GHANA:

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

(Leipzig, 1996)

Bunso, March 1995

Note by FAO

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Table of Contents

CHAPTER 1
Introduction - Ghana and its Agricultural Sector

Ghana is situated in the centre of the countries along the Gulf of Guinea in West Africa. The country has an area of 238,530 square kilometres and lies between latitudes 4°44' and 11°11'N and longitudes 01°12' and 03°11'W. It is bordered on the east, west and north by the Republics of Togo, Cote d'Ivoire and Burkina Faso respectively. On the south it is bordered by the Atlantic Ocean. The sea coast is 550 km long.

Administratively, Ghana is divided into ten regions as follows (capital towns in brackets): Ashanti (Kumasi), Brong Ahafo (Sunyani), Central (Cape Coast), Eastern (Koforidua), Greater Accra (Accra), Northern (Tamale), Upper East (Bolgatanga), Upper West (Wa), Volta (Ho) and Western (Sekondi-Takoradi). The administrative regions are shown in Figure 1. The population of Ghana is about 16.8 million (1995) with a growth rate average of 3.3% per annum. About 52% of the population live in rural areas and derive their income from agriculture and related activities. Ghana is a democratic country and it practises the parliamentary type of Government.

There are five main agro-ecological zones defined on the basis of climate, reflected by the natural vegetation and influenced by the soils (Figure 2). These are: High Rain Forest, Semi-deciduous Forest, Transitional Zone, Coastal Savannah and Northern Savannah or Guinea-Sudan Savannah Zones. The High Rain Forest is found in the south-western part of the country. The annual rainfall of this zone is between 1,700 and 2,100 mm and there are two rainy seasons. The soils are heavily leached and fertility is relatively low. The major crops grown are oil palm, rubber, coconut, rice, bananas, plantains and cocoyam.

The Semi-deciduous Forest constitutes 21% of the land area of the country. It has two rainy seasons: March to July and September to November and a rainfall amount of 1,200 - 1,600 mm. Soils are more fertile than in the High Rainfall Forest and are suitable for cocoa, coffee, oil palm, maize, plantain, cocoyam, cassava, rice and vegetables including eggplant, beans, pepper and okro.

The Forest-savannah Transition zone has two rainy seasons with an annual rainfall of 1,300 - 1,800 mm. The major season is from April to June and minor from September to November. Soil fertility is fairly high but the soil is

liable to erosion. Major crops grown include maize, plantain, cassava, yam, cocoyam, cotton, tobacco, groundnut, tomato, pepper, eggplant, cowpea and beans.

The Coastal Savannah forms 7% of the land area of Ghana. It has two rainy seasons. The major season is from March/April to June whilst the minor is from September to October. The average rainfall is 600 - 1,000 mm. Relief is gentle and soils are either heavy clay or light textured and underlain by clay. Among the crops grown are cassava and maize. Vegetables are grown on lighter soils while rice, cotton and sugarcane are planted on the heavier soils. Coconut is found on the coastal fringe.

The Sudan and Guinea Savannah zones cover about 57% of the land area of Ghana. These zones are sometimes referred to as interior savannah and are characterized by level to gently undulating topography. Unlike the rest of the country the interior savannah has only one rainy season that is, April/May to October. Annual rainfall ranges from 800 to 1,200 m. It declines from South to North. Soils are generally poor. Important crops include millet, sorghum, maize, rice, yam, peanut and tomatoes. The sheanut tree grows wild and it is an important cash crop. Over 70% of Ghana's livestock: cattle, sheep, goats are raised in these zones.

In Ghana the agricultural sector consists of crops, livestock, fisheries, and the cocoa sectors. Agriculture is vital to the overall economic growth and development of Ghana and it is the largest contributor to the Gross Domestic Product (GDP), accounting for about 55%. Cocoa accounts for 18% of agricultural GDP and other crops for 62%, livestock for about 7%, fishing for about 3% and forestry about 7%. The principal food crops are maize, cassava, plantain, yam, cocoyam, rice, sorghum and millet. Maize accounts for between 50% - 60% of the total cereal production. Vegetables include pepper, eggplant, tomato, okro and beans. The country's important cash crops are cocoa, oil palm, cotton, coconut, tobacco, groundnut and rubber. About half of the country's total cultivated land area is under cocoa, followed by cereals (25%) and roots and tubers (20%).

The bulk of farmers are small holders who account for about 80% of agricultural production. Average holding is less than 1.5 hectare. Shifting cultivation is widely practised and subsistence farming is common in the rural areas. Productivity is low mainly because of low fertility of the land limited use of available technical packages, non-timely delivery of inputs (particularly fertilizers), and, poor credit availability. In recent years a few commercial farms have been initiated and have started exporting pineapples, mangoes, pepper and yams.

The Ministry of Food and Agriculture (MOFA) has the responsibility for agricultural production with the exception of cocoa, coffee, sheanuts and cola which are the responsibility of the Ghana Cocoa Board (COCOBOD) headed by a Chief Executive who is directly responsible to the Presidential staffer responsible for Cocoa. The Ministry of Food and Agriculture is headed by a Minister who is assisted by two Deputy Ministers for Crops and Fisheries and Livestock. There are 2 Chief Directors for Administration and Planning respectively. There are eight departments namely, Bilateral and Multilateral Relations and Aids, Agricultural Engineering Service, Policy Planning, Monitoring and Evaluation, Manpower Development, Agricultural Extension Service, Crop Services, Animal Production and Fisheries and Plant Protection and Regulatory Service. Each department is headed by a Director. In the regions there is a Deputy Minister of Agriculture who is responsible for policy making. Below him is the Regional Director of Agriculture for co-ordination and supervision of agricultural disciplines. Under the Regional Director are Regional Agricultural Officers who in turn supervise the activities of the District Agricultural Officers in the districts and subdistricts.

There are several institutes within the Council for Scientific and Industrial Research (CSIR) which is under the Ministry of Environment, Science and Technology and outside it which are mandated to carry out agricultural research in Ghana. These include the Crops Research Institute (CRI), Kumasi, Plant Genetic Resources Centre (PGRC), Bunso, the Soil Research Institute (SRI), Kumasi, the Oil Palm Research Institute (OPRI), Kade, Animal Research Institute (ARI), Achimota, Savannah Agricultural Research Institute (SARI), Nyankpala, the Food Research Institute (FRI), Accra, the Institute of Aquatic Biology (IAB), Accra, the National Agricultural Research Project (NARP) and the Cocoa Research Institute (CRIG), Tafo. The country's universities including the University of Ghana (UG), Legon, the University of Science and Technology (UST), Kumasi, the University of Cape Coast (UCC) also carry out agricultural research. Other institutions which carry out research include the Ghana Atomic Energy Commission (GAEC), Kwabenya and the Irrigation Development Centre (IDC), Ashiaman.

The Seed Growers Association has the mandate to produce certified seeds and planting material to meet the requirement of farmers. The Crops Research Institute provides foundation seeds of maize, cowpea and soybean for the production of certified seed. However only a few farmers benefit from this; most farmers use their own selection of seeds. Vegetable and ornamental seeds are imported from Holland, Israel and Japan by Shell Company, Reiss and Co and other agents for the expatriate community and a few urban elite. Main staples of the forest areas are root and tuber crops made up of cassava, yam and cocoyam. These contribute about 46% of GDP with yam exhibiting largest growth rate in area planted.

