MAURITIUS:

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

(Leipzig,1996)

Prepared by:

Ministry of Agriculture and Natural Resources

Collaborators:
Ministry of Economic Planning and Development
Ministry of Environment and Quality of Life
Ministry of Education and Science
Mauritius Sugar Industry Research Institute
Food and Agricultural Research Council
Agricultural Marketing Board
University of Mauritius
Mauritius Institute of Education

Port Louis, April 1995

Note by FAO

This Country Report has been prepared by the national authorities in the context of the preparatory process for the FAO International Technical Conference on Plant Genetic Resources, Leipzig, Germany, June 17-23 1996.

The Report is being made available by FAO as requested by the International Technical Conference. However, the report is solely the responsibility of the national authorities. The information in this report has not been verified by FAO, and the opinions expressed do not necessarily represent the views or policy of FAO.

The designations employed and the presentation of the material and maps in this document do not imply the expression of any option whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Table of contents

CHAPTER 1
Introduction

The Republic of Mauritius is composed of the islands of Mauritius, Rodrigues, Agalega, St. Brandon and a number of outlying smaller islands, all located in the south of the Indian Ocean between latitudes 10° S and 20° S and longitude 55° E and 65° E. Mauritius is the principal island and is located at latitude 20° South and longitude 58° East, some 800 km from the south east of Madagascar and has a land area of 1,865 km^2 (Fig. 1). The population of the Republic of Mauritius was estimated at 1,106,000 at the end of December 1993 and the rate of population growth was 1.3 percent. About half of the population is concentrated in the urban areas which lie along the axis from the capital Port-Louis to the city of Curepipe. The standards of health, nutrition and education are high compared to other countries in Africa. The adult literacy rate is 83 % and the life expectancy at birth is about 66 for males and 73 for females (MEPD, 1993).

Mauritius has a tropical maritime climate generally dominated by the south east trade winds and enjoys a warm moist summer during the months of December to May and a cool dry winter from June to November. Mauritius was formed by volcanic activity starting some 8-9 million years ago. The soils belong to the latosolic group. In function of altitudes and climates, the soils are classified according to various sub groups starting from humid latosol to ferruginous latosol. According to USDA classification (7th approximation), the soil can be grouped as: the Podsol Order on the high plateau and Oxisol on the dry low lying region.

In isolation the island has evolved a unique flora and fauna with high levels of endemism. On the discovery of the island in 1598, the land was covered with a thick green vegetation with a variety of palm trees and wood trees. These began to decline under the three successive colonisation by the Dutch (1638-1710), French (1715-1810) and British (1810-1968). The Dutch started the process of clearing the forest to exploit ebony and palm in the lowland regions and coastal plains. Indeed, ebony, the finest indigenous wood, was the first exported agricultural commodity of the island and at one time Mauritius supplied most of the ebony used in Europe. The clearing process was later accelerated markedly during the French and British administrations to make room primarily for agriculture and also infrastructure like roads, and settlements. The Dutch Governor Van der Stel introduced various seeds and fruits to the island. Thus, vegetables, rice, indigo, tobacco and sugar cane were cultivated to feed the population and for export.

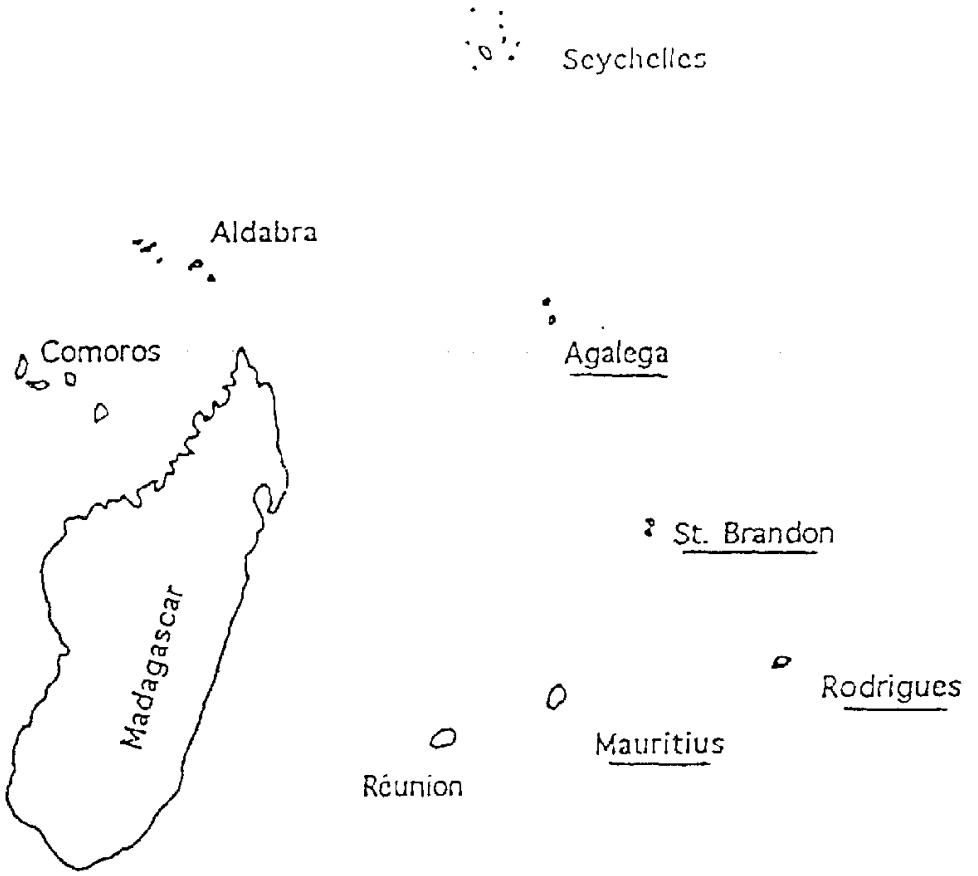

Fig.1. Map of the SW Indian Ocean

Cleared native forest areas in Mauritius have already been converted to monoculture of exotics crops and trees such as sugar cane, tea, *Pinus* spp., *Eucalyptus* spp., and *Cryptomeria japonica* with a resulting loss of important biodiversity. Today there is no commercial exploitation of native timber. Nowadays the native forests are restricted to the south west escarpments which comprise some of the most inaccessible parts of the country and which contain some of the most scenic landscapes. Currently, the total protected area (National Parks and Nature Reserves) amounts to 7,363 ha or about 3.7% of the total land area.

There are about 12,400 hectares of state-owned production forests mostly under pine and about 34,500 ha of privately owned forests in Mauritius. Some of the other introduced species that are raised in plantations are *Eucalyptus tereticornis*, *E. robusta*, *Casuarina equisetifolia*, *Cryptomeria japonica*, *Araucaria cunninghamii*, *Swietenia mahagoni* and *Tabebuia pallida*. Eucalyptus and Casuarina make up 20% while the remaining species constitute about 10% of the forest plantation. All the above mentioned species, with the exception of *Cryptomeria japonica,* grow in the lowlands where there is hardly any land available for the creation of forest plantation. Most of the private forests are under scrub vegetation. The forestry sector is able to produce only about 15,000 m^3 of timber and poles. The timber production figure represent only 30 % of the local demand for utility timber and the rest has to be imported.

Up to the 70's, Mauritius was a predominantly agricultural economic system, based on a mono-crop-sugar cane. With the advent of industrialisation in the 80's and diversification of agriculture, the Mauritian economy rested on a broader base. However, sugar cane remains the most important agricultural export followed by flowers and vegetables. Recent statistics (1993) show that sugar cane covered about 88% of the cultivable land, 7.5% was under vegetable, fruits and flowers, 3.6% under tea and 0.6% under tobacco. With the implementation of the agricultural diversification policy, sugar cane is intercropped with bean, potato, groundnut, tomato and maize. The result is encouraging; the country has produced 67% of its needs in potato, 40% in onion, 17% in garlic and 5% in maize. The food balance sheet for the year 1992 gives a picture of the food situation in the country (Appendix 1).

However, the contribution of agriculture to the national economy has registered a significant decline with a reduction of the GDP from 23 percent in 1970 to 9 percent in 1994, mainly as a result of the rapid expansion of the

manufacturing, tourism and services sectors. Nevertheless, the sugar industry is the second most important net foreign-exchange earner because of the low import content of sugar production. The manufacturing sector, principally textile and garment, has grown to become the largest single sector in the economy. Its share of the GDP has risen from 15 percent in 1970 to 23 percent in 1994. In addition, an Export Processing Zone (EPZ) has been set up to attract foreign capital through a combination of tax incentives and facilities. In Mauritius tourism is another fast expanding industry. It comprises 24 percent of the total export earnings and 11.4 percent of the GDP in 1994. The number of tourists has increased significantly in the past years and it passed the mark of 400,500 tourist arrivals in 1994.

CHAPTER 2
Indigenous Plant Genetic Resources

Mauritius as an oceanic island far from the large land masses, has evolved a unique flora ever since it was formed 7.8 million years ago. Nevertheless the origin of this flora comes from several sources. It is believed that 70% of the phanerogams are derived from the Madagascar and African continent, 8% from Asia, 12% are of pan-indopacific origin and 8% are endemic. (Cadet, 1977; Guého, 1988).

2.1 FOREST GENETIC RESOURCES

The extent of native forest area in Mauritius is very limited due to the large scale forest clearing which occurred during the colonisation period of the island. Fig. 2 shows the decline in native forests area since 1773. Nowadays, the bulk of the native forests are located in the south west of the island and on the upper reaches of mountains and make up between one and two percent of the land area of Mauritius. These areas still harbour a great diversity of important indigenous forest trees which the early colonisers had been harvesting. The black ebony (*Diospyros tesselaria*), Bois d'Olive (*Elaeodendron orientale*), Bois de fer (*Stadtmannia oppositifolia*), Makaks (*Mimusops* spp.), and many others were highly prized for their valuable timber. With the decline in native forest area, the population level of these species has become too low to allow any sustainable utilisation. However, the remnant areas of native vegetation still hold a great diversity of plant species and are of great conservation value. About 700 native flowering plants, of which some 250 are endemic, are known to occur in Mauritius (World Conservation Monitoring Centre, 1992; Strahm, 1994). Many of these have become highly endangered, with about 50 taxa being reduced to less than 10†individuals (Appendix 2). The island of Rodrigues has 36-38 taxa of endemic flowering plants, the majority of which are also highly threatened (Strahm, 1989).

