JAMAICA:

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

(Leipzig,1996)

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Kingston, December 1995

Note by FAO

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CHAPTER 1
Introduction

Jamaica has had approximately 210 years of scientific investigation into Jamaican Agriculture which has developed from the assessment of plant introductions to more complex matters, but up to the 1940's the volume of work was small (Edwards, 1965). The present major economic crops of agriculture were all introduced and hence scientific investigations were centered on these exotics. Indigenous germplasm has not featured very significantly in Jamaican Agriculture. Substantial research began in the 1950's when the Department of Agriculture was strengthened and the Sugar Industry began its own field research. Other commodity organizations eventually began research programmes (Banana Board 1956, Coconut Industry Board, 1959). The over-emphasis on Sugar research (during the 1960's), compared with that devoted to other export crops has been reduced but research into the problems of small farming and local food crop production is far from adequate. This is only partly due to the limited research resources available (Edwards, 1965). A seminar was held at the University of the West Indies, Mona Campus, in 1965 to discuss Agricultural Research in Jamaica (see Miller, 1965). Subsequently many management audits have been done of Jamaica's Agricultural Research and Development. The current subject "Management of Jamaica's Plant Genetic Resources Conservation and Use" has never featured, even superficially, in its evaluations.

A diverse set of agencies undertake Agricultural Research and Development , such as the Ministry of Agriculture (MINAG), the Scientific Research Council (SRC), the Caribbean Agricultural Research and Development Institute (CARDI), and the Commodity Associations. There is no overall National Coordinating Mechanism for policy and plan of actions on Management of Plant Genetic Resources.

CHAPTER 2
Background on Jamaican Agricultural Sector

Jamaica is the third largest island of the Greater Antilles with a total area of 10,962 km2. The topography is rugged: only 384,000 ha have slopes less than 10 degrees while 330,000 ha consist of moderately steep or slopes and 290,000 ha have slopes greater than 30 degrees. More than half of the Island has an altitude of 300 m and about 1% is about 1,500 m. There are five broad topographic divisions in Jamaica: The Blue Mountain Area, Central-Western Limestone Plateau, Central Inliers Areas, Interior Valleys and Coastal Plains. The Island is divided into 14 parishes or political subdivisions, which are the principal administrative units (Timon et al 1989).

Jamaica has a wide range of soil types, due to the variability of source materials, topography and rainfall distribution. Nearly 60% of the soils are associated with plant material of limestone origin: about 20% are of shale conglomerates, tuffs and igneous rocks, and another 20% are alluvial soils located on the plains, Inland basins and valleys. The average annual precipitation is about 1,980 mm, varying from 890 mm in the southern coastal region to more than 5,000 mm in the Blue Mountain slopes. The main rainy periods are April/May and September/November. Because of the many types of soil and the range in rainfall and altitude, numerous micro-environments exist for growing a wide range of plants and animals of both temperate and tropical origin (Timon et al, 1989).

1.1 AGRICULTURAL PRODUCTION AND TRADE

Some 51% of Jamaica's 2.4 million inhabitants live in rural areas while 28% of the total work force is employed in agriculture. The agricultural labour force is also older and generally considered to be less productive than in other sectors of the economy (Timon et al, 1989).

Jamaican agricultural activity is characterized by two very distinct types: a small number of large scale producers of export crops and cattle and a large number of very small farms producing mainly for the domestic market and home consumptions. Forty seven percent farms have less than 0.81 ha and

93% have less than 4 hectares. At the other extreme, 500 farms of 41 hectares or more account for 39% of the total farm area (Timon et al, 1989).

About 145,800 hectares of the 374,158 hectares of farmland are potentially highly productive, mostly coastal plains. The remainder is on hilly and mountainous land where cultivation is restricted by danger of erosion. The climate of Jamaica is favourable for the production of a wide variety of crops, but irregular length of dry seasons, frequent flooding, tropical rain storms and hurricanes impact adversely on the sector.

Sugar is the most important crop in terms of agricultural GDP and accounts for about 11% of the total output in 1987. All other export crops together accounted for 7.9% of agricultural GDP; root crops 20.6%; fruits, vegetables and other miscellaneous crops for domestic consumption, 32.3%; livestock, 19.5%; forestry, 2%; and fishing, 6.6%.

In years past agriculture has been Jamaica's main source of economic growth. Export crops (sugar, bananas, citrus, coffee, cocoa and spices) have contributed significantly to national and rural development. However, the sector's contribution to GDP has fallen from 15-17% in the early 1960's to about 8.3% in 1987.