Agricultural production varies with total rainfall distribution and soil factors with strong regional diversities. Crops which have suffered major losses in times due to droughts, pests and diseases include cocoa, maize, rice, sorghum, oil palm, cape and okro. Landraces and introductions of these various crops are being tested and utilized in breeding programmes to produce cultivars which are resistant to pests and diseases. Local cultivars or landraces are facing genetic erosion and efforts are being made to collect them for conservation and utilization for breeding programmes.

CHAPTER 2
Indigenous Plant Genetic Resources

Ghana abounds in indigenous plant genetic resources. These comprise forest genetic resources, food crops, spices, plantation and industrial crops (Tables 1-4).

2.1 FOREST GENETIC RESOURCES

The forest genetic resources are made of timber species, medicinal plants and other non-timber plant species like rattan and raphia. Timber species, especially have been harvested and managed in the natural forest. Most of these species have been harvested in such a way that they are highly threatened. Examples are *Milicia excelsa* and *Afromosia* spp which are near extinction in Ghana.

There are measures aimed at the conservation of forest species. These include conservation in forest reserves. The Forestry Department of Ghana for example maintains 279 Forest Reserves throughout the country. However it has been observed that the rate of encroachment of these forest reserves is quite high and the damage being done to the resources therein is quite enormous. More efforts must be made to prevent further degradation of forest reserves.

The Forestry Department carries out reforestation programmes whereby seedlings of timber species are raised in nurseries and given out to farmers who in turn plant them in their farms. This process should be intensified and expand.

The Forest Inventory Project (FIP) has classified timber species into three group (Appendix 1).

Class 1: Consists of any timber species that has been exported from Ghana in the last 15 years. There are 66 species.

Class 2: Consists of all three species that grow to timber size but have not been utilized yet. No market value at present. There are 60 spp.

Class 3: All other trees.

Timber extraction in Ghana is limited to a small number of presently very desirable species. The traditional redwoods are threatened and are likely to be exhausted within 2-3 decades at the present rates of felling.

The FIP has estimated the resource life for 14 species which has clearly indicated the threatened timber species and whose that are being under utilized which include *Piptadeniastram africanum* and *Antaiaris toxicaria*. *Triplochiton scleroxylon* is sustainable. There is no available data on all other species.

2.2 PROGRAMMES AND MEASURES AIMED AT SUSTAINABLE MANAGEMENT OF NATURAL FORESTS

Under the Forest Inventory Project, Forests have been grouped into permanent Forest Estates i.e. Forest Reserves (are of 2 types).

Group A - Productive forest reserves.
Group B - Protective forest reserves

The productive forest reserves are under 40 years felling cycle. All this started in the FIP, 1990 project.

a. There is selective logging based on species, size, and location. The area is mapped before logging and there is part felling audit to access the performance of concessionaires.

b. **Regulated yield** - There is also felling limits for all species. This work is being carried out by the Forest Resource Management Project funded by the World Bank.

c. **Enrichment Planting** - Where natural regeneration is not enough, enrichment planting is carried out using nursery raised seedlings. All the above measures are being carried under the Forest Inventory Project under ODA and the Forest Resources Management under World Bank. Both of which the funding ends in 1996. NGOs have been working mainly as The Department of Game and Wildlife also maintains fifteen protected areas throughout the country. Protected in these areas are both floral and faunal forest resources. These resources are protected for their cultural, educational, aesthetic and medicinal values for both the present and the future.

Forest genetic resources are also conserved in arboreta in various parts of the country. The Plant Genetic Resources Centre (PGRC) at Bunso for example maintains an arboretum in which several timber species, medicinal and other forest species are conserved. Similarly, the Centre for Scientific Research into

Plant Medicine (CSRPM) at Mampong Akwapim maintains three arboreta of medicinal plants at Mampong, Mamfe and Ayikuma. Some of the plants contained in the arboreta include the plants listed in Appendix 2.

2.3 WILD SPECIES AND WILD RELATIVES OF CROP PLANTS

There are some wild forest species which are of great economic importance industrially. Two of these species are *Thaumatococcus daniellii* and *Dioscoreophyllum cumminsii*. Both plants are known to have sweetening principles several times greater than those of sucrose. Research work was conducted on their agronomy, phenology and chemical extraction in the 1970's. Since the active principle of *T. daniellii* is a protein, the sweetener obtained from it is good for diabetic patients. The leaves of the *T. daniellii* are of commercial importance in Ghana in that they are used as wrapper in the market. The culm is also used in making mats.

T. daniellii and *D. cumminsii* are both plants which thrive in the High Forest environment. With the destruction of the forest, these species face the risk of being lost.

There are several wild species which can be potentially useful in plant breeding programmes. These include wild cowpea species like *Vigna reticulata*. Others are wild yam, wild oil palm, most medicinal plants like mahogany, *Rauwolfia vomitoria*. These species are in the danger of being lost due to the rampant bush-fires, forest clearance for farming purposes, deforestation by logging and overgrazing by livestock. Since these species are found in the wild, by the road sides, the constant bush-fires which plague these areas may tend to eradicate them.

Efforts are being made to educate people about the hazards of bush-fires. People are educated through the media, namely, newspapers, radio and television. Also seminars and durbars are held in towns and villages to discuss the havoc caused by bush-fires. The Ghana National Fire Service also runs training courses for volunteers in fire-fighting techniques and how to prevent bush-fires.

Whilst some of these wild species have been collected, most have not. It is therefore important that such useful or potentially useful species are identified and collected, developed and utilized in diverse ways. These species may be used for crop improvement, for medicinal use, for industrial purposes and as ornamentals.

There are several widely used indigenous forest species which are harvested from the wild. These species include *Piper guineese*, which is used both as

spice and as an ingredient for herbal medicine, *Tetrapleura tetraptera* (prekese), *Xylopia aethiopica* (hwentea), *Monodora myristica* (Calabash nutmeg), *Aframomum melegueta* (grain of paradise), and *Parkia clappertoniana* (Dawadawa).

2.4 LANDRACES AND OLD CULTIVARS

There are landraces of several crops with Ghana either as centre of origin or centre of diversity. These include the yams. Typically, *Dioscorea cayenensis* (yellow yam), *D. dumetorum* (bitter yam) and *D. rotundata* (white yam). These species together with other species like *D. esculenta, D. praehensilis, D. alata* and *D. bulbifera* have been collected as germplasm from various regions of the country and are under field maintenance at the Plant Genetic Resources Centre at Bunso. These yams are used generally for food in various regions of the country.

Germplasm of certain local pulses are also available in conservation. These include *Vigna unguiculata* (Cowpea), *V. subterranea* (Bambara groundnut), *Arachis hypogaea* (groundnut), *Kerstingiella geocarpa* (Kersting's groundnut), *sphenostylis stenocarpa* (African yam bean) and *Mucuna pruriens* var *utilis* (Velvet bean). Of these pulses, the cultivation of *M. pruriens* var *utilis*, *K. geocarpa,* (Northern Region), *S. stenocarpa* (Volta Region) and *V. subterranea* is limited to certain local areas.

Research activities aimed at the improvement of cowpea and groundnut have been intensified at various research institutions. This necessitates the collection and conservation of these legumes to forestall the erosion of the landraces of these crops.