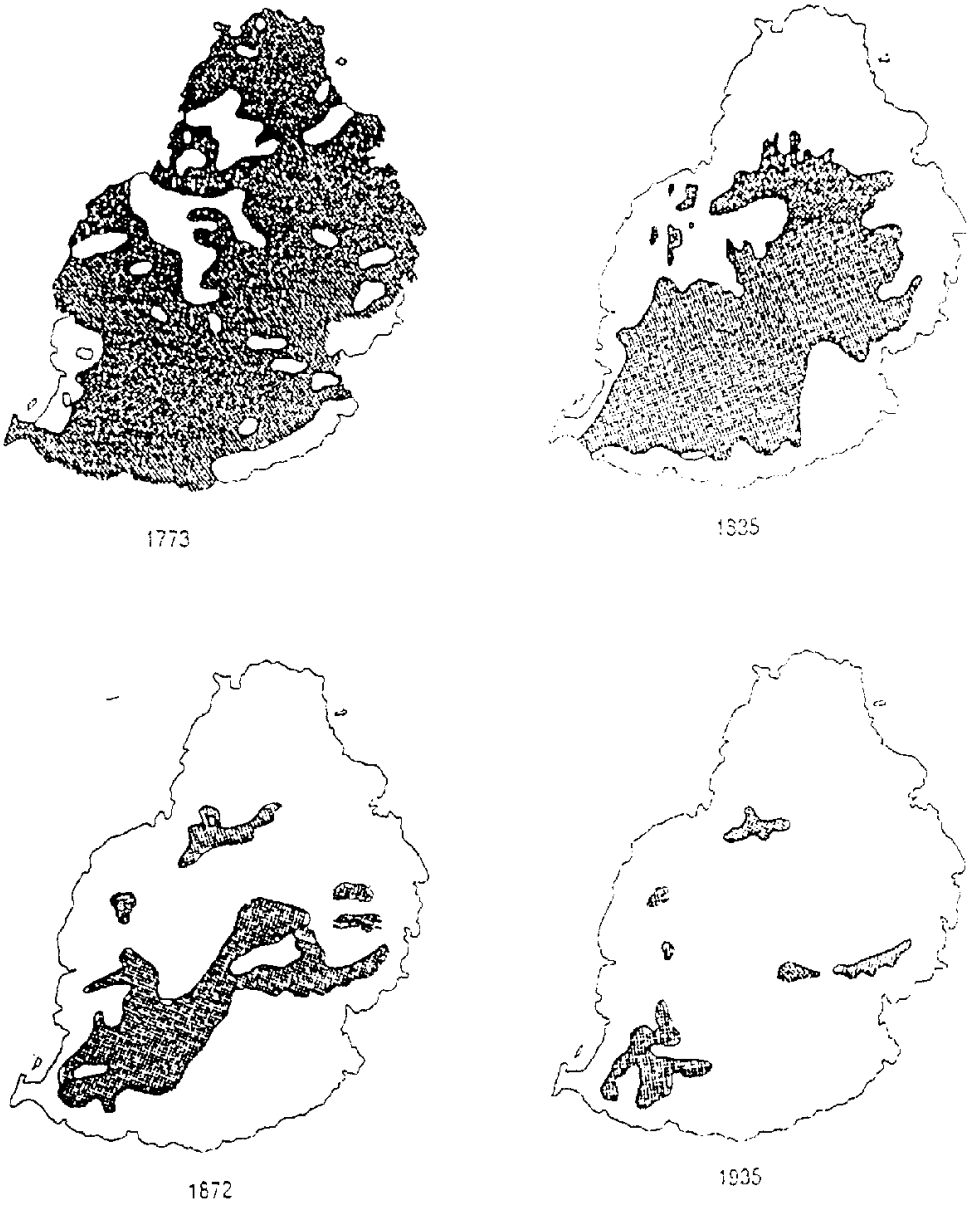

Fig.2. Decline in Area under Native Vegetation in Mauritius from 1773 to 1935

With human settlements, many plants have been introduced intentionally as food crops, ornamentals, forest species and as medicines from many parts of the world. Others have been introduced inadvertently to the country and have become weeds. Some have been introduced to control previously imported pests, only to become pests themselves; for instance the privet *Ligustrum robustum* var. *walkerii* is believed to have been introduced to out compete the thorny bramble *Rubus alceifolius* in forest plantations. (Rouillard & Guého, 1994).

Many of the introduced exotic plants, such as chinese guava (*Psidium cattleianum*), privet (*Ligustrum robustum* var *walkerii*), poivre marron (*Schinus terebinthifolius*) among others, have become naturalised in the native forests. Over the years they have displaced the native plants from their habitat through intense competition. Also the regeneration of native species are compromised by exotic seed predators such as rats, monkeys and birds. Other vertebrates deer and pigs browse their seedlings. Because of these factors, the indigenous vegetation is becoming impoverished, both in numbers and genetically. Many species are now threatened with extinction. Loss of this biodiversity would represent a significant loss to the global community.

For reasons stated above, the Mauritian Government has taken steps to protect its native genetic resources through the creation of a number of protected areas. Under the Environment Investment Program, the World Bank funded a US$ 2.42 million project to establish the first National Park in Mauritius - the Black River Gorges National Park (World Bank, 1990). A new legislation, The *Wildlife and National Parks Act* has been proclaimed and the Black River Gorges National Park has been established since June 15, 1994. The park is managed by the National Parks and Conservation Service, a department of the Ministry of Agriculture and Natural Resources. A Wildlife and National Parks Advisory Council and a National Parks and Conservation Fund, have been established to advise and provide necessary funds respectively for the development of the park. Other areas of conservation value have been declared as Nature Reserve ever since the 1950's. Fig. 3 shows the distribution of protected areas in Mauritius.

2.2 WILD SPECIES AND WILD RELATIVES OF CROP PLANTS

Many of the wild native plants from Mauritius could be of economic value. Several species may have great ornamental value (e.g. *Trochetia boutoniana*, *Hibiscus liliiflorus).*

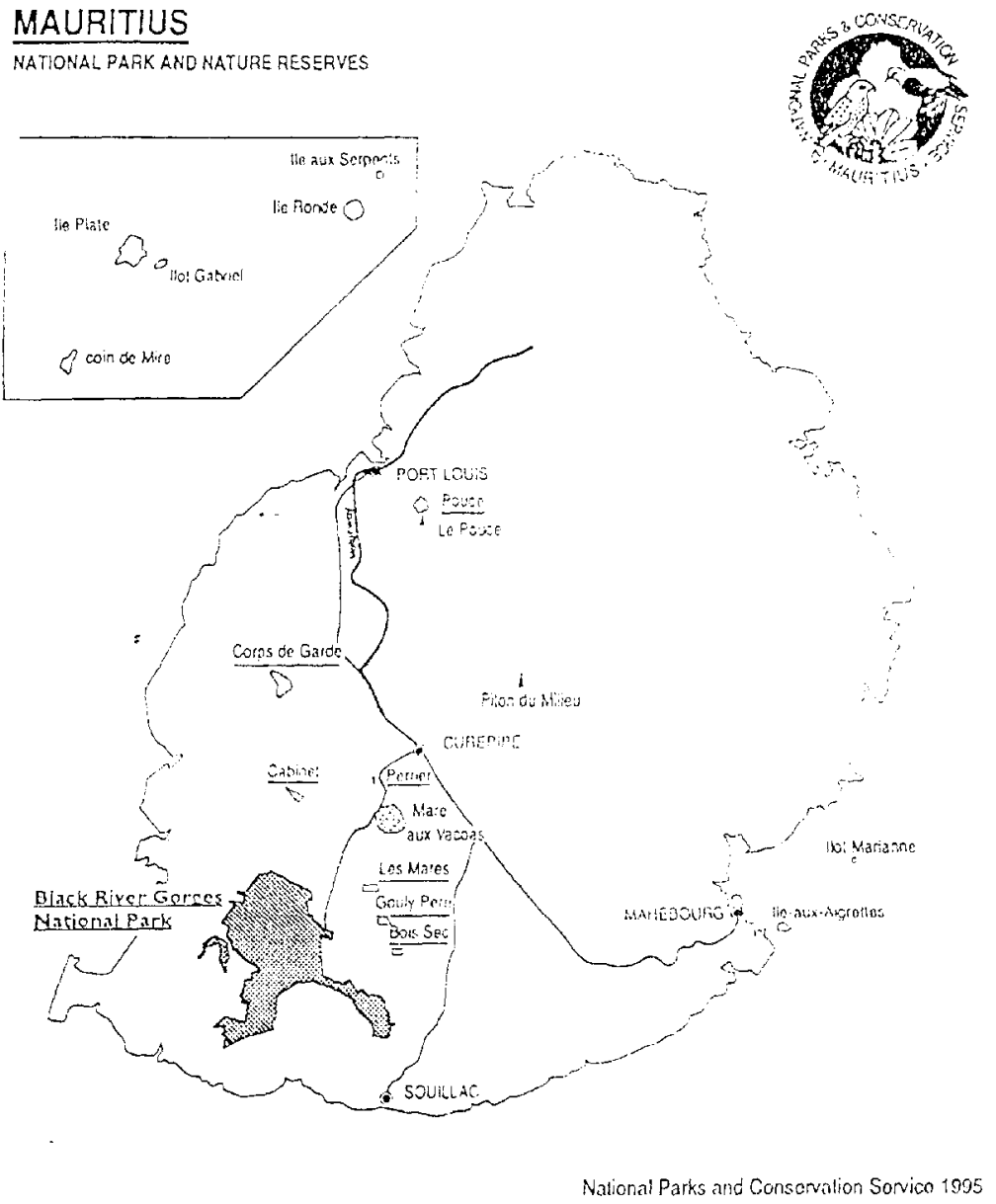

Fig.3. Protected Areas in Mauritius

Others may have economic potential as herbal remedies (*Bakerella hoyifolia* in case of dyspepsia and flatulence, *Erythroxylum laurifolium* for nephritic spasm and lithiasis, *Toddalia asiatica* for cough and influenza and many others) (Adjanohoun *et al.*, 1983). A high number of endemic plants are also noted for their use in traditional pharmacopoeia and unfortunately many are highly endangered (Appendix 3). The Faculty of Science, University of Mauritius is carrying out a project on medicinal and aromatic plants of Mauritius and Rodrigues, as part of a regional project under the aegis of the Indian Ocean Commission. Over and above the computerised database, including ethnobotanical, botanical, phytochemical and to some extent pharmacological data that are currently available for over 600 plants, anti-fungal and anti-microbial; screens of some endemic medicinal and aromatic plants are being studied. The phytochemical contents as well as the composition of the essential oils of some of the rare endemic as well as exotic species have been studied (Gurib-Fakim, 1991). The work on Regional IOC project has led to the publication of a book on the medicinal plants of Rodrigues (Gurib-Fakim *et al.*, 1994) and a three volume pharmacopoeia of Mauritius is currently being produced. Data are also available on the medicinal plants growing in the Indian island States, i.e. Comoros, Seychelles and Madagascar. It must be stressed that many of these plants are common in other countries and are not unique to Mauritius. Many other medicinal and aromatic plants (e.g. *Eucalyptus* spp., Vetiver etc.) exist but their full potential can only be realised once a proper market study has been carried out.

