



GUYANA:

**COUNTRY REPORT TO THE FAO
INTERNATIONAL TECHNICAL
CONFERENCE ON PLANT
GENETIC RESOURCE**

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Note by FAO

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CHAPTER 1

Introduction to Guyana

1.1 GEOGRAPHY

The Cooperative Republic of Guyana is located in the north eastern corner of South America 1⁰10' and 8⁰33' north latitude 56⁰20' and 61⁰22' west longitude. It is bordered on the north by the Atlantic Ocean, on the east by Suriname, west and northwest by Venezuela and south and southwest by Brazil.

1.2 POPULATION/AREA

Guyana has a population of about 768, 891 persons made up by six ethnic groups namely East Indians, Africans, Mixed, Amerindians, Europeans and Chinese (Guyana Statistical Bulletin, 1994). About 90 percent of the population lives on the low coastal plain. The area of Guyana is 216,000 sq. km.

1.3 BIOGEOGRAPHICAL PROVINCES

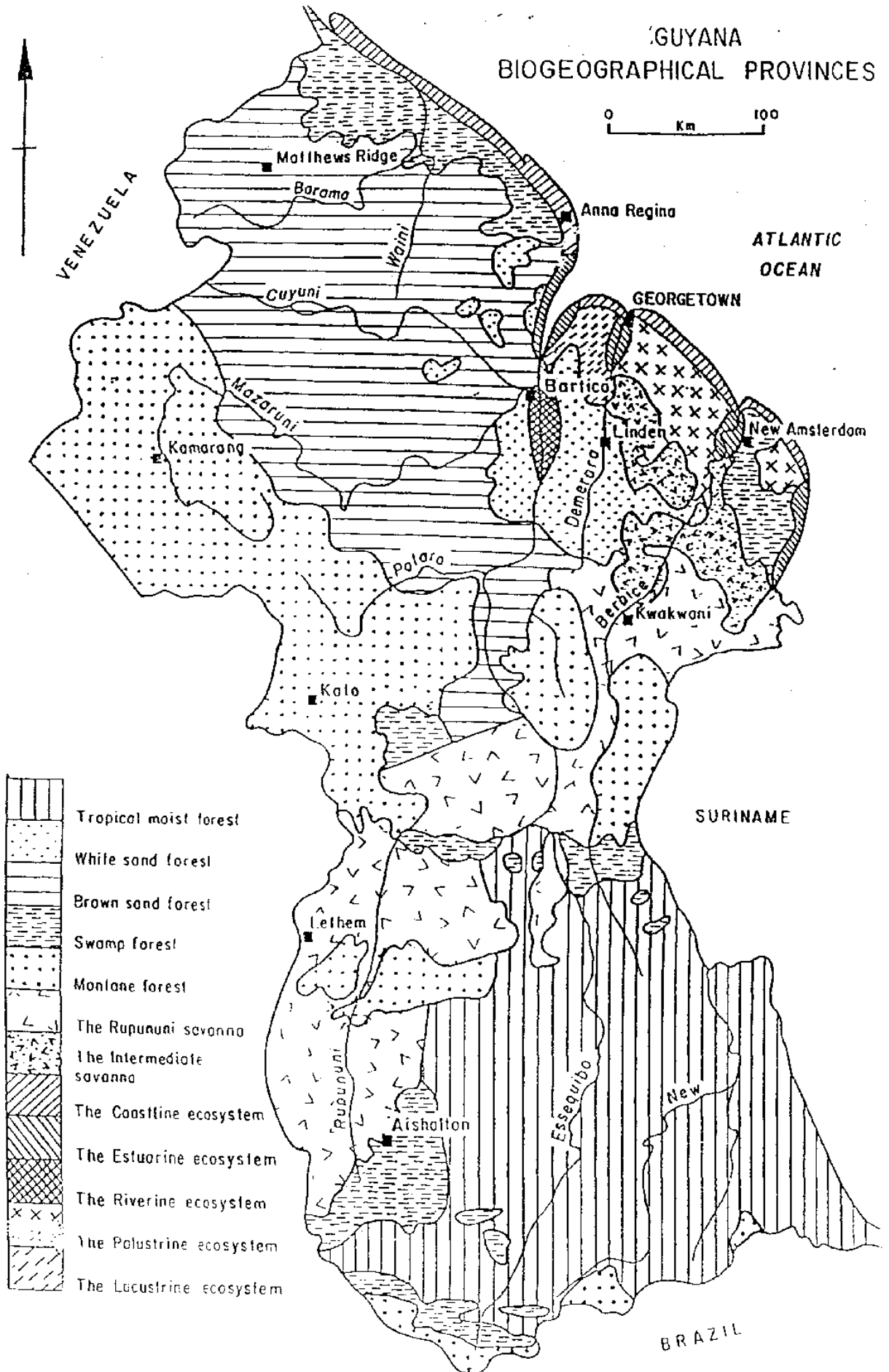
Biogeographically, Guyana may be divided into three major provinces (Guyana/UNEP, 1992) namely:

- i. the coastal biogeographical province
- ii. the savannah biogeographical province
- iii. the forest biogeographical.

These biogeographical provinces have been subdivided into twelve biotic communities based on vegetation (Figure 1).



FIGURE 1 BIOGEOGRAPHICAL PROVINCES IN GUYANA





1.4 THE COASTAL BIOGEOGRAPHICAL PROVINCE

This province is located within the Low Coastal Plain and contains the following biotic communities:

- a. The marine ecosystem - includes mudflats, mangrove forests and shell beaches. The mangroves protect the shoreline against erosion.
- b. The estuarine ecosystem - is characterized by wetlands which occur at the mouths of the rivers.
- c. The riverine ecosystem - is characterized by tidal wetlands which occur along river banks.
- d. The palustrine ecosystem - comprises marshes and swamps in river flood plains, as well as 'water savannahs'.
- e. The lacustrine ecosystem - consists of natural lakes and the water conservancies. Some flora include water lilies, razor grass, ite palm and ferns.

1.5 THE SAVANNAH BIOGEOGRAPHICAL PROVINCE

This province consists of various types of grasses interspersed with woody plants in clumps called 'bush islands'. The biotic communities are:

- a. The Intermediate or Berbice Savannahs - bunch grass with scattered patches of small trees, sand paper and huriya are the dominant species.
- b. The Rupununi Savannahs - an extension of the Rio Bronco Savannahs of Brazil. Vegetation is of the xerophytic and wet savannah type. Bunch grass is the dominant type with patches of trees.

