabean (selected for and specifically useful for breeding purposes, African local maize, materials and some breeding maize materials, developed at IITA. In addition, it also maintains a significant number of germplasm accessions of minor food legumes and some trees and shrubs in collaboration with International Centre for Research in Agroforestry (ICRAF) became active in Nigeria in 1990. Considerable collections of multipurpose trees and shrubs species have been collected both for conservation and evaluation of seeds of over 121 plant (MPT's) species are presently stored at IITA and at NACGRAB. Also, duplicates of live-gene banks have been established on NACGRAB premises in the collaborative initiative between ICRAF and NACGRAB. *Irvingia gabonensis* and *Vernonia amygdalina* are amongst these species which have been conserved in order to prevent the loss of these important species in Nigeria.

The case of *Irvingia gabonensis* is outstanding in the sense that some genetic resources (64 accessions) for Cameroon/Nigeria and Gabon are kept at NACGRAB. As at the end of 1992, the GRU at IITA was maintaining about 40,000 accessions of germplasm, consisting of about 200 species. Cowpea is the largest accessions (over 15,000 accessions) followed by rice (over 12,000 accessions) yams (about 2,600 accessions) Bambara, Groundnut, Cassava and Soyabean.

The germplasm which GRU maintains is held in trust for the World Community. Materials are available to researchers worldwide on request.

Seed samples of the germplasm collection are maintained in an active collection seed store conditioned at 5°C and 30% RH for distributions. Seed accessions with 90% germination or more are dried to 5% seed moisture content and sealed in aluminium cans or aluminum foil envelopes for storage in base collection seed store at -20°C for long term conservation. Vegetatively propagated materials, particularly, yams and cassava are maintained as living collections in field genebanks as well as in Vitro culture. To date about 1,700 accessions of yams and about 200 accessions of local cassava varieties had been successfully cultured *in vitro* in IITA's tissue culture laboratory to

compliment the field genebank for conserving the germplasm. The GRU Unit rejuvenates the accessions when the seed viability drops to below the recommended standard (85% of initial viability) or when the vegetatively propagated living plants or propagules need to be regenerated.

In recent time, seeds of about 1,000 accessions of rice, 3,000 accessions of cowpea, 166 accessions of 11 food legumes, were multiplied or regenerated in the field at IITA, Ibadan, Nigeria. All of the existing accessions of yam germplasm (tubers) of more than 2,500 accessions were planted out in the fields and fresh tubers were harvested and stored for distribution, evaluation and conservation.

The excellent facility available at IITA allows Nigeria (both students and researchers etc.) to have first hand view and training opportunities at this unit. However, the existence of this international centre will not handle species outside its mandate thus the need to further enhance local capability.

4.2 CROP IMPROVEMENT PROGRAMMES AND SEED DISTRIBUTION

There are 17 Agro-based Research Institutes in Nigeria. Each Research Institute has mandate for the genetic improvement of specific crops (Appendix† 5). All these Institutes have plant breeding and variety development programmes. Productivity in recent years has not been high as expected due to inadequate funding.

Nigeria enjoys the benefit of varietal development being conducted by a number of International research Centres funded by the Consultative group on International Agricultural Research (CGIAR). While IITA, Ibadan works on maize, legumes, rice, and root crops, plantain and banana. ICRISAT is engaged in sorghum and millet research at the Nigeria station in Kano. CIMMYT, a long term collaborator with IITA on maize is now working on wheat. All these international organisations limit their activities to their mandate crops. But there are other indigenous crops that have to be worked upon for genetic improvement. There is need to equip the national system for the effectiveness of crop improvement. The efforts of the National research institutes supported with the International Research Centres have resulted in the development and release of a large number of high yielding, disease/pest resistant varieties of major food and industrial crops.

Products of in-country crop improvement are made available to farmers through provision of released superior cultivars. For exceptionally superior cultivars, release takes at most two years and three years for others. All categories of farmers are covered.

Promising varieties identified under the Nationally Co-ordinated Research Projects (NCRP) on various crops are tested by National Crop Centres in conjunction with the Agricultural Development Programmes (ADPs) on farmers' fields with a view to obtaining farmers opinion and also to involve them in the varietal release system.

Plant breeding activities are conducted by government funded programmes, private companies and foreign companies/organisations on about 10% of our crops. All categories of farmers (20%) are involved in the process, which also includes variety evaluation activities through the information on the source and indigenous knowledge on the crop varieties collected from them.

Although all improved crop varieties are made available to farmers, there are identifiable constraints that affect seed production and distribution, these include: inadequate production of breeder seeds; high cost of other inputs like agro chemicals and inorganic/organic fertilizers; and lack of adequate seed storage facilities.

4.3 USE OF FOREST GENETIC RESOURCES

There is no national programme/system for better forest seed production/supply but seed stands and provenances have been identified and the Forestry Research Institute of Nigeria (FRIN) use them. Seed supply is organised for forest species through the Forestry Research Institute Seed Store only.

4.4 BENEFITS DERIVED FROM THE USE OF PLANT GENETIC RESOURCES

All the germplasm collected at the national genebank are used for only national programmes, they are not yet being sent to foreign users.

There is direct and clear benefit from our indigenous plant genetic resources in respect of the crop improvement programmes.

Use of indigenous plant genetic resources is made by researchers and plant breeders for the development of agricultural programmes and specific materials are provided for overseas institutions on request.

Non indigenous materials are received from donor Institute/ International research centres to assist the National programmes Arrangement in term of sharing of benefits is not in place.

4.5 IMPROVING PGR UTILIZATION

PGR activities enhance agricultural and plant production programmes. It is also a very good source of agricultural raw material for exportable products, when we consider the broad economic value of these resources.

There is need for improvement in the relationship between the users of plant genetic resources that is the breeders, and researchers for an effective and meaningful utilisation programme.

Plant genetic resources conservation is the bed rock of the nations agricultural development programme. The resources are valuable/ profitable both in the short term and the long term. The joint effort of relevant organisation and research outfit through proper co-ordination and utilization of our valuable genetic resources would enhance our pursuit of self sufficiency in food production in no distant time. Proper documentation, better characterization and evaluation would be a plus when well co-ordinated by the relevant organisations such as the IPGRI.

Training of technical support staff in conservation activities and germplasm utilization is highly needed. Supply of conservation facilities and equipment from international organisations on favourable terms would greatly enhance our activities.

CHAPTER 5
National Goals, Policies, Programmes and Legislation

5.1 NATIONAL PROGRAMMES

The Plant Genetic Resources is a national programme. However, Plant Genetic Resources activities are yet to be accorded sufficient recognition. For now the activities are somehow fragmented, because only a few tertiary Institutions and Research Institutes keep and maintain some level of plant genetic resources.

Commercial firms are not involved in plant genetic resources activities yet. Although a few NGO's are involved, but their roles are purely advisory. Farmers are also involved at the varietal evaluation level.

The Federal Government realises the fact that our valuable genetic resources constitute a capital asset with great potential for yielding suitable benefits. It was along this line that the National Centre for Genetic Resources and Biotechnology (NACGRAB) was established to ensure the conservation, preservation and maintenance of our valuable germplasm for overall agricultural development. Consequently, the implementation of the conclusions of the convention on Biological Diversity is viewed with all seriousness.

The idea of putting in place a National Committee to oversee and give direction to plant genetic resources activities is being mooted.

The Genetic resources programme is under the Federal Ministry of Science and Technology and headed by Scientists/Civil Servant. The position of the head has no political inclination.

Whilst the annual programme is endorsed by the parent Ministry, the budget aspect is approved by the Ministry of Finance. Plant Genetic Resources as one of the programmes of NACGRAB is within the National rolling plan, and has its own annual budget. However, a secure level of funding is presently not available but the need to ensure proper funding is recognised.

Our plant genetic resources collections are yet to be protected by any form of legislation. The fate of our collections in future would be determined by the relevant organisation for protection.

5.2 TRAINING

One of the main constraints militating against the effectiveness of our plant genetic resources programme is the inadequacy of technical support staff. Although some members of staff have benefitted in the form of one training or another along the line through sponsorships by International organisations like IPGRI/IITA, there is need for more trained staff in all sphere of plant genetic resources conservation for effective and better operations.

The National programme is relatively in its infancy. The improvement in the level of the staffing situation for effective and meaningful operations is being pursued with the Ministry. The few scientific staff on ground (4) is usually supplemented with the assistance received from relevant sister organisations in form of collaboration.

The International Institute of Tropical Agriculture (IITA) has a well established Plant Genetic Resources Unit and offers short term training courses in various aspects of plant Genetic Resources Conservation. Over the years, some members of the National programmes have benefitted from the training courses. Some of our National Institutions are in the process of offering basic plant genetic resources courses. These include the University of Ibadan and the Federal University of Agriculture Umudike and Abeokuta Nigeria. As far as regional courses are concerned, the IITA GRU unit extends its training activities to trainees from the African region. The IITA training courses meet some of our national needs.

The training in the area of plant genetic resources in Nigeria has been organised by IITA, ICRAF, the Commonwealth Science Council among others. The involvement of ethnic groups and traditional farmers in plant genetic resources collection and conservation is being increased, to the advantage of all groups, within the populace in Nigeria.

The breeder agricultural/user community have some degree of knowledge about the importance and the need to conserve our valuable plant genetic resources. This is still being enhanced by NGO's such as PDRO, CENRAD and other related organisations.

5.3 NATIONAL LEGISLATION

There are quarantine laws operating in the country which affect the delay the import and/or export of plant genetic resource accessions due to the implementation of measure aimed at minimizing the risk of introduction of pests and diseases into the country.

There is no need for more stringent quarantine control in the country since the existing measures are adequate to minimize the risk of introducing pests and diseases into the country through germplasm exchange.

Imported genetic resources that have been cleared by Nigerian Plant Quarantine Services can be planted in the country. In essence, there is no national law restricting the planting out of imported genetic resources.

There are no incentives provided yet by the government to farmers for the conservation of traditional varieties.

5.3.1 Sale/Seed Distribution

The legislation that governs the sale and distribution of seeds is the National Agricultural seed Decree No. 72 of 1992, which compliments the crop varietal registration and Release Decree 33 of 1987. Whilst the former governs post release activities. The latter regulates and covers pre-release activities. Both components ensure the quality and the types of varieties that are available to farmers. Farmers varieties can be traded as Seed legally.

The issue of Intellectual property rights (IPR) does not exist. There is no legislation or legal cover in respect of developed crop varieties, even though the advantages of the issue is fully understood. Assistance is definitely needed for the development in this area.

As regards restriction on plant genetic resources exchange, the only policy on ground is the Nigerian Plant Quarantine Service regulations on importation and exportation of plant materials and products. This being an FAO, thus global arrangement, Nigeria follows the rules very closely to ensure the non transference of pests and diseases over international boarders. However, the decision whether or not to export plant genetic resources for national programme comes from the head of National genebank before they (genetic resources) are been passed through the national quarantine services.

5.4 OTHER POLICIES

The Federal government of Nigeria formulated the National Seed Policy in 1990. It stresses the importance of ensuring an adequate supply of good quality seeds and provides a framework for future development of the seed sub-sector. This key goals of the seed sub-sector are to:

1. Support varietal improvement, registration, release and multiplication of released varieties.
2. Improvement in quality of seeds sold to the farmers.
3. Re-orientation of the operation of public sector agencies along commercial lines, and
4. Encourage private sector participation in seed operations through appropriate policies and promotion activities.

The National Seed Service (NSS) was responsible for the production and distribution of foundation seed to public and private sector organisations. The ADPs were engaged in multiplication of foundation seed stage II and certified seed production through contract seed growers as well as on their own farms. The NSS was also supplementing the certified seed production for supply to some of the ADPs.

The ADPs at the state level assist farmers in terms of agricultural equipment on soft terms, aside from the provision of fertilizers and agrochemical at the National level. From the standpoint of farmers' varieties or indigenous genotypes seem to be suffering from the use of hybrid or modern varieties. Special efforts on conservation of native materials and particularly their wild relatives require special attention now.

5.5 TRADE, COMMERCIAL AND OTHER INTERNATIONAL AGREEMENTS

Apart from International/Global Agreements, Nigeria is at present not involved in any form of trade or commercial agreements on plant genetic resources products with any country. This is an area which should be looked into to facilitate *ex situ* germplasm conservation as a security measures.

CHAPTER 6
International Collaboration

It is already stated that the establishment of the National Genebank of Nigeria (NACGRAB) was attained through the support of the FAO, IPGRI/UNDP. This collaboration with organs of the United Nations (UN) thus preceds other international collaborations which have been relatively limited. In scope IPGRI initiative on wild fruit tree collection *(Irvingia gabonensis)* has allowed us to interact and collaborate with Ghana, Gabon and Cameroon in this region. This collaborative activity has been described elsewhere. Within the CGIAR in Nigeria, we have had a close relationship with IITA but we have not been involved in joint exploration with this organisation although training activities, workshops and conferences, has translated to tremendous collaboration. Nigeria has gained a lot, together with other countries from the activities of IITA and ICRAF.

It is important, here to mention the forest trail project of IITA. This place of denuded secondary forest within IITA has become an important *in situ* bank of important plant genetic resources. Over 15 threatened plant species are protected in this forest bank with Milicea excelsa being particularly plentiful at this site. Additionally, substantial genetic resources of some wild fruit and food crops are also available here (Ladipo, perscomm). This plant genetic resources bank has great potential for collaboration between IITA, ICRAF, IUCN/FAO and other NARS interested in conservation to translate it into a more effective research and conservation plot.

6.1 UNITED NATIONS INITIATIVES

Nigeria was represented at the 1992 UN meeting by the head of the Federal Environmental Protection Agency, and actions taken on recommendations since the conference took place include small scale activities in the areas of review of the vegetational states of the country (to update and identify changes in the vegetation and biodiversity. It is realized that much more activities are expected of Nigeria. If the agreed recommendation of the 1992 Biodiversity conference will be fully implemented, and NACGRAB will ensure this soonest as soon as necessary assistance are extended to the centre.