Other species can provide active ingredients for drugs and pesticides. Some preliminary phytochemical investigations carried out on a number of native plants from Mauritius have revealed the presence of useful active ingredients. For example, extract of the leaves of *Aphloia theiformis*, a native species of Mauritius was found to be active within 24 hours against *Biomphalaria glabrata* snails, the intermediate hosts of *Schistosoma mansoni* (Gopalsamy *et al.*, 1988). Similarly the endemic species *Polycias dichroostachya* was shown to have strong molluscicidal activity. There also exists a score of aromatic plants which are being exploited for commercial purposes and they include the Ylang ylang (*Cananga odorata*), the Vanilla (*Vanilla fragans*), Baies roses or the Brazilian pepper tree (*Schinus terebinthifolius*).

Other plants have more obvious economic importance because they are close relatives of major crops. In Mauritius the only truly indigenous genus which is a wild relative of an economic crop is *Coffea*. There are three species of native *Coffea* growing in the native forest of the island. Two of them namely *Coffea macrocarpa* and *C. myrtifolia* are endemic to Mauritius and the other *C. mauritiana* is endemic to Mauritius and Réunion. These species are known to be naturally caffeine-free and could thus be of great importance in developing coffee cultivars with low caffeine (Dulloo and Owadally, 1991). Wild coffee species might provide new genes for improving this globally

important crop. Other native species which are used as a food crop is the native palm *Dictyosperma album* var *album*. This species is cultivated to provide palm hearts for the making of palm heart salad principally in the hotels and restaurants.

Among agricultural crops, the Lentil Creole (*Phaseolus glabreceus/Vigna glabreceus* Roxburg) is another species believed to be unique in its kind although some species were reported in Bengal, India. It was found in the Pamplemousses Botanical Garden and seeds are stored in the *Vigna* collection at Gembloux, Université Agricole, Belgium. This wild species is extensively used in the breeding of cowpea (*Vigna unguiculata*).

Apart from the above two species, which are used for breeding of two important food crops, there are few important ones which have been maintained and characterised. Others need to be studied to establish their potential for improving the existing cultivars.

In tomato (*Lycopersicon esculentum*), one species L. *esculentum* var. *tallerelli* has been located in the wild but no serious work has been done although it shows some interesting characters. Two wild species of broad bean (*Phaseolus lunatus*) were identified - one in Mauritius (sieva type) and a second one (indeterminate type) in Rodrigues. The Rodrigues one bears big pods with few big seeds, which are highly toxic. It is believed that the species originates from the Malagasy Republic. The Mauritian type, locally known as "antac" is a small seeded one, which was previously used as food.

Wild species of pigeon pea *Cajanus cajan* are also known to exist in Mauritius. They are believed to have been cultivated in the past 150 years and to have been introduced by Indian Immigrants.

One wild species of potato has been found and is yet to be identified and characterised. In the same family, two species of egg plants (*Solanum* spp) are found in the wild - *Solanum torvum* having white flowers and *S. indicum* having violet flowers. These wild species of solanum are used sometimes for grafting cultivars of *S. melongenea* as the latter is susceptible to bacterial wilt. Tabac marron (*S. auriculatum*) can be found in the wild.

In the fruit section wild guava *P. cattleianum* commonly known as "Goyave de Chine" can be found on the plateau and rain catchment areas. A wild species of pine apple (*Ananas bracteatus*)and banana called "banane la grain" can be encountered in the wild.

There is a form of sugar cane, *Saccharum spontaneum* (Spontaneum Mauritius), which is known to occur in the wild in Mauritius (Ramdoyal and Domaingue, 1995), but it is believed to be close to the Coimbatore local from

India (Stevenson, 1940). It is found growing in water courses near Hindu temples in Mauritius and is used in Hindu ceremonies. It is believed to have been introduced by Indian immigrants.

In the MSIRI, the sugar cane collection amounts to 1,841 entries. They are grouped as:

- Basic species and allied genera - *S. officinarum, S. barberi, S. sinense, S. spontaneum, S. Robustum*

, the genus *Erianthus Sect. Ripidium* and the genus *Miscanthus*

- F1 interspecific and intergeneric hybrids
- BC1 derived interspecific and intergeneric hybrids
- BC2 derived interspecific and intergeneric hybrids
- Commercial hybrids

Details of this collection are given in Appendix 4.

2.3 LAND RACES AND OLD CULTIVARS

With the introduction of new and improved cultivars of food crops to maximise commercial production, old varieties and land races are fast disappearing. In Rodrigues and in remote places, some land races still persist. Two landraces of bean (*P. vulgaris*), local red and navy bean, are still cultivated in Rodrigues, while in Mauritius, there is an old cultivar known as "Long Tom". Similarly, there is one old cultivar of cowpea (*Vigna unguiculata* cv *sesquipedalis*) "Long yard bean". There is also a local variety of onion, the "local Red" which is characterised by a very strong pungent smell and very good keeping quality, but it is low yielding. This germplasm is rapidly eroding due to its replacement by other high yielding imported varieties.

For other crops, few old cultivars are still planted for commercial production. They are tomato (var. quatre carrés), groundnut (var. cabri), garlic (var. local), cucumber (var. local white) and pumpkin. It should be noted that the seeds of the above mentioned crops are produced and conserved by the farmers themselves, although the Ministry of Agriculture is making attempts to produce and conserve the varieties.

In maize (*Zea mays*) several ecotypes had been collected by the MSIRI in an attempt to preserve the germplasm and to use them in the breeding programmes. Local ecotypes have been replaced by new hybrids, but in Rodrigues the farmers are still growing their ecotypes. The collection is still difficultly maintained at the MSIRI and the viability of seeds is threatened with the existing storing facilities (Govinden & Rummun, 1995).

In the root crops sector, especially sweet potato (*Ipomoea batatas*) and cassava (*Manihot esculenta)*, many old cultivars still exist as they were used as starchy food during the Second World War. Appendix 5 gives a list of local and foreign accessions from Taiwan of sweet potato and maintained *in situ* at the University of Mauritius and some at the Ministry of Agricultural experimental farms separately.

In fruit crops, many old cultivars are still grown, some for commercial exploitation and some just form part of the local landscape, e.g. Jack fruit, Bread fruit etc. Among the commercially exploited crops, mangoes (*Mangifera indica*), litchis (*Litchis chinensis*, pine apple (*Ananas comosus*) and banana (*Musa* spp.) could be cited. Six new lines of litchis were introduced to the island from China to broaden the narrow existing genetic base. There are 3†existing old cultivar of litchis - Culcutta late, Toi Tso local, Kwan Mi Pink. A list of the local cultivars of banana is given in Appendix 5.

In Mauritius there is quite a large diversity of landraces and old cultivar of mangoes. These are: Agnes, Agnes Labourdonnais, Alphonse, Alphonse Indian, Ambin, Amini, Aristide, Auguste, badami, Baissac, Begum Khsh of Muldeb, Bibi Gazli, Champo, Cheribon, Chitoor-Amloot, Christian, Dauphine, Divisne, Dodhol, D'Arifat, Early Gold, Elise, Eugenie, Ferdinand, Figet, Gebert, Geneve, Goa, Goa, Alphonso, Haphus Pasind, Henriette, Irwin, Jagat Mani, Jansheedi, Jaune, Josee, Julie, Katha Mitah, Labourdonnais, Madras, Maison rouge, Mamood, Miel, mulguava, Neelam, Normand, Orphee, Overseer, Pairi, Petite Josee, Pignon d'Inde, Pope Hennessy, Raspuri, Rosat, Rupee, Society No. 3, Soondarshah, Torse, Victoria and Yone, Sabre, Lacorde, Petrole, Begumkhash of Mursidabad.

These old cultivars are planted at Richelieu and Bois Marchand experimental stations.

CHAPTER 3
National Conservation Activities

There is no national programme concerned with the conservation of genetic resources, but each Institution or Department - MSIRI, Agricultural Services, Forestry Service, National Parks and Conservation Service and the University of Mauritius, has its own conservation activity, depending on the species on which they are working on. The conservation activity of these institutions may be of short, medium or long term duration.

Mauritius organised a National Workshop on Plant Genetic Resources in 1993, sponsored by the International Plant Genetic Resources Institute (IPGRI), to try and develop a strategy for the conservation and utilisation of plant genetic resources in Mauritius. More than 100 participants from various institutions attended the workshop and 13 scientific papers covering various fields of plant genetic resources of relevance to Mauritius were presented and the proceedings have been published (Dulloo and Dulymamode, 1995). It has been successful in bringing together local scientists and in promoting cooperation between them. One of the major recommendations was the setting up of a National Coordinating Committee on PGR with a well defined terms of reference (Appendix 6).

In the field of conservation of indigenous forest genetic resources, Government has been running a native plant conservation project with the help of World Conservation Union (IUCN) and World Wide Fund for Nature International (WWF). The assistance of a botanist was obtained to study and assess the status of the flora. A Red Data book on Rodrigues has been published as a result of this work (Strahm, 1989), while one on Mauritius is nearing completion. The Friends of Kew, Royal Botanic Gardens, Kew through the Mauritius Wildlife Appeal Fund (MWAF) is now assisting with plant conservation works on the island. With the collaboration of these organisations, Government has set up conservation programmes both for the *in situ* and *ex situ* conservation of its wild plant genetic resources. Further, a National Committee on threatened plants has been established by Government to draw up a list of threatened plants and to document and monitor their status in Mauritius. It also makes recommendations about specific action plans to save those which are most endangered.

3.1 *IN SITU* CONSERVATION ACTIONS

The *in situ* conservation of crop genetic resources is restricted to actions undertaken by farmers to preserve their owns varieties, as for example the maize, tomatoes and beans. Apart from this there is no *in situ* conservation activity for crop plants which is undertaken in Mauritius.

With regard to the conservation of wild native plant genetic resources, the National Parks and Conservation Service has a well defined *in situ* conservation programme.

In Mauritius three main native vegetation associations are recognised. These are a palm savanna now restricted to the Northern offshore islets, Round Island in particular, lowland dry forest under 365 m altitude and with 1,000-2,500 mm/year rainfall and an upland wet forest over 365 m and with 2,500-5,000 mm/year rainfall. These associations are under threat as described above. With a view to protect them and at the same time to conserve the biological resources they contain, Conservation Management Areas (CMA), ten in total, have been established in the different vegetation types. These are areas of native forests where intensive *in situ* conservation activities are undertaken. In each CMA invasive exotic plants have been manually removed and the area fenced to keep out deer and pigs as well as people. Besides selective weeding and predator control, planting of nursery grown seedlings derived from plants from the area of re-introduction is also effected. Permanent quadrats have been set up in each of the CMA to monitor the change in vegetation following the elimination of the exotic species. These quadrats are surveyed at five years intervals.