1.6 THE FOREST BIOGEOGRAPHICAL PROVINCE

This province comprises tropical rainforest of the Amazon type. The biotic communities are:

- a. The tropical moist forest - major forest type in Guyana. It covers half of the country and occur at elevations below 300m. This forest has two associations; one that occur in the low- land areas and one that is found in the



Pakaraima region. Some of the main tree species include greenheart, purpleheart, morabukea and kakaralli. Below the canopy level are various palms, manicole and awarra. Herbs and ferns dominate the forest floor.

- b. The white sand forests - considered as climax vegetation. The main plant species include wallaba, ituru, dakama and muri. In some areas, evergreen seasonal forests are found.
- c. The brown sand forest - occurs on the borders of the white sand forests. The main forest species is greenheart but other species found are morabukea, lianas and epiphytes.
- d. Montane forest - two types exist; those that flourish on the lower mountain slopes of the Pakaraima, Kanuku and Akarai mountains at elevations below 365m and those that occur between 610 and 1535m. Few commercial trees are found in this ecosystem. On the higher slopes are mosses, epiphytes, ferns and dwarf palm trees. Above 1525m are Elfin Forests which are recognized by gnarled and stunted trees.
- e. The swamp forests - are found in the poorly drained coastal areas in the northwest of the country. Mora and corkwood are the dominant species found in association with various palms. Marshes are mixed with crabwood, white cedar and kakaralli.

1.7 CLIMATE

The climate of the coastal plain is two wet and two dry seasons with an average annual rainfall of 1,500-2,000 mm; the forest zone is marked by hotter days, cooler nights and heavier rainfall than the coast and the interior savannahs is one dry and one wet season.

1.8 PRIMARY AGRICULTURAL SECTOR

The primary agricultural sector which accounts for about 31 percent of the country's Gross Domestic Product (GDP) and employs about 35% of the labour force may be attributed to the traditional subsectors of sugarcane (*Saccharum officinarum*) and rice (*Oryza sativa*) production. The nontraditional sub-sector (fruits and vegetables), livestock and fisheries play an important role in the economy of Guyana (Table 1).



Table 1: Contribution of agriculture to the Gross Domestic Product (GDP) and to the agricultural GDP of Guyana

COMMODITY	GDP %	Agricultural GDP %
Sugar cane	18.45	61.39
Rice	2.88	9.57
Livestock	1.42	4.38
Non-traditional (Fruits, vegetables)	4.71	15.65
Fishing	2.71	9.00
Total	30.70	100.00

Source: Ministry of Agriculture. 1993. Review of the Agricultural Sector. Ministry of Agric., Georgetown, Guyana.

There are about 25,000 farm households in Guyana of which over 90 percent are located on the more fertile soils of the coastal plain covering some 400,000 ha of arable land and comprising administrative regions 2, 3, 4, 5 and 6 (Figure 2). Rice and sugarcane are grown on small farms as well as large estates. Most farmers practice mixed farming on farms of 2-5 ha. Ninety percent of farms is under 10 ha (on 40 % of farmland); 25 percent is under 1 ha (2 % of farmland); 38 percent is between 1- 4 ha (12 % of farmland); and 5 percent on more than 20 ha (47 % of cropland).

The following farming systems are operating in Guyana:

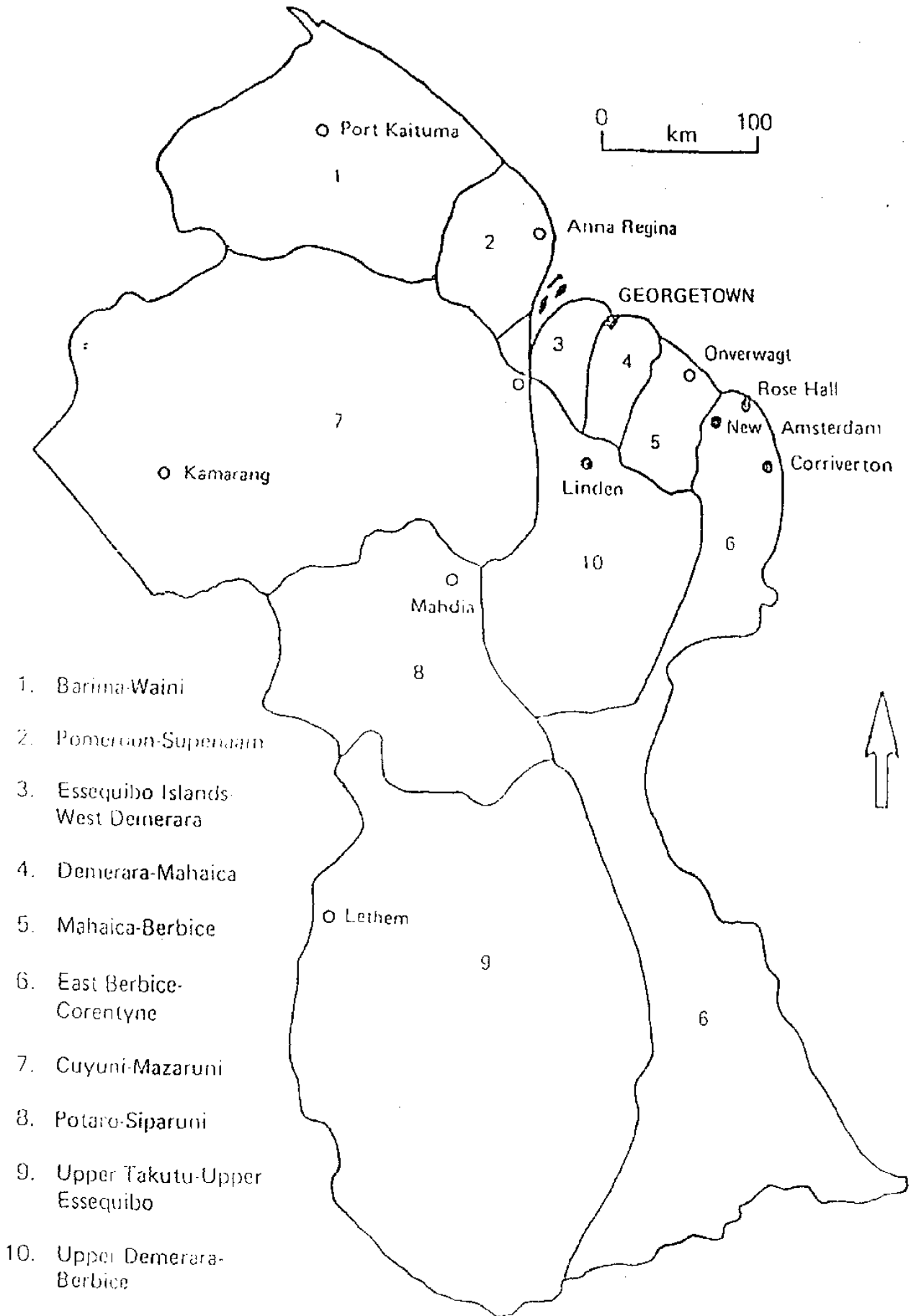
- a. large-scale, highly mechanized sugarcane and rice farms producing for domestic and export markets;
- b. extensive grazing ranches in the savannahs, producing beef;
- c. small-size family farms producing rice, coconuts, sugarcane and some staples, particularly cassava;
- d. small-size mixed crop farms producing some rice but mainly plantains, cassava and other ground provisions;
- e. small-scale shifting cultivation (slash and burn system) of mixed crops.