Among the cereals the most popular landraces are maize, rice, millet and sorghum. Hungry rice *(Digitaria exilis)* is also available but endemic only in the Bimbila area. Research activities on the most popular species of these cereals have been intensified, therefore there is an urgent need for germplasm collection and characterization.

Attention is now being given to the tuber crop *Coleus dysentericus* (Frafra potato) a minor crop used in time of famine as food in the northern regions of Ghana. Research activities have commenced on this crop in both the C.R.I. at Kumasi and the S.A.R.I. at Nyankpala in the Northern Region. It will be necessary to collect the germplasm of this crop.

Ghana abounds in many indigenous vegetables. These include *Amaranthus* spp, *Adansonia digitata, Celosia argentea, Cucumeropsis edulis, Telfairia occidentalis, Trichosanthes cucumeropsis, Abelmoschus esculentus, Solanum*

spp, Corchorus olitorius and *Vernonia amygdalin*a. Germplasm of these vegetable crops have to be thoroughly collected throughout the country to forestall the erosion of these species and to encourage research aimed at their improvement.

It is important to mention some few indigenous industrial crops of immense commercial importance. These include the oil palm, shea nut *(Vitellaria paradoxa)*, cashew *(Anacardium occidentale)* and kola. Germplasm of these crops have to be collected for characterization and subsequent utilization for their improvement.

Landraces are the main sources of planting materials available to most farmers; very few farmers have access to improved varieties. In most cases farmers have no other choice. In the few crops in which improved varieties exist, the government encourages their use. Examples are maize, cowpea and oil palm.

Local farmers like genetic diversity in their crops as an insurance against pest and diseases and adverse conditions. Landraces of crops plants are preferred by local people for their taste and other culinary qualities.

Local farmers preserve genetic diversity only as long as it is considered useful. The preservation methods are not documented.

Government legislation on forest reserves are supposed to protect wild genetic resources. The unprotected forest is threatened from farming and logging activities. Forest reserve also suffer from serious encroachment problems. Security at the forest should be strengthened by the provision of the necessary input and logistics for the guards to be effective.

CHAPTER 3
National Conservation Activities

The main institution in Ghana mandated to carry out plant genetic resources activities is the Plant Genetic Resources Centre (PGRC) based at Bunso in the Eastern Region. The PGRC undertakes the collection of plant genetic resources (PGR) throughout the country and sometimes in neighbouring countries. The Centre also carries out characterization, evaluation, conservation, distribution and documentation of plant genetic resources. The resources under conservation are distributed to local researchers, scattered in various institutions in the country for their research projects and to foreign researchers and local farmers who request for these resources.

3.1 *IN SITU* CONSERVATION ACTIVITIES

Ghana has several in situ conservation activities going on at several locations throughout the country. The PGRC and the Centre for Scientific Research into Plant Medicine (CSRPM) at Mampong-Akwapim have arboreta which contain timber species, medicinal plants and local spices. In addition, the Forestry Department maintains 279 Forest Reserves which contain timber species and other forest resources. In many cases these forest reserves have been seriously encroached upon. Serious attention has to be given to the conservation of the Forest Reserves. The Department of Game and Wild Life also maintains fifteen protected areas throughout the country where plant and animal resources are conserved *in situ.*

3.2 *EX SITU* COLLECTIONS

Collection of landraces of local germplasm has been carried out throughout the country. The germplasm is under conservation at the national genebank at Bunso. The PGRC, the national genebank was established in 1964 from the Ministry of Food and Agriculture (MOFA) as the Plant Introduction and Exploration Section of the Crops Research Institute (CRI). In 1985 its name was changed to the Plant Genetic Resources Unit to reflect its mandate of plant genetic resources activities. In August 1994, it was elevated to the status of Centre with full funding being provided by the Ghana Government.

The collection at Bunso consists of both orthodox and recalcitrant species. Seeds of orthodox species are conserved in cold storage at -20°C whilst recalcitrants are conserved as living plants in orchards and in the field. Most

of the country's major crop germplasm have been collected. Some of the living collections have been duplicated at the Agricultural Research Station (ARS) at Kade whilst the cowpea germplasm has been duplicated at the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria.

3.3 UTILIZATION

The main use to which germplasm under conservation is put is for research purposes by researchers in the country's agricultural oriented research institutions. The germplasm is also utilized by foreign scientists who request for it. The country's farmers and other individuals also request for germplasm to plant on their farms. This applies especially to fruit tree crop species which are multiplied either vegetatively or from seed and distributed to farmers.

3.4 CONSERVATION FACILITIES

Three methods are used for the conservation of plant genetic resources in Ghana. These are storage of seeds, conservation of plant meristems using *in vitro* methods and conservation of living plants in the field.

The PGRC uses two methods for conservation of germplasm. Orthodox seeds are dried to a moisture content (m.c.) of 5% over silica gel. The dried seeds are then packaged in aluminium foil envelopes and sealed. The seeds are stored at a temperature of -20°C in deep freezers. The power supply is stabilized by a voltage stabilizer. There is a stand-by generator which is used when power goes off. There is the need for a higher capacity stand-by generator for the operations of the genebank. There is a drying room with a dehumidifier and an air conditioner. There is the need to expand the seed storage facilities and to provide *in vitro* facilities at the PGRC, Bunso.

Various institutions maintain cold storage facilities at 5°C. These facilities are mainly used for storing breeders' seeds. The Ghana Grain Development Project (GGDP) for example stores breeders' seeds of maize and legumes at 5°C. Similarly, the Savanna Agricultural Research Institute (SARI) and the Crop Science Department (CSD) of the University of Ghana, Legon, have cold storage facilities at 5°C for maintaining breeders' seeds. The Forestry Research Institute of Ghana (FORIG) maintains refrigerators and deep freezers for storage of seeds.

Since the PGRC is a national genebank it is necessary to develop it to attain a very high standard. Facilities at the genebank must be expanded to befit its national status. Storage facilities must be improved and expanded. The multidisciplinary approach should be adopted in solving problems at the

genebank. Therefore researchers of various disciplines, namely, Entomologists, Pathologists, Taxonomists, Biometricians and so on must be recruited. This means adequate office and residential accommodation must be provided for these specialists.

In addition to the arboreta at Bunso and Mampong, and country has botanical gardens at Aburi and the Botany Department of the University of Ghana. There is the need to expand the botanical garden at Aburi to befit its national status. More species have to be introduced and existing ones must be well maintained.

3.5 DOCUMENTATION

All aspects of the PGR work is documented in Ghana. Documentation is currently manual though in the very near future it will be fully computerized. Germplasm collection is documented by recording passport data consisting of information on the materials collected as well as information on the donors and collection sites. In addition, after collection reports are produced on the germplasm collection expeditions.

For the samples collected to be useful, characterization and evaluation have to be carried out on them. They are planted in the field and agro-morphological and phenological data are recorded on them. These data are very useful for the utilization of the samples since they provide basic information on their traits.

With computerization, information storage and retrieval will be made fairly easy and can be provided more easily. Information on germplasm can be duplicated and up-dated very easily.

3.6 EVALUATION AND CHARACTERIZATION

Preliminary characterization consists of recording characters which are highly heritable and which can be easily scored visually and will be exposed in most environments. Some of these data can be collected in the field with the germplasm collected, otherwise they can be collected during multiplication of the germplasm. Characterization data are useful because they can be used for identification purposes and they are a good guide for the future use of the material. Characterization data are reliable and constant.
Preliminary evaluation consists of recording a limited number of additional agronomic traits thought desirable by a consensus of users of the particular crop. These characters are capable of visual assessment but not in all

environments. Examples are reaction to diseases and pests and resistance or tolerance to environmental stresses.