The main objective of the work on CMA is to restore the highly degraded native forest ecosystem. The major problem is the method of elimination of exotic species. It will not be possible to sustain the manual elimination of these plants and thus novel techniques will need to be found. In this respect, Government has submitted a project through UNDP for funding under the GEF Biodiversity portfolio to look into this problem. The project has been approved and the final project document is under preparation. The project will also help to document the biodiversity of the areas under study.

The conservation of the endangered flora at the species level alone is not enough. There is an urgent need to analyse levels and distribution patterns of genetic variability in their wild populations for conservation of their genepool. This is crucial for selecting subset of plants as genetically diverse as possible for *ex situ* conservation and for reintroduction programmes. It would be helpful to develop a project along those lines for studying the genetic

variability within the wild population of *Coffea* species with a view to develop a conservation strategy for these species, given that coffee is the only wild relative of an important crop which is considered as a priority species by the International Plant Genetic Resources Institute. Such a project would provide a role model for the use of genetics both for analysing the conservation status of other threatened species and for their conservation management.

There are two islets where active conservation measures are being undertaken. Round Island, 151 hectares in area, off the north coast of Mauritius supports the last remnants of palm savanna, once characteristic of the northern plain of Mauritius, along with a number of endemic reptiles and many sea birds. For its size it is one of the most important islands in the Indian Ocean for biological conservation. A rabbit eradication programme has been successfully undertaken and a ten-year Management Plan for the restoration of Round Island has been published by the Government of Mauritius and Jersey Wildlife Preservation Trust in 1989 (Merton *et al.*, 1989). In line with the Management Plan, four management expeditions are organised annually to control invasive weeds, to monitor and enhance regeneration by dispersing seeds and to monitor the rare flora and fauna of the islet. Another islet, Ile aux Aigrettes, leased to the Mauritian Wildlife Appeal Fund, is subject to an active programme aimed at restoring the original vegetation.

In addition to the above, the ODA financed an offshore islets management project for all the islets around Mauritius and Rodrigues. The first phase of the project which involved the survey of the islets and the drafting of the management plan has been completed (Bell *et al.*, 1994). The second phase will involve the implementation of a number of projects that are proposed in the Management Plan. These would involve the eradication of rats from Gunners Quoin, Flat and Gabriel islets, hares from Gunners Quoinand shrews from Ile aux Aigrettes. On Rodrigues pest eradication is proposed on some of the islets of high conservation values. The long term objective of the project is to restore some of the key islets important for their conservation values.

3.2 *EX SITU* COLLECTIONS

3.2.1 Sugarcane collection

At the MSIRI, the conservation activities of the *Saccharum* spp. and allied genera is carried over exclusively by vegetative means. Clones are established from stem cutting and grown through varying numbers of ratoons.

Replantation is done directly with three-eyed cuttings, following hot water treatment or in some cases by transplanting one-eyed potted cuttings. The latter technique is used either to supplement the former one or used exclusively for clones with low germination capacity such as the nobles and a number of wild clones, as well as for the field establishment of varieties issuing from quarantine cycle. Generally, noble would be replanted every 3 to 4 years, and commercial type hybrids every 6 to 8 years, and wild canes every to 10 to 15 years.

The area planted to each clone also depends on the germplasm group. Wild canes are confined in concrete basins of size 2.8 m^2. Noble canes are grown on 6 m lines where as most of the foreign and "Mauritian" commercial type clones are maintained on 3 to 5 m line. Rogueing is regularly carried out in all collections so as to maintain the purity of the genetic material.

3.2.2 Other field collections

In root crops mentioned above, the genetic materials are maintained through vegetative means. The clones are planted in rows of 6 m long and recruited every year after completion of its vegetation cycle. Planting is renewed yearly on new site. However, banana is maintained on a specific field, with a clone to clone planting distance of 5 m apart. With the visit of cyclone "Hollanda" in 1994 the collection had been completely destroyed. Steps are being taken to replant the collection.

Few collections of fruits species are maintained on government stations thus:

Fruit species	Government stations
Mango (62 cv/ecotypes)	on different stations
Banana (8cv)	at Central E.S, Réduit
Pine-apple (3cv)	Barkly E.S
Litchis (3cv)	Barkly and Pamplemousses E.S
Coffee (13cv)	Central E.S, Reduit
Cassava (18cv)	Central E.S, Réduit

Appendix 5 gives a list of cultivars of banana, cassava and sweet potato. Some of which are maintained in the field at the crop museum of the University of Mauritius.

3.2.3 Seed bank

Within the Agricultural Services of the Ministry of Agriculture and Natural Resources, a small facility exists for the storage of seeds at the required temperature and humidity. These include basic cold room facilities, cabinets, driers and other equipment donated by IBPGR in 1986 to facilitate conservation of germplasm. However, for large scale collections, the existing storage facilities are not adequate; a more elaborate system has to be put into place to be effective. Sugar cane seeds obtained from intraspecific hybridisation are also stored at MSIRI with a view to preserve the species as genes rather than as genotypes. Facilities exist to dehydrate and store seeds according to IPGRI norms, but improvements are necessary to enable seed storage at lower relative humidity.

In 1989, a programme for collecting wild species. and land races had been undertaken by the Agricultural Services. The seeds collected were sun-dried to 6% of moisture and kept in aluminium foil at low temperature. However, the programme had been discontinued because the trained officers had been muted to other services. It is now planned to train more staff and ensure that the PGR programme is reactivated and does not get disrupted. About 228†accessions, principally seeds of *Amaranthus* spp., *Allium cepa*, *Brassica* spp., *Lycopersicon esculentum*, *Phaseolus* spp., *Solanum* spp., and *Zea mays* had been collected and characterised. Due to staff limitations, these collections have been held in freezers and no germination tests, nor any regeneration work, have been carried out on them.

In the forestry sector, seeds (mainly *Pinus elliottii*) are collected locally from selected trees for propagation. Since a few years, the Forestry Service has been importing genetically improved seeds from the Forestry Seed Centre, South Africa. The plants obtained from these seeds adapt very well to the local conditions and the first indication shows a faster growth rate than those from local seeds. As the annual requirement in pine seeds is low (about 50 Kg) there is no justification to go for the creation of seed orchards. Moreover, these orchards are prone to cyclones and are expensive to maintain.

At present there is no seed banking of native forest species either. Only seeds of the most threatened plant species are collected in small quantities, because of availability, for immediate propagation. Problems regarding the collection of seeds include a lack of field staff, destruction of seed sources by animal pests chiefly monkeys and storage of seeds once collected. The National Parks and Conservation Service need to develop a project for the seed conservation of threatened native species.

However, many aspects of seed conservation for both native and crops genetic resources will need to be studied. There has been no research undertaken on

the seed physiology and it is highly probable that many of the native species may have recalcitrant seeds. These could be taken up as research projects for University students.

3.2.4 *In vitro* conservation

In Mauritius, several institutions, MSIRI, Agricultural Services (Barkly E.S.) and FARC have developed *in vitro* facilities, principally for the large scale propagation of tissue-cultured plantlets. Thus facilities for receipt, conditioning and hardening of tissue-cultured plantlets are now available for handling around a million tissue-cultured plantlets a year. These facilities could be used for short-term or long term storage of plant genetic resources.

Three tissue culture laboratories are either functional or about to be, in the various agricultural institutions. One private tissue culture laboratory is turning out some half a million tissue cultured anthurium plantlets to-day. Starting late 1970's several hundred thousand tissue-cultured anthurium plantlets, now constituting a flourishing industry, covering over 60 ha, were imported into the country. Some of the plantlets were of local origin.

The MSIRI is investigating the feasibility of cryopreservation of sugar cane germplasm currently threatened by diseases.

3.2.5 Herbarium

The national herbarium is housed at the MSIRI and comprise of over 25,000 sheet-mounted specimens including many type specimens, all carefully preserved in an air-conditioned room. A smaller amount of material is preserved on slide-mounts and in liquid. The maintenance of these collections and a continuing endeavour to enrich them are the day-to-day tasks of the Herbarium staff. The Herbarium additionally has a unique assemblage of publications, manuscripts, original sketches and paintings relating to the regional flora and maps and charts of the Western Indian Ocean. The Herbarium collections are strictly regional, being confined to plant material from the three Mascarene Islands of Réunion, Mauritius and Rodrigues, and from islets to the north including Agaléga, St Brandon and the Chagos Archipelago.

A project to produce a Flora of the Mascarene Islands has been underway since 1970 with the collaboration of MSIRI, ORSTOM and Royal Botanic Gardens, Kew. This has entailed several missions to undertake detailed surveys of the vegetation of the territories concerned and to obtain herbarium material for botanical studies. The plant material housed locally together with

that of the Museum National d'Histoire Naturelle, Paris, the Royal Botanic Gardens, Kew, the Université de la Réunion, amongst other herbaria, offers ample documentary basis in the elaboration of programmes for the conservation of genetic resources from native plant taxa, including medicinal plant resources.

The publication of the above flora is at present nearing completion, but some 11 families are still awaiting publication. However, some extra funding is needed for its completion. The completion of this regional flora is considered as one of the highest priority for the conservation of plant genetic resources, as it is an important tool for the identification of local plant species.

3.2.6 Botanical gardens and arboreta

Botanical Gardens have an important role to play in the conservation of plant genetic resources. The Sir Seewoosagur Ramgoolam Botanical Garden (SSRBG) at Pamplemousses is one of the oldest tropical Botanic Gardens in the world. It has been used in the past as an acclimatisation station for the introduction of many crop species to the island including sugarcane, cassava, and many spices. A vast collection of tropical trees and palms is held in SSRBG and a collection of native plants has also been established. A medicinal plant collection will be established in the garden. There is a need to set up a seed bank which will enable exchange of seeds with other botanic gardens.

A computerised database of the native and exotic plant species which are represented in the SSR Botanical Gardens are to be set up as well as a herbarium for the plants of the garden. Both information sources will be available to the scientific community and members of the public on visit to the gardens.

The need is felt for setting up arboreta for native forest species in view of creating an *ex situ* collection of the native flora which can be better conserved *ex situ* rather than *in situ*. These will provide materials to restock the plant communities from which they are derived. It is proposed to create five hectares individual 'arboreta' in Mauritius located purposefully in the three climatic zones (sub-humid, humid and superhumid belts), two in Rodrigues (Plaine Corail and Solitude) and one at Agaléga (northern part of Ile du nord). These 'arboreta' will be stocked with species typical of the primary plant communities pertaining to the given sectors of the respective islands.

3.2.7 Crop museum

This crop museum is largely a living field collection of plant species of economic importance and useful to Man. Ornamental species are excluded. Plants are classified according to use. e.g. cereals, root crops, oil crops, forages (grasses, legumes, others), fibres, essential oils. There is a special section on weeds.