Many farms in the latter three categories are also involved in livestock production, including poultry, small ruminants and beef and dairy cattle.

The development of the sugar and rice sub-sectors is the responsibility of two government agencies namely, Guyana Sugar Corporation (Guysuco) and Guyana Rice Development Board (GRDB), respectively.



FIGURE II: THE ADMINISTRATIVE REGIONS OF GUYANA





The production and marketing of non-traditionals is an almost completely private sector operation. Governmental support comes from the research and extension services, from the public market system and from the “New” Guyana Marketing Corporation (NGMC).

The system for the generation and transfer of agricultural technology is the responsibility of the National Agricultural Research Institute (NARI) and Crops and Livestock Department of the Ministry of Agriculture MOA/CLD.

These, together with the Caribbean Agricultural Research and Development Institute (CARDI), the National Dairy Development Programme (NDDP), the Inter-American Institute for Cooperation on Agriculture (IICA), the Guyana School of Agriculture (GSA) and the Faculty of Agriculture of the University of Guyana (UG/FA), provide a variety of services to the agricultural sector.

The sugar and rice industries, are self-contained in terms of technology development and transfer.



CHAPTER 2

Indigenous Plant Genetic Resources

2.1 FOREST GENETIC RESOURCES

Guyana can be divided into three major biogeographical provinces namely, coastal biogeographical province, savannah biogeographical province (bush islands), and forest biogeographical province.

The forest genetic resources are located in the forest biogeographical province. The forest species of interest in Guyana can be found in the wallaba, mora, mixed lowland forests (morabukea, greenheart forest) and seasonal and marsh forests (Mennega et al., 1988; Polak, 1992).

The wallaba forests are located on the white sand peneplains on more or less flat to slightly undulating terrain in the near interior and the sandstone areas of the Pakaraima plateau.

The dominant canopy species are *Eperua* spp. (soft wallaba), *Aniba hypoglanca* (yellow silverballi) and *Talisia squarrosa* (moraballi).

The mora forests are located on alluvial silt, clay or loam along rivers and on riverine flats throughout the lowland region. The dominant species is *Mora excelsa*.

In the mixed lowland forests, the Morabukea forest is found in laterite areas, less frequently it is encountered on sandy loam or on brown sand.

It occurs on undulating terrain with slopes in the near interior, east of the Cuyuni River. The dominant species is *Mora gonggrijpii*.

The greenheart forests are found on brown sand as well as on laterite, often on slopes of ridges. It is known from the area east of the Pomeroon R. north of the line Kartuni-Puruni-East Kaburi-Kurduni R. The dominant species is *Chlorocardium rodiei*.

Seasonal forests are located on well drained soils in areas where there is a marked seasonal distribution in the rainfall. Marsh forests are located on pegasse or alluvial silt and is inundated at least during the long rainy season.



In Guyana, the biodiversity of plants can be grouped as:

<i>Bryophyta</i>	186
<i>Lycopodiophyta</i>	28
<i>Filixophyta</i>	100
<i>Gymnospermae</i>	6
<i>Dicotyledonae</i>	4238
<i>Monocotyledonae</i>	1109

Giving a total of 5,667 species or 89.9% of all groups of plants recorded to date in Guyana or 2.3 % of the world's current total.

There are 70 endemic species of plants, 145 introduced/exotic plant species and 106 introduced/cultivated plant species.

According to Ramdass (1992), available information restricts placement of any population in the categories of known extinctions, endangered, rare and vulnerable (IUCN classification).

2.2 LANDRACES AND OLD CULTIVARS

With respect to traditional varieties, cassava (*Manihot esculenta*), rice (*Oryza sativa*), pineapple (*Ananas comosus*), yam (*Dioscorea* spp.) are the crops for which traditional varieties are maintained. Different coloured-skinned (white, yellow and white with red underskin) varieties of cassava are maintained by Amerindians (Dagon, 1967).

For rice, BG79, D110 and Ledger are the traditional varieties maintained. The Amerindians also maintain varieties of other crop plants (Appendix 1). Salisbury et al. (1968) noted that in Amerindian agriculture, the main cropping system in newly cleared fields was corn - cassava - cassava.

Of particular note, the Amerindians made use of non-food plants in their agriculture. Acoushi ants were controlled by growing the cunaparu (*Phyllanthus* sp.) plant in cultivated areas. In the clearing of new areas Indians usually saved from destruction any economic palms or edible fruit trees.