CHAPTER 3
National Conservation Activities

The study of plant genetic resource in Jamaica dates back to 1770 when Hinton East established a garden as a private enterprise on his estate at Gordon Town, situated about nine miles from Kingston.

In 1779 the Bath Botanical Garden was established by Government and placed under the supervision of Dr. Thomas Clarke, Island Botanist. He was succeeded by Dr. Thomas Dancer (1779) who was commissioned to collect, classify and describe the native plants, find out their medicinal and other values and submit annually a report to the House of Representatives. Dr. Dancer was succeeded by Dr. McFayden in 1825 and later by Dr. Higson in 1828.

In 1846 Nathaniel Wilson of the Royal Botanical Gardens, Kew, England, took over the care of the Bath Botanical Gardens. He introduced a number of plants including the *Poinciana* from Madagascar, the Bouganvilla from Brazil and the *Amberstia nobilis* from India. He also paid special attention to the collection of a large number of fibre plants to fit into future requirements.

As a consequence of there being no room to extend the Bath Garden and its frequent flooding by rains a new garden was established at Castleton in 1860. Bath Gardens then became neglected until 1920 when it was used as a propagation center for cacao. At present it occupies only one acre but contains a rare collection of palms and other trees.

Castleton, established under the direction of Mr. Wilson, is 174 m above sea-level but well protected by hills. It is approximately 12 hectares in extent and enjoys an annual rainfall of about 3,000 mm. Development was rapid and included the collection of plants from all over the tropics; in one year (1869) no less than 400 species of plants were introduced from Kew Gardens, England. In addition, two (2) lots of grafted mangoes came in from India.

Cinchona Gardens

The idea of developing a 'hill-garden' or "European-garden", as he called it, was conceived by a governor of the then colony, Sir Basil Keith, in 1774.

He planned specially to introduce the cultivation of the European vegetables in the cool, moist, hill country. The plan was first realized in 1869, through the energy of the late governor, Sir John Peter Grant, whose primary object

was the encouragement of the culture of Peruvian bark, coffee and tea. Here in the early eighteen seventies, scores of acres were cleared and planted with seedlings of several species of Cinchona. These were derived from plants brought out of Peru in 1860 by Clements Markham. In 1874 the Jamaican Government organized at Cinchona an experiment station, which became the center of botanical work in the island. A director's residence, other buildings, office laboratories, greenhouses etc were constructed. A beautifully planned garden was developed around these buildings, and planted with hundreds of sub-tropical and temperate-zone plants.

Here was stationed during the prosperous days of Cinchona culture, nearly the whole botanical staff of the Department of Public Gardens and Plantations. For seven years, under Sir Daniel Morris (1879-1886), and eleven years under the Honourable William Fawcett (1886 -1897), the staff was engaged in agricultural and in some purely botanical researches. Methods of propagation, cultivation, harvesting and curing, Cinchona tea, etc. were studied. At a lower altitude, experimental plantations were made of oranges, forage-plants, and fibre plants such as China grass, which showed that these could be grown successfully in the island. William Nock was brought over to demonstrate the possibility of cultivating vegetables in those higher parts of the island. Besides their purely agricultural investigations important taxonomic studies were made of the flowering plants of this most interesting part of Jamaica by William Harris. Diligent search for new forms in the more inaccessible regions was made especially by Mr. Harris, while C.L. Jenman, then Superintendent of Castleton Gardens, studied the forms of that area. Hundreds of species of mosses, ferns and seed plants new to the island and to science, were found by the workers. The Flora of Jamaica published by Fawcett and Rendle from the British Museum, was initiated at Cinchona. Records were also made of the temperate and rainfall at several stations in this region, including the Blue Mountain Peak at 2,227 m elevation.

About 1900 the staff was removed to new Headquarters at Hope Gardens, near Kingston, from which the lowland agriculture now of most importance to the island, can be more readily studied and aided. In a number of years after the removal of Headquarters, the Cinchona Station was not occupied, except occasionally as a summer retreat from the heat of the plains by the Governor or other island-officials, or by visiting botanists (compiled by B.B. Collins, MINAG, 1987).

CHAPTER 4
Plant Genetic Resources and their Usage

Responsibilities of national plant germplasm conservation and use are as diffuse as are the entities doing research and development and, will be dealt with as Commodities under the Commodity Associations (e.g. Sugar, Banana) or under MINAG or CARDI or UWI.