3.3 DOCUMENTATION

With the exception of *Saccharum* spp. and *Phaseolus* spp., there is no complete computerised database of other crops. Only passport data have been prepared and kept in printed papers. As the materials have not been evaluated agronomically, there is no correlation between the quality of documentation and the use of samples.

In the conservation sector, records of indigenous species collected are kept on a computer database. As far as possible all passport data of the plant collections made are kept both on book ledger and on computer database. However, at present, there is very little documentation of *in situ* collections. In each of the Conservation Management Areas (CMA), a permanent quadrat has been established. These quadrats are surveyed at regular intervals (5 years) and the data are held on files. The purpose of these surveys is to study the forest dynamics in the CMAs so as to understand the regeneration pattern of the native species. However, these surveys are not being carried out as often as they should. It is proposed to train qualified scientists to ensure that follow-up activities are not hampered by lack of personnel. The areas identified for training include Conservation Management field collections, characterisation and evaluation.

CHAPTER 4
In-Country Uses of Plant Genetic Resources

4.1 USE OF PGR COLLECTION

The germplasm utilisation depends on the breeding policy and philosophy. In the cases of *Saccharum* spp., *Zea mays*, *Phaseolus vulgaris* and *Lycopersicon esculentum*, genetic materials are used for breeding proposes to meet the aspiration of the planting community. The objectives are multi-purpose: high yielding, resistance to common diseases, adaptation to various agro-climatic conditions and widening of the genetic base. Breeding *per se* is not practised for vegetables because of the country's limited size and market but farmers participate by evaluating the materials when they reach the multi-locational stage and semi-commercial testing.

4.2 USE OF FOREST GENETIC RESOURCES

Besides the wild relative of coffee mentioned earlier, which has potential uses, the natural and man made forests in Mauritius and Rodrigues have the potential of providing a range of products. Examples includes fruits, meliferous plants, medicinal plants, fodder, wood and fibres. Plants like Aloe (*Furcraea foetida*), Pandanus (*Pandanus utilis* and *P. heterocarpus* in Rodrigues), date palms (*Phoenix dactylifera*) and bamboo are extensively used in local handicrafts. With the booming tourist industry, the local handicraft products are in high demand.

Medicinal plants are collected from the forests by the local inhabitants. While this is not legal, it is difficult for the authorities to control the collection of these plants and it is feared that several species may have become endangered due to over-collection. There is a need to establish an *ex situ* collection of the more commonly used native medicinal plants. An attempt has been made to establish a collection of medicinal plants at the Long Mountain Hospital, but these include mostly exotic medicinal plants.

The ship model industry is yet another industry which make use of local timber resources. The species used include Juniper (*Juniperus* sp.), Tecoma

(*Tabebuia pallida*), and Camphor (*Cinnamomum camphora*) among others. There is need to test the characteristic of the native species for such uses.

4.3 IMPROVING PGR UTILISATION

At present there are various constraints such as scarcity of land, lack of funds, lack of trained personnel and lack of quarantine facilities for rapid introduction and bulking which retard the utilisation of plant genetic resources.

CHAPTER 5
National Goals, Policies, Programmes and Legislation

5.1 CONSERVATION AND ENVIRONMENT POLICY

In 1985, Government published a White Paper on the National Conservation Strategy (NCS), in which it defined the major objectives for the conservation of its natural resources, based on the same objectives as the World Conservation Strategy I. With reference to genetic resources, objective (ii) of the NCS states: *to preserve genetic diversity, on which depend the breeding programmes necessary for the protection and improvement of cultivated plants and domesticated animals as well as for scientific development.*

In the field of genetic diversity, the NCS gave priorities to:

- Avoid extinction of endangered and threatened species of flora and fauna by providing sound planning, allocation and management of land and water uses supported by an on-site preservation in protected areas and an off-site protection such as in zoos and botanical Gardens.
- Preserve as wide a genetic diversity as possible of many varieties of the same plants and animals.
- Preserve as many habitats as possible.
- Maintain existing nature reserves and to create new ones.
- Co-operate with international bodies in the furtherance of biosphere reserves.

The White Paper contained a number of projects aimed at alleviating some of the more pressing conservation problems at the time. However due to lack of financial resources, very few of these projects had been implemented. There is a need to re-actualise the strategy. In fact, the Government of Mauritius is presently cooperating with UNEP and the Biodiversity Convention secretariat for the preparation of a National Biodiversity Strategy and Action Plan.

Government also published a White Paper for the National Environment Policy in 1990 in which it stated that Government shall pursue conservation, ecosystem preservation and environmental quality goals by focussing on monitoring, managing and enhancing the natural system. Government shall

also conserve and enhance the quality of the natural heritage of the State of Mauritius including wildlife, biotic diversity, and sanctuaries for specific habitats such as mountains, forests, lakes and rivers, beaches, estuaries, lagoons and islands.

At a time when the country has been pursuing sound macroeconomic policies, Mauritius has seized the opportunity to focus on an approach that aims at reducing future costs from environmental degradation and to develop an overall strategy which integrates environmental concerns into its development process. With the help of the World Bank, the Government developed a National Environmental Action Plan (NEAP) covering all the key sectors and the country as a whole.

In September 1988, the Government organised a Technical Seminar on the Environment, with the assistance of the World Bank to discuss the key environmental issues facing the country. The outcome of this seminar was a comprehensive Environment Investment Program (EIP) to address the key issues of the NEAP. The EIP comprises a number of components, including institutional strengthening, land management and tourism, industry, sewage and solid wastes, agriculture, marine conservation and terrestrial conservation. The latter included a World Bank funded project to set up the country's first National Park to conserve endangered endemic species of flora and fauna (World Bank, 1990).

Mauritius, with the assistance of UNDP, has also initiated a National Long-Term Perspective Study (NLTPS) which seeks to look into the development prospect of the country in 2020. The key objective is to shape a vision of the country by making an assessment of the opportunities and challenges ahead, articulating a clear vision of what the country would look like a generation from now and setting out a practical strategy to translate that vision into reality (MEPD, 1994b).

5.2 FOREST POLICY

The approved forest policy by which state forest lands are managed aim at:

1. Effecting the preservation of a tree cover for the benefit of the present and future inhabitants of Mauritius, on areas of land as are required for the maintenance and improvement of the climatic and physical condition of the country; safeguarding water supplies and soil fertility, and the prevention of damage to rivers and agricultural land by flooding and erosion.

2. Effecting the permanent reservation as forests of such areas of land as are required for the supply in perpetuity, at reasonable rates, of all forest produce required by the people for agricultural, domestic and industrial purposes.

3. Managing the forest estate with the objective of obtaining the highest revenue compatible with sustained yield, in so far as is consistent with 1. and 2. above.

4. Carrying out such experimental work as may be required to implement the forest policy.

5. Educating and training Mauritian personnel to the standard required to fill posts of all grades within the Forestry Services; fostering, by education and propaganda, a real understanding among the people of Mauritius of the value of forests to them and to their descendants and encouraging and assisting in every way, the owners of private forests, woodlands, and plantations to manage such crops in a sound manner.

6. Co-operating with other land interests in the achievement of optimum land allocation and usage, and in all projects for soil and water conservation and the prevention of erosion, and accepting the principle that security of tenure and long-term planning are essential for the successful management of the forest estate.

5.3 NATIONAL LEGISLATION

5.3.1 Quarantine laws

The Mauritius National Plant Protection Legislation is embodied in the *Plants Act 1976*, which is presently being reviewed. Provisions of the Act are in line with the recommendations of the International Plant Protection Convention (Rome, 1951 as subsequently amended in 1977) of the FAO, to which the country is signatory. The Minister for Agriculture and Natural Resources has the legal authority for making regulations, subject to Government policy and whenever otherwise technically necessary for the protection and promotion of plant life over the territory of Mauritius.

Quarantine is in containment, open quarantine being rare or rather exceptional. This is because of the small size of the island and absence of the vast majority of devastating diseases found elsewhere in the world. Processing through quarantine of graminaceous crops is strictly in containment and exclusively from seed to seed for fear of inadvertently introducing diseases

common to sugarcane. Importation of dried graminaceous materials in any form is prohibited for the same reasons. Also importation of sugar cane and some cereals like maize, is excluded from areas where the downy mildew, mosaic and fiji disease of sugarcane exist.

It is Government policy to favour accelerated introduction of new and existing improved varieties of crops of economic importance, so as to broaden its agricultural diversification base, relating to plant genetic resources utilisation. The objective is not only to produce more on less land but also to enhance quality and provide diversity, for meeting the more and more sophisticated needs of its growing population and evolving tourist industry and for export requirements of high cash value produce. Government has therefore been facilitating development of appropriate infrastructure and transfer of the required technology, such as *in vitro* laboratories. Tissue-cultured plantlets or materials of tissue culture origin (bananas, citrus, strawberry, coffee, ginger, etc.,) have been introduced recently, there being no restriction for imports of tissue cultured plantlets on agar in their original container.

From the plant protection point of view, Government policy is towards adoption of advanced diseases detection techniques in conjunction with routine application of biotechnology for reducing risks of introducing pests and diseases and bringing down time of processing through quarantine. The overall objective is to possess adequate technical capability to rapidly respond to end users demands in matters of plant genetic resources.

5.3.2 Forest and wildlife laws

Government has set up national legislation to enable the establishment of protected areas and to protect its components. The *Forest and Reserves Act 1983* and the *Wildlife and National Parks Act 1993* are the main legislation which provides for the protection of the flora and fauna of the island. The first Act also makes provisions for the control of soil erosion in forest lands, mountains, river and nature reserves.

Currently there is no provision in national legislation to protect the indigenous genetic resources. While collaboration between *bona fide* local and international scientists, institutions and organisations should be encouraged, no germplasm of endangered species must be allowed to leave the Mauritian territory except within a special legal framework to be legislated in due course. Provision will also have to be made for the protection of national and intellectual property rights so that the full benefits may be reaped by Mauritius and local scientists, whenever endemic species are exploited commercially overseas.

5.4 OTHER POLICIES

In addition to the above policies, there is a further need to carry out a thorough inventory of plant genetic resources in the country. The aim of this exercise is to evaluate our genetic potential for the improvement of crops or for the transfer of valuable genes for local or international demands. This may give rise to problems of intellectual rights, breeders rights and farmers rights which will require further attention. In this context, special emphasis must be laid on species with industrial, commercial potential or other uses such as medicinal plants and in particular endemic species.

There is a need for management of exotic species representing a threat to local species as well as setting up of appropriate infrastructures against accidental/criminal fires, vandalism, theft and so on.