2.3 Centre of Diversity

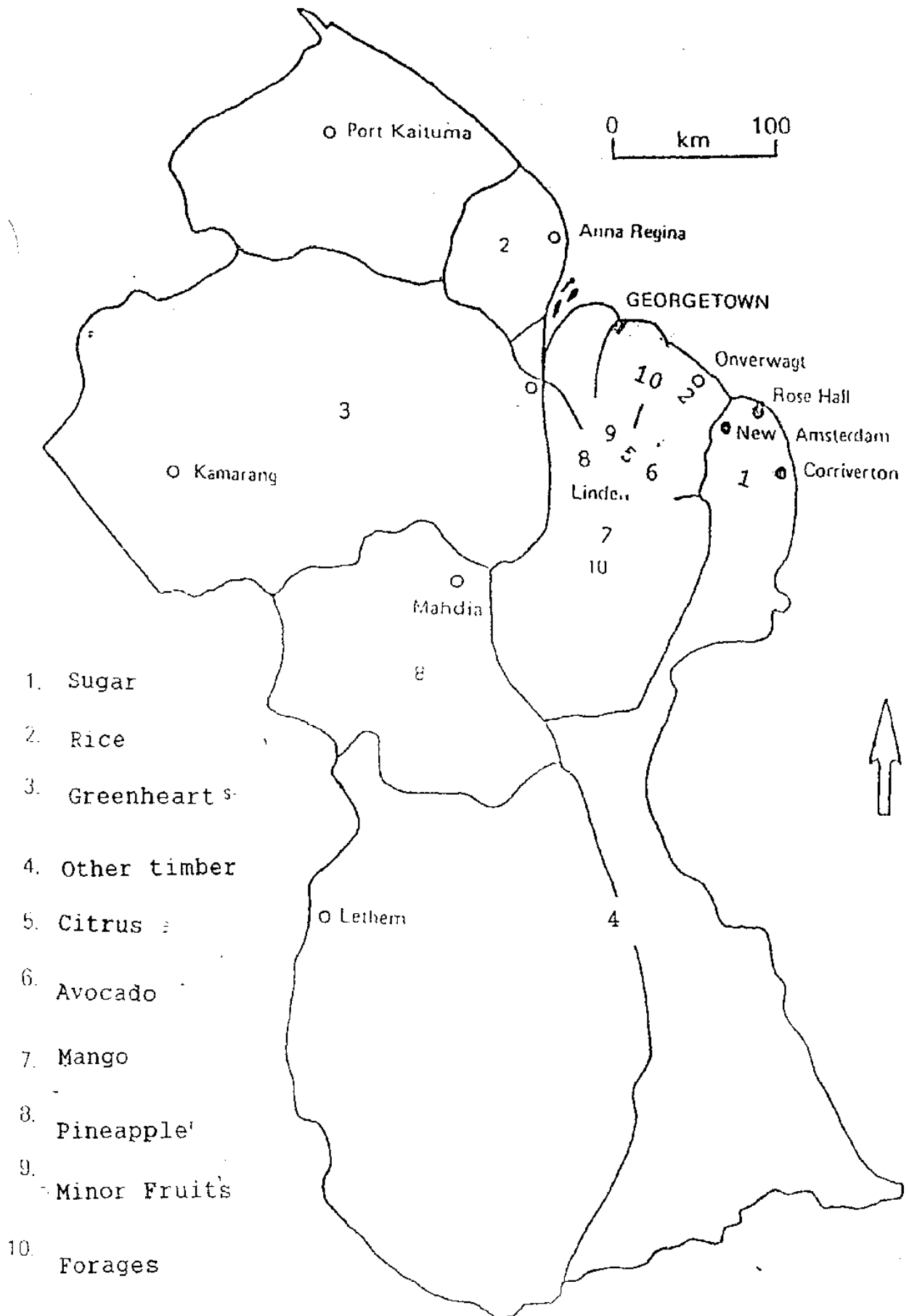
Guyana is included in the centre of diversity for cashew (*Anacardium occidentale*), pineapple (*Ananas comosus*), yam (*Dioscorea* spp.), cassava (*Manihot esculenta*), numerous timber species, several palms and forage grasses and legumes and other crop and wild plants not yet investigated or discovered. Figure 3 is a map showing the location of the areas in Guyana where some of these germplasm materials occur.

There is an ongoing “Flora of the Guianas Project” in Guyana carried out jointly by the University of Guyana, Smithsonian Institute, New York Botanical Gardens and the University of Utrecht to collect and document information on forest resources and on landraces indigenous to Guyana.



FIGURE III: LOCATION OF PLANT GENETIC RESOURCES IN GUYANA

Figure III: Location of plant genetic resources in Guyana





CHAPTER 3

National Conservation Activities

3.1 *IN SITU* CONSERVATION ACTIVITIES

The Moraballi Reserve in the Essequibo River is the only known ongoing *in situ* conservation activity. Here, greenheart (*Chlorocardium rodiei*) is the dominant forest species. This reserve is managed by the Guyana Forestry Commission.

The only area that is legally protected is the Kaieteur National Park occupying an area of 222 sq mls. This area is rich in biodiversity but the focus of the park is the world renowned Kaieteur Falls (GAHEF, 1995).

The Guyana Forestry Commission (GFC) now has a Code of Practice for Forest Management that was formulated to ensure the effective administration and management of the existing state forest thereby ensuring the sustainable utilization of the resource base while maintaining the ecological balance.

The management plan and operating plan sets out that every Timber sales agreement and woodcutters lease requires the grantee/lessee to produce a management plan for the area of operations.

The GFC maintains the right to restrict logging within a concession for the following reasons:

- environmental protection against logging damage
- conservation of biodiversity
- unharvestable areas.

A total of 76 species of timber are permitted to be harvested from the forests of Guyana once harvesters conform to the Code of Practice (Appendix V) (Guyana Forestry Commission, 1994).



3.2 EX SITU COLLECTIONS

In Guyana, there is as yet no plant genetic resources system that has a deliberate policy to collect, conserve, manage or utilize plant genetic resources. Table 2 presents a summarized listing of conserved species and the number of accessions.

Table 2 (a): Summarized listing of ex situ collections, in vitro

Plant species	No. of accessions	Location
<i>Ipomea batata</i>	7	NARI
<i>Manihot esculenta</i>	4	NARI
<i>Ananas comosus</i>	2	NARI
<i>Dioscorea sp.</i>	1	NARI
<i>Musa spp.</i>	3	NARI
Blue Green Algae	6	NARI

Table 2 (b): Summarized listing of ex situ collections, in-field

Plant species	No. of accessions	Location
<i>Mangifera indica</i>	19	Ebini
	7	Mon Repos
<i>Gossypium hirsutum</i>		
<i>Gossypium hirsutum</i>	6	Ebini
<i>Persea americana</i>	26	Kairuni
<i>Citrus spp.</i>	12	Kairuni
<i>Averrhoa carambola</i>	*N.A.	Kairuni
<i>Psidium guajava</i>	N.A.	Mon Repos, Kairuni
<i>Averrhoa bilimbi</i>	N.A.	
<i>Malpighia glabra</i>	N.A.	Mon Repos
<i>Malpighia glabra</i>	N.A.	Mon Repos
<i>Ananas comosus</i>	N.A.	Kairuni

* N.A. - Not available

Different user groups conserve collections in-vitro (NARI), in seed storage facilities (MOA, GRDB), greenhouses (Guysuco) and field repositories (MOA, NARI and Guysuco). These collections represent local and regional materials.