6.2 FAO GLOBAL SYSTEM

6.2.1 Undertaking

Action has been effected in respect of the endorsement of the undertaking stated above.

6.2.2 International Fund

International fund should be established. This we believe will cushion the activities of plant genetic resources organisation particularly in needy Nations. The fund should be used strictly for the purpose of its establishment. However, Nigeria aside from benefitting from the fund would be obliged to contribute to it within the context of its financial status.

6.2.3 Collaboration with FAO

Apart from the role of FAO etc. on NACGRAB's establishment, a second phase project document on plant genetic resources was developed for purpose of funding by UNDP, this has still not been implemented.

6.3 INTERNATIONAL AGRICULTURAL RESEARCH CENTRES

The National Centre for Genetic Resources and Biotechnology (NACGRAB) has enjoyed tremendous assistance from the CGIAR family notable among which are ICRAF, IITA, IPGRI, and CMMYT.

Aside from the training opportunities available at IITA from which the national programme has benefitted in the past, germplasm are also received from IITA and ICRAF on request. Exotic germplasm materials are also received from CMMYT as the need for them arises.

Some of the plant genetic resources conservation equipment at the National Centre were received from IBPGR now IPGRI. The International organization further supplies documentation and publications on various GRC (genetic resources conservation) Issues. From all indications, the CGIAR centres are in the position to provide the assistance being sought for now in view of the level of our needs. However, additional support would be

needed in the area of training, supply of modern equipment and also assistance in forms of communication gadgets that would facilitate collaboration between the National programme, NGO's and the centres.

The most important function of IPGRI in the next decade should be intensification of efforts in the promotion of plant genetic resources conservation and utilization on a global plan. Joint surveys, explorations and conservation will be major areas of collaboration in the future.

6.4 REGIONAL RESEARCH CENTRES

The country's relationship with other regional centres is mainly in the area of information dissemination as relates to plant genetic resources conservation. The magnitude of involvement with any of these regional research outfits or international organisation is thus low. This development is a policy area of GRC Collaborative within the country.

6.5 REGIONAL INTERGOVERNMENTAL INITIATIVES

Within the ECOWAS framework, a Scientific Collaborative arrangement is included. However, there was also an arrangement under the Technical Co-operation among developing countries (TCDC) programmes through the National Planning Commission with the Government of India in the area of germplasm exchange which is yet to materialise. There is thus a good potential for regional intergovernmental initiatives in Nigeria. However, this has not grown into any specific projects but IPGRI/FAO will do well to inquire from the ECOWAS headquarters in the state of this collaboration.

6.6 BILATERAL INTERGOVERNMENTAL INITIATIVES

Presently there is no bilateral agreement between Nigeria and other countries, but under the ECOWAS articles of association as stated above support collaboration, and this is already entreched in the articles of ECOWAS. This is a possible seed for stronger and more specific bilateral initiatives in the future with other countries in this sub region.

Additionally ICRAF started an initiative on *Irvingia* germplasm collection in West Africa. It involves ICRAF, Ghana, Cameroon, Nigeria, and Gabon. This arrangement has put these countries on a direct bilateral relationship on this species. The distribution of *Irvingia* over West Africa covers these countries.

Finally, the EEC also has a project on *Parkia biglobosa*. It involves, Nigeria, Burkina Faso and some other countries in West Africa. The activities of this project involves parkia germplasm collection and characterization (Ref. University of North Wales Bangor - F. Sinclair).

Efforts to revive a West African initiative on Hardwoods Improvement through FAO, has for over 10 years not been successful. This initiative requires some attention as most of the tree Species listed on the project proposal are now more or less threatened (Pers. Comm. D.O. Ladipo). Urgent effort and support from FAO/IPGRI on this is needed as the initiative involves substantial germplasm conservation effort.

CHAPTER 7
National Needs and Opportunities on Plant Genetic Resources Conservation

It is well understood that this chapter is very important and is capable of helping our national planning process.

Additionally, it will help ICPPGR include Nigeria on the Synthesis to be prepared on National needs and opportunities during the next decade.

With the understanding of the above, our need list is approached individually with specific areas enumerated under each sub-heading.

Areas of need include:

- Exploration, collection, and conservation of some threatened plant genetic resources including wild relatives of some cultivated crops.

  Species[1]:

  - Cucurbits (bottle gourds). II
  - *Chrysphyllom albidum* (Star apple) FT
  - *Delschnedia manii* FT/S
  - *Irvingia gabonensis* (Already in ICRAF/NACGRAB Project) FT
  - Iroko *(Millicea excelsa)* FTS
  - *Vernonia amygdalina* FT
  - *Onchobaca anbrevillei* FTS
  - Gossweiledendron sp. FTS
  - Kola Species (Wild relatives only) F
  - *Zanthoxylum zythoytoides* (Ex Fagara) M.
- Utilization of Plant Genetic Resources:
  - Support the establishment of crop networks.

[1] (Key: FTS - Forest tree species; F - Food tree; M - Medicinal tree; FT - Fruit tree; H - Horticultural Crops).

- Support basic training on breeding including seed/pollen storage and studies on breeding system in overseas centres of excellence.

- Inventory and Demarcation of *In situ* Conservation sites:
  - Review State of Strict natural Reserves in Nigeria.
  - Establishment of new SNRs to provide a better (vegetational) spread and creation of multiple strict natural reserves per ecology.
  - An evaluation of floral composition in selected of crop gardens, compound forms and fettish groves in Southern Nigeria.

- Training:

  Urgent needs are recognized in Technical and professional training, but substantial resources (Manpower) is known to be available in Nigeria. Thus IPGRI/FAO should encourage the tapping of these and arranging for mostly local (Nigerian and Subregional) or overseas training in the case of specialized areas.

  Areas of training required include:
  - Genebank Administration/management (short course at a Genebank overseas)
  - Exploitation, Collection and Conservation of PGR
  - Computer Science including Information Management
  - Biotechnology (Tissue Culture/Production - Conservation)
  - Particularly of the Oil palm and other species. (Shell-UK?/Malaysia? etc.)
  - Recalcitrant seed management and conservation (*Ellis group - Reading UK?)

- Strengthening and Development of Capabilities at NACGRAB:

  NACBRAB is, and will continue to be the focal point for Plant genetic resources conservation in Nigeria. It is presently handicapped in various ways and will require support in the following areas:
  - Staffing (Expert support)
  - Infrastructure and equipments (including generator, modern seed handling equipments and expansion of seed storage facilities plus 4†wheel vehicles)
  - Linkage with an overseas genebank to enhance interaction in scientific areas

- Documentation of genetic resources data:

  The need to have a viable documentation procedure is recognized.

  Areas of need include:

  - Development of a data base
  - The acquisition of necessary hardware and softwares
  - Developing a network system between NACGRAB, Research Centres and other Sub regional Centres
  - In addition to this is the need to enhance information services, i.e. provision of express mail network and production of good quality information leaflets, etc.

- Support on the review of existing national laws decrees, or legislations backing plant genetic resources conservation.
- Expert assistance on review of existing laws or legislations supporting plant genetic resources conservation, and the development of appropriate new ones.
- Support on review of international Commitments on plant genetic resources conservation with the objectives of identifying progress and problems in their implementation including needs to join or committee efforts on other ones.
- Specifically, the need for enhancing FHI (The national Herbarium at FRIN is solicited). This herbarium supports NACGRAB and other Centres but needs staffing, and the renewal of old collections which have now become poor and useless. Facilities to enhance this activity at FHI will help NACGRAB on plant identification and biosystematic research generally.

7.1 URGENT NEEDS

After a detailed review of the above points, we have concluded that the following is a ranking of needs.

- Enhancement or creation of a viable information system.
- Organisation of a National Workshop on plant genetic resources conservation.
- Strengthening of NACGRAB.

- Enhancement of documentation and conducting an inventory of materials available in *ex situ* and *in situ* gene banks.
- Collection and Conservation of threatened plant species (Horticultural crops, Fruit trees and Forest tree species).
- Review and enhancement of *in situ* conservation.
- Training (Technical and professional) - Assess the needs, and discuss with CGIAR Centres etc. to support.
- Enhancement of GR utilization in Nigeria
- Review of laws, negotiations and policy issues.

CHAPTER 8
Proposals for a Global Plan of Action

We recognize that germplasm does not follow political or international boundaries.

In the light of this, we need to develop a strong global programme following species or genus distribution.

These plan of specific and important plants can be used as a base for global networking. For example all members of the genus *Parkia,* or the members of the genus *Pentaclettra* can be used as a base from which we can start this activity.

We propose that on a global scale, an initiative on broadly distributed species be developed.

Germplasm collection and conservation at different locations will be useful, while genebank even outside the locations of collection or region of collection can be involved in conservation (seed and pollen).

A candidate species for this initiative would be the egusi melon/the watermelon and *Parkia biglobosa* (a forest tree).

APPENDIX 1
List of Some Arable and Cash Crops of Nigeria

Staple Food Crops

Cassava
Yam
Sorghum
Maize
Millet
Rice

Hungry rice

Cowpea

Timber (forest trees)

Triplochiton scleroxylon (Obeche)
Terminalia superba
T. ivorensis
Mansonia altisimina
Mellicia excelsa (Odum) (Iroko)
Sapela Entandrophragma spp

Fruits

Domesticated oranges
Mango, Pineapple, Guava, Pawpaw *Plantain & Banana
Irvingia gabonensis - bush mango
I. Wombulu
Dacroydis edulis
Chriysophyllum albidum
Tetrocarpidium conophorum
Parlcu Biglobulus

Horticultural Crops

Pepper
Tomato
Onion
Amaranthus
Okro and other indigenous vegetable
Eggplant

Cashcrops (Trees)

Cocoa
Kola
Coffee
Cashew wtc.
Oil palm

APPENDIX 2

Threatened Species of the Nigerian Flora

Family	Genus and species	Cited specimens and vegetation zones
Lycopodiaceae	Lycopodium ophioglossoides Lam. (F)	B. Hopkins FHI 54305 Obudu (5A)
Selaginellaceae	Selaginella njamensis Hieron. (F)	Gbile and Daramola FHI 68902 Ado Awaiye (5A)
Cyatheaceae	Cyathea mildbraedii (Brause) Domin (F)	Savory and Keay FHI 25136 Obudu (5A)
Hymenophyllaceae	Hymenophyllum capillare Desv. (F)	Hall. FHI 73152 Obudu (5A)
	Trichomanes horbonicum V. de B. (F)	Onochie FHI73152 Obudu (5A)
	Trichomanes clarenceanum Ballard. (F)	Keay FHI 28288 Calabar (Ikom) (6A)
	Trichomanes giganteum Bory ex Willd. (F)	Savory and Keay FHI 25198 Obudu (5A)
Dennstaedtiaceae	Lonchitis gracillis Alston (F)	Jackson, Magaji and Tuley 2110 FHI 33076 Mambilla (Mayodaga) (SA)
Vittariaceae	Antrophyum Mannianumq	TALBOT (BM)
	Hook. (F)	Calabar (Oban) (6A)
Adiantaceae	Actiniopteris australis (Linn. f.) Link (F)	Zwilling FHI. 47053 Jos (Plateau) (5A) Kabwir.
	Adiantum soboliferum Wall. ex Hook. (F)	Acharane F.R Okafor, FHI. 36878 Ankpa (6D)

Family	Genus and species	Cited specimens and vegetation zones
	Cheilanthes anceps Blanford (F)	Lawlor and Hall FHI. 46579. Jos (Naraguta) (7F)
	Coniogramme africana Hieron. (F)	R. Ata, Savory and Keay, FHI. 25044 Obudu (5A)
	Pteris pteridioides (Hook.) Ballard (F)	Chapman FHI 67149 Mambilla (Ngelyaki) (5A)
Aspleniaceae	Asplenium cornutum Alston (F)	IDC. 3105 - 67866 FHI., Mambilla (5A)
	Asplenium gemmascens Alston (F)	Savory and Keay FHI. 25201 Obudu (5A)
	Asplenium geppii Carruth (F)	Savory and Keay FHI. 25250, Ikwette Obudu (5A)
	Asplenium gaundeense Hieron (F)	Gillett 15378 = FHI. 54483, Ojo Rock Ibadan (6C)
	Asplenium mannii Hook. (F)	Riyandi Paha Chapman 2922 FHI. 46212 Mambilla (5A)
	Asplenium paucijugum Ballard (F)	Okafor, FHI. 36118 x Calabar (Oban) (6A)
Thelypteridaceae	Menisorus pauciflorus (Hook.) Alson (F)	Savory and Keay FHI. 25192, Ikwette Balegete path. Obudu (5A)
	Thelypteris zambesiaca (Bak.) Tard. (F)	Savory and Keay FHI. 25071, Obudu (5A)

Family	Genus and species	Cited specimens and vegetation zones
Athyriaceae	Athyrium glabaratum (Mett.) Alston (F)	Savory and Keay FHI. 25032, Calabar (Okorshie) (6B)
Lomariopsidaceae	Bolbitis salicina (Hook.) Ching (F)	Jones and Onochie FHI. 18931 Calabar (Ohan) (5A)
	Lomariopsis decrescens (Bak.) Kuhn (F)	Savory and Keay FHI. 25254 Obudu (5A)
Aspidiaceae	Ctenitis efulensis (Bak.) Tard. (F)	Jones, FHI. 4806 Calabar (Itu) (6B)
	Ctenitis jenseniae (C. Chr.) (Bonap.)	Hall. 933-FHI. 21151 Sapoba, Benin (6B)
Aspidiaceae	Ctenitis securidiformis var. nana (bonap,) Tard. (F)	Onyeachusim FHI. 4915.. Calabar (Osomba)(6B)
	Ctenitis speciosa (Mett.) Alston (F)	Daramola, Macauley and Oguntayo FHI. 78701 Calabar (6B)
	Ctenitis pubigera Alson (F)	Barter 158, Aboh (6B)
Acanthaceae	Acanthopale decempedalis C.B. C.I. (S)	Van Meer 1738 = FHI. 46694 Obudu (5A)
	Adhatoda buchholzii (Lindau) S. Moore (S)	Jones, FHI. 6858 Calabar (Itu) (6B)
	Adhatoda camerunensis Heine (S)	Daramola, FHI. 62364 Mambilla (Maisamari) (5A)
	Adhatoda maculata C.B. CI. (S)	Onyeachuslm, FHI. 94087, Calabar, (Orem.) (6B)
	Afrotittonia silvestris Lindau (S)	Latilo, FHI. 45809 Calabar (Orem) (6B)
	Asystasia decipiens Heine (H)	Daramola, FHI. 56419 Calabar (Oban) (6A)