4.1 INDIGENOUS PLANT GENETIC RESOURCES

Rich soils, a hot climate with a good rainfall and copious underground water permit a wide variety of crops to grow. Few of the trees and plants found here are native to Jamaica. Native ones include the pineapple, cassava, cedar, mahoe, mahogany and pimento. Nearly all others were brought here from elsewhere; the breadfruit was brought here from the South Pacific by Captain Bligh of Bounty in 1793. Others which might be mentioned are the sugar-cane, guinea grass, cinnamon, jackfruit, mango, yam, tobacco, ackee and coffee (Bent and Bent-Golding, 1968).

4.2 FOREST TREES

Mahoe (the national tree), mahogany and cedar are important forest trees, for furniture purposes. Bamboo is widely used for soil conservation and in the construction industry.

The Pimento Plant - *Pimenta dioica*

The *pimento* plant is indigenous to the Central American Mainland and the Caribbean Islands and exists and thrives in Jamaica more abundantly than in any other part of the world; commonly known as "Jamaican Allspice". Jamaica has the largest population of pimento trees and by and large it is safe to say that it grows under a wide range of climatic conditions (D.D. Henry, 1968). In 1967 MINAG established a pimento nursery at Lawrencefield Research Station in St. Catherine. The Ministry of Agriculture has been producing grafted pimento (Jamaica Allspice) seedlings for distribution to farmers since 1969. An important aspect of the University's (UWI, Mona) work on pimento arising out of the use of the grafting technique is the selection of high producing strains or varieties; buds are genetically identical with the plants from which they are taken: hence pimento budding has

facilitated the selection and reproduction of high producers. To date two (2) males and twelve (12) varieties have been isolated and are currently being tested (JAS Pamphlet) (see also Chapman, 1965).

Pimento is an important export crop. The berry is used as a spice and to make a popular liqueur. "Essential Oils" are extracted from the leaves.

A genebank of Pimento trees was established in orchard form in St. Ann, and later at Lawrencefield in St. Catherine.

Cassava

The Ministry of Agriculture has a collection of germplasm of cassava of both local and overseas origin. This collection is maintained at the Bodles Research Station. The collection is partially maintained with inadequate research work being undertaken.

Cassava is widely cultivated for human consumption and is used to make a popular local bread "bammy" which is also exported.

4.3 OTHER INDIGENOUS PLANT GENETIC RESOURCES OF JAMAICA

The other species of indigenous plant genetic resources of current minor economic interest., in situ, are some species of bamboo, Palms, starapples, naseberries and medicinal plants.

Non-Indigenous Plant Genetic Resources

(a) Pasture Grass and Legume germplasm/genebank

The Ministry of Agriculture has just published "A Review of Pasture Grass and Legume Research from 1984 - 1994 by D. Richards, P. Alfred and William
J. Fielding", was published in 1995. An account is given of the Forage introductions pre-1946 to post 1990, on species which were investigated and grown by farmers. "This paper reviews the grass and legume research undertakenby the ministry of Agriculture from 1948-1994. Where possible, data from several sources have been combined to provide an overall picture of species performance. The agronomy of each family of grass and legume is considered as well as the effects that the species have on livestock production. Areas for future research are suggested". "The search for high-yielding. high

quality forage needed to support a cattle industry led to the introduction of many grasses. These grasses were evaluated between 1947 and 1952 at Grove Place. The introduction of germplasm from tropical and sub-tropical areas was an important activity of the Pasture Research Department from 1950 to 1980. A major introduction of new germplasm took place in 1965 with the arrival of cultivars from the Oakes Collections; fifty-five cultivars were received by Jamaica in the Spring of 1965.

This review is an invaluable source of information on germplasm introduction, evaluations and establishments over a fairly extended period in different ecological conditions.

(b) Cultivated Fruit Trees

(i) Genebanks of Ackee (*Blighia sapida*); two observation plots were established in 1961 at Rhymesbury. Rooted cuttings established at Lawrencefield in 1969 started to fruit early in 1972 at 13 months. This growth is low and spreading and has given rise to the belief that a dwarf line was established, but this is not correct. By 1974 the branches needed propping up, and the trees used to be tested for pruning results. The easy collection of fruit is certainly desirable. Hypoglycine tests were started by the Scientific Research Council in 1972 from selected trees, but were discontinued due to difficulties in analysis. Indications were that there were no differences from tree to tree, cultivar to cultivar nor material from pods picked open compared to those opening within three (3) days of picking. Forty-five trees from stands at Vernamfield, Orange River, and Hopefield Stations were selected as producing fruit with good canning properties, and these were vegetatively propagated. A museum of these plants was started at Lawrencefield in 1969 and additions made from which rooted cuttings are available from these selections. In 1976 it was reported that the Museum of eight (8) cultivars at Lawrencefield Research Station was maintained; at Orange River Field Station fourteen (14) cultivars were maintained. "It is to be regretted that the source of the main cultivars selected for propagation at Vernamfield was destroyed in November, 1975. Selections planted out at Bodles and Jamaica House in 1976 have no labels and have therefore lost much of their research value.