5.5 TRAINING NEEDS AND OPPORTUNITIES

There is in general a lack of trained personnel in the field of genetic resources in Mauritius. The various institutions involved in genetic resources conservation and in particular the Agricultural Services, cannot adequately carry out their conservation activities due to staff limitation. The seed bank unit at the Barkly E.S. has one scientist responsible for all seed conservation activities and has no supporting staff. The National Parks and Conservation Service is also heavily understaffed with regards to qualified scientists and has to rely on expatriate volunteers from NGO organisations to carry out the bulk of conservation work in Mauritius. There is a need to expand the seed bank unit at Barkly into a full fledged National Gene Bank for Mauritius with adequately trained scientists in the field of collection, conservation, characterisation, evaluation, documentation and storage of plant genetic resources. Special consideration should also be given to the training of specialists in the field of identification/taxonomy, conservation and management of reserves.

Another important aspect is education of the general public. Education programmes at primary, secondary and tertiary levels will need to cater for creating awareness for the importance of conserving and preserving plant genetic resources. A programme has to be urgently developed for the training of trainers, as well as for the NGO organisations and private owners of agricultural and forest lands. In view of the importance attached to PGR there is an urgent need to strengthen capability in this area.

CHAPTER 6
International Collaboration

The Government of Mauritius is signatory to many International Conventions relating to nature conservation, plant protection and genetic resources including:

- the IUCN Convention for the Protection of Nature and Natural Resources
- the Convention on International Trade in Endangered Species of Fauna and Flora (CITES)
- the OUA Convention for the Protection of Nature and Natural Resources
- the Convention of International Whaling Commission
- the Convention on Biodiversity

Mauritius is also a member of the FAO and its Commission on Plant Genetic Resources and has adhered to the International Undertaking on Plant Genetic Resources.

Mauritius is party to the Inter-African Phytosanitary Council of the Scientific and Technical Commission of the Organisation of African Unity. In the regional context, Mauritius belongs to the Committee for Agricultural Collaboration of the Mascarene Islands and also forms part of the Commission of the Indian Ocean.

Government has strong ties with a host of international organisations like the Jersey Wildlife Preservation Trust (UK), Peregrine Fund (USA), World Wide Fund for Nature (WWF), Kew Garden, Flora and Fauna Preservation Society and the local Mauritian Wildlife Appeal Fund (MWAF). The international NGOs are providing financial help and technical expertise through MWAF. A Memorandum of Agreement concerning the cooperation between some of these organisations and Government in the field of biodiversity has recently been signed.

Technical assistance is currently being provided by the Mauritius Herbarium to several international organisations (International Union for Conservation of Nature (IUCN), the World Wildlife Fund (WWF), the International Council for Bird Preservation (ICBP) and the Jersey Wild Life Preservation Trust.

6.1 EXCHANGE OF GERMPLASM

The exchange of germplasm has to satisfy rigorous quarantine procedures according to International norms. In the case of noble canes, Mauritius has played an important role in the exchange of germplasm. The current policy is to encourage a free exchange of basic species and commercial varieties on a reciprocal basis between cane breeding stations. Through the exchange programme, the MSIRI has introduced new genes into locally bred population. That institution has imported noble and wild species of sugarcane from World Collection in USA and sugarcane germplasm collections in India.

6.2 INTERNATIONAL AGRICULTURAL RESEARCH CENTRES

Improved genetic material from International Agricultural Research Centres have been introduced in Mauritius. Maize germplasm was obtained from CIMMYT, bean from CIAT, cowpea from IITA, groundnuts and pigeon pea from ICRISAT, potato from CIP and vegetables from AVRDC. New lines of beans have been bred and released.

Germplasm collection in the Ministry of Agriculture was initiated by the Division of Horticulture, with the collaboration of IBPGR led by A.B. Damania in 1985. IBPGR has also sponsored training courses on PGR conservation and handling and Management of Seed Germplasm.

It would be desirable that the CGIAR centres become more active in farming and research in genetic engineering. Moreover, it is hoped that IPGRI with its new mandate will ensure that the world's genetic resources become more readily available to developing countries and no individual developed country restricts germplasm flow or institutes morally unacceptable plant protection rights or barriers.

6.3 BILATERAL RELATIONS AND REGIONAL COOPERATION

Mauritius has established many bilateral relations in the field of plant genetic resources. There is the Indo-Mauritian commission covering agreements for the exchange of sugarcane germplasm between Mauritius and Coimbatore. Relations also exist with CIRAD, France and other organisations such as

AVRDC. Bilateral relations also exist with China in the field of medicinal plants.

Mauritius is a member of the Indian Ocean Commission (IOC) and is participating in a number of regional projects under its aegis.

One of the IOC projects relevant to the plant genetic resources is the regional project on the 'Inventory and Study of Medicinal and Aromatic plants of the States of the Indian Ocean' funded by the European Communities.

Mauritius is also participating in the IOC Regional Environment Project which contains some actions for the conservation of the endangered species. This project, financed by European Union (EU) has been approved by Government and will be implemented in the near future. The project will focus on the creation of a Native Plant Propagation Centre and a database on endangered species as part of a regional network in the five countries of the IOC. It will also involve the establishment of a 'Conservation Management Area' in the dry lowland forest type for the control of exotic pests.

6.4 BENEFITS

The exchange of germplasm between regional states are beneficial to agriculture on the whole. From CIRAD, MSIRI has imported the sugarcane variety R570 which now covers 27% of the area under cane cultivation. Similarly one Mauritian variety of tomato is planted in Réunion. Clones of potato developed in Mauritius have also been sent to CIP.

CHAPTER 7
National Needs and Opportunities

The following National needs with regard to plant genetic resources have been identified:

1. A National Gene Bank (NGB) need to be created to carry effective plant genetic resources activities. It should be equipped with cold storage facilities for long term and medium term conservation as well as seed storage and auxiliary facilities needed in a genebank for carry its support activities. A Documentation Unit for acquiring, storing and retrieving information in germplasm and supporting extension work will also be required.
2. Regular collection expeditions in different ecological and environmental zones of the country need to be programmed in collaboration with the NGB.
3. A concise training programme for local staff in specific fields such as collection, monitoring, regeneration and documentation need to be developed. An expert on PGR is required to organise a local training programme for the Ministry of Agriculture and Natural Resources, University of Mauritius, MSIRI and other institutions.
4. A core-collection should be developed through evaluation of local germplasm and improved collection within the NGB.
5. The completion of the regional flora, Flore des Mascareignes, is considered as one of the highest priority for the conservation of plant genetic resources, as it is an important tool for the identification of local native species of plants.
6. Exotic species in protected areas are the major cause for the endangerment of many of the rare endemic plant genetic resources. Novel techniques will need to be found and a costed project developed for the control of pest species.
7. To effectively conserve the genepool of wild relatives of crop plants, coffee in the case for Mauritius, it is important to undertake a detailed ecogeographical survey of the *Coffea* species in Mauritius and to study the amount and distribution of the genetic variability within the wild population of *Coffea* species with a view to develop a conservation strategy for these species. This could then be adapted to other threatened species.

8. The vegetation types of the island should be analysed by remote sensing techniques to produce a vegetation map.

9. There is a need for developing a project for the seed conservation of threatened native species. However, many aspects of seed conservation of these native species will need to be studied.

10. Studies on medicinal plants especially with regard to pharmacology and toxicology need to be undertaken. The propagation of rare endangered species of medicinal plants should be ensured.

11. A market study on potential medicinal and aromatic plant genetic resources need to be carried out.

12. A national biodiversity strategy and action plan must be urgently developed and regularly reviewed.

13. The characteristics of the native species for artisanal uses of the timber (e.g. the model ship industry) have to be tested.

14. Five hectares of individual 'arboreta' located purposefully in the three climatic zones (sub-humid, humid and superhumid belts) of Mauritius, two in Rodrigues (Plaine Corail and Solitude) and one in Agaléga (northern part of Ile du nord) need to be created. These 'arboreta' will be stocked with species typical of the primary plant communities pertaining to the given sectors of the respective islands.

CHAPTER 8
Proposals for a Global Plan of Action

It is proposed that IPGRI considers:

- An ecogeographic survey and collection of wild coffee germplasm in the Madagascar and Mascarene region. The wild coffee germplasm is fast eroding due to invasion by exotic species. This is considered as a priority given the world wide importance of this crop and in particular given the potential of developing low caffeine cultivars from the Mascarocoffea group.
- Development of control measures for exotic species. This is a world wide problem and is the cause for genetic erosion in plants occurring in the wild.
- Collection of important plant genetic resources including medicinal plants and storage in *ex situ* collection. It is also recommended to develop regional collections and to duplicate these collection in at least two countries of the region.
- Setting up of a regional network for the collaboration between the country of the region, perhaps under the aegis of the IOC.
- Collection and maintenance of land races of all economic crops should receive high priority.
- The *in situ* conservation of maize germplasm in Rodrigues need to be continued.

APPENDIX 1

Food balance sheet for Mauritius 1992 (part I)

Commodity	Production		Estimated changes in stock	Gross imports	Supply	Gross exports
	Input	Output				
Cereals						
Wheat	-	-	-1,997	89,757	87,760	-
Wheaten flour	87,760	66,990	+2,139	11,698	80,827	8,146
Paddy/milled rice	5	4	+7,631	64,242	71,877	4,301
Maize	-	1,995	+2,025	35,617	39,637	503
Oats	-	-		376	376	-
Barley	-	-	-	20	20	-
Malt	-	-	-7	5,112	5,105	-
Other cereals (unmilled)	-	-	-	614	614	1
Other cereals	87,760	18,098	-20	893	18,971	11,501
Cereals preparations [1/]	-	-	-	5,899	5,899	70
Starcy foods						
Potatoes	-	20,790	-1,338	7,217	26,669	525
Sweet potatoes	-	330	-	-	330	-
Cassava (Manioc)	-	210	-	-	210	-
Tapioca & sago [2/]	-	-	-	188	188	-
Taro (eddoes)	-	460	-	-	460	-
Sugars						
Cane/Sugar [3/]	5,780,512	643,168	-6,378	1	636,791	599,470
Other sugars	-	-	-	606	606	-
Sugar preparations	-	-	-	551	551	32
Honey	-	45	-	69	114	-
Pulses, nuts & seeds						
Pulses [4/]	-	-	-	10,365	10,365	206
Groundnuts (in shells or not)	-	1,190	-	717	1,907	2
Coconuts [5/]	-	2,200	-			
Other edible nuts	-	-	-	67	67	17
Vegetables						
Tomatoes	-	10,220	-	-	10,220	25
Other (fresh) [6/]	-	32,980	-	116	33,096	467
Onions	-	3,240	+335	3,927	7,502	14
Vegetables prepared or preserved	-	625	-	1,360	1,985	35

Food balance sheet for Mauritius 1992 (part II)

Commodity	Domestic utilization					
	Feed	Feed	Manifacture	Waste	Food	Total
Cereals						
Wheat	-	-	87,760	-	-	-
Wheaten flour	-	-	-	725	71,956	72,681
Paddy/milled rice	-	-	-	676	66,900	67,576
Maize	37,419	15	-	200	1,500	39,134
Oats	316	-	-	-	60	376
Barley	-	-	20	-	-	20
Malt			4,575	-	530	5,105
Other cereals (unmilled)	-	-	-	-	613	613
Other cereals	7,200	-	-	70	200	7,470
Cereals preparations [1/]	-	-	-	-	5,829	5,829
Starcy foods						
Potatoes	-	1,700	-	900	22,544	26,144
Sweet potatoes	-	-	-	-	330	330
Cassava (Manioc)	-	-	-	-	210	210
Tapioca & sago [2/]	-	-	-	-	188	188
Taro (eddoes)	-	-	-	-	460	460
Sugars						
Cane/Sugar [3/]	-	-	-	373	36,948	37,321
Other sugars	-	-	-	-	606	606
Sugar preparations	-	-	-	-	519	519
Honey	-	-	-	-	114	114
Pulses nuts & seeds						
Pulses [4/]	-	-	-	100	10,059	10,159
Groundnuts (in shells or not)	-	-	-	-	1,905	1,905
Coconuts [5/]						
Other edible nuts	-	-	-	-	50	50
Vegetables						
Tomatoes	-	-	125	255	9,815	10,195
Other (fresh) [6/]	-	-	600	800	31,229	32,629
Onions	-	-	-	175	7,313	7,488
Vegetables prepared or preserved	-	-	-	-	1,950	1,950

1/ Refers to prepared breakfast foods, macaroni and spagheti, bakery products and other.