Family	Genus and species	Cited specimens and vegetation zones
	Barleria oenotheroides Dum. Cours. (H)	Jones and Onochie (6A) FHI. 14726, Omo F.R.
	Brachystephanus africanus S. Moore (S)	Chapman 3294 FHI. 72131. Mambilla(Ngelnyaki) (6B)
	Brachyastephanus longiflorus Lindau (S)	Van Meer 1741 = FHI. 46697, Obudu (5A)
	Dicliptera obanensis S. Moore (H)	Daramola, FHI. 55329 Calabar (Awi) (6A)
	Dischistocalyx tunbergiiflorus (T. Anders.) Benth (S)	Van Meer 1408 = FHI. 33968, Oban (6A)
	Endosiphon primuloides T. Anders. ex Benth. (H)	Jones, FHI. 6872 Calabar (Itu) (6B)
	Graptophyllum glandulosum Turrill (S)	Onochie FHI. 86442x Calabar. (6B)
	Hygrophila borellii (Lindau) Heine (H)	Latilo, FHI. 60846 Egbado (6C)
	Justicia hepperi Heine (H)	Hepper, 1393x Mambilla (5A)
	*Justicia nigerica S. Moore (S)	Onochie, FHI. 36391x Calabar (6B)
Acanthaceae	Physacanthus batanganus (G. Braun & K. Schum.) Lindau (H)	Daramola, FHI. 55318 Calabar (6B)
	*Physacanthus talbotii S. Moore (H)	Keay, FHI. 37718a Calabar, (Eket) (2A)
	Pseuderanthermum ludovicianum (Buttner) Lindau (S)	Keay and Savory, FHI. 25199. Obudu (5A) Ikwette-Balegete path.
	Rungia paucinervia (Anders. exC.B.C1.)	Onochie and Olorunfemi FHI. 36121x, Calabar

Family	Genus and species	Cited specimens and vegetation zones
	Heine (H)	(6B)
	Rungia paxiana (Lindau) C.B.C1. (H)	Savory and Keay, FHI. 25011. Obudu (5A)
	Sclerochiton preussii (Lindau) C.B.C1. (S)	Daramola, FHI. 55515 Obudu (5A)
	Schaueria populifolia C.B.C1. (S)	Ariwodo, FHI. 36063x Calabar (6B)
	Staurogyne kamerunensis (Engl.) Benost (H)	Onochie, FHI. 33225 Calabar (Orem) (6D)
	Thomandersia laurifolia (T. Anders. ex Benth.) Baill. (S)	Onochie, FHI. 36063x Umon-Ndealichi F.R. Calabar (Orem) (6B)
	Thunbergia rufescens Lindau (S)	Latilo and Edwin FHI. 15282, Akure F.R. (63)
Agavaceae	*Bracaena goldieana Bull (H)	Ujor, FHI. 30833 Calabar (Oban) (6A)
	Bracaena viridiflora Engl. & K. Krause (S)	Onochie, FHI. 36135x Calabar (Oban) (6A)
Amaranthaceae	Achyranthes talbotii Hutch. et. Dalz. (H)	Keay, FHI. 28284, Calabar (Ikom) (6A)
Anacardiaceae	Lannea humilis (Oliv.) Engl. (S)	Uyamadu, FHI. 42754 Bornu, Maiduguri (8C)
	Sorindeia collina Keay (T)	Gbile and Daramola FHI. 63236, Mambilla (5A)
	Sorindeia mildgbraedii Engl. & v. Brehm. (T)	Onochie FHI. 32906 Ibena area, Calabar (Eket) (2A)
Anacardiacea	Trichoscypha acuminata Engl. (T)	Van Meer 1625 = FHI. 36751 Calabar (Awi) (6A)
	Trichoscypha arborea (A. Chev.) A. Chev. (T)	Latilo, FHI. 45811 Calabar (Oban) (6A)
	Trichoscypha mannii	Onochie andOlorunfemi

Family	Genus and species	Cited specimens and vegetation zones
	Hook. f. (T).	FHI. 36115x Calabar (Ikom) (6A)
	Trichoscypha patens (Oliv.) Engl. (T)	Latilo, FHI. 59724 Calabar (Ikom) (6A)
Annonaceae	Anonidium friesianum Exell (T)	Keay, FHI. 28257 Calabar (Ogoja) (6D)
	Artabtrys insignis (Engl. & Diels. (L)	Onochie, FHI. 41627 Ilaro (6C)
	Enneastemon foliosus (Engl.) & Diels.) Robyns & Ghesq. (L.)	Ebuade, FHI. 41627 Benin (Okomu) (4B)
	Friesodielsia hirsuta (Benth.) Van Steenis (L)	Onochia, FHI. 49739 Benin (Ohosu) (6B)
	Friesodielsia soyauxii van Steenis (L)	Ahmed and Chizea FHI. 19780. Ibadan South (Sprague et Hutch.) F.R. (6C)
	*Oxymitra obanensis (Bak. f.) Sprague Hutch. (L)	Talbot, 1246 Calabar (Oban) (6A)
	Pachypodanthium staudtii Engl. & Diels (T)	Ejiofor, FHI. 21895 Calabar (Oban) (6A)
	*Piptostigma pilosum Oliv. (T)	Daramola FHI. ..... Calabar (Oban) (6A)
	Uvaria ovata (Dunal) A.DC. subsp. ovata (S)	Abrahall, FHI. 27559 Enugu (Nsukka) (6D)
	Uvariastrum zenkeri Engl. & Diels (T)	Talbot 1534 Calabar (Oan) (6A)
	Uvariastrum pierreanum Engl. (T)	Brenan 8827 = FHI. 39218, Benin (Okomu) (4B)
	Uvariodendron connivens (Benth.) R.E. Fries	Ujor, FHI. 31636 Calabar (Oban) (6A)
	Xylopia africana	Keay and Savory

Family	Genus and species	Cited specimens and vegetation zones
	(Benth.) Oliv. (T)	FHI. 25179, Obudu (5A)
	Xylopia chrysophylia Louri ex Boutique et Onochie (T)	Onochie, FHI. 21820 Okomu (Benin) (4B)
Annonaceae	Xylopia staudtii Engl. & Diels (T)	Rosevear C21 = FHI. 1318, Calabar (Uwet Rd.) (6A)
Apocynaceae	Baisson loonensis Benth. (S)	Onochie, FHI. 32935, Calabar (6B)
	Baisson tenuiloba Stapf (S)	Kalbreer 73 = FHI. 77166, Bonny River (6B)
	Callichilia mannii Stapf (S)	Ujor, FHI. 30819 Calabar (Oban) (6A)
	Cylindropsis parvifolia Pierre (L)	Ujoh, FHI. 31796 Calabar (Oban) (6A)
	Hunteria eburnea Pichon (T)	Keay, FHI. 28250 Calabar (Ogoja) (6D)
	Landolphia Klainei Pierre (L)	Henderson, FHI. 755 Onitsha (Anambra) (6B)
	Landolphia parvifolia var. johnstonii (A. Chev.) Pichon (L)	Van Meer 1610 = FHI. 36738A Calabar (Oban) (6A)
	Malouetia boquaertiana Woodson (S)	Okafor, FHI. 60320 Imo River (Imo State) (6B)
	Orthopichonia nigeriana (Pichon) H. Huber (L)	Ekwuno, Fagbemi Osanyinlusi, FHI. 88923 Calabar (Obubra) (6D)
	Orthopichonia schweinfurthii (Stapf) Huber. (L)	Onochie, FHI. 36652 Sapoba (6B)
	Pleiocarpa mutica Benth. (S)	Van Meer 1266 = FHI. 33697, Calabar (Oban) (6A)

Family	Genus and species	Cited specimens and vegetation zones
	Pleiocarpa talborii	Keay, FHI. 28277
	Werham (T)	Calabar (Ikom) (6A)
	Strophanthus bullenianus	Ujoh, FHI. 31798
	Mast. (L)	Calabar (Akampa) (6A)
	Stronphanthus thollonii	Latilo, FHI. 40901
	Franch. (L)	Calabar (Akampa) (6A)
	Tabernaemontana	Okafor and Latilo
	glandulosa (Stapf)	FHI. 36415x Calabar (Awi) (6A)
	Tabernaemontana crassa	Van Meer 1550, FHI.
	Benth. (T)	34783, Calabar (Oban) (6A)
Apocyhacea	Tabernaemontane ventricosa	Opara 1150, FHI.
	Hochst. ex A.DC. (T)	34783, Obudu (5A)
	Voacanga bracteata Stapf var.	Onochie, FHI. 36425x
	bracteata (S)	Calabar (Oban) (6A)
	Voacanga bracteata var zankeri	Aninze, FHI. 15434
	(Stapf) H. Huber (S)	Calabar (Oban) (6A)
Araceae	Cercestis afzelii	Ariwodo, FHI. 89141
	Schott (L)	Calabar (Obubra) (6D)
	Zantedeschia angustiloba	Chapman 2780= FHI.
	(Schott) Engl. (H)	49071 Mambilla (5A)
Araliaceae	Schefflera abyssinica	Chapman, 2712= FHI.
	(Hochst ex. A. Rich) Harms (T)	46071, Mambilla (5A)
Aristolochlaceae	*Pararistolochia talbotii	Onochie, FHI. 36224x
	(S. Moore) Keay (L)	Calabar (Oban) (6A)
	*Pararistolochia tenuicauda	Jones and Onochie, FHI.
	(S. Moore) Kaey (L)	14142, Calabar (Obudu) (6A)
	Pararistolochia zenkeri	Brenan, 8464=
	(Engl.) Hutch. et Dalz. (L)	FHI. 39446, Benin (Okomu) (4B)
Asclepiadaceae	Brachystelma constrictum	Daramola, FHI. 62731
	J.B. Hall (H)	Mambilla (Yelwa) (5A)

Family	Genus and species	Cited specimens and vegetation zones
	Brachystelma omissum	Chapman, 2760= FHI.
	Bullock (H)	6051, Mambilla (Yelwa) (5A)
Balsaminaceae	Impatiens zenkeri	Daramola FHI. 62742
	Warb. (H)	Mambilla (Yelwa) (5A)
Begoniaceae	Begonia cilio-bracteata	Richard, 5177= FHI.
	Warb. (H)	38917, Calabar (Oban) (6A)
	Begonia poculifera Hook.f. (H)	Wit and Daramola 2393 = FHI. 77542 Obudu (5A)
Boraginaceae	Cordia rothii Roem. & Schult. (T)	Jackson 484 = FHI. 14949, Bornu (8C)
	Cordia vignei Hutch. & Dalz. (S)	Binuyo, FHI. 41280, Calabar (Obubra) (6D)
Boraginaceae	Heliotropium subulatum	Ujor, FHI. 23903
	(Hochst. ex DC.)	Bornu, Maiduguri (8C)
	Heliotropium supinum	Tuley 6 = FHI. 17902
	Linn. (H)	Bornu (Gashua) (8C)
Burseraceae	Commiphora quadricincta	Daggash FHI. 24866
	Schweinf. (T)	Gashagar (Bornu) (8C)
Buxaceae	Notobuxus acuminata	Amachir Igboeli
	(Gilg) Hutch. (S)	FHI. 38273, Calabar (Obubra) (6D)
Butomaceae	Tenogocharis latifolia	Stanfield FHI. 55967
	(G. Don) Buchen (H)	Bida, Badeggi (7C)
Caesalpiniaceae	Anthonotha fragrans (Bak. f.)	Keay FHI. 28155
	Exell et Hillcoat (T)	Ikom (6A)
	Anthonotha lamprophyilla	Onochie FHI. 7726
	Oban (Harms.) J. Leonard (T)	
	Berlinia bracteosa	Keay FHI. 28153
	Benth. (T)	Ikom (6A)
	*Cryptosepalum diaphyllum	Jones FHI. 1765
	Duvign. (T)	Obubra (6D)

Family	Genus and species	Cited specimens and vegetation zones
	Crytosepalum pellegrinianum (J. Leonard) J. Leonard (T)	Caterall, FHI. 2885 Ukom F.R. (6D)
	Cynometra hankei Harms (T)	Onochie, FHI. 36323x Oban, Orem (6A, 6B)
	Dialium pachyphyllum Harms (T)	Olorunfemi, Ariwodo Onijamowo, FHI. 76394 Obubra, Ikom (6D, 6A)
	*Didelotia african Baill. (T)	Latilo, FHI. 41337 Oban (6A)
	*Loesenera talbotii Bak.f. (T)	Latilo, and Onyeachusim FHI. FHI. 24259, Calabar Ikpan (6B)
	Microerlinia bisulcata A. Chev. (T)	Daramola and Eka, FHI. 55600, Oban (6A)
	Monopetalanthus sp. B. (T)	Ejiofor, FHI. 21893 Calabar, Orem, Oban (6B, 6A)
Caesalpiniaceae	Schotia africana (Baill.) Keay (t)	Onochie, FHI. 36244x Orem, Oban (6B, 6A)
	Zenkerella citrian Taub. (T)	Odeyinde 4 = FHI. 57870 Obudu, Boshi (5A)
Capparidaceae	Capparis erythrocarpos Isert	Onochie, FHI. 13544 Ilaro F.R. (6C)
	Ritchiea albersii Glg (T)	Savory and Keay, FHI. 15212, Calabar, Oban, Obudu (6B, 6A, 5A)
Caryophyllaceae	Stellaria mannii Hook, f. (H)	Daramola, FHI. 62358 Ngelyaki (Mambilla) (5A)
	Uchelinia nigeriaca Turrill (H)	Emwiogbon and Osanyinlusi