The provision of preliminary characterization and evaluation data is considered the responsibility of the curator of the genebank. In Ghana these data are collected by the PGRC using IPGRI descriptors where they are available, otherwise locally prepared descriptors are used. Some of the germplasm under conservation has been characterized agro-morphologically and undergone preliminary evaluation. Characterization and evaluation data are available to users of germplasm.

Further characterization and evaluation are carried out by users of germplasm, like breeders, by recording a range of characters of interest to them. Recording of such data may require the assistance of experts familiar with specific characters and procedures for testing and specialized laboratory. In Ghana further characterization and evaluation are carried out by crop specialists who request for specific germplasm.

3.7 REGENERATION

Regeneration is carried out, when the stock of germplasm under conservation depletes to a certain value or loses viability to levels below 85%, to replenish the stock and to improve the viability. Regeneration is done in the field. During regeneration efforts are made to avoid contamination of the accessions. In predominantly out crossing species like maize individual accessions are isolated so that contamination does not occur. This is supervised by qualified personnel.

CHAPTER 4
In-Country Uses of Plant Genetic Resources

The plant genetic resources of Ghana are put to many uses. First, several research institutions in the Country use these resources in crop improvement programmes. There are several projects within the Crops Research Institute which utilize various crop germplasm in their programmes. The Ghana Grain Development Project (GGDP) is mandated to work on the improvement of maize and legumes. Both indigenous and introduced germplasm of maize and cowpea are used in their research work. For work on soybean, mostly introduced germplasm is used. Similarly projects like the Plantain Development Project, Root and Tuber Project, and the Valley Bottom Rice Project all use both local and introduced germplasm for their work.

Other institutes and the Universities working on various commodities also use both introduced and local germplasm for their work. Examples are: the Cocoa Research Institute of Ghana (CRIG), works on cocoa, cola, coffee and shea butter; Savanna Agricultural Research Institute (SARI) on sorghum, millet, groundnut, yam, sweet potato, cassava, cowpea, pigeon pea, bambara groundnut and frafra potato. The Animal Research Institute (ARI) works on both introduced and local forage species. These include *Centrosema macrocarpum, Stylosanthes guianensis, Pennisetum purpureus* and *Cynodon dactylon.*

The Forestry Research Institute of Ghana (FORIG) works on different aspects of forest resources whilst the Oil Palm Research Institute (OPRI) works on the improvement of oil palm and coconut. These uses include finding remedy for pest and disease problems through the use of resistant germplasm.

Germplasm of fruit tree crop species are supplied to farmers for establishing their own plantations. These species include various species and cultivars of citrus, cultivars of mango, avocado, guava, coconut and a lot of introduced species.

Plant resources under conservation in various arboreta, botanical gardens, forest reserves and elsewhere are used for medicinal purposes. For example at the PGRC and CSRPM various medicinal plants are found in arboreta. These species include *Xylopia aethiopica, Piper guineense, P. nigrum, Citrus aurantifolia, Aframomum melegueta, Monodora myristica, Rauwolfia vomitoria* and *Mangifera indica.* The plant genetic resources in forest

reserves, arboreta, botanical gardens and nature reserves are very important for educational and tourism purposes.
Students from various educational institutions every year visit such collections of plant genetic resources for educational tours. These resources are also a source of attraction for tourists from both within the country and outside it.

Judicious use of the plant genetic resources of the forest ecosystem is of immense economic importance. Controlled extraction of timber species and other useful species from the forest is an important source of income for the country. On the other hand, uncontrolled exploitation of timber and other resources from the forest without replacing them may in the long run lead to the depletion of these species. It is imperative that replanting programmes are instituted so that the forest resources which are harvested can be replenished. Species which are at risk in this respect include various timber species like *Milicia excelsa, rattan* and *raphia palms* and the chew stick, *Garcinia spp.*

The presence of plant genetic resources on land surface is of environmental importance. The disturbance of these resources by human activities poses a problem to the stability of the environment. Less disturbed environment is a source of beauty and joy. It will be beneficial if the environment can be protected from such activities as bush burning, destruction of forests and farming along river banks and head waters, all of which degrade the environment in many ways.

Plant genetic resources are a source of animal feed and forage. Maize for example is an important component of animal feed. Sorghum and millet are also used as animal feed and fodder in the savannah regions of the country. Cassava leaves and peels are used as feed for livestock on the domestic level in areas where cassava is abundant. There are some wild and weedy species of plants which are used for forage. These include *Baphia nitida, Centrosema spp, Panicum maximum* and *Digitaria decumbens.*

Various repositories of plant genetic resources are of cultural importance in the country. Various cultural activities take place in forest groves scattered all over the country. These groves are considered as sacred and are used for religious activities. Various religious groups visit these forests for prayers and other rituals.

4.1 ACHIEVEMENTS

The PGRC has several achievements to her credit in plant genetic resources activities. Some crops which have been introduced into the country as germplasm have now been developed and are being promoted as non-traditional export crops. These crops include the spices black pepper and

nutmeg. These crops have a great potential as export crops. Several improved fruit tree crops have been promoted in the country. These include citrus species, mangoes, avocado and guava.

A major achievement of the PGRC is the establishment of an arboretum of various timber species and other forest species both *in situ* and *ex situ*. The arboretum contains several medicinal, ornamental and fruit tree species. The establishment of the arboretum has gone on for several years and it still goes on with the addition of more species from time to time.

The PGRC was the site for the initial agronomic studies on the introduced citronella grass. It was also the site of the pilot studies on the crop. It is now being produced in commercial quantities by farmers.

The level of utilization of the plant genetic resources under conservation is rather on the low side. Efforts are being made to stimulate increased use of these resources by plant breeders and other users. A workshop was organized for various users of plant genetic resources in November, 1994 to inform them of the present status of PGR activities in the country.

CHAPTER 5
National Goals, Policies, Programmes and Legislation

The PGRC is the national Centre for plant genetic resources activities The activities of the Centre are predominantly funded by the Ghana Government. Some revenue is however generated from the sale of plant materials and training programmes arranged for interested individuals and organizations. Sometimes germplasm collection is carried out with assistance from international organizations.

The objectives of the Centre are as follows:

1. to collect and conserve the plant genetic resources of Ghana;
2. to serve as a central agency for the introduction and exchange of plant genetic resources;
3. to characterize and evaluate the plant genetic resources under conservation;
4. to document plant genetic resources activities in the country; and
5. to carry out research on any problems that may arise from any of the above objectives.

The resources thus collected and conserved are available to researchers who work on them. They are also available to individuals who request for them. The role the Centre plays in the conservation of our plant genetic resources is related to the implementation of the Convention on Biological Diversity.

There is a nine member national committee made up of researchers from various agriculture-based institutions in the country. The function of this committee is to co-ordinate activities and policies on plant genetic resources in the country.

The PGRC is a centre within the Council for Scientific and Industrial Research (CSIR), an organization which embraces several research institutions including those mandated to carry out agriculture-related research and other activities. The CSIR is headed by a Director-General who co-ordinates the activities of the various institutes. The Head of the Centre is accountable to the Director-General.