Seed storage facilities at MOA/NARI Mon Repos and Ebini field stations, contain sorghum, corn, peanut, and soybean accessions and at GRDB Burma station, 816 local and regional rice accessions are maintained.

Three local and two regional strains of azolla are maintained in the NARI Microbiology facility.

Numerous forage species are maintained at the Burma (Coastal ecozone) and Ebini (Intermediate Savannas ecozone) Field Stations (Appendix IV).

Specimens of cultivated and weed plants are also maintained in herbaria. The main herbarium collection is at the University of Guyana, Faculty of Natural Sciences, Department of Biology. There, 224 plant families are preserved.

This herbarium is complemented by a smaller one at NARI which mainly deals with rice weeds. A total of 48 families are maintained with the majority being from *Poaceae* (40) and *Cyperaceae* (18), the main rice weed families in Guyana. Appendix II is a listing of the plant families maintained in NARI's herbarium.

These collections are specialized and by no means represent the wide diversity of plants of Guyana. Except for Guysuco and NARI/MOA, no other organization in Guyana maintains collections of plants.

3.3 EVALUATION AND CHARACTERIZATION

There are no curators in the national system. As such evaluation and characterization of germplasm is not done except at Guysuco and NARI. At NARI, some efforts have been made to evaluate and characterize grasses, forage legumes and rice germplasm.

At Guysuco, there is a plant breeding and selection unit which is responsible for the creation of new varieties of sugar cane, choosing the best possible clones and thoroughly testing and evaluating these clones for commercial extension. A new variety takes about 12 years to develop. Selections are based on:

- i) good agronomic characteristics
- ii) high yields
- iii) more sugar in stalk
- iv) medium fibre content and
- v) good millability



The amount of seeds handled per year is 100,000 of which 50,000 are from Guyana and 50,000 are from Barbados. The total number of varieties maintained is 1,200 of which 157 are foreign varieties that are maintained in-field quarantine.

Guysuco has a six stage breeding programme comprising seedling, 1 row propagation plots, 5 row propagation plots, smut evaluation trials, estate variety trials and large scale field testing. Appendix II is a pedigree analysis of sugar canes of interest to Guysuco in 1994.

At the NARI/Plant Tissue Culture facility (NARI/PTC), commissioned in 1989, explants used are usually shoot tips (plantains, cassava, sweet potato and yam) and dormant axillary buds (pineapple).

The cultures are usually stored in slow growth medium with either sucrose or mannitol as the osmotium. Slow growth subculturing interval is 3-5 months. Usually ten replicates of each accession are maintained. However, no characterization of the germplasm has ever been done, no regeneration studies on stored germplasm have been attempted nor virus indexing done.

3.4 STORAGE FACILITIES

The central storage for seeds is at Mon Repos. Seed bins are available for grain storage. *In vitro* storage is done at NARI, PTC facility for pineapple, yam, plantain, sweet potato, banana and cassava.

3.5 DOCUMENTATION

Each organization that maintains plant germplasm utilizes non-electronic media in its own unique system of documentation. Recently, the Caribbean Group for Plant Genetic Resources (CMPGR), under the auspices of the Food and Agriculture Organization (FAO) installed a computer database for fruit and other germplasm documentation that networks with the English speaking Caribbean and Suriname.

The database, Caribbean Seed and Germplasm Resources Information Network (CSEGRIN), is a powerful and friendly electronic environment that can accommodate 99 crop descriptor lists and 200 descriptions per crop.



CHAPTER 4

In-Country Uses of Plant Genetic Resources

4.1 USE OF PGR COLLECTIONS

Rice: The aim of the crop improvement programme is to produce varieties with the following characteristics:

- i. high yield (> 5t/ha),
- ii. good grain - long, slender, translucent, free from “white belly”,
- iii. blast resistance,
- iv. salt tolerance,
- v. high milling and head rice recovery,
- vi. semi-dwarf,
- vii. crop duration of 100 - 115 days,

Accessions from the germplasm collection are evaluated in Observation Yield Trials and the successful entries are promoted to Replicated Yield Trials. On-farm Trials and Demonstrations then further evaluate high yielding lines. The successful entries are also evaluated for their response to abiotic and biotic stresses.

Only the rice industry utilizes rice germplasm material. The major sources for germplasm materials are CIAT, Colombia and IRRI, Philippines.

Sugar: In the sugar industry, nine varieties (DB 7869, DB 66113, DB 75159, DB 7047, B 41227, DB 7160, D 15841, B 47258 and DB 70172) are currently grown on all of Guysuco’s sugar estates.

The other varieties mentioned in Appendix III are part of ongoing evaluations in the variety selection programme. Only Guysuco utilizes sugar cane germplasm materials. The major source for germplasm material is Barbados (Motie Mangal, Personal Communication. 1995)



Grain legumes: Varieties of peanut, *Arachis hypogea*, (florunner and AK 62); cowpea, *Vigna unguiculata*, (Minica 1, Minica IV and California #5); and soyabean, *Glycine max*, (Doko), are utilized for research at NARI/Ebini Field Station and for seed production for farmers.

The Crop germplasm evaluation methodology comprises:

- i. screening for general adaptability
- ii. comparative yield trials
- iii. large scale field trials

Cereal crops other than grains: Sorghum (*Sorghum bicolor*) and maize (*Zea mays*) are also subjects of research and development for the Intermediate Savannahs ecozone.

Fruits: The main species of fruits that are frequently used include *Citrus* spp., *Persea americana*, *Malpighia glabra*, *Passiflora* spp., *Averrhoa carambola*, and *Mangifera indica*.

These are used by the government owned nurseries for propagation of fruit plants in support of orchard establishment and expansion.