Family	Genus and species	Cited specimens and vegetation zones
		FHI. 87153, Obudu (5A)
Celastraceae	Maytenus undatus (Thunb.)	Hepper 1110 = FHI.
	(Thunb.) Blakelock (S)	21482, Jos Plateau (5A)
	Salacia dusenii Loes. (L)	Latilo, FHI. 30973
		Afi F.R., Aboabam (6A)
	Salacia fimbrisepala	Jones Keay and Onochie
	Loes. (S)	FHI. 1925 Olokemeji
		F.R. (6C)
	Salacia hispida Blakelock (L)	Eimunjeze and Oguntayo
		FHI. 72558 Sapoba, Okomu (6B, 6A)
	Salacia mannii Oliv. (T)	Brenan Jones 8426 = FHI.
		41681, Okomu, Sapoba,
		Usonigbe (4B, 6B)
	Salacia staudtiana Loes. (L)	Latilo, FHI. 31854
		Ikom, Awi (6A)
Combretaceae	Combretum bauchiense Hutch.	Lely p. 39 = FHI. 31854
	& Dalz (T)	Jos Plateau (5A)
	Combretum comosum G. Don (S)	Emwiogbon, FHI. 64000
		Mamu River F.R. (6B)
	Combretum confertum (Benth.)	Keay, FHI. 28170
	Laws. (L)	Ikom (6A)
	*Combretun excelsum Keay (L)	Keay, FHI. 28147
		Ikom (6A)
	Combretum insulare Engl.	Chizea, FHI. 23971 Oyo,
	& Diels (L)	Ibadan North F.R. (6D, 6C)

Family	Genus and species	Cited specimens and vegetation zones
Combretaceae	Pteloopsis habeensis Aubrev. ex Keay (S)	Keay, FHI. 37897 Yankari (8D)
	Pteleopsis hylodandron Milbdr. (T)	Ujor, FHI. 30189 Ukpon, Itu (6D, 6B)
	Strephonema mannii Hook. f. (S)	Latilo, FHI. 30952 Ogoja, Band of R. Oyi (6D. 6B)
	Terminalia bellerica Roxb. (T)	Anya. FHI. 4215 Kano (8B)
Commelinaceae	Commelina bracteosa Hassk. (H)	Lawlor and Hall 274 = FHI. 56308, Panshanu (7D)
	Palisota bracteosa C.B.Cl. (H)	Ujor, FHI. 30844, Ore, Afi R., Calabar. (6B, 6A. 6(B)
	Palisota preussiana K. Schum. ex. C.B. Cl. (H)	Chapman 2820, FHI. 46110, Mambilla Mbamingo (5A)
Compositae	Acanthospermum australe (Loefl. Kuntze (H)	Latilo, FHI. 69419 Jos, Naraguta (7F)
	Carduus nyassanus (S. Moore) R.E. Fries (H)	Wit, Gbile and Daramola, FHI. 66763 Nguroji (Mambilla) (5A)
	Centaurea senegalensis DC. (H)	Onochie and Ibrahim FHI. 23346, Bornu, Nguru (8C)
	Conyza clarenceana (Hook. fl) Oliv. & Hiern (H)	Daramola FHI. 41179 Gembu, Mambilla (5A)
	Conyza spartioides O. Hoffm. (H)	Daramola FHI. 627111 FHI. 67302, Pankshin (7D)
	Conyza steudelii Sch. Bip. ex A. Ric. (H)	Daramola and Ekwuno FHI. 67302, Pankshin (7D)

Family	Genus and species	Cited specimens and vegetation zones
	Conyza stricta Wild. (H)	Hepper 1102 = 50565, Jos (7D)
	Echinops amplexicaulis Oliv. (H)	Hepper 1750 = FHI. 50609 Gembu, Nguroje (5A)
	Echinops lanceolatus Mattf. (H)	Hepper 1549 = FHI. 50825..... Peak (5A)
	Gnaphalium indicum Linn. (H)	Daramola and Josephine FHI. 63696. Maiduguri (8C)
Compositae	Gnaphalium undulatum Linn. (H)	Jackson 5320 = FHI. 44883, Gembu, Nguroje (5A)
	Grengea maderaspatana (Linn.) Poir. (H)	Ujor FHI. 21931, Maiduguri, Katau (8C)
	Helichrysum albiflorum Moeser (H)	Wit and Daramola 2424A = FHI. 77604 Obudu (5A)
	Helichrysum alimatifolium Moeser (H)	Daramola 72 = FHI. 84497, Obudu (5A)
	Helichrysum cameroonense Hutch. et Dalz. (H)	Gbile and Daramola FHI. 63271 Chappai Waddi (5A)
	Helichrsum cymosum (Linn.) Less. (H)	Daramola FHI. 62429 Gembu, Chappai Waddi (5A)
	Helichrysum foetidum (Linn.) Moench. (H)	Savory and Keay FHI. 25095, Obudu Yelwa (5A)
	Helichrysum quartinianum A. Rich. (H)	Daramola FHI. 61392 Gembu (5A)

Family	Genus and species	Cited specimens and vegetation zones
	Helichrysum rhodolepis Baker (H)	Lowe 3659A = FHI. 85098, (5A)
	Inula glomerata Oliv. & Hiern (H)	Chapman 3277 = FHI. 72130, Gembu (5A)
	Inula subscaposa S. Moore (H)	Hepper 1819 = FHI. 42818, Mayodaga, Gembu (5A)
	Lactuca grandulifera Hook.f. var grandulifera (H)	Hepper 1730 = FHI. 42922, Nguroje, Ngelyaki (5A)
	Lacturca tuberosa A Chev. (H)	Hepper 1764, Nguroje, (5A)
	Lactuca schweinfurthii Oliv. & Hiern (H)	Daramola FHI. 62749 Vogel Peak (5A)
	Lactuca ugandensis C. Jeffr. (H)	Daramola FHI. 81619 Gembu (SA)
	Mikaniopsis paniculata Milne - Redhead (L)	Savory and Keay FHI. 25238, Obudu, Ikwette (5A)
	Nicolasia quinqueseta O. Hoffm. ex Thollg. (H)	Hepper 1554 = FHI. 52309, Maisamari Salinghe, Gasaka (5A)
	Sigesbeckia abyssinica (Sch. Bip.) Oliv. et Hiern (H)	Daramola 164 = FHI. 86222, Njawai, Jauro Umanu (8D)
	Sonchus angustissiumus Hook.f. (H)	Savory and Keay PHI. 25261, Gurum (8D)
	Sonchus exauriculatus (Oliv. & Hiern)). Hoffm. (H)	Hepper 1598 = FHI. 42856, Gurum (8D)
	Sonchus oleraceus Linn. (H)	Hepper 1027 = FHI. 42904, Maisamari Gembu (5A)
	Sonchus schweinfurthii Oliv. & Hiern (H)	Hepper 1656 = FHI. 42861, Jos (7D).
	Vernonia bamendae C.D.	Daramola FHI. 40649

Family	Genus and species	Cited specimens and vegetation zones
	Adams (H)	Chappal Waddi Maoselbe (5A)
	Vernonia calvoana var. microcephala C.D. Adams (H)	Hepper 1671 = FHI. 48354, Maisami (8D)
	Vernonia chapmannii C.D. Adams (H)	Chapman 42, Zanche (Gonyole) (8D)
	Vernonia cistifolia O. Hofm. (H)	Keay FHI. 21026, Jos Bukuru Road (7D)
Connaraceae	Agelaea dewevrei De Wild & Th. Dur. (S)	Van Meer 1775 = FHI. 46730, Boshi Extension Extension (5A)
	Cnestis grisea Bak. (L)	Onochie FHI. 36476x Orem, Oban (6B, 6A)
Connaraceae	Cnestis iomalla Gilg (L)	Latilo FHI. 30975 Ogoja (6D)
	Jollydora duparquetiana (Baill.) Pierre (T)	Van Meer 1144 = FHI. 29114, Ekinte F.R. Akamkpa (6A)
	Jollydora glandulosa Schellenb. (T)	Latilo FHI. 30923, Obudu (5A)
	Reureopsis obliquifoliolata (Gilg) Schellenb. (S)	Onochie FHI. 36103x Eket, Ikot, Orem (2A, 6B)
Convolvulaceae	Ipomoea alpina Rendle (H)	Daramola FHI. 62746 Vogel peak (5A)
	Ipomoea obscura (Linn.)	Dalziel 183 = FHI. 49905,
	kerGawl. (L)	Katagum (8C)
	Ipomoea verbascoidea Choisy	Brown 44 = FHI. 59880,
		Jos, Pankshin, Panshan (7D)
Cruciferae	Cardamine trichocarpa Hochst. ex. a. Rich. (H)	Daramola FHI. 61532 Maisamari, Nguroje, Mayondaga (5A)

Family	Genus and species	Cited specimens and vegetation zones
Cucurbitaceae	Corallocarpus beehmii (Cogn.) C. Jeffey (H)	Hall and Daramola FHI. 67398, Shere. Mt. (7D)
	Cucumis prophetarum Linn. (H)	Redhead FHI. 55954 Sokoto, Kware (8A)
	Gerrardanthus lobatus (Cogn.) Jeffrey (L)	Lawlor & Hall 288 = FHI. 8455, Panshanu Pas (7D)
	Lageraria guiaeensis (Cogn.) C. Jeffrey (L)	Redhead FHI. 47006 Gambari F.R. (6C)
	Luffa acutangula Roxb. (L)	Probably cltivated Ibadan (6C)
	Trichosanthes cucumerina Linn. (L)	Oseni FHI. 39580, Ibadan (6C)
Cyperaceae	Coleochioa abyssinica castanea (C.B.Cl.) Pichi-Sermolli (C)	Daramola HI. 62913, Vogel peak (5A)
	Cyperus dichroostachyus Hochst. ex. K. Rich (C)	P. Wit 2061, Nguroje (5A)
	Cyperus mannii C.B.Cl.) (C) Nguroji (5A)	Wit, Gbile and Daramola 2088 = FHI. 66794
	Cyperus tenax Boeck (C) 82028 Lagos - Badagry Rd. (1)	Thomas P. 32 = FHI.
	Eleocharis brainii Svenson (C)	Clayton 1508 = FHI. 42003, Bacita (7C)
	Fimbristylis dipsacea (Rottb.) C.B.Cl. (C)	Eimunjeze et al. FHI. 70395, Koton Karfi (7C)
	Kyllinga appendiculata	Hepper 1271 = FHI.

Family	Genus and species	Cited specimens and vegetation zones
	53772, Yola, Garum (8D) K. Schum. (C)	
	Kyllinga melanosperma Nees (C)	Okafor FHI. 59252, Bauchi, Kurra (7D)
	Kyllinga robusta (C)	Jones FHI. 19426, Lagos, Ikorodu (1)
Cyperaceae	Lipocarpha nana (A. Rich) Cherm. (C)	Lely FHI. 11181, Jos (7D)
	Mapania amplivaginata K. Schum. (C)	Jones & Onochie FHI. 18641. Manko Area, Awi, Afi F.R. (6B, 6A)
	Mapania macrantha (Boeck.) Pfeiffer (C)	Ujor FHI. 30845, Orem, Akarara (6B)
	Mariscus hamulosus (M. Bieb.) Hooper (C)	Daramola FHI. 63692 Maiduguri, Alo R. (8C)
	Mariscus luridus C.B.Cl. (C)	Lowe 2865 = FHI. 77522
	C.B.Cl. (C)	Olokemeji, R. Ogun (6C)
	Mariscus tomaiophyllus (K. Schum.) C.B. Cl. (C)	Lowe ..... FHI. 69285 Obudu, Cattle Ranch (6C)
	Scrirpus mucronatus Linn. (C)	Latilo and Daramola FHI. 29000, Mayo Ngaga (5A)
	Scirpus oxyjulos Hooper (C)	Clayton 1323 = FHI. 39874, Kufari Hill, Kaduna (7D)
	Scrirpus uninodis (Del.) Boiss. (C)	G. Jackson 2574 = FHI. 59162, Bornu (8C)
	Scleria iostephana Nelmes (C)	Meikle 779 = FHI. 69665 Nemme, Kachia Rd. (7D).

Family	Genus and species	Cited specimens and vegetation zones
	Scleria lithosperma	Jones, Keay and Onochie
	(Linn.) (C)	FHI. 14189, Olokemeji (6C)
	Websteria confervoides	Onochie FHI. 34310,
	(Poir.) Heoper (C)	Sapoba (6B)
Dichapetalaceae	Dichapetalum gabonense	Onochie FHI. 36403 x
	Hiern (L)	Ibadan South F.R. (6C)
	Dichapetalun gabonense	Onochie FHI. 24486,
	Eng. (S)	Ikom, Orem (6A, 6B)
	Dichapetalum insigne	Onochie FHI. 36191x
	Engl. (S)	Orem (6B)
	Dichapetalum longitubulosum	Onochie FHI. 36473x
	Engl. (S)	Ikom, Orem (6A, 6B)
	Dichapetalum mundense	Daramola FHI. 57420
	Engl. (L)	Calabar, Oban F.R. (6B, 6A)
	Dichaptelum parvifolium Engl. (L)	Breteler 11324 = FHI. 80182, Efferum-Ughelli. Rd. (4B)
Dichapetalaceae	Dichapetalum staudtii	Jones and Onochie
	Engl. (S)	FHI. 7037, Omo (6A)
	Dichapetalum tomentosum	Van Meer 1307 = FHI.
	Engl. (L)	33770, Oban (6A)
	Dichapetalum zenkeri	Binuyo FHI. 45451,
	Engl. (T)	Agodi F.R. (6A)
	Tapura africana Oliv.	Latilo FHI. 30976, Orem,
	(T)	Aboabam (6B, 4B)
Ebenaceae	Diospyros gabonensis Gurke (T)	Onochie FHI. 33186, Ntete (6B)
	Diospyros hoyleana	Adebusuyi FHI. 51710
	F. White (T)	Agoi F.R. Oban (6A)
	Diospyros melcocarpa	Jones and Onochie FHI.