The annual programme and budget for plant genetic resources are approved by a Management Board. Annual budget is allocated for the salaries and operations of the Centre. The Centre generates some income to supplement the funds from Government.

Ghana is a member of the FAO Commission on Plant Genetic Resources and adheres to the International Undertaking on Plant Genetic Resources. There are laws concerning the availability of the country's germplasm.

The national PGR programme and other activities are very important to national food security which is constantly being threatened by yearly bush fires, construction activities, introduction of improved and high yielding varieties of food crops into the system and the wanton destruction of the forests.

5.1 TRAINING

The national PGR programme of Ghana is under-staffed. Currently there are only three (3) Research grade staff with two of them on stody leave leaving only one at post. Three senior staff have been trained to the post-graduate level at the University of Birmingham and elsewhere. However efforts are being made to recruit additional staff for the following disciplines: entomology, pathology, biometry and taxonomy. It is hoped that PGR activities will be managed on multidisciplinary basis.

The present staff have received training in such disciplines as seed technology, statistical sampling, agro-morphological characterization, data management and programme management.

Currently no training programmes exist in the country. The Botany Department of the University of Ghana, Legon has the capability of offering relevant courses in PGR. Already aspect of PGR work have been incorporated in the degree programmes of the department. To embark fully on such a course would require international inputs like equipment, infrastructure and expertise. If such a course is started it would serve students from Ghana and those from neighbouring countries. Such courses could be at the graduate level.

5.2 NATIONAL LEGISLATION

The Government has enacted a law, ACT 307 of 1965 which regulates the importation and exportation of plant genetic resources. This law established the Plant Protection and Regulatory Services Department (PPRSD) within

the Ministry of Food and Agriculture which enforces quarantine regulations in the country. It is required that import permits must be obtained for importation of *in vitro* cultures of any crop; imports must be accompanied by relevant phytosanitary certificates/export permits from the country of origin. Certain materials like soil or plants with soil, plants and plant products infested with pests and diseases and specified plants are prohibited.

The implementation of the plant quarantine laws falls short of expectation since the PPRSD lacks adequate facilities required for effective discharge of its duties. The situation could improve if facilities like green houses are provided the department. Also terminal quarantine facilities are required at the PGRC, Bunso and the Cocoa Research Institute of Ghana, Tafo. These are areas where international assistance will be welcomed.

CHAPTER 6
International Collaboration

The plant genetic resources programme of Ghana has been in touch with international institutions working in that field and the country has signed several international conventions on biological diversity. For example, the following conventions have been signed by Ghana:

1. The African Convention on the Conservation of Nature and Natural Resources, Algiers, 1968.
2. Convention concerning the Protection of the World Cultural and Natural Heritage, 1972.
3. Convention on International Trade in Endangered Species of Wild Flora and Fauna, Washington, 1973.
4. Convention on the Conservation of Migratory Species of Wild Animals, Bonn, 1979.
5. International Tropical Timber Agreement, Geneva, 1983.
6. Member of FAO Commission on Plant Genetic Resources and adheres to the International Undertaking on Plant Genetic Resources.
7. African Regional Seas Conventions: Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region.
8. Convention on Biological Diversity, Rio de Janeiro, 1992.

6.1 INTERNATIONAL AGRICULTURAL RESEARCH CENTRES

There has been some collaboration with several institutions within the Consultative Group on International Agricultural Research (CGIAR). These institutions have funded several plant genetic resources activities of some institutions in Ghana. The institutions in Ghana include the PGRC and the Animal Research Institute. The Animal Research Institute has been receiving germplasm of forage crops from the International Livestock Centre for Africa (ILCA). The PGRC has benefited from several International Centres in diverse ways. The International Plant Genetic Resources Institute (IPGRI) has trained the three senior staff, funded one multicrop germplasm collection, sponsored conferences and provided some equipment, literature and

chemicals.
The International Institute of Tropical Agriculture (IITA) has provided some funds for germplasm collections and sponsored conferences. The International Rice Research Institute (IRRI) has funded one rice germplasm collection. The International Crops Research Institute for Semi-Arid Tropics (ICRISAT) has trained staff.. The Japanese Government has sponsored vegetable germplasm collection in Ghana and training of senior staff.

The PGRC is the national genebank of Ghana but it is not well equipped to dis- charge its functions. First there is the need to expand the cold storage facilities at the Centre. The present freezers are not adequate. It is essential that a proper cold store and a stand-by generator are provided. Secondly it will be necessary to provide infrastructure and facilities for tissue culture to supplement the conservation of root and tuber crops in the field.

The provision of the above facilities will require support from the CGIAR or any other international organizations like the F.A.O.

CHAPTER 7
National Needs and Opportunities

For the future progress and effective management and utilization of Ghana's PGR, the following needs and opportunities have been identified both for the PGRC and the nation as a whole.

The following facilities are required for PGR work in Ghana for PGRC.

1. Expanded cold storage facilities and a stand-by generator.
2. Facilities for tissue culture and biochemical characterization of germplasm at PGRC and the Botany Department of University of Ghana.
3. Plant quarantine facilities at the following stations:
   a) National Station at Pokuase.
   b) Terminal station at PGRC, Bunso and
   c) Terminal station at CRIG, Tafo.
4. Training for all categories of personnel.
5. Provision of vehicles for the effective operation of the gene bank.
6. Provision of the necessary infrastructure like offices, laboratories and residential accommodation for PGRC. For a Centre which is in a typical rural setting these facilities are very necessary to attract and maintain well qualified staff.
7. The essential policies for safe guarding our plant genetic resources should be put in place by the government.
8. Identification, protection, regeneration and conservation of endangered species.
9. Total characterization, evaluation and documentation of all germplasm under conservation.
10. Recruitment of requisite complement of staff to effectively manage the genebanks.

CHAPTER 8
Proposals for a Global Plan of Action

1. International sanctions should be introduced to ensure the sustainable exploitation, utilization and management of the timber industry and other forest resources of Ghana.
2. International auditors should be used to check the exploitation of our timber resources.
3. The country supports the Rio de Janeiro International Biodiversity Convention.
4. Royalties should be paid to countries whose genetic resources are utilized by developed countries.

Table 1 List of Germplasm collected by the PGRC between 1981 and 1993.

SPECIES	COMMON NAME	FAMILY	TOTAL
Abelmoschus esculentus	Okra	*Malvaceae*	176
Amaranthus sp	-	*Amaranthaceae*	3
Arachis hypogaea	Groundnut	*Papillionaceae*	76
Cajanus cajan	Pigeon pea	"	5
Canavalia ensiformis	Jack bean	"	8
C. gladiata	Sword bean	"	4
Capsicum annuum	Pepper	*Solanaceae*	30
C. fructescens	"	"	10
Celosia argentea	-	*Amaranthaceae*	1
Citrullus lanatus	Egusi	*Cucurbitaceae*	15
Citrus sp.	Tango	*Rutaceae*	6
C. aurantifolia	Lime	"	2
C. limon	Lemon	"	1
C. paradisi	Grape fruit	"	2
C. reticulata	Tangerine	"	12
C. sinensis	Sweet orange	"	9
Coleus dysentericus	Frafra potato	-	2
Corchorus olitorius	-	*Malvaceae*	1
Cucurbita sp.	-	*Cucurbitaceae*	1
Dioscorea alata	Water yam	*Dioscoreaceae*	85
D. bulbifera	Aerial yam	"	2
D. cayenensis	Yellow yam	"	18
Dioscorea dumetorum	-	*Dioscoreaceae*	12
D. esculenta	-	"	8
D. praehensilis	-	"	19
D. rotundata	White yam	"	229
Hibiscus cannabinus	Kenaf	*Malvaceae*	1
Kerstingiella geocarpa	Kersting's groundnut	*Papillionaceae*	7
Lagenaria siceraria	Gourd	*Cucurbitaceae*	28
Luffa sp	-	"	1
Lycopersicon esculentum	Tomato	*Solanaceae*	7
Manihot esculenta	Cassava	*Euphorbiaceae*	161
Mucuna pruriens var utilis	Velvet bean	*Papillionaceae*	15
Oryza sativa	Rice	*Graminae*	258
Pennisetum typhoides	Millet	"	5
Phaseolus lunatus	Lima bean	*Papillionaceae*	41
P. vulgaris	French bean	"	11
Psophocarpus tetragonolobolus	Winged bean	"	11
Ricinus communis	Castor	*Euphorbiaceae*	1