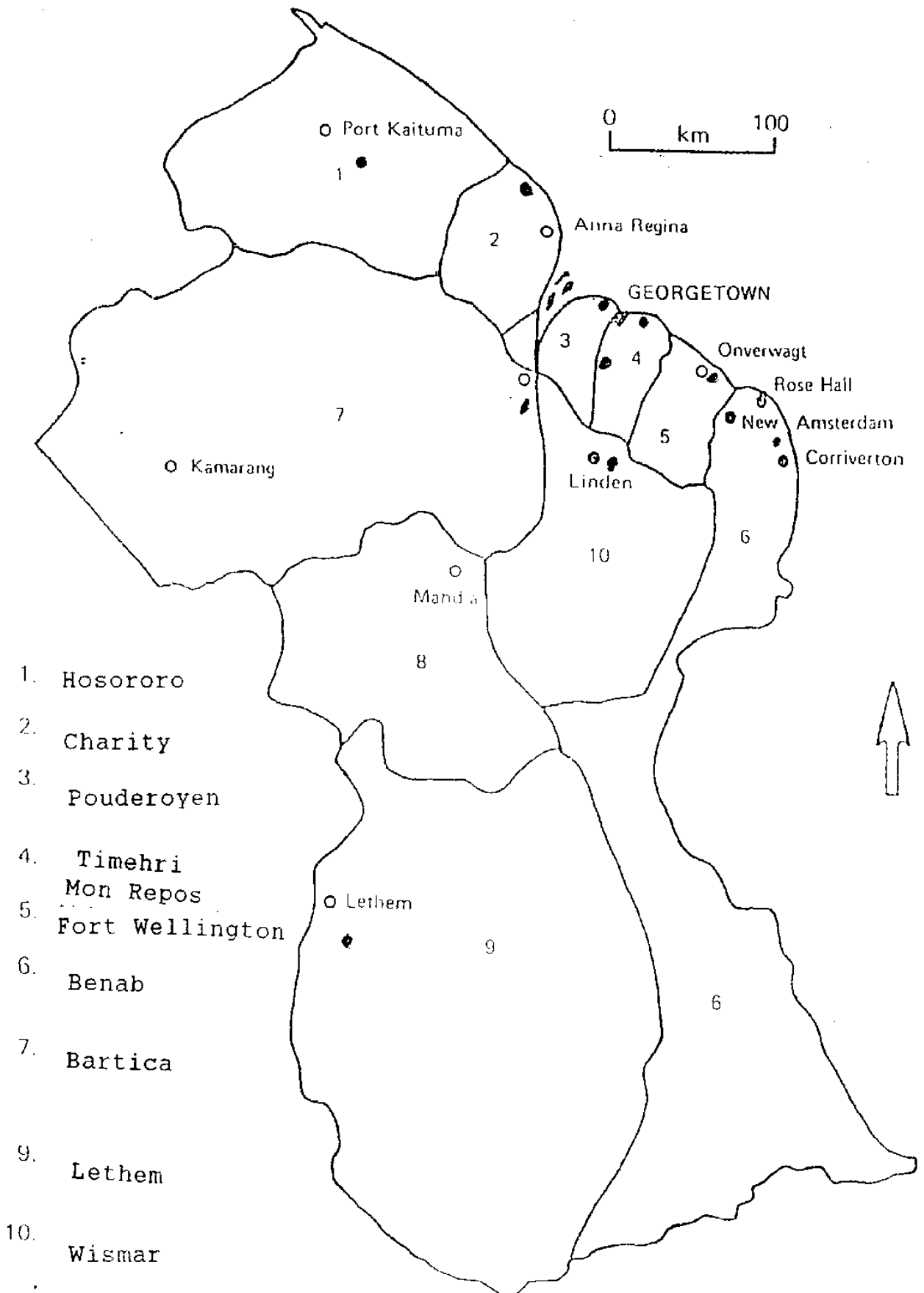
The prominent areas for the production of fruits are:

Citrus (<i>Citrus</i> spp.)	Pomeroon River, Corentyne River, East Bank Demerara, Demerara River
Avocado (<i>Persea americana</i>)	North West District, Pomeroon River, Canals Polder/West Bank Demerara, Kairuni/Linden Highway
W.I. Cherry (<i>Malpighia glabra</i>)	East Bank Demerara, Timehri
Passion fruit (<i>Passiflora</i> spp.)	Timehri, Letter T Estate ECD
Carambola (<i>Averrhoa carambola</i>)	Pomeroon River, East Bank Essequibo
Mango (<i>Mangifera indica</i>)	East Coast Demerara, Region No. 5, Corentyne Coast, Essequibo Coast, Rupununi Savannahs.

The Government owned nurseries where these plants are propagated are the Central Horticultural Station, Mon Repos, Benab, Bartica, Linden, Lethem, Pouteroyen, Charity and Hosororo (Figure 4).



FIGURE IV: LOCATION OF GOVERNMENT-OWNED PLANT NURSERIES IN GUYANA





4.2 CROP IMPROVEMENT PROGRAMMES AND SEED DISTRIBUTION

Crop improvement programmes are characteristic only of Guysuco (sugar) and NARI (rice). The main functions of the national plant breeding programmes are to:

- i. improve local varieties
- ii. to introduce specific characteristics to locally adapted varieties
- iii. to adapt imported germplasm to local conditions

The ultimate objective of plant breeding programmes is to increase production and productivity. For rice and sugar, the amount and quality of scientific plant breeding is adequate but could be improved if the following is provided:

- i. improved storage facilities for base collections
- ii. establishment of a national germplasm system for efficient and effective use of limited resources
- iii. investment in modern breeding technology

Plant breeding programmes are conducted only by government funded programmes. The rice varieties produced by NARI are most valuable to commercial producers. Guysuco produces sugar cane varieties only for Guysuco and not for private farmers.

Farmers have access to seed materials multiplied for release to the national seed system. The National Seed Committee (NSC) has the responsibility of ensuring distribution of seed for commercial production. In the case of rice, some farmers are used as contract farmers for commercial paddy seed production. A buy back system by the NSC to ensure fair distribution is not in place.

4.3 USE OF FOREST GENETIC RESOURCES

The Guyana Forestry Commission maintains a collection of exotics at Laluni, Soesdyke and Wairuni (*Acacia mantium* sourced from Australia), and Mon Repos (*A. mantium* and *Tmelina arborea* sourced from Costa Rica). These materials are evaluated for ecozone adaptability.



4.4 BENEFITS DERIVED FROM THE USE OF PGR

Guyana does not maintain germplasm for foreign users. The absence of a national plant germplasm system precludes the country from deriving direct benefits from its indigenous plant genetic resources. Certainly in the sugar and rice industries, the use of non-indigenous resources is the mainstay of the breeding programmes.

4.5 IMPROVING PGR UTILIZATION

The main achievement of Guyana's plant genetic resources activities (rice, sugar and some fruit crops) has been in improving commercial plant production. The linkages (collection / conservation / management / utilization) necessary for a plant germplasm system are absent.

The lack of a government mandate to manage and utilize our resources have created institutional, financial and technical barriers to a successful plant germplasm system.

Today, the emphasis is on conservation of plant biodiversity. Two international projects are currently at various stages of implementation.

i. Tropenbos Sustainable Forest Utilization Project

This project is in its second phase (1994-1999). The research area is near Mabura Hill, at the fringe of the white sands area where the landscape meets the Pre-Cambian Plateau.