Family	Genus and species	Cited specimens and vegetation zones
	F. White (T)	FHI. 8302, Aboabam (4A)
	Diospyros obliquifolia (Hiern ex Gurke) F. White (T)	Hall 17956 = Oban. Aboabam (6A, 4A)
	Diospyros preussii Gurke	Coopeh FHI. 31718, Akamkpa, Orem, Oban (6A, 6B, a)
	Diospyros tricolor (Schum. et (Schum et Thonn.) Hiern (S)	Hossain & Opayemi 1225, FHI. 29766, Lagos (1A)
	Diospyros zenkeri FHI. (Gurke) F. White (T)	Latilo & Olorunfemi, 43938, Ikom, Orem Afi (6A, 6B, 6A)
Ericaceae	Agauria salicifolia (Comm.) Hook. f. ex. Olive (T)	Chapman 2688 = FHI. 45129, Dorofi, Tamaya Tamaya (7C)
	Philippi mannii (Hook.f. Alm & Pries (S)	Chapman 2861 = FHI. Chappal Waddi (5A)
Eriocaulaceae	Eriocaulon elegantulum Hochst. (H)	Hepper 1126 = FHI. 51621, Jos (7F)
	Eriocaulon elegantulum Engl. (H)	Onochie FHI. 34258, Badagry (4A)
	Mesanthemum jaegeri Jac. - Fel. (H)	Savory & Keay, FHI. 25079, Koloishe (6D)
Euphorbiaceae	Acalypha manniana Mull. Arg. (T)	Savory & Keay, FHI. 25261, Ikwette, Obudu (5A)
	Amanoa strobilacea Mull. Arg. (T)	Ujor FHI. 31630, Ikotewa, Calabar (6B)
	Cyrtogonone argentea (Pax) Prain (T)	Latilo FHI. 30988, Afi R. F.R., Oban (6A)
	Cythogyne viridis Mull. Arg. (S)	Onochie & Okafor, FHI. 36058x Orem (6B)
	Dichostemma glaucescens	Daramola FHI. 57438

Family	Genus and species	Cited specimens and vegetation zones
	Pierre (T)	Oban, Awi (6A)
	Drypetes gossweileri S. Moore (T)	Olorunfemi FHI. 31901 Okomu, Sapoba, Usonigbe (1B, 6B, 6B)
	Erythrococca chevallieri Okomu, Sapoba (Boille) Prain (T)	Keay FHI. 38312, (1B, 6B)
	Euphorbia baga A. Chev. (H)	King FHI. 18079, Jos (7D)
	Euphorbia depauperata Hochst. ex A. Rich (H)	Chapman 2676 = FHI. Chappal Waddi (5A)
	Euphorbia glaucophylla Foir. (H)	Onochie FHI. 33485 Badagry (1A)
	Sapium grahamii (Stapf) Prain (H)	Latilo FHI. 62564, Borgu (7D)
	Sapium guineenses (Benth.) O. Ktze. (S)	Latilo & Daramola FHI. 28720, Gangumi, Gidan Anju (7C)
	Grossera macrantha Pax (T)	Latilo and Daramola, FHI. 28897, Gangumi, (Gongola) (7C)
	Grossera vignei Hoyle (T)	Amachi FHI. 38294, Ukpon River F.R. (6A)
	Macaranga paxii Prain (T)	Jones FHI. 14120 Ikom (6A)
	Maesobotrya dusenii (Pax) Hutch. (T)	Latilo & Olorunfemi FHI. 43930, Awi, Ikom Oban, Obudu (6A, 5A)
	Measobotrya staudtii (Pax) Hutch. (T)	Latilo & Olorunfemi, FMI. 43941, Iyamoyong Boshi Ikom, Afi R. (6A, 6A)
	Mareyopsis longifolia (Pax) Pax ex K. Hoffm.	Onochie FHI. 33187 Ntete bar beach (6A)

Family	Genus and species	Cited specimens and vegetation zones
	Phyllanthus maderaspatensis Linn. (S)	Latilo FHI. 62771, Gedon village. Sokoto (8A)
	Phyllanthus mannianus Mull. Arg. (H)	Ekwuno FHI. 77250 Ngelyaki (5A)
	Plagiostyles africana (Mull. Arg.) Prain (T)	Onyeachusim, FHI. 54242, Ekang (6A)
	Protomegabaria macrophylla Hutch. (T)	Onochie FHI. 34832 Oban (6A)
	Pseudagrostistachys africana (Mull. Arg.) Pax & K. Hoffm. (T)	Savory & Keay, FHI. 25207, Obudu, Ikwette (5A)
	Pycnocoma macrophylla Benth. (T)	Jones FHI. 6859, Itu Calabar (6B)
	Tetrorchidium oppostifolium (Pax) Pax & K. Hofffm. (S)	Brenan 9233 = FHI. 36373, Awi, Kwa Falls, Ikom, Calabar (6A, 6A, 6B)
	Thecacoris annobonae Pax & K. Hoffm. (T)	Jones & Onochie 17328 Afi River F.R. (6A)
	Thocacoris leptobotrya (Mull. Arg.) Brenan. (T)	Ujor FHI. 30153, Oban, Ikom, Awi (6A)
	Tragia preussi Pax. (H)	Onochie FHI. 36094x Orem (6B)
	Uapaca acminata (Hutch.) Pax & K. Hoffm. (T)	Hall 17969 = FHI. 88217, Manko area, Cross River (6B)
	Unpaca paludosa Aubrev. & Loandri (T)	Jones FHI. 6293. Sapoba Okomu, Gilli-Gilli (6B, 4B, 4B)
	Uapaca vanhouttei De Wild. (T)	Binuyo FHI. 41395, Osomba, Uwet, Aboabam

Family	Genus and species	Cited specimens and vegetation zones
		C.R.S. (6B, 6A, 4A)
Flacourtiaceae	Caloncoba echinata (Oliv.) Gilg (T)	Oni FHI. 33635, Ilaro Omo (6C, 6A)
	Caloncoba gilgiana (Sprague) Gilg (T)	Ross 170 - FHI. 1849 Badagry (4A)
	Camptostylus ovalis (Dliv.) Chipp (T)	Keay FHI. 28248, Afi R.F.R. (6A)
	Dasylepis blackii (Oliv.) Chipp (T)	Latilo FHI. 10912, Dukwe C.R.S. (6A)
	Ophiobotrys zenkeri Gilg (T)	Catterall 192 = FHI. 1253, Okunde, Afi F.R. (Cross) (6A)
	Phyllobotryum soyauxianum Baill. (T)	Onochie FHI. 7714, Oban F.R., Eket (6A, 2A)
Gentianaceae	Sebaea branchyphylla Griseb.	Gbile and Daramola FHI. 62853, Gembu (5A)
	Swertia quartiniana Hochst. ex & A. Rich (H)	Chapman 2908 = FHI. FHI. 46228, Gembu (5A)
Gerantaceae	Geranium ocellatum	Jackson, Tuley, Magaji 2013 = FHI. 21738, Chappal, Waddi (5A)
Gnetacea	Gnetum budhholzianum Engl. (S)	Onochie and Okafor FHI. 36137x, Orem, Ikom (6B, 6A)
Goodeniaceae	Scaevola plumieri (Linn.) vahl (S)	Onochie FHI. 33488 Badagry (4A)
Gramineae	Eragrostis curvula Nees (G)	Clayton 1490 = FHI. 42014, Shika, Zaria (7D)
	Eragrostis pobeguinii Hubbard (G)	Wit, Gbile, Daramola 2080 = FHI. 66785

Family	Genus and species	Cited specimens and vegetation zones
		Nguroji (5A)
	Guaduella donsiflora	Keay FHI. 28156, Ikom
	Pilger (G)	Odukpani (6A)
	Guaduella macrostachys	Hall S.M. (UIH 17926)
	(K. Schum.) Filger (G)	FHI. 88187, Manko, Ayip-Eku area (6B, 4B)
	Hemarthria altissima (Poir.)	Latilo FHI. 62756
	Stapf & C.E. Hubbard (G)	Argungu, Sokoto (BA)
	Hyparrhenia filipendula	Clayton 1448 = FHI.
	(Hochst.) Stapf (G)	FHI. 41960, Jos (7D)
	Hyparrhenia nyassae (Rendle) Stapf (G)	Hubbard 85 = FHI. 58790, Ahiya, Benue (C)
	Hypseochloa cameroonensis C.E.	Gbile and Daramola FHI.
	Hubbard (C)	63271, Chappal Waddi
		Waddi (5A)
	Isachne angolensis Rendle (G)	Daramola FHI. 62431
		Tugan, Gongola (8D)
	Ischaemum baratum	Onochie FHI. 33125,
	Retz. (G)	Ethiope, Bendel (6B)
	Loudetiopsis scaettae	Jackson FHI. 44876
	(A. Camus) W.D. Clayton (G)	Jebba (7C)
	Pennisetum monostigma	Wit, Gbile and Daramola
	Pilger (G)	FHI. 66745 Gembu (5A)
Gramineae	Schizachyrium pulchallum	Dalz. 1325, Lagos (4A)
	(Don ex Benth.) Stapf (G)	
	Sehima ischaemoides	Chapman 2744 = FHI. 45135, Maisamari, Forsk. (G) Gongola (5A)
	Sporobolus montanus Engl. (G)	Chapman 2744 = FHI.
		45185, Maisamari,

Family	Genus and species	Cited specimens and vegetation zones
		Gongola (5A)
	Sporchbolus piliferus (Trin.) Kunth (G)	Lawlor and Hall 438 = FHI. 56312, Panshanu (7D)
	Themeda villosa (Poir.) A. Camus (G)	Chapman 2571 = FHI. 31309, Gembu (5A)
	Trichopteryx marungensis Chiov. (G) (SA)	Daramola FHI. 62130 Mayo Ndaga, Gembu
Guttiferae	Garcinia brevipedicellata (Bak. f.) Hutch. & DAlz. (G)	Onochie FHI.. 36394x Orem (6B)
	Garcinia mannii Oliv. (G)	Onochie FHI. 34822, Oban, Mabarakom (6A)
	Garcinia punctata Oliv. (G)	Latilo FHI. 40909 Oban, Uwet, Akomkpa (6A)
	Garcinia staudtii Engl. (S) Garnicia kola (orogbo)	Latilo PHI. 40343, Odukpani, Calabar, Uwet (6A, 6B, 6A)
Hypericaceae	Hypericum lanceolatum Lam. (T)	Chapman 2873 = FHI. 46162, Chappal Waddi (5A)
	Hypericum peplidifolium A. Rich. (H)	Daramola FHI. 62412, Gembu, Yelwa (5A)
	Psorospermum densipunctatum Engl. (T)	Chapman 2675 = FHI. 45116 (5A)
Icacinaceae	Iodes kamerunensis Engl. (L)	Onochie FHI. 35998 Calabar, Oban (6A, 6B)
	Lavigeria macrocarpa (Oliv.) Pierre (L)	Onochie FHI. 36198x Calabar, Oban, (6A, 6B)
Iridaceae	Lapeirousia rhodesiana	Olorunfemi FHI. 55801

Family	Genus and species	Cited specimens and vegetation zones
	N.E. Br. (H)	Jos (7D)
Labiatae	Achyrospermum erythrobotrys Perkins (H)	Savory & Keay FHI. 25211, Sonkwala (6B)
	Achyrospermum oblongifolium (Bak. (H)	Keay FHI. 28195, Afi River F.R. (6A)
	Aeolanthus repens Oliv. (H)	Hepper 1356 = FHI. 51630 Mambilla Plateau (5A)
	Leucas deflexa Hook. f. (H)	Lowe 2677 = FHI. 67822 Obudu Cattle Ranch (5A)
	Satureja punctata (Benth.) Briq. (H)	Odewo FHI. 87937, Mambilla plateau (5A)
	Solenostemon repens (Gurkey) J.K. Morton (H)	Daramola FHI. 72375 Ikom (6A)
Lauraceae	Beilschmiedia hutchinsoniana Robyns & Wilczek (S)	Onochie FHI. 36426x Calabar (6B)
	Beilschmiedia preussii Engl. (T)	Oban F.R. (6A)
Lecythidaceae	*Crateranthus talbotii Bak. f. (T)	Ejiofor FHI. 21878 Calabar (6B)
	Napoleona egertonii Bak. f. (T)	Hall s.n. (UIH17965) = FHI. 88214 Oban F.R., Manko area (6A, 6B)
Emmaceae	Wolffiella nyalina (Del.) Monod (H)	Macfarlane FHI. 58986 Zaria (7D)
Lentibulariaceae	utricularia rigida Benj. (H)	Hepper 1029 = FHI. 58986 Jos Plateau (5A)
Liliaceae	Aloe macrocarpa var. major A. Berger (H)	Latilo FHI. 25208, Jos (7D)
	Wurmbea tenuis (Hook. F.) Bak (H)	Gbile and Daramola FHI. 63272, Mambilla (5A)