SPECIES	COMMON NAME	FAMILY	TOTAL
	Sesame	-	1
Solanum aethiopicum	Egg plant	*Solanaceae*	10
S. anguivi	Wild Egg plant	"	7
S. erianthum	" "	"	1
S. gilo	Egg plant	"	48
S. intergrifolium	" "	"	2
S. macrocarpon	Egg pant	*Solanaceae*	23
S. melongena	" "	"	28
Sorhum bicolor	Sorghum	*Graminae*	64
Sphenostylis stenocarpa	African yam bean	*Papillionaceae*	11
Urena lobata	-	*Malvaceae*	1
Vigna subterranea	Bambara groundnut	*Papillionaceae*	65
V. unguiculata	Cowpea	"	177
Vigna spp	Wild cowpea species	"	179
Zea mays	Maize	*Graminae*	421

Table 2 List of Species in Orchards (From Bennett-Lartey, 1992)

FAMILY	BOTANICAL NAME	COMMON NAME
ANACARDIACEAE	*Anacardium occidentale*	Cashew
	Mangifera indica	Mango
ANNONACEAE	*Annona muricata*	Sour sop
	A. reticulata	Bullock's heart
	A. squamosa	Sweet sop
	Cananga odorata	Ylang ylang
	Monodora myristica	Calabash nutmeg
BIXACEAE	*Bixa orellana*	Annato dye plant
BOMBACACEAE	*Pachira insignis*	Tree-nut
GUTTIFERAE	*Garcinia kola*	
	Garcinia xanthocymus	Egg tree
	Pentadesma butyracea	Tallow tree
IRVINGIACEAE	*Irvingia gabonensis*	
LAURACEAE	*Cinnamomum camphora*	
	C. zeylanicum	Cinnamon
	Persea americana	Avocado
LECYTHIDACEAE	*Lecythis zabucajo*	Monkey nut
	Bertholletia excelsa	Brazil nut
MARANTACEAE	*Maranta arundinacea*	Arrow root
	Thaumatococcus daniellii	Miraculous berry
MORACEAE	*Artocarpus incisa*	Breadfruit, breadnut
	A. intergrifolia	Jack fruit
	Morus indica	Mulberry
MUSACEAE	*Musa spp*	Banana and Plantain
	M. textilis	Manila hemp
MYRTACEAE	*Eugenia jambos*	Rose apple
	E. malaccensis	Malay apple
	E. uniflora	Pitanga cherry
	Myrciaria cauliflora	Jaboticaba
	Psidumguajava	Guava
	P. catleianum	Strawberry guava
OXALIDACEAE	*Averrhoa carrambola*	Carambola
PALMAE	*Areca cathecu*	
	Cocos nucifera	Coconut
	Elaeis guineensis	Oil palm
	Phoenix spp	Date palm
	Roystonia regia	Royal palm
	Borassus aethiopica	Fan palm
	Vitchea sp.	Vitchea
PAPILLIONACEAE	*Gliricidia sepium*	
	Pterocarpus santalinoides	Red sandalwood

FAMILY	BOTANICAL NAME	COMMON NAME
	Pueraria phaseoloides	
PASSIFLORACEAE	*assiflora edulis*	Passion fruit
PIPERACEAE	*Piper nigrum*	Black pepper
PHYTOLACCACEAE	*Phytolacca dodecandra*	
PROTEACEAE	*Macadamia integrifolia*	Macademia
ROSACEAE	*Photinia japonica*	Loquat
RUTACEAE	*Casmiroa edulis*	
	Citrus aurantifolia	Lime
	C. grandis	Pumello
	C. limon	Lemon
	C. paradisi	Grape fruit
	C. reticulata	Tangerine
	C.sinensis	Sweet orange
SAPINDACEAE	*Nephelium lappaceum*	Rambuttan
SAPOTACEAE	*Achras sapota*	
	Chrysophyllum albidum	White star apple
	Synsepalum dulcificum	Sweet berry
SIMAROUBACEAE	*Simarouba glauca*	Simarouba
THEACEAE	*Camellia sinensis*	Tea
VITACEAE	*Vitis vinifera*	Grape
STERCULIACEAE	*Cola acuminata*	Kola
	C. nitida	Kola

Table 3 List of plants used as spice (From Bennett-Lartey, 1992)

FAMILY	BOTANICAL NAME	COMMON NAME
ANNONACEAE	* *Monodora myristica*	Calabash nutmeg
LAURACEAE	*Cinnamomum zeylanicum*	Cinnamon
MYRISTICEAE	*Myristica fragrans*	Nutmeg
PIPERACEAE	* *Piper guineense*	Black pepper
	P. nigrum	
ZINGIBERACEAE	* *Aframomum melequeta*	Melegueta pepper

* **Used both as spices and as ingredients for herbal medicine.**

Table 4 List of Plant Genetic Material at the ARS Okumaning-Kade (from Ahiekpor and Afreh-Nuamah, 1992)

FAMILY	BOTANICAL NAME/ VARIETY CULTIVAR	COMMON NAME
1. *Anarcadiaceae*	*Anacardium occidentale*	Cashew
	Magnifera indica	Mango
	Alphenso	
	Bombey Yellow	
	Florigon	
	Haden	
	Jacquiline	
	Jaffna	
	Palmer	
	Springfield	
	Sunset	
	Zill	
	Local (Fibrous)	
	Spondias cytharea	English plum
	Spondias monbin	Hog plum
2. *Annonaceae*	*Annona muricata*	Sour sop
	Annona squamosa	Sweet sop
	Cananga odorata	Ylang-Ylang
3.*Bombacaceae*	*Bombax sessilis*	
	Pachira insignis	Pachira
4. *Caricaceae*	*Carica papaya*	Pawpaw
5. *Combretaceae*	*Terminalia catapa*	India almond
6. *Dileniaceae*	*Dilenia indica*	Honda para
7. *Euphorbiaceae*	*Hevea brasiliensis*	Para rubber
	Tjir 1 x Tjir 16	
	Tjir 1 x BD 10	
	Tjir 1 x BD 5	
	Tjir 1 x Selfed	
	GT 1	
	ICE 1320	
	PR 107	
	Tjir 1	
	BD 5	
	PB 86	
	RRIM 501	
	RRIM 513	
	RRIM 600	
	RRIM 605	
	RRIM 607	