2/ New item, formerly included in preserved and prepared vegetables.

3/ Brown sugar and white sugar combined.

4/ Green peas and beans are accounted for as vegetables.

5/ Includes green and fried coconuts and copra for manufacturing.

6/ Excludes potatoes, tomatoes, bananas, pineapples, garlic, manioc, sweet petter, chillies, sweet potatoes, eddoes, rice, maize which are given separately.

APPENDIX 2
List of the Most Threatened Native Plants

Name	Family
Hyophorbe amaricaulis	*Palmae*
Astelia hemichrysa	*Liliaceae*
Badula reticulata	*Myrsinaceae*
Dictyopserma album var conjugatum	*Palmae*
Diospyros angulata	*Ebenaceae*
Euodia obtusifolia var gigas	*Rutaceae*
Ochrosia borbonica	*Apocynaceae*
Ocotea lancilimba	*Lauraceae*
Pandanus pyramidalis	*Pandanaceae*
Polyscias paniculata	*Araliaceae*
Psiadia canescens	*Compositae*
Syzygium new sp.	*Myrtaceae*
Chasalia boryana	*Rubiaceae*
Chionanthus boutonii	*Oleaceae*
Claoxylon linostachys var pedicellare	*Euphorbiaceae*
Diospyros neraudii	*Ebenaceae*
Elaeocarpus bojeri	*Elaeocarpaceae*
Helichrysum caespitosum	*Compositae*
Polyscias sp.	*Araliaceae*
Carissa xylopicron	*Apocynaceae*
Croton vaughanii	*Euphorbiaceae*
Diospyros nodosa	*Ebenaceae*
Ficus laterifolia	*Moraceae*
Hibiscus boryanus	*Malvaceae*
Monarrhenus salicifolia	*Compositae*
Agelaea pentagyna	*Conaraceae*
Chionanthus bromeeana	*Oleaceae*
Diospyros chrysophyllos	*Ebenaceae*
Euphorbia pyrifolia var ?	*Euphorbiaceae*
Gouania tiliifolia	*Rhamnaceae*

Name	Family
Hyophorbe vaughanii	*Palmae*
Tambourissa cocottensis	*Monimiaceae*
Memecylon myrtiforme	*Melastomataceae*
Eugenia vaughanii	*Myrtaceae*
Poupartia borbonica	*Anacardiaceae*
Weinmania tinctoria	*Cunoniaceae*
Pilea articulata	*Urticaceae*
Dombeya populnea	*Sterculiaceae*
Eugenia hastilis	*Myrtaceae*
Dombeya acutandula var rosea	*Sterculiaceae*
Hibiscus columnaris	*Malvaceae*
Lobelia serpens var serpens	*Campanulaceae*
Pilea pollicina	*Urticaceae*
Psiadia cataracte	*Compositae*
Korthalsella opuntia var bojeri	*Loranthaceae*
Acalypha integrifolia var marginata	*Euphorbiaceae*
Croton tiliifolius	*Euphorbiaceae*
Eugenia bojeri	*Myrtaceae*
Monimiastrum fasciculatum	*Myrtaceae*
Ocotea obtusata	*Lauraceae*

APPENDIX 3
List of Endemic Medicinal Plants of Mauritius and Rodrigues

Botanical name	Family name	Common name
Carissa xylopicron (En)	*Apocynaceae*	Bois de ronde
Ochrosia borbonica	"	Bois jaune
Tabernaemontana mauritiana (En, MRU)	"	Bois de lait
Acanthophoenix rubra (En, MRU)	*Arecaceae*	Palmiste piquant
Latania verschafeltii (En, RO)	"	Latanier jaune
Sarcostemma cf odontolepis (En, RO)	*Asclepiadaceae*	Liane calé
Sarcostemma viminale	"	Liane calé
Tylophora coriaceae (En, MRU)	"	Ipéca du pays
Faujasiopsis flexuosa (En, MRU)	*Asteraceae*	Bois cassant
Launaea sarmentosa (En, MRU)	"	Lastron maritime
Psiadia arguta (En, MRU)	"	Baume de l' île Plate
Psaidia terebenthina (En, MRU)	"	"
Psiadia viscosa (En, MRU)	"	"
Senecio lamarkianus (En, MRU)	"	Bois chèvre
Ehretia petiolaris (En, MRU)	*Boraginaceae*	Bois de pipe
Canarium paniculatum	*Burseraceae*	Bois colophane
Protium obtusifolium (En, MRU)	"	Bois colophane bâtard
Elaeodendron orientale	*Celastraceae*	Bois d'olive
Maytenus pyria (En, MRU)	"	Bois à poudre
Grangeria borbonica (En, MRU)	*Chrysobalanaceae*	Bois buis
Harunga madagascariensis	*Clusiaceae*	Bois harongue
Terminalia bentzoë (En, MRU)	*Combretaceae*	Bois benjoin
Termanialia bentzoë (En, RO)	"	"
Cnestis glabra (En, MRU)	*Connaraceae*	Mort-aux-rats
Ipomoea pes-caprae	*Convolvulaceae*	Liane batatran
Agauria salicifolia (En, MRU)	*Ericaceae*	Bois cabri

Botanical name	Family name	Common name
Erythroxylum laurifolium (En, MRU)	*Erythroxylaceae*	Bois de ronde
Acalypha integrifolia (En, MRU)	*Euphorbiaceae*	Bois queue de rat
Antidesma madagascariensis (En, MRU)	"	Bois bigayon
Euphorbia thymifolia	"	Petite rougette
Phyllanthus casticum (En, MRU)	"	Bois castique
P. Lanceolatus (En, MRU)	"	Bois dilo
P. phyllyreifolius (En, MRU)	"	
Caesalpinia bonduc	*Caesalpinaceae*	Cadoque
Aphloia theiformis	*Flacourtiaceae*	Bois fandamane
Scaveola taccada	*Goodeniaceae*	Veloutier vert
Plectranthus madagascariensis	*Lamiaceae*	Baume du Pérou
Cassytha filiformis	*Lauraceae*	Liane sans fin
Foetidia rodriguesiana	*Lecythidaceae*	Bois puant
F. mauritiana	"	"
Dracaena reflexa	*Liliaceae*	Bois de chandelle
Draceaena reflexa (En, RO)	"	"
Lomatophyllum lomatophylloides (En, RO)	"	Ananas marron
Bakerella hoyifolia (En, MRU)	*Loranthaceae*	Bois fier
Hibiscus liliiflorus (En, RO)	*Malvaceae*	Var
Turraea laciniata (En, RO)	*Meliaceae*	Bois balai
Ficus reflexa	*Moraceae*	Laffouche petite feuilles
Ficus rubra	"	Laffouche grandes feuilles
Badula balfouriana (En, RO)	*Myrsinaceae*	Bois papaye
Embelia micrantha (En, MRU)	"	Liane poilly
Eugenia rodriguesensis (En, RO)	*Myrtaceae*	Bois fer
Pisonia grandis	*Nyctaginaceae*	Mapou
Jumellea fragrans	*Orchidaceae*	Fahame
Olea lancea	*Oleaceae*	Bois cerf
Pandanus heterocarpus (En, RO)	*Pandanaceae*	Vacoas
Piper borbonense (En, MRU)	*Piperaceae*	Cubebe du pays
Pittosporum balfourii (En, RO)	*Pittosporaceae*	Bois bécasse
Cymbopogon excavatus	*Poaceae*	Citronelle sauvage

Botanical name	Family name	Common name
Clematis mauritiana	*Ranunculaceae*	Vigne vierge
Gouania leguatii (En, RO)	*Rhamnaceae*	
G. tiliifolia (En, MRU)	"	Liane Charretiers
Scutia myrtina		Bois senti
Rhizophora mucronata	*Rhizophoraceae*	Manglier
Antirhea bifurcata (En, MRU, RO)	*Rubiaceae*	Bois goudron
A. bifurcata	"	Bois losteau
Danais fragrans	"	Liane jaune
Mussaenda arcuata	"	Liane cacapoule
M. landia var. landia	"	Quinquina indigène
M. landia var. stadmanii (En, MRU)	"	Quinquina sauvage
M. landia var. holosericea (En, MRU, probably extinct)		
Ramosmania heterophylla (En, RO)	"	Café marron
Scyphochlamys revoluta (En, RO)	"	Bois mangue
Toddalia asiatica	*Rutaceae*	Patte poule piquant
Vepris lanceolata	"	Rampoule
Zanthoxylum paniculatum (En, RO)	"	Bois pasner
Z. heterophyllum (En, MRU, RO (extinct), RE)	"	Bois catafaille
Allophyllus cobbe	*Sapindaceae*	Bois de reinnette
Mimusops maxima (En, MRU, RE)	*Sapotaceae*	Makak
Sideroxylon cinereum (En, MRU)	"	Manglier vert
S. puberulum (En, MRU)	"	Manglier rouge
Dombeya acutangula (En, RO)	*Sterculiaceae*	Bois bête
Mathurina penduliflora (En, RO)	*Turneraceae*	Bois Gandine
Clerodendrum laciniatum (En, RO)	*Verbenaceae*	Bois cabri
Premna serratifolia	"	Bois sureau
Clerodendrum heterophyllum (En, MRU, RE)	"	Bois chenille
Ophioglossum ovatum	*Ophioglossaceae (Ptéridophytes)*	
Adiantum hispidulum	*Polypodiaceae*	Capillaire
A. rhizophorum	"	"
Asplenium nidus	"	Langue de boeuf