Family	Genus and species	Cited specimens and vegetation zones
Lobeliaceae	Lobelia baumannii Engl. (H)	Savory and Keay FHI. 25208, Obudu Cattle Ranch (5A)
	Lobelia columnaris Hook. f. (H)	Hopkins FHI. 54309 Cattle Ranch (5A)
	Monopsis stellarioides var. schimperiana (Urb.) E. Wimm. (H)	Hepper 1957 = FHI. 50835 Mambilla (5A)
Loganiaceae	Anthocleista schweinfurthii Gilg (T)	Kennedy 2131 = FHI. Benin (6B)
	Strychnos angolensis Gilg (L)	Onochie FHI. 36285x Calabar (6B)
	Strychnos asterantha Leeuwenberg (L)	Onochie FHI. 31247 Benin, Usonigbe (6B)
Koranthaceae	Gobimetula orsophila (Oliv.) Van Tiegh. (S)	Wit, Gbile and Daramola FHI. 65089 Mubi, Gongola (8B)
Malvaceae	Hibiscus manihot Linn. var manihot (S)	Stanfield FHI. 60748 60748 Ogbomosho (6D)
Marantaceae	Afrocalathea rhizantha (K. Schum.) K. schum. (H)	Daramola FHI. 55320 Uyo Creek (6A)
Melas Tomataceae	*Dissotis fruticosa (Brenan) Brenan & Keay (S)	Keay FHI. 25512, Ondo Idanre Hill (6B, 5A)
	Dissotis sessilis Hutch. ex Brenan & Keay (H)	Gbile and Daramola FHI. 63266, Gembu (5A)
	Memecylon englerianum Cogn. (T)	Benin, Usonigbe (6B)
	*Memocylon obanense Bak. f. (S)	Okafor and Olorunfemi FHI. 41729, Oban (6A)
	Memocylon zenkeri Gilg (S)	Onochie FHI. 36207x Oban (6A)
	Myrianthemum mirabile	Onochie FHI. 36310x

Family	Genus and species	Cited specimens and vegetation zones
	Gilg (S)	Oban F.R., Calabar (6A, 6A)
	Froussiella kamerunensis Gilg (H)	Binuyo FHI. 45432, Calabar, Oban F.R. (6B, 6A)
	Tristemma crassiflora Hiern (S)	Onochie FHI. 33599 Badagry (4A)
Melliaceae	Guarea glomerulata Harms (T)	Daramola FHI. 33599 Uyo Creek F.R. (6A)
	Turraeanthus mannii Baill. (S)	Onochie and Okafor FHI. 36203x, Calabar, Oban F.R. (6B, 6A)
Menis Permaceae	Dioscoreophyllum volkensii Engl. (L)	Calabar (6B)
	Penianthus longifolius Miers (S)	Emwiogbon FHI. 65801 Calabar, Oban, Orem (6B, 6A, 6b)
Nimosaceae	Acacia laeta R. Br. ex Benth (T)	Keay FHI. 37813 Maiduguri, Pompomari (8C)
	Newtonia buchanani (Bak.) Gilbert & Boutique (T)	Chapman 2699 = FHI. 45140 Mambilla (5A)
	Newtonia duparquetiana (Baill.) Keay (T)	Adebusuyi FHI. 51351 Oban (6A)
Monimiaceae	Glossocalyx brevipes Benth. (S)	Brenan 9242 = FHI. 48296 Awi, Oban, Calabar (6A, 6A, 6B)
	Glossocalyx staudtii Engl. (S)	Brenan 9242 = FHI. 18295 Calabar, Kwa Falls (6B, 6A)
Moraceae	Dorstenia africana (Baillon) C.C. Berg (S)	Van Meer 1392 = FHI. 33939, Awi, Oban (6A)

Family	Genus and species	Cited specimens and vegetation zones
	Dorstenia buesgenii Engl. (S)	Keay FHI. 28214, Cross River, Afi (6A)
	Engl. (S)	
	Dorstenia ciliata Engl. (H)	Olorunfemi & Ariwodo FHI. 76218, Calabar, Oban, Ikom (6B, 6A, 6A)
	Dorstenia ledermannii Engl. (S)	Onochie and Okafor FHI. 36174x, Oban Osoniba (6A)
	Dorstenia mannii Hook. f. (H)	Jones FHI. 508, Ikom, C/R North F.R. (6A)
	Ficus dekdekena (Nig.) A. Rich (T)	Keay FHI. 21423, Zaria (7D)
	Myrianthus preussii Engl. (S)	Ekwuno FHI. 60455, Oban, Afi R., Ikom (6B, 6A)
	Neosloetiopsis kamerunensis Engl. (S)	Amachi FHI. 38280, Calabar, Oban (6B, 6A)
Myristicaceae	Pycnanthus marchalianus Ghesq. (T)	Amachi FHI. 24324, Calabar (6B)
	Pycnanthus microcephalus (Benth.) Warb. (T)	Binuyo FHI. 41399, Ikom, Calabar, Akamkpa (6A, 6B, 6A)
Myrtaceae	Eugenia callophylloides DC. (S)	Onochie FHI. 32095 Calabar, Eket, Ibomo area (6B, 2A)
Najadaceae	Najas pectinata (Parl.) Magnus (H)	Ohaeri 1041 = FHI. 78895, Zaria (7D)
Ochnaceae	Campylospermum laxiflorum (De Wild. et Th. Dur.) V. Tiegh (S)	Ujor FHI. 27416, Urhehue (6B)
Orchidaceae	Habenaria weilerana Schltr (O)	Onyeabocha FHI. 7761

Family	Genus and species	Cited specimens and vegetation zones
		Oban, Calabar (6A, 6B)
	*Polystachya cooperi Summerh. (O)	Sanford FHI. 68261, Calabar, Obudu (6B, 6A)
	Polystachya coriscensis Rehb.f.	Sanford FHI. 60813, Benin, Sapoba (6B)
	Polystacha ramulosa Lindi (O)	Sanford FHI. 60814 Benin, Sapoba (6B)
	Rangaeros tropnata Summerh. (O)	Onochie & Latilo FHI. 32937, Calabar Eket (2A)
	Stolzia repens (Rolfe) Summerh. (O)	Sanford FHI. 60774 Benin, Sapoba (6B)
	Tridactyle bicaudata (Lindl.) Schltr. (0)	Hall 643 FHI. 26553 Plateau (5A)
	Vanilla imperialis Kraenzl. (O)	Savory & Keay FHI. 25165, Ogoja, Obudu (6D, 5A)
Orobanchaceae	Cistanche phelypaea (Linn.) Cout. (O)	Oseni FHI. 23030 Lake Chad (9A)
Oxalidaceae	Biophytum talbotii (Bak. f.) Hutch. & Dalz (O)	Latilo FHI. 40337 Ikom, Obudu, Afi R Bank (6A, 5A, 6A)
	Biophytum zenkeri Guillaum (H)	Onochie FHI. 34804 Ikom, Oban (6A)
Papilionaceae	Baphia laurifolia Baill. (T)	Ujor FHI. 27978, Calabar, Awi (6B, 6A)
	Baphia maxima Bak. (T)	Daramola FHI. 55184 Calabar, Mambe (6B)
	Dalbergia afzeliana G. Don (S)	Onochie, Ladipo & Ibrahim, FHI. 21611 Onitsha, Akpaka (6B)
	Eriosema linifolium Bak.	Keay FHI. 25998,

Family	Genus and species	Cited specimens and vegetation zones
	F. (H)	Mando F.R., Anara (7D)
	Physostigma venenosum balfour (L)	Onochie FHI. 7704, Oban (6A)
	Sesbania macrantha Welw. ex Phill. & Hutch. (H)	Ekwuno FHI. 77269 Ngelyaki F.R., Mambilla (5A)
	Vigna esculenta (De Wild.) De Wild. (L)	Onochie FHI. 40855 Minna (7C)
Pedaliaceae	Pedalium murex Linn. (H)	Onochie FHI. 33470 Lagos, Badagry (4A)
Periplocaceae	Zacatez pedicellata (K. Schum.) Bullock (L)	Killick 0248 = FHI. 57858 Ikorodu, Ikeja (1)
Pittosporaceae	Pittosporum mannii Hook. f. (T)	Hall 17905 = FHI. 88176 Obudu (5A)
	Pittosporum viridiflorun Sims subsp. feddeanum Cuf. (T)	Olorunfemi FHI. 55102 Jos Naraguta (7F)
Podostemaceae	*Pohliella flabellata G. Tayl. (H)	Keay FHI. 28240 Ikom, Afi F.R. (6A)
Palmae	Calamus deeratus (for cane chair)	
Podostemaceae	Stonesia gracilis G. Tayl. (H)	Geerling 4429 = FHI. 46512, Upper Ogun Game Reserve (7C)
Proteaceae	*Protea argyrophaea Hutch. (S)	Keay FHI. 37209, Naraguta F.R., Jos (7F)
Ranunculaceae	Ranunculus mutifidus Forsk. (H)	Wit, Gbile & Daramola 1963 = FHI. 66710, Mambilla, Gembu (5A)
Rosaceae	Acioa klaineana Pierre ex De Wild. (S)	Ujor FHI. 31793, Eket Oban (2A, 6A)
	Parinari chrysophylla Oliv. (T)	Jones & Onochie FHI. 14147. Ikom, Obudu (6A, 5A)
	Rubus rosifolius Sm. (S)	Ekwuno FHI. 77225,

Family	Genus and species	Cited specimens and vegetation zones
	Gembu, Mambilla (5A)	
Rubiaceae	Bertiera retrofracta K. Schum. (T)	Jones & Onochie FHI. 17394, Oban, Afi River F/R., Obudu (6A, 5A)
	Didymosalpinx parviflora Keay (T)	Jones & Onochie, FHI. 18905, Afi River F/R (6A)
	diodia vaginalis Benth. (H)	Onochie FHI. 33483 Colony, Badagry (1)
	Fadogia ledermannii K. Krause (S)	Hepper 1368, Vogel 1368, Vogel peak (5A)
	Hymenodictyon biafranum Hiern (T)	Daramola FHI. 56414 Calabar, Obudu (6B, 5A)
	Ixora hippoperifera Bremek. (S)	Van Meer 1440 = FHI. 34039, Oban Group F.R. (6A)
	Ixora nematopoda K. Schum (S)	Onochie & Okafor FHI. 36026x, Oban F/R (6A)
	Pentanisia schweinfurthii Hiern (H)	MacGregor 44 = FHI. 10101, Bauchi Plateau, Jos (7F)
	Psychotria dorotheae Wernham (S)	Onochie & Latilo FHI. 36312x Calabar, Oban F.R. (6B, 6A)
	Sabicea lanuginosa Wernham (L)	Keay & Savory FHI. 22451, Lagos (2 & 4A)
	Sabicea medusula K. Schum. ex Wernham (H)	Daramola FHI. 56390 Calabar, Oban, Awi (6B, 8A, 6A)
	Sabicea neglecta Hepper (L)	Ujor FHI. 30836, Oban F.R. Calabar (6A, 6B)

Family	Genus and species	Cited specimens and vegetation zones
	Tarenna grandiflora (Benth.)	Jones & Onochie FHI. 17444 F/R. (6A)
	Tarenna vignei Hutch. et Dalz. (S)	Olorunfemi FHI. 31914 Benin (6B)
Rutaceae	Araliopsis tabouensis Aubrev. & Pellegr. (T)	Binuyo FHI. 41450 Uwet, Calabar (6B)
	Taclea afzelii Engl. (T)	Latilo FHI. 30993 Afi F/R. (6A)
	Teclea sudanica A. Chev. (S)	Chapman 503 = FHI. 17062 Adamawa, Gwoza, Uba South (7C)
Salvadoraceae	Salvadora persica Linn. (T)	Oseni FHI. 23031, Mallam Fatori, L. Chad (9A)
Santalaceae	Thesium schweinfurthii Engl. (H)	Standield FHI. 56379, Kumbul Plateau (7C)
Santnidaceae	Allophylus hirtellus (Hook.f.) radlk. (S)	Daramola FHI. 56379, Calabar, Oban, Ikom (6B, 6A, 6A)
	Aporrhiza nitida Gilg. ex Engl. (T)	Kennedy 2054 =FHI. 9266, Sapoba, F.R. (6B)
	Aporrhiza talbotii Bak.f. (T)	Tuley 657 = FHI. 54391 Oban, Edondon (6A)
	Chytranthus bracteosus Radlk. (T)	Brenan, Jones, Onochie & Richard 8811 = FHI 48350 Okomu F.R. (4B)
	Crossonephelis africanus (Radlk.) Leenh. (T)	Binuyo FHI. 40899 Ilaro F.R. (6C)
	Deinbollia insignis Hook.f. (T)	Onochie FHI. 20598 Sapoba, Usonigbe F.R. (6B)
	Placodiocuanturbinatus	Latilo & Olorunfemi

Family	Genus and species	Cited specimens and vegetation zones
	Radlk (T)	FHI 43937, C.R. North Ikom (6A)
	Radlkofera calodendron Gilg (T)	Onochie FHI= 33508 Okomu, Sapoba, Usonigbe (6B)
Sapotaceae	Gambeyobotrys gigantea (Chev.) Aubr. (T)	Onochie FHI. 44539 Shasha F.R. (6C)
	Tieghemella heckelii Pierre ex. A. Chev. (T)	Keay & Onochie FHI. 21584, Usonigbe F.R. (6B)
Scrophulariaceae	Bacopa monniera (Linn.) Wettst. (H)	Gbile, Daramola & Ekwuno FHI. 64013 Majifun R. (4A)
	Veronica abyssinica Fres. (H)	Ibhanescbhor, FHI. 77839, Nguroje, Mayo Ndaga (5A)
Scytioetakaceae	Rhaptopetalum coriaceum Oliv (T)	Latilo FHI. 30920 Eket Calabar, Obudu (6B, 5A)
	Scytopetalum tieghemii (A Chev.)Hutch & Dalz (T)	Van Meer 1436 = FHI. 33997, Oban F.R. (6A)
Simaroubaceae	Brucea guineensis G. Don (T)	Onochie FHI. 36258x Oban FR. (6A)
	Hannoa ferruginea Engl. (T)	Savory & Keay FHI. 25052, Obudu (5A)
	Datura stramonium Linn. (H)	Jos (7F)
Sterculiaceae	Leptonychia pallida K. Schum. (T)	Keay FHI. 28223, Afi River F/R, Orem, Oban (6B, 6A, 6A)
	Scaphopetalum amoenum A. Chev. (S)	FHI. 76288 Olorunfemi, Onijamowo & Ariwodo, Uwet, C/R. North F.R., Oban (6A)