FAMILY	BOTANICAL NAME/ VARIETY CULTIVAR	COMMON NAME
	RRIM 623	
	RRIM 628	
	PB 5/51	
	PB 5/63	
	RRIC 41	
	RRIC 45	
	Herbel 1	
	GL 1	
	WAR 4	
8. *Guttiferae*	*Garcinia cf. xanthochymus*	Egg-tree
9. *Lauraceae*	*Cinnamomum zeylanicum*	Cinnamon
	Persea americana	Avocado pear
10. *Lecythidaceae*	*Couroupita guinensis*	Cannon ball tree
	Lecythis zabucajo	Monkey pot tree
11. *Moraceae*	*Artocarpus communis*	Bread fruit
	Artocarpus heterophyllus	Jack fruit
12. *Musaceae*	*Musa sp* (AAB)	Plantain
	French Plantain (Apem)	
	Osabum	
	Oniaba	
	Nyeretia apem	
	True horn (apantu)	
	Asamienu	
	Aowin	
	False horn (apantu)	
	Abomienu	
	Borodewuio	
	Nyeretia apantu	
	Intermediate	
	Osoboaso	
13. *Myristicaceae*	*Myristica fragrans*	Nutmeg
14. *Myrtaceae*	*Eugenia jambos*	Rose apple
	Eugenia malaccensis	Malay apple
	Psidium cattleianum	Strawberry
	Psidium guajava	Guava guara
15. *Orchidaceae*	*Vanilla fragrans*	Vanilla
16. *Papillionaceae*	*Psophocarpus tetragonulobus*	Winged bean
	TPT 1	
	TPT 8	
	UPS 31	
	UPS 47	

FAMILY	BOTANICAL NAME/ VARIETY CULTIVAR	COMMON NAME
	UPS 59	
	LBNC 1	
	SLS 7	
	SLS 37	
	SLS 40	
	SLS 44	
17. *Palmae*	*Cocos nucifera*	Coconut
	Elaeis guineensis	Oil palm
18. *Passifloraceae*	*Passiflora edulis*	Passion fruit
19. *Piperaceae*	*Piper nigrum*	Black pepper
	Balancotta	
	Kalluvalli	
	Kalbalacotta	
	Cheriakodi	
20. *Polygonaceae*	*Coccolaba uvifera*	Sea-side grape
21. *Rubiaceae*	*Coffea robusta*	Robusta coffee
	Vangueria venosa	?
22. *Rutaceae*	*Citrus sp*	Oranges
	Citrus aurantifolia	Lime
	Citrus aurantium	Sour orange
	Citrus grandis	Shaddock
	Citrus limon	Rough lemon
	Citrus medica	Citron
	Citrus nobilis/	Tangerine/
	C. reticulata	Mandarin
	Satsuma	
	Ponkan	
	Mrs. Wright	
	Dancy	
	Cleopatra	
	Ranpur lime	
	Citrus paradisi (C. grandis)	Grape fruit
	C. sinensis	Sweet orange
	Washington Navel	
	Late valencia	
	Mediterranean sweet	
	Ovelleto	
	Bleed red (Maltse, Ruby)	
	Pineapple	
	Sekkan	
	Hamlin	

FAMILY	BOTANICAL NAME/ VARIETY CULTIVAR	COMMON NAME
	Locals - Obuasi	
	Subi	
	Anomabo etc.	
	Interspecific hybrids	
	C. reticulata x C. paradisi	Tangelo
	C. reticulata x C. sinensis	Tangor
23. *Sapindaceae*	*Blighia sapida*	Akee-apple
	Nephelium lappaceum	Rambutan
24. *Sapotaceae*	*Chrysophyllum albidum*	White star apple
	Chrysophyllum cainito Star	apple
	Synsepalum dulcificum	Sweet berry
25. *Sterculiceae*	Cola nitida	Kola
	Red nut (Rubea)	
	White nut (Alba)	
	Mixtda (Red, White, Pink)	
	Theobroma cacao	Cocoa
26. *Verbenaceae*	*Helmakieldia sanguinea*	Parasol flower
27. *Zingiberaceae*	*Aframomum melegueta*	Guinea grain
	Curcuma domestica	Turmeric
	Zingiber officinale	Ginger

APPENDIX 1
FOREST INVENTORY PROJECT CLASSIFICATION OF GHANA HIGH FOREST TREE SPECIES

Class 1 (Species registered as having been exported from Ghana 1973-188)

Latin name	Local name	Alternative names	Previous classifications	
			ID	SILVICON-SULT
Afzelia bella/africana	Papao	Apa, Apal, Afzelia	III	A
Albizia ferruginea	Awiemfosamina		III	A
Albizia zygia	Okoro	Atanza	III	
Alstonia boonei	Sinuro			
Amphimas pterocarpoides	Yaya	Lati		B
Aningeria spp.	Asantewa	Asamfona		A
Anopyxis klaineana	Kotote		III	A
Antiaris toxicaria	Kyen-kyen	Ako	IIB	A
Antrocaryon micraster	Aprokuma			B
Berlinia spp.	Kwatafompaboa	Tekon, Limbali		
Bombax brevicuspe	Onyinakoben	West African Bombax		A
Bambax buonopozense	Akonkodie	Akata		B
Canarium schweinfurthii	Bediwonua	Aile	III	A
Ceiba pentandra	Onyina	Fronoquer		
Celtis mildbraedii/zenkeri	Esa	Obia, Akosika, Chia	III	B
Chrysophyllum giganteum/ subundum/albidum	Akasaa	Adasena, Akatio		B
Copaifera salikounda	Entedua	Bubinga		A
Cordia millenii/platythyrsa	Tweneboa			
Cylicodiscus gabunensis	Denyao	Okan	III	A
Cynometra ananta	Ananta		III	B
Daniellia ogea/thurifera	Hyedua	Sopi, Faro, Gun/Niger Copal		B

Latin name	Local name	Alternative names	Previous classifications	
			ID	SILVICON-SULT
Dialium aubrevillei	Duabankye			
Diospyros sanza-ninika	Sanza-mulika	Kusibiri, African Ebony, Flinkbark	III	
Distemonanthus benthamiaus	Bonsamdua	Avan, novinqui	III	A
Entandrophragma angolense	Edinam	Gedunohor, tiana	IA	A
Entandophragna cylindricum	Penkwa	Sapele	IA	
Entandrophragma utile	Efoobrodedwo	Utile, Sipo	IA	A
Entandrophragma candollei	Penkwa-Akoa	Onu, Kossipo, Ceda-Kokote	IIA	
Erythrophleum spp.	Potrodom	Odon, Missanda, Tali	III	B
Guarea cedrata	Kwabohoko	Scented Guarea, Bosse	IIA	A
Guarea thompsonii	Kwadwuma	Black Guarea, Bosse	IIA	A
Guibortia ehie	Anokye-hyedua black hyedua, amazakone, ovangol iib			A
Heretiera utilis	Nyankom	Niangon	IC	A
Khaya anthotheca/grandifoliola	Krunben	African Mahogany, Akajon, Boules	IA	A
Khaya ivorensis	Dubini	" " " "		A
Klainedoxa gabonesis	Kroma			
Lophira alata	Kaku	Ekki, Azobe	IIA	A
Lovoa trichilioides	Dubinibiri	African Valnut	AB	A
Mannea africana	Bompagya	Pegya	III	B
Mansonia altissima	Oprono	Nansonia, Bete	IIB	A
Milicia excelsa/regia	Odum	Iroko, Chlorophora	1A	A