Botanical name	Family name	Common name
Microsorium punctatum	"	Langue de vache
Pellaea viridis	"	Capillaire
Phymatodes scolopendria	"	Polypode
Sellaginella deliquescens	"	Patte de lézard

APPENDIX 4

Status of sugar cane germplasm at M.S.I.R.I. (1993)

Germplasm group	Type	No. of accessions
Saccharum spp. and allied genera		
S. officinarum	(2n = 80)	149
S. spontaneum	(2n = 40-128)	29
S. robustum	(2n = 60,80)	13
S. sinense	(2n = 81 - 121)	6
S. Barberi	(2n = 81 - 121)	1
Erianthus (sect. *Ripidium)*	(2n = 20 - 60)	12
Total		210
F1 Hybrids		
S. officinarum x S. spontaneum		63
S. officinarum x S. robustum		45
S. officinarum x S. sinense		7
S. officinarum x E. (Sect. *Ripidium)*		3
Commercial hybrids x *S. spontaneum*		100
Total		218
BC1 Hybrids		
S. officinarum x NSO[1]		2
S. officinarum x NRO[2]		8
Commercial hybrids x NSO		218
Commercial hybrids x NRO		8
Commercial hybrids x CMiO[3]		2
Total		238
Commercial Hybrids		
Foreign hybrids collections		557
Mauritian hybrids collections		618
Total		1,175
Grand total		**1,841**

Source: Ramdoyal and Domaingue, 1995.

1: S. Officinarum X S. Spontaneum; 2: S. Officinarum X S. Robustum;
3: Commercial hybrids X Miscanthus.

APPENDIX 5
List of Old Cultivars of Sweet Potato, Cassava and Banana

Sweet potato	Cassava	Banana*
AMO (Tombeau Bay)	Australie	Banana Carré
AMO (Moka near Val Ory/AMB)	Bitter	Banana plantain
Bourbon	Blanc Bourbon	Gingeli
Chain	Blanchite	Philibert Gingely Blanc
Chestnut	Cassava Burman	Gingely faux
Chowning	De Table St. Martin	Hybrid Ducasse
Gandia	Icery	Kisukari
Kwan Tung	Jaune Trianon	Majunga Tonga
Leeks	Manoic 29	Mamoule
Little leaf	Manoic Blanc	Mamzelle
Long red (N. Decouverte)	Manoic Jaune Rempart	Matelot
Mirabelle	Negrita	Mille
Pekin	Nestor	Naine
Pelican processor	Paloma	Nouvelle France
Raisin	Rodney	Ollier
Red	Singapore	Banana rouge (Red Banana)
SM1	Yeyein	Sans Doudou
SM2		Banane la grain (Banane graine, Seed Banana)
SM3		
SM4		
Violette		
Yue		

Note: Material largely from MOA.

* **This collection is maintained at the University of Mauritius.**

APPENDIX 6
Terms of Reference for a National Coordinating Committee on Plant Genetic Resources

1. To provide technical and scientific advice to Government and other institutions on all matters relating to genetic conservation.
2. To promote national *in situ* conservation of plants genetic resources and wild relatives of crops within Nature Reserves, National Parks and other protected area, with special reference to endemic endangered species.
3. To promote *ex situ* conservation of plants germplasm in gene banks, field gene banks and other facilities.
4. To promote information exchange between institutions, collection of pertinent information and experience with a view to facilitate the formulation and implementation of policies relating to genetic resources.
5. To review and preview activities of genetic resources.
6. To promote biotechnology applications for conserving genetic resources.
7. To identify training needs of institution and advise on the implementation of training program.
8. To promote conservation education at all levels of the community.
9. To establish working relation with national, regional and international institutions and NGO, in particular IBPGR.
10. To review guidelines, initiate studies on relevant matters.
11. To develop a long-term strategy for plant genetic resource conservation.

Acknowledgment

The Ministry of Agriculture and Natural Resources wishes to express its gratitude to the following resource persons for their valuable contributions to this country paper:

S. Appiah
M. Aumeer
J. C. Autrey
S. Benimadhu
Y. Boodhoo
J. Bucha
C. Cangy
R. Domaingue
A. Dookun
M. E. Dulloo
N. Govinden
J. Guého
A. Gurib-Fakim
J. M. Heerasing
F. Jeeroobarkhan
S. Juggurnauth
S. Malhotra
Y. Mungroo
S. Naidu
R. Naseeven
A. M. Osman
S. A. Paupiah
N. Pem
K. Ramdoyal
P. Ramgoolam
D. Reetoo
H. Rojoa
V. Veeramundar
N. B. Yerrigadoo

References

Adjanohoun, E.J., Ak• Assi, L., Eym•, J., Gassita, J.N., Goudot•, E., Gu•ho, J., Ip F.S.L., Jackaria, D., Kalachand, S.K.K., Keita, A., Koudogbo, B., Landeau, D., Owadally, A.W., and Soopramanien, A. 1983. Médecine traditionelle et pharmacopée. Contribution aux études ethnobotaniques et floristiques à Maurice (Iles Maurice et Rodrigues). Agence de Cooperation Culturelle et Techniques. 214 pp.

Bosser, J., Cadet, Th., Gu•ho, J., Julien, H.R. and Marais, W. (Eds) 1976 - ongoing. Flore des Mascareignes: La Réunion, Maurice, Rodrigues. Mauritius Sugar industry Research Institute, L'Office de la Recherche Scientifique et Technique Outre Mer (ORSTOM) and Royal Botanic Garden , Kew, Port Louis, Mauritius.

Cadet, T. 1977. La végétation de l'Ile dela Réunion: Etude phyto-écologique et phytosociologique: Thèse de Doctorat-ès-Sciences. Université Aix-Marseille III.

Bell, B. D., Dulloo, M.E. and Bell, M. 1994. Mauritius Offshore Islands survey report and management plan. prepared for Government of Mauritius on behalf of Jersey Wildlife Preservation Trust.

Dulloo, M. E. and Dulymamode, R. (Editors) 1995. Plant Genetic Resources in Mauritius: towards a National Strategy. Proceedings of a National Workshop on Plant Genetic Resources in Mauritius, University of Mauritius, 21-22 October 1993. Published by National Parks and Conservation Service, Ministry of Agriculture and Natural Resources, Réduit, Mauritius. 104 pp.

Dulloo, M.E. and Owadally, A.W. 1991. Conservation and Utilisation of Wild Coffee. In Crop Genetic Resources of Africa. Volume 1 Proceedings of an International Conference on Crop Genetic Resources of Africa, 26-30 September 1988, Nairobi, Kenya. Edited by Attere F, Zedan H., Ng N.Q., and Perrino P. IBPGR, UNEP. IITA and CNR.

Gopalsamy, N., Vargas, D., Gu•ho, J., Ricaud, C., Hostettmann K. 1988. Saponins from leaves of Aphloia theiformis. Phytochemistry 27(11), 3593-95.

Govinden, N. and Rummun, K. 1995. Collection, conservation, characterization and utilization of maize genetic resources. In M.E. Dulloo and R.

Dulymamode Plant Genetic Resources in Mauritius: towards a National Strategy. published by National Parks and Conservation Service, Ministry of Agriculture and Natural Resources.

Gu•ho, J. 1988. La végétation de l'île Maurice. Edition de l'Ocean Indien, Mauritius 57pp

Gurib-Fakim, A. et al. 1991. Phytochemical screening of 38 Mauritian Medicinal Plants. Revue Agricole et Sucrière de l'ile Maurice 69, 42-50.

Gurib-Fakim, A., Gu•ho, J., Sewraj, M.D., and Dulloo, M.E. 1994. Plantes medicinales de l'ile Rodrigues. Edition de l'Ocean Indien, Mauritius 580pp.

Merton, D. V., Atkinson, I. A. E., Strahm, W., Jones, C. G., Empson, R.A., Mungroo, Y., Dulloo, M. E., and Lewis, R. 1989. A management plan for the restoration of Round Island, Mauritius. Jersey Wildlife Preservation Trust and Ministry of Agriculture, Fisheries and Natural Resources, Mauritius, 46 pp.

Ministry of Economic Planning and Developmen. 1993. National Development Plan 1992-1994 Volume 1 Programme and Policies. Ministry of Economic Planning and Development , Port-Louis , Mauritius.

Ministry of Economic Planning and Development. 1994. Economic Indicators. An occasional paper No. 183 and 184. Ministry of Economic Planning and Development , Port-Louis , Mauritius.

Ramdoyal, K. and Domaingue, R. 1995. Conservation, Exchange, Evaluation and Utilization ofSugar Cane Germplasm in Mauritius. In *Plant Genetic Resources in Mauritius: towards a National Strategy*. Edited by Dulloo M.E. and Dulymamode R.

Rouillard, G. and Gu•ho, J. 1994. Histoire des plantes d'interet horticole, medicinal et économique à l'ile Maurice - XXII *Revue Agricole et Sucriere de l'ile Maurice* Vol. 73, Nos 1&2 75-101.

Stevenson, G. C. 1940. An investigation into the origin of the sugar cane variety Uba Marot. *Dept. Agric. Mauritius Sugar Cane Res. Stn. Bull.* No. 17.

Strahm, W. 1989. *Plant Red Data Book for Rodrigues*. WWF/ IUCN Koeltz Scientific Books, West Germany

Strahm, W. 1994. *The Conservation and restoration of the flora of Mauritius and Rodrigues*. Ph.D. thesis, University of Reading, England.

World Bank. 1990. Staff appraisal Report. Mauritius Environmental Monitoring and develoment Project. Report No. 8996-MAS.

World Conservation Monitoring Centre. 1992. *Global Biodiversity: Status of the Earth's Living resources*. Chapman & Hall, London. xx + 594pp.

Abbreviations

IPGRI	International Plant Genetic Resources Institute
ODA	Overseas Development Administration
IUCN	World Conservation Union
WWF	World Wide Fund for Nature
MSIRI	Mauritius Sugar Industry Research Institute
NPCS	National Parks and Conservation Service
CIMMYT	International Maize and Wheat Improvement Centre
CIAT	International Centre for Tropical Agriculture
IITA	International Institute of Tropical Agriculture
ICRISAT	International Crops Research Institute for Semi-Arid Tropics
CIP	International Potato Center
AVRDC	Asian Vegetable Research and Development Centre
FARC	Food and Agricultural Research Council
DARE	Directorate of Agricultural Research and Extension
EU	European Union
IOC	Indian Ocean Commission
SADCC	Southern African Development Coordination Countries
AMCEN	African Ministerial Conference on Environment Network