Family	Genus and species	Cited specimens and vegetation zones
	*Scaphopetalum letestui letestui Pellegr. (T)	Onochie FHI. 36243 Oban (6A)
	*Scaphopetalum parvifolium Bak f. (T)	Onochie & Okafor FHI. 36311x, Oban, Afi F/R. (6A)
Thymelaeaceae	Dicranolepis persei Cummins (S)	Olorunfemi FHI. 38053 Amahor, Ojogba Ugu F/R., Bendel (6B)
	Dicranolepis polygaloizes Gilg ex H.H.W. Pearson (S)	Jones & Onochie FHI. 18629, Afi River F/R. (6A)
	Deddiea fischeri Engl. (T)	Chapman 3272 = FHI 68566, (Mambilla) Gasaka (5A)
Tiliaceae	Cephalonema polyandrum K. Schum	Daramola FHI. 55305 Oroku, Eket (2A)
	Grewia hookerana Exell & Mendonbca (L)	Onochie FHI. 20675, Ijebu, 1/4 mile from Akila (6C)
Ulmaceae	Celtis durandii Engl (T)	Offokansi FHI. 59076 Ago F.R. (Obubra) (6D)
Umeelliferae	Caucalis melanantha (Hochst.) Hiern (H)	Gbile & Daramola FHI. 62888, Nguroje, Gembu, Mambilla (5A)
	Sium repandum Welw. ex Hiern (H)	Latilo FHI. 77448 Mambilla Ngelyaki (5A)
Urticaceae	Elatostema mannii Wedd. (H)	Richards 9235 = FHI 39220, Manko, Kwa Falla (6B)
	Pilea ceratomera Wedd. (H)	Savory & Kaey FHI. 25187, Ikwette, Obudu (5A)
Verbenaceae	Clerodendrum melanocrater	Daramola FHI. 56412,

Family	Genus and species	Cited specimens and vegetation zones
	Gurke (L)	Calabar, Uyanga Ikot (6B)
	Cleredendrum welwitschii Gurke (L)	Savory & Keay FHI. 25189, Obudu, Ikwette (5A)
Violaceae	Rinorea ardisiiflora (Welw. ex Oliv.) O. Ktze. (T)	Binuyo FHI. 41224, Iyamoyong F.R. Obubra (6D)
	Rinorea longisepala Engl. (S)	Brenan 9229 = FHI. 36230A, Oban (6A)
Vochystaceae	Erismadelphus exsul Mildbr. var. platyphyllus Keay & Stafleu (T)	Igboeli FHI. 32455 Calabar, Ikom (6A)
Xyridaceae	Xyris hildebrandtii Nilss. (H)	Chapman 2719 = FHI. 45160, Mambilla (5A)
Zingiberaceae	Aframomum pilosum (Oliv. & Hanb.) K. Schum. (H)	Emwiogbon 304 = FHI. 72142, Umuahia (6B)
	Renealmia africana Benth. ex Hook.f. (H)	Onochie FHI. 34819, Nsan F/R., Oban (6A)

Some endangered species of horticultural importance

Genus and species	Locations/Factors constituting threat
Dioscoreophyllum cumminsii	
Tetracarpidum conophorum (Wallnut, Asala)	
Ceiba petandra (silk cotton tree)	Savanna zone
Struchium sparganophora (Ewuro-odo)	Usually growing around swamps
Vitex doniana (Oori)	Big tree usually growing in savanna
Adansonia digitata (BAobab)	Adapted to dry to semi dry environment
Afremomum melegueta (Alligator Pepper)	Produced seeds that are not viable, little knowledge about propagation thus limiting extent of cultivation
Irvingia gabonensis var. (Excelsa, African mango)	Seeds are generally not viable, difficult to propagate through cuttings.
Piper guineense (Uziza - Black pepper)	Problem with seed germination
Gnetum africanum (Utazi) *G. bucholzidnum*	Vines difficult to propagate. Grows in Anambra, Imo and Rivers States
Synsepalum duloificum (Agba yun)	Berries which are dificult to propagate
Thaumatococcus danielli	Fast growing species which exhibit serious competition with other species except with tree crops like cocoa and kolanuts
Artocarpus attilis (African breadfruit)	As these are likely to shade the intended crop to be produced and are thus completely removed by bulldozing
Xylopia aethiopica (Ude)	
Cola millenii (Obi edun)	
Hibiscus sabdariffa	Grazing by animals destruction for building and industrial development purposes
Treculia africana	
Ocimum gratissimum (Efinrin)	
Chrysophyllum albidum	
Tetracarpidium conophorum	
Dialium guinense	
Dennetia trip tala	Anambra, Bendel, Imo States, Rivers
Gongronema latifolia	Anambra, Imo, Rivers, Ondo

Genus and species	Locations/Factors constituting threat
Cucumis melo var. agreetis	Onitsha Agulu (Anambra State)
Zehneria minutriflora	Rivers, Oyo State
Momordica argustisepala	Bendel, Anambra, Imo, Rivers, Ondo, Oyo etc.
Cucumeropsis mannii	Anambra, Bendel Rivers, Imo
Bielschmiedia mannii (Lauraceae)	Moist forest area
Chrysophylum albidum	Southern forest zone
Milicia excelsa	Southern forest zone
Triploclyton scleroxylon	Southern forest zone
Marsonia altissima	Southern forest zone
Entandop liraginia utile	Southern forest zone
Pterocarpus osun (Osun)	Southern forest zone
Phaseolus lunatus (Lima beans)	
Canavalis ensiformis (sword beans)	
Sphenostylis stenacarpa (African yam bean)	

Some endangered wild flora of Nigeria

Genus and Species	Description/Uses
Anova palustris	Used as a substitute or cork but looses bouyance after immersion. Suitable for coarse brown paper pulp.
Anova senegalensis	The root and leaf are sold as native medicine in hausa markets - Applied to guinea worm sores. Root along with root of Ximenin americana is used in treating sleeping sickness. Fruit edible
Monodora brevipes (Yor. 'ariwo')	The seeds aromatic and used as acondiment in soup and sold all over West Africa
Monodora myristica (Ibo 'Ehuru') (Yor. 'ariwo')	Seeds aromatic and used as a condiment in soup and sold all over West Africa.
Xylopia aethiopica (Yor. 'erunje' Ibo 'uda' Efik 'atta')	Protected in forests
Cassytha filiformis	Plant is rootless. In southern Nigeria, a decoction is taken by women to suppress lactation after a still birth (Carpenter, 1936).
Tylostemon mannii (Yor. 'gboko misa')	Seeds are sold throughout West African markets. Seeds look like bitter kola bu are distinguished from Garcinia kola by being easily separated into two cotyledons. They are roasted and ground and added to soup, rce, etc. as enricher of the ordinary native foods.
Pararistolochia goldieana	A climber originally discovered at Calabar in 1864 by the Rev. W. Thomas, now cultivated in hot houses in temperate Botanical Gardens.
Physostigma venenosum (Calabar bean)	Yields physostigmine, of value inophthalmology for contracting the pupil. A woody forest climber found in the wild.
Dioscorea spp.	Steroids extract from several wild species used to derive the sapogenin, diosgenin used in the manufacture of cortisome. Other wild Dioscoreaceae can be improved for food.
Ephedra spp.	Alkaloid from stem was used until a synthetic form was developed to make bronchial drugs and in treatment of low blood pressure.

Genus and Species	Description/Uses
Colocynthis oitrullus	Occurring both wild and cultivated in Africa yields a well-known cathartic, colocynth, made from dried pulp and seed of the fruit.
Panax guinquefolium	Has fleshy roots that contain a glycoside, panaquilon. Used for curing many diseases by the Chinese.
Lonchocarpus nicou	Yields rotenone known as mysterious and unidentified fish poison of the South America. The roots are collected and used for fishing. The fish is not poisonous for human consumption just as rotenone, a contact and stomach poison to insects is not detrimental to humans when dusted on vegetable crops. This material is used exensively in South America. A variety selected and planted is Louchocarpus nicou var utilis.
Landolphia owariensis	Bears very popular fruit as well as stem tapped for latex used, rolled into balls.

APPENDIX 3
Plant Conservation Legislation Currently in Force in Nigeria

Forest Ordinance 1937
The Eastern Region Forest Law 1955
The Forestry Ordinance with Amendments Northern Region 1960
Forestry Law (Eastern State) Cap 38
Forestry Amendment Edict; Western State 1973
The Kainji Lake National Park Decree 1985
The Endangered Species Decree 1985
The Natural Resources Conservation Council Decree 1989
Environmental Impact Assessment (EIA) Decree 86 1992

APPENDIX 4
List of Some Underutilized Plants Species for Research in Nigeria

Fruit trees

Irvingia gabonensis
Dacryodes edulis
Treculia africana
Chrsophyllum albidum
Dennettia tripetala
Parkia biglobosa
Pentaclethra macrophyla
Garcinla kola
Azanza garckeana
Parinari curatellifolia
Vitellaria paradoxa
Adansonia digitata
Balanites aegyptiaca
Xylopia aethiopica
Cola spp.

Vegetables

Corchorus olitorius
Vernonia amygdalina
Pterocarpus spp.
Solanum spp.
Gnetum spp.
Musa ersete
Musa ersete
Bambusa spp.
Amaranthus spp.

Cereals

Digitaria spp.
Kleusine spp.
Echinochloa spp.
Glycine max.

Forages

Moringa oleifera
Pennisetum spp.

Pulses

Voandzeia subterranea
Sphenostylis stenocarpa
Cajanus cajan
Canavalia ensiformis
Macrotyloka geocarpum
Psophocarpus tetragonolobus

Medicinal plants

Chessalia kolly
Garcinia kola
Alstonia boonei
Anogeissus leiocarpus
Alchornea cordifolia
Alstonia boonei
Kigelia africana
Rauvolfia vomitoria
Xylopia aethiopica
Zanthoxylum zanthoxyloides

Fibre plants

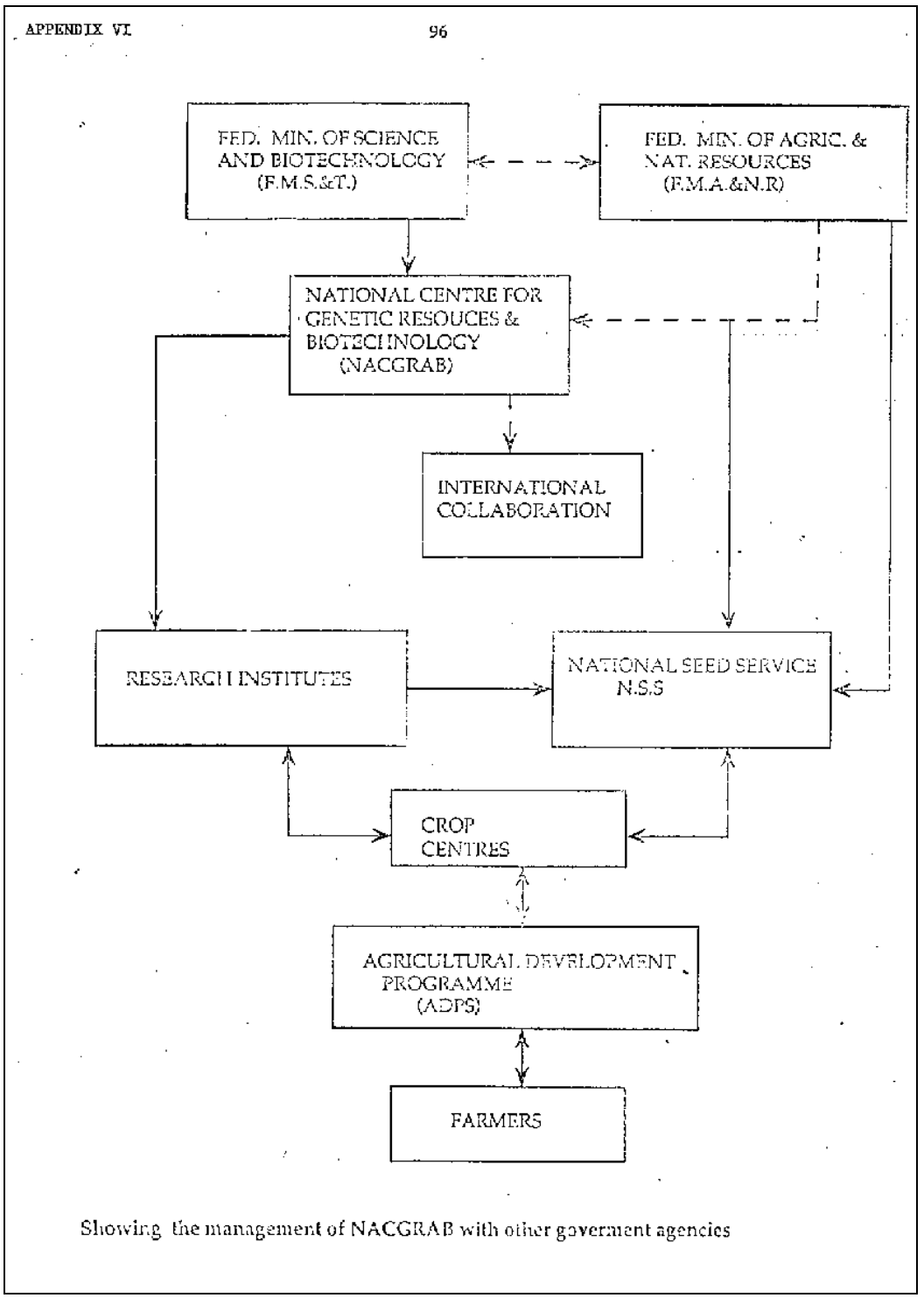
Hibiscus sabdariffa
Urena spp.
Musa
Sida spp.