Latin name	Local name	Alternative names	Previous classifications	
			ID	SILVICON-SULT
Mitrasyna/ciliata/stipulosa	Subaha	Abura, Bahai	IB	A
Nauclea diderrichii	Kusia	Opepe, Bilinga	IA	A
Nesogordonia papaverifera	Danta	Kotibe	IIB	A
Parkia bicolor	Asoma			B
Pericopsis elata	Kokrodua	Afronosia, Asanela	IB	A
Petersianthus macrocarpus	Esia		III	B
Piptadeniastrum africanum	Dahoma	Dabena	IIA	A
Pterygota macrocarpa	Kyereye	Koto		A
Pycanthus angolensis	Otie	Illonba	III	A
Sterculia rhinopetala	Wawabina		III	B
Strombosia glaucescens	Afena		III	A
Terminalia ivorensis	Emire	Idigbo, Framire	IA	A
Termimalia superba	Ofram	Afara	III	A
Tieghenella heckelii	Baku	Nakore, Bakure	IA	A
Triplochiton scleroxylon	Wawa	Obeche, Samba, Ayous	IB	A
Trurraeanthus africanus	Apapaye	Avodire	IIB	A

Sources

1. **Average unit prices by species 1973-1986, Silviconsult (1986).**
2. **Monthly Timber Export Market Report 1986-1988, Timber Export Development Board.**

Class 2 (Species attaining 70 cm dbh and occurring at a frequency of more than 1 km^{-2} in the overall inventory results and not presently exported).

Latin name	Local name	Previous classifications	
		ID	SILVICONSULT
Afrosersalisia afzelii	Bakunini	III	
Albizia adianthifolia	Pampena		
Albizia glaberrima	Okora-akoa		
Aningeria spp	Asantewa		
Balanites wilsoniana	Krobodua		
Blighia spp	Akye		
Bussea occidentalis	Kotoprepre		
Calpocalyx brevibracteatus	Atrotre		
Celtis adolfi-friderici	Esakosua	III	B
Celtis wightii	Prempresa		
Chidlowia sanguinea	Ababima		
Chrysophyllum perpulchrum	Atabene		
Chrysophyllum pruniforme	Duatadwe		
Cleistopholis patens	Ngonenkyene		
Cola gigantea	Watapuo		
Corynanthe pachyceras	Pampenana		
Coula edulis	Bodwue		
Dacryodes klaineana	Adwea		
Duboscia viridiflora	Akokoragyebini		
Erthroxylun manii	Pepeanini		
Ficus spp (nan-stranglers)	Domini		
Gilbertiodendron spp.	Tetekon		
Hannoa klaineana	Fotie		
Hexalobus crispiflorus	Duabaha		
Holoptelea grandis	Nakwa	III	B
Honalium letestui	Esononankoroma		
Honalium stipulaceum/devev.	Owebiribi		
Irvingia gabonensis	Abesebuo		B
Lannea welwitschii	Kumanini		
Lonchocarpus sericeus	Sante		
Maranthes spp	Afam etc.		
Margaritaria discoidea	Pepea		
Morus nesoxygia	Wonton	III	B

Latin name	Local name	Previous classifications	
Monodora myristica	Wereaba		
Ongokea gore	Bodwe		
Pachypodanthium staudtii	Kumdwie		
Panda oleosa	Kokroboba		
Parinari exelsa	Afam		A

APPENDIX 2
List of Medicinal Plants

Group A (Very rare species)

1. *Cnestis ferruginea*
2. *Corynanthe pachycerus*
3. *Croton membranaceus*
4. *Dialium guineensis*
5. *Kigelia africana*
6 *Pachypodanthium staudtii*
7. *Mitragyna stipulosa*
8. *Treculia africana*

Group B (Not very rare but being threatened)

1. *Albizia ferruginea*
2. *Antiaris africana*
3. *Bosqueia angolensis*
4. *Canthium glabriflorum*
5. *Carapa procera*
6. *Claysena anisata*
7. *Fagara xanthoxyloides*
8. *Khaya ivorensis*
9. *Maytenus senegalensis*
10. *Pseudocedrela kotschyi*
11. *Strophanthus gratus*
12. *Terminalia glaucescens*
13. *Trichilia heudelotii*
14. *Trema orientalis*

Group C (Common medicinal plants)

1. *Albizia ferruginea*
2. *Antiaris africana*
3. *Bosqueia angolensis*
4. *Canthium glabriflorum*
5. *Carapa procera*
6. *Capsicum annuum*
7. *Capsicum frutescens*
8. *Carica papaya*
9. *Cassia alata*
10. *Cassia occidentalis*
11. *Clausena anisata*
12. *Cnestis ferruginea*

13. *Corynanthe pachyceras*
14. *Croton membranaceus*
15. *Dialium guineensis*
16. *Euphorbia hirta*
17. *Fagara xanthoxyloides*
18. *Justicia flava*
19. *Khaya grandiflora*
20. *Khaya ivorensis*
21. *Khaya senegalensis*
22. *Kigelia africana*
23. *Mangifera indica*
24. *Manihot esculentus*
25. *Maytenus senegalensis*
26. *Mitragyna stipulosa*
27. *Ocimum viride*
28. *Pachypodanthium staudtii*
29. *Parkia clappertoniania*
30. *Pseudocedrela kotschyii*
31. *Rauvolfia vomitoria*
32. *Strophanthus gratus*
33. *Sporobolus pyramidalis*
34. *Trema orientalis*
35. *Terminalia glaucescens*
36. *Treculia africana*
37. *Trichilia heudelotii*

ACKNOWLEDGEMENTS

The authors acknowledge with thanks the sponsorship of this report by the management of the Plant Genetic Resources Centre, Bunso.

Abbreviations

ARI	Animal Research Institute
ARS	Agricultural Research Station
CGIAR	Consultative Group on International Agricultural Research
COCOBOD	Ghana Cocoa Board
CRI	Crops Research Institute
CRIG	Cocoa Research Institute of Ghana
CSD	Crop Science Department, University of Ghana
CSIR	Council for Scientific and Industrial Research
CSRPM	Centre for Scientific Research into Plant Medicine
FAO	Food and Agricultural Organization
FORIG	Forestry Research Institute of Ghana
FRI	Food Research Institute
GAEC	Ghana Atomic Energy Commission
GDP	Gross Domestic Product
GGDP	Ghana Grains Development Project
IAB	Institute of Aquatic Biology
ICRISAT	International Crops Research Institute for Semi-Arid Tropics
IDC	Irrigation Development Centre
IITA	International Institute of Tropical Agriculture
ILCA	International Livestock Centre for Africa
IPGRI	International Plant Genetic Resources Institute

IRRI	International Rice Research Institute
MOFA	Ministry of Food and Agriculture
NARP	National Agricultural Research Project
OPRI	Oil Palm Research Institute
PGR	Plant Genetic Resources
PGRC	Plant Genetic Resources Centre
PPRSD	Plant Protection and Regulatory Services Department
SARI	Savanna Agricultural Research Institute
SRI	Soil Research Institute
UCC	University of Cape Coast
UG	University of Ghana
UST	University of Science and Technology

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