(ii) Avocado Museum Orchard:an orchard was established at Rhymesbury in 1961. It was attacked in 1961 by root-rot *Phytophthora* spp and the development of the disease led to abandonment of the plot and transfer of the project to Charlton Agricultural Station where it was hoped conditions would be more suitable for Avocado.The following varieties

were represented in the Museum -- Gripina 4, Gripina 5, Semil 34, Mexicola, Corona, Zutona. Lula, Hass, Benik, Dickenson, Duke, Lyon, Ganter, Taft, Jean, McArthur, Carlsbad, Topa-Topa, Mayapan, Gattried, Bacon, Hickson, Nabal, Booth 7, Butler, Utnado, D.W.I Bank, Waldin, Winslowson, Cinda, and Fuerte. A brief review of the history of the Avocado work of the Crop Research Division, and a preliminary assessment is made of ten (10) avocado cultivars at Lawrencefield Agricultural Station, 1949-1977 (see Investigations Bulletin, No. 65, 1976 MINAG). Earlier work done could not be included as records had not been found; however some selections of Jamaica avocados were made and importations of many cultivars - Simmonds, Lula, Collinson and Winslowson were selected for propagation. Many other Museums in other locations were established but eventually abandoned because of diverse factors. Even the Lawrencefield Museum Plot (the largest genebank, with germplasms from California, Florida, Hawaii and Australia) seems to have had many intractable problems.

(iii) Mango - Lawrencefield Museum: the Investigations Bulletin No. 64, 1970 - 1974 informed that the following cultivars fruited - Robin, Alampu, Baneshan, Peach, Governor, nash, Roose, Carpenter, McPherson, Black, Tringram, Julie, East Indian, Cumsee-Long, Bombay, Alphanso, Allen, Kent and Glen, Himayuddin and Baneshan, flowered for the first time in Jamaica. The cultivar Tommy Atkins was lost due to shortage of irrigation water. In 1972 flowering and good fruiting was observed on the following cultivars - No. 11, Nash, Robin, Peach, Governor, Allen, Carpenter, Tringram, East Indian, Haden, Bombay, Julie, Cumsee-Long, Alphanso, Himayuddin, Parri, Roose, Alampur, Banesham, Parri, Baneshu, Early Gold, Glen and Kent.

(iv) Orange River: the germplasm collection at Lawrencefield has been replicated at Orange River, St. Mary, an area of medium to high rainfall. Fifty-two varieties are maintained there - the basic purpose apparently to ensure survival of the germplasm.

(v) Coconut Germplasm - *Cocos nucifera*: the Coconut Industry Board has a significant collection of coconut germplasm; this collection embraces varieties and hybrids. There are located at several places (see Report attached).

(vi) Banana *Musa* spp: Jamaica has a significant international collection of Banana and Plantain Germplasm at Bodles, St. Catherine. There is deliberate policy to maintain the germplasrn intact, however a very limited amount of research is done with it.

(vii) Cocoa - *Thebroma cacoa*: a very significant amount of cacao germplasm are maintained at 'Montpelier Agricultural Research Station, Orange River Agricultural Research Station, and Water Valley, St. Mary. very limited research is being done .

(viii) Citrus *Citrus* spp: over the years a significant amount of citrus germplasm has been introduced into Jamaica. The now defunct Citrus Rese

arch Unit of the University of the West Indies introduced many cultivars of citrus to be tested as rootstocks and established an orchard with these cultivars at Manchester Pastures, Manchester. The land was subsequently mined for bauxite; prior to mining the germplasm was established elsewhere.

(ix) Root Crops - *Ipomoea botata:* there were two (2) centers of sweet potato germplasm collection in Jamaica one at the Caribbean Agricultural Research and Development Institute CARDI) Headquarters, Mona Campus, University of the West Indies and one at Bodles Agricultural Research Station. There is apparently a collaborative effort between the Ministry of Agriculture (Crop Research) in Jamaica and the International Potato Center (CIP) in Peru, "for the characterization, preservation and retrieval of various sweet potato cultivars from the collection, at the CIP Sweet Potato Germplasm Bank". Another objective of the maintenance of this germplasm is "to maintain a collection of various sweet potato cultivars under similar conditions to carry out morphological comparisons of potential duplicates in the collection of 75 sweet potato accessions, for observation and measurement of the various characterization parameters.