APPENDIX 5
List of Research Institutes

Research institutes	Functions/Mandates
Cocoa Research Institute of Nigeria (CRIN) Onigambari, PMB 5244, Ibadan	Research into Cocoa, Cashew and kolanut, coffee & tea.
Forestry Research Institute of Nigeria (FRIN) PMB 5045, Ibadan	Research into national forests, plantations, wood products and wood products and wild-life.
Institute of Agriculture Research (IAR), Zaria, Samaru, PMB 1044, Zaria	Research into (a) genetic ABU, improvement of sorghum, groundnut, cowpea, cotton and sunflower (b) Agric. mechanization.
Institute for Agricultural Research & Training (IAR&T), OAU, PMB 5029, Ibadan	Research into maize, Kenaf, Jute and soil sciences.
Lake Chad Research Institute, (ILRI), PMB 1293, Maiduguri	Research into Millet, Wheat and Barley.
National Cereals Research Institute, Badeggi, PMB 8, Bida	Research into Rice, soyabean Benised, and sugar cane.
National Horticultural Research Institute (NIHORT), Idi-Ishin, PMB 5432, Ibadan	Research into fruits, vegetables, their processing for preservation.
Nigeria Institute for oil palm Research (NIFOR) PMB 1030, Benin city.	Research into oil palm, Rafia palm and ornamental plams and dates.
Nigeria Stored Products Research Institute, (NSPRI), PMB 12543, Ilorin Kwara State	Research into storage and preservation systems for agricultural products.
Rubber Research Institute of Nigeria, (NRIN) PMB 1049, Iyanomo, Benin City	Research into natural rubber and its by-products
National Centre for Genetic Resources and Biotechnology (NACGRAB), PMB 5383, Moor plantation, Ibadan	Collection and conservation of plant and animal genetic resources developmental research in genetics.
Kainji Lake Research Institute, PMB 666, New Bussa.	Ecology of Aquatic plants (fresh water) etc.

APPENDIX 6

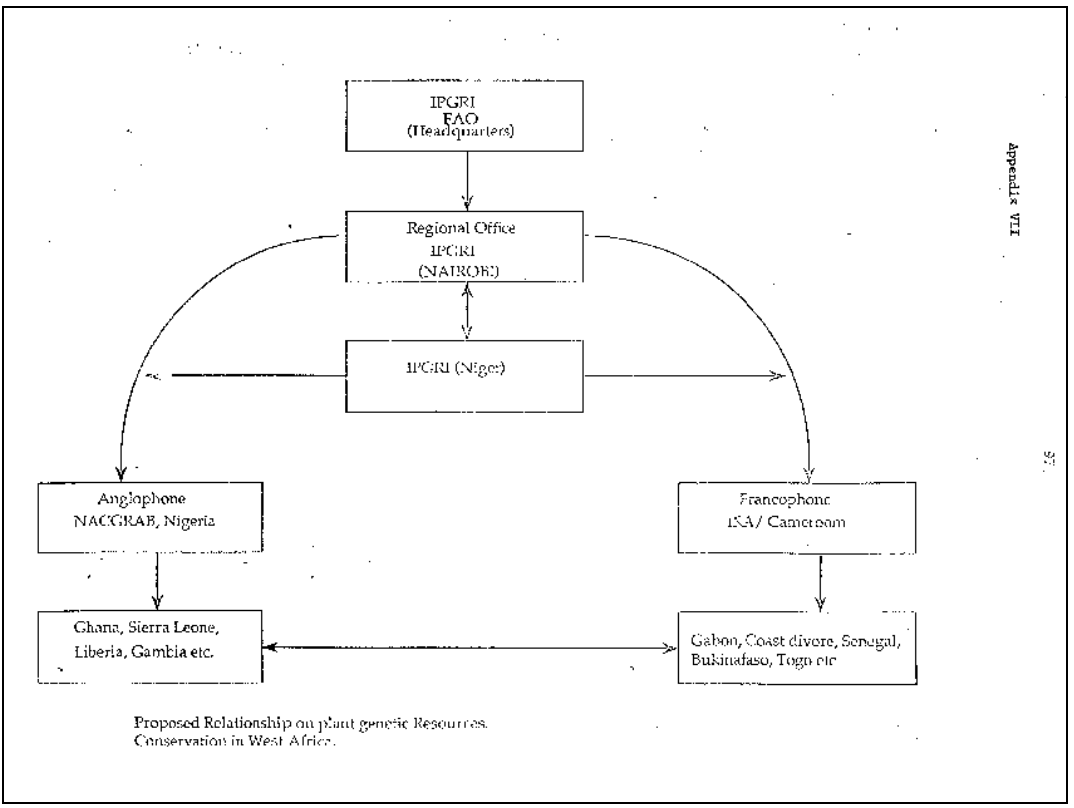
Management of NACGRAB with other Government Agencies



Showing the management of NACGRAB with other goverment agencies

APPENDIX 7

Proposed Relationship on Plant Genetic Resources Conservation in West Africa



Proposed Relationship on plant genetic Resources Conservation in West Africa.

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Abbreviations

IUCN	International Union for conservation of Nature
NACGRAB	National Centre for Genetic Resources and Biotechnology
NARS	National Agricultural Research system
IITA	International Institute of Tropical Agriculture
NPQS	National Plant Quanrantine Services
SNRs	Strict Natural Reserves
FRIN	Forestry Reserch Institute of Nigeria
NCF	Nigerian Conservation Foundation
CENTRAD	Centre for Environment Natural Reseource Management Research and Development
PDRO	Plant Density Research Organisation
NEST	Nigerian Environmental study/Action Team
FAO	Food and Agricultural Organisation of the United Nations
UNEP	United Nations Environemental programme
CRIN	Cocoa Research Institute of Nigeria
NIHORT	National Horticultural Research Institute
IPGRI	International Plant Genetic Resources Institute
UNDP	United Nations Development Programme
ICRAF	International Centre for Research in Agroforestry
ICRISAT	International crop Research Institute for the semi Arid Tropics

CIMMYT	International Centre for maize and wheat
ICARDA	International Centre for Agricultural Research in Dry Areas
IBPGR	International Board for Plant Genetic Resources
GRU	Genetic Resources Unit
FEPA	Federal Environmental Protection agency
CGIAR	Consultative Group on International Agricultural Research
NCRP	Nationally Co-ordinated Research Projects
ADP	Agricutural Development programme
NGOs	Non-governmental Organisations
NSS	National Seed Service
WACRI	West Africa Cocoa Research Institute
TCDC	Technical Co-operation among Developing Countries
ECOWAS	Economic Communities of West Africa States
GDCU	Genetic Resources Conservation Unit
OAU	Organisation of African Unity
UNESCO	United Nations Educational Scientific and Cultural Organisation
CIFOR	Centre for International Forestry Research

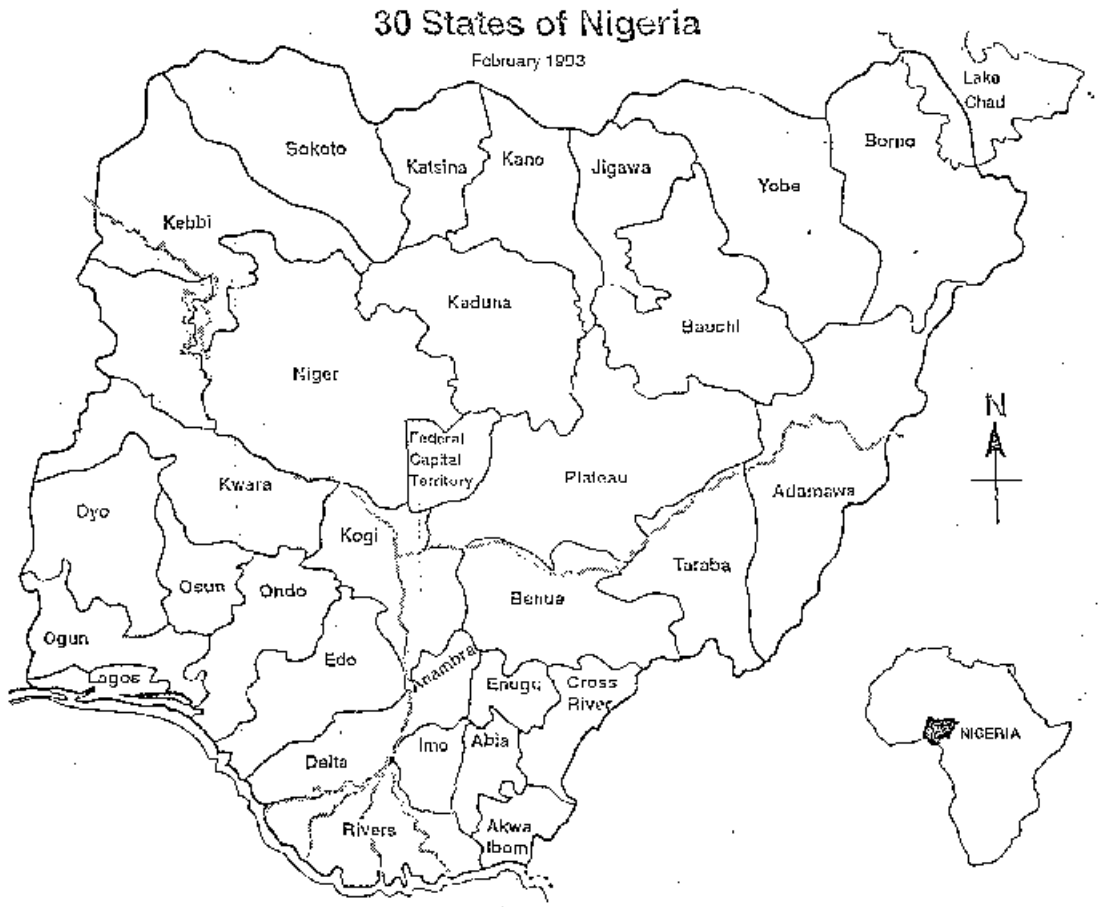

Fig. 1. 30 states of Nigeria

Nigeria, indicating 30 states and the Federal Capital territory and boundaries

Fig. 2. Nigeria; showing relief and drainage patterns (Barbour 1982)

Fig. 2 Nigeria; showing relief and drainage patterns (Barbour 1982)

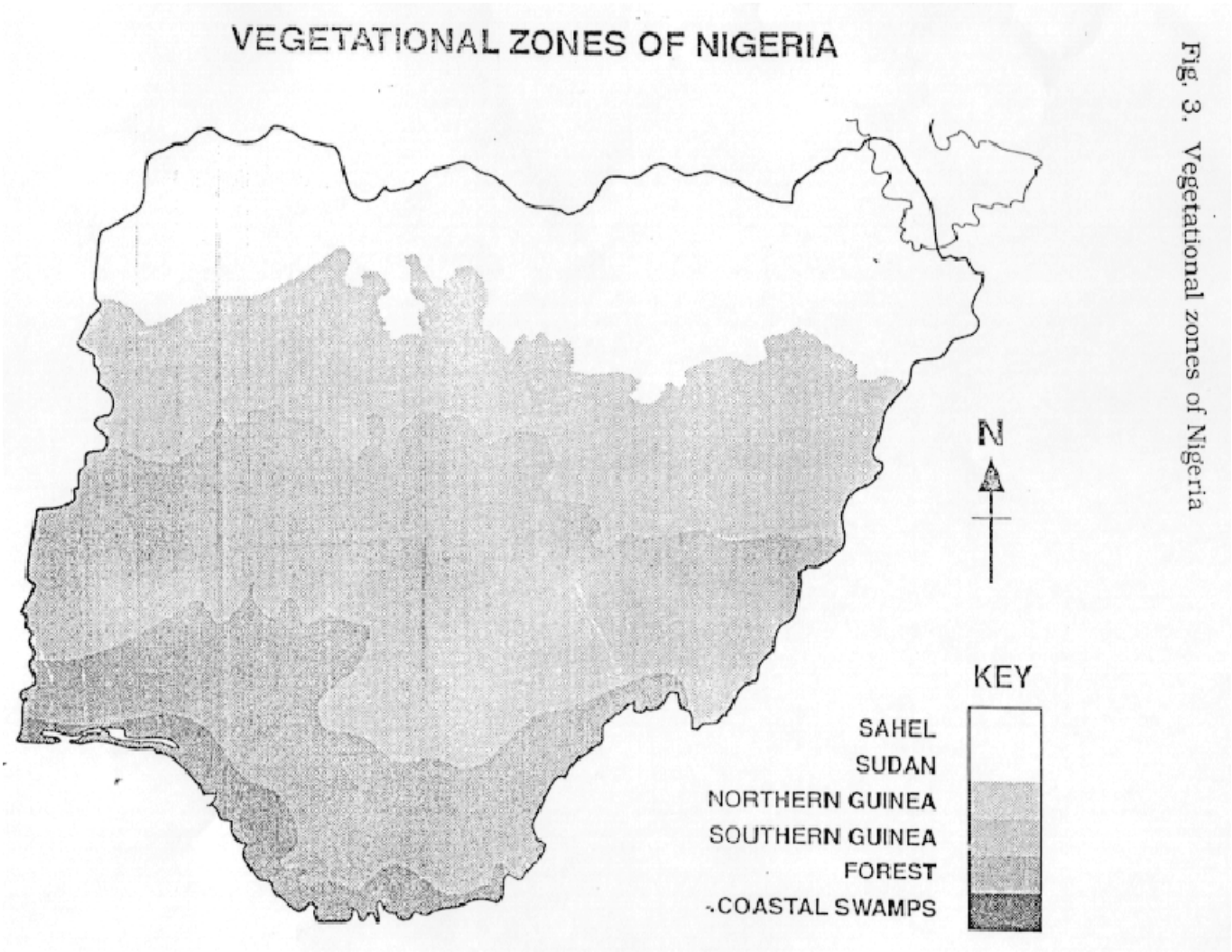

Fig. 3. Vegetational zones of Nigeria