Essentially, this project focuses on the design of management systems based on a better understanding of various processes related to the biology of tree species, the hydrological balance and nutrient cycling both in virgin and in logged tropical rainforest.

ii. Iwokrama International Rainforest Programme

This programme is jointly supported by the government of Guyana, The Commonwealth Secretariat and The United Nations Development Programme. Guyana offered an area of 388,000 ha of undisturbed Amazonian forest (about 2% of Guyana's rainforest) for conservation of biodiversity and scientific research leading to the development of techniques for sustainable utilisation of forest resources.



The project site is located in the central part of Guyana ($40^{\circ}30'N$, $58^{\circ}50'N$).

It is envisaged that the major components of the programme will be

- (a) International Centre for Research and Training
- (b) Environmental Conservation Unit
- (c) An Amazonian Rainforest Wilderness Reserve
- (d) An area for sustainable utilisation of forest resources.



CHAPTER 5

National Goals, Policies, Programmes and Legislation

5.1 NATIONAL GOALS, POLICIES AND PROGRAMMES

The main government agencies directly involved with agricultural development are the Ministry of Agriculture (MOA) and the Guyana Cooperative Agricultural and Industrial Development Bank (GAIBank). Indirectly, the Ministry of Finance and Planning and the State Planning Secretariat are also involved in decisions on agricultural development policies and allocation of funds.

The Ministry of Agriculture major functions include determining agricultural policy, providing support services, developing and maintaining sector infrastructure as well as analysing and evaluating sectoral performance. Main support services provided by MOA are:

- extension
- development and maintenance of irrigation and drainage systems
- distribution of land and
- plant and animal quarantine.

The Honourable Senior Minister of Agriculture, Mr. Reepu Daman Persaud (1994) summarized the main tenets of Government's agricultural policy as follows:

- i. The private sector will continue to be the main engine of growth. Government is committed to the maintenance of a free and open economic system.
- ii. Government will seek to ensure that all publically owned infrastructure and facilities are operated on an efficient basis and that, wherever possible, the main users of these facilities are intimately involved in their management.
- iii. Support services and institutions are made to function in the most efficient manner possible.



- iv. Government is committed to the orderly transfer of land to legitimate occupants as well as the rapid expansion of opportunities for the productive occupation of available land now under its control.

Sookraj and Persaud (1994) outlined the priorities of the agricultural sector as:

- i. Sugar - maximisation of the long-term viability and technical productivity of the industry at a level of output which satisfies the requirements of preferential and local markets and which puts the industry on a path where it can eventually compete on the world market.
- ii. Rice - improve productivity in the rice industry and establish Guyana internationally as a reliable and competitive rice exporter.
- iii. Other crops & Livestock - exploit the great potential for contributing to the overall development of the sector and the economy.

5.2 NATIONAL LEGISLATION

There is no legislation on plant genetic resources. Efforts are ongoing towards articulating strategies for the management of Guyana's biodiversity (Guyana/UNEP, 1992). The responsibility for this lies with the Biodiversity Commission that operates out of the Office of the President.

There are two pieces of legislation related to plant genetic resources in Guyana. These are:

- i. The "Plant Protection Act", Chapter 68:03 (Appendix VI) This Act is meant to deal with plant quarantine. It is recognised that the legislation is inadequate and efforts have started for the enactment of new quarantine legislation.
- ii. "The Seeds Act", 1991 (Draft).

The Draft Seeds Act provides for regulating the production, sale and quality of certain seeds for sowing and further to provide certification of seeds and for matters identical to or connected therewith.



CHAPTER 6

International Collaboration

So far there has been no specific project in support of the nontraditional agricultural sector. There are, however, a number of ongoing or planned projects which have a component dealing with nontraditional crops.

The International Fund for Agricultural Development (IFAD) financed East Bank Essequibo Development Project which started in 1988 and is supporting 2,300 farm families through improvement of drainage and irrigation infrastructure and some feeder roads, input supply, improvement of research and extension activities.

FAO has supported NARI's research programme focusing mainly on rice production but, to a limited extent on nontraditional crops. In addition FAO has assisted the Government of Guyana (GOG) with the establishment of an organized and systematic programme for seed production, certification and distribution of improved cultivars of rice and other cereals, and also legume crops, and on the development of linkages between agricultural technical training, research and extension.

Another FAO programme had focused on strengthening the capability of the NGMC to facilitate domestic and export marketing activities through market and price information and administrative support.

The Commonwealth Fund for Technical Cooperation (CFTC) continues to provide technical assistance to strengthen the capacity of MOA.

The Caribbean Agricultural Research and Development Institute (CARDI) has provided assistance to improving milk and beef production systems and to support Caribbean sheep production and marketing.

The Inter-American Institute for Cooperation on Agriculture (IICA) has, inter alia, been active in supporting the development of tropical fruits.

The CGIAR's like CIAT, IRRI, CIMMYT, AVRDC, IITA, have all contributed in the areas of germplasm exchange, training and technical collaboration.



CHAPTER 7

National Needs and Opportunities

The national needs may be itemized as follows:

- i. Training in management of plant genetic resources.
- ii. Establishment of a national plant germplasm system (NPGS).
- iii. Sustainable utilization of biodiversity and plant genetic resources.
- iv. Survey of plant species diversity in Guyana.

7.1 TRAINING

Perhaps, because of the absence of a national plant germplasm system, there are no curators or plant breeders in Government service outside of the traditional agricultural subsectors of sugar and rice. If Guyana is to make good use of its plant genetic resources endowment, then specialist training in these areas will assume great importance. Additional training will also be required in the collection and management of tropical germplasm, and electronic documentation and management.

7.2 ESTABLISHMENT OF NPGS

A sufficient number of successful tropical models are available for Guyana to fashion its system after. The main components of such a system are - Collection, Management (Conservation, Characterization, Evaluation) and Documentation. In the area of Collection, special attention needs to be paid to plant quarantine and plant introduction. There is urgent need to strengthen the Plant Quarantine system, both post-entry and internal to effectively deal with vegetative propagules and seeds.

A task force should be formed to articulate a programme for the management of PGR in Guyana in much the same way that a National Commission on Biodiversity has been formed. The need to collect and manage PGR is predicated on conserving genetic diversity and the increasing need for varietal improvement in the area



of nontraditional agriculture. The increasing intensity in logging, mining in Guyana's reserve agricultural ecozones and the threat of the Atlantic Ocean to the bastion of Guyana's agriculture, the low coastal plain, makes this even more relevant and urgent.