(x) Miscellaneous Germplasm:

There are limited *in situ* remnants of germplasms of Guava, Black Pepper, Annatto, Naseberry, Sour Sop, Breadfruit, Corn and Pigeon Peas. These are mainly located on lands owned by the Ministry of Agriculture.

CHAPTER 5
National Goals and Policies

Genetic resource conservation activities are not organized into any discreet programmes. In general they are informal collections mainly by the Ministry of Agriculture and Mining, and certain of the Commodity Boards or Non-Governmental organizations (NGO's). The involvement of commercial farms, and farmers organization are minimal as they import most of their planting material (vegetable seeds).

The government visualize the need to enhance food security through the manipulation of these collections but the lack of proper funding arrangements curtail these activities. A Seed Policy is now being drafted in order to provide improved planting material for farmers. This will involve Government, Non-government Organizations and Farmers.

5.1 TRAINING

The need to conserve genetic resources is seen as a national priority. Therefore, the training of nationals are taking place through a Food and Agriculture Organization of the United Nations (FAO) Regional Germplasm Programme. The programme envisages the training of nationals in:

(i) the need to conserve germplasm;

(ii) computer programmes;

(iii) appreciation for tissue culture to improve the use and transfer of plant materials. The University of the West Indies is also engaged in genetic engineering through work being pursued at the Biotechnology Unit.

5.2 NATIONAL LEGISLATION

The Plant Quarantine Act 1992 provides for the protection of the country from the introduction and spread of exotic pests and diseases through the activities of man. The penalties for breaches have been made more realistic than previous Plant Protection Acts. Basically, this act is consonant with FAO Plant Quarantine Guidelines and is applied where plant genetic resources is being imported:

(a) As a quarantine measure imported genetic material may be routed through Post Entry Quarantine before being released for multiplication and/or general planting out.

(b) Intellectual Property Rights Legislation discussions have only begun recently. Assistance may be needed with regards to plant genetic resources.

(c) N.B. Certain plant species, mainly orchids, have been declared endangered under National Resources Conservation Authority Act . These may not be exported.

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5.3 INTERNATIONAL COLLABORATION

Jamaica works with many international organizations, however the area of collaboration needs to be strengthened. Some of the organizations include Asian Vegetable Research and Development Center, International Center for Potato (CIP), International Center for the Improvement of Maize and Corn (CIMMYT), International Center for Tropical Agriculture (CIAT), International Crops Research Institute for Semi-Arid Tropics (ICRISAT), and International Institute of Tropical Agriculture (IITA).

5.4 REGIONAL INSTITUTIONS

There is a dependence on CARDI and UWI for the introductions and training in germplasm activities to match national goals and objectives.

5.5 OTHER POLICIES

A national seed policy is being developed. Under this policy incentives will be given for production, distribution and usage of improved planting materials. Presently some Commodity Boards, for example Coconut and Sugar produce disease resistant planting varieties which are distributed to farmers at low prices. These are enthusiastically received.

CHAPTER 6
National Needs and Opportunities

Over a period of 210 years, plants and germplasm have been introduced into Jamaica. Some of these introductions have developed into the mainstay of the agricultural sector, such crops being sugar cane, bananas and citrus.

The maintenance, management and use and research with the diverse germplasm collected over the years is extremely disappointing. There is no significant research work into actual crop improvement. However, significant quantities of improved varieties of crops have been introduced into Jamaica to be tested for their productivity under Jamaican conditions. Even in this latter case, however the research work has been discontinuous and very disappointing. Pimento research could have become the model for research on an indigenous plant resource but, it too suffered from the general lack of appreciation of the importance of the need to husband our very precious plant genetic resources. Reports have been discontinuous and in some cases inaccessible.

Jamaica has a rich and diverse plant species. Research has not come to grips to exploit these in response to agricultural development and productivity.

There is a need to:

- Examine the germplasm at our disposal.
- To document these and keep the necessary records.
- Develop policies to protect these for the national good.
- Examine their potential use for national development.
- Have an agency responsible for coordination and management of collections.
- Ensure adequate funding by having germplasm conservation as a separate line item in the national budgets.

CHAPTER 7
Global Plan

In general there is a need for technical assistance for developing programmes and policies for germplasm conservation and exploitation in developing countries. With such relevant programmes in place these countries including Jamaica would be well placed to maximize benefits from the world's plant germplasm resources. Therefore, Jamaica would be supportive of a global plan of action embodying:

- Training related to germplasm management.
- Funding for formal programmes at regional and national levels.
- Documentation and information exchange.
- Methods development, research and technology transfer.
- Guidelines and Legislations related to Intellectual Property Rights, Biotechnology and Genetic Engineering.

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