The National Agricultural Research Institute's focus on non-traditional crops has been intensified. NARI therefore can take the lead role in executing this initiative. NARI is also the focal point of ICPPGR.

7.3 SUSTAINABLE UTILIZATION OF PLANT BIODIVERSITY AND PGR

The advent of the National Commission on Biodiversity has seen some serious efforts towards the sustainable utilization of plant biodiversity in Guyana. The same needs to be done for PGR. A coherent, market focused, sustainable system is required if the nontraditional crops, more valuable than rice in terms of contribution to agricultural GDP, are to make a significant contribution to the economy of Guyana.

7.4 SURVEY OF PLANT SPECIES DIVERSITY

It is imperative that Guyana maps out an urgent programme aimed at finding out what is its plant diversity endowment. This will help in determining what needs to be conserved and utilized. Guyana runs the risk of losing plant genetic resources to ignorance, indiscriminate logging and mining activities, changing land use patterns and disinterest. International organizations may also exploit Guyana's resources without direct benefit being returned to the country's agricultural programme.



CHAPTER 8

Proposal For a Global Plan Of Action

- i. Assistance to poor countries like Guyana for the sustainable utilization of PGR. Mutual agreements can be worked out with countries with an established traditional of PGR management for the careful management and utilization of its PGR.
- ii. Institution of mechanisms to facilitate access to and exchange of PGR.
- iii. Protection of centres of diversity in the region in which Guyana falls.



Appendix I

List of the more common economic plants other than cassava which have been recorded as having been cultivated by the Amerindians

Common Name	Scientific Name
Pineapple	<i>Ananas sativa</i>
Cashew	<i>Anacardium sp.</i>
Arum sp.	
Peach-palm	<i>Bactris gasipaes=Guilielma speciosa</i> <i>Bixa orellana</i> <i>Bromelia sp.</i>
Pepper	<i>Capsicum sp.</i>
Papaw	<i>Carica papaya</i>
Coconut	<i>Cocos nucifera</i>
Calabash	<i>Crescentia cujete</i>
Potato	<i>Ipomea batatas</i>
Lemon	<i>Citrus sp.</i>
Lime	<i>Citrus sp.</i>
Orange	<i>Citrus sp.</i>
Yam	<i>Dioscorea sp.</i>
	<i>Euphorbia cotinoides</i>
	<i>Genipa americana</i>
Arro reed	<i>Gynerium saccharoides</i>
Cotton	<i>Gossipium spp.</i>
Haiari fish poison	<i>Lonchocarpus spp.</i>
Banana/Plantain	<i>Musa spp.</i>
Tobacco	<i>Nicotiana tabacum</i>
Avocado	<i>Persea gratissima</i>
Sugar cane	<i>Saccharum officinarum</i>
Fish poison	<i>Tephrosia toxicaria</i>
Cacao	<i>Theobroma cacao</i>
Maize	<i>Zea sp.</i>
Other food plants used by Indians	
Sapodilla	<i>Achras sapota</i>
Soursop	<i>Anona muricata</i>



Common Name	Scientific Name
Custard apple	<i>Anona reticulata</i>
Awarra	<i>Astrocaryum tucomoides</i>
Brazil nut	
Sawari nut	<i>Caryocar tuberculosa</i>
	<i>Cereus sp.</i>
	<i>Eugenia sp.</i>
	<i>Genipa mariana and G. eddulis</i>
	<i>Hymenaea courbaril</i>
Shirada	<i>Inga laterifolia</i>
Truli	<i>Manicaria saccifera</i>
Kokerit	<i>Maximiliana regia</i>
Ite	<i>Mauritia flexuosa</i>
	<i>Malpighia</i>
Mammee apple	<i>Mammea americana</i>
	<i>Melicocca bijuga</i>
Bullet tree	<i>Mimusops balata</i>
Mushrooms	
Small guava	<i>Nigrita schomburgkii</i>
Turu	<i>Oenocarpus sp.</i>
Palms	
Guava	<i>Psidium sp</i>

Source: Arts and Crafts of Guiana Indiana. Eth. Ann. 38.



Appendix II

List of families of weeds in NARI weed herbarium

Family name	No of species
<i>Acanthaceae</i>	1
<i>Alismataceae</i>	0
<i>Araceae</i>	3
<i>Amaranthaceae</i>	4
<i>Asclepiadaceae</i>	3
<i>Asteraceae</i>	8
<i>Boraginaceae</i>	3
<i>Butomaceae</i>	1
<i>Cesalpiniaceae</i>	4
<i>Cleomaceae</i>	2
<i>Commelinaceae</i>	1
<i>Convolvulaceae</i>	2
<i>Crassulaceae</i>	1
<i>Cucurbitaceae</i>	4
<i>Cuscutaceae</i>	1
<i>Cyperaceae</i>	18
<i>Dennstaediaceae</i>	1
<i>Euphorbiaceae</i>	11
<i>Poaceae</i>	40
<i>Lamiaceae</i>	3
<i>Fabaceae</i>	8
<i>Malvaceae</i>	5
<i>Marantaceae</i>	1
<i>Marsileaceae</i>	1
<i>Melastomaceae</i>	4
<i>Mimosaceae</i>	3
<i>Molluginaceae</i>	1
<i>Nymphaeaceae</i>	2
<i>Onagraceae</i>	2



Family name	No of species
<i>Parkeriaceae</i>	1
<i>Passifloraceae</i>	2
<i>Pedaliaceae</i>	1
<i>Phytolaccaceae</i>	1
<i>Piperaceae</i>	1
<i>Polygonaceae</i>	1
<i>Pontederiaceae</i>	1
<i>Portulaccaceae</i>	2
<i>Rhamnaceae</i>	0
<i>Rubiaceae</i>	4
<i>Salvinaceae</i>	0
<i>Sapindaceae</i>	1
<i>Scrophulariaceae</i>	1
<i>Solanaceae</i>	5
<i>Sphenocleaceae</i>	2
<i>Sterculiaceae</i>	1
<i>Tiliaceae</i>	1
<i>Urticaceae</i>	1
<i>Verbenaceae</i>	3



Appendix III

Pedigree analysis of sugar canes of interest to Guysuco in 1994

Variety	Female Parent	Male Parent	MGM	MGF	PGM	PGF
DB 7869	B 75585	MY 54129	UCW 5465	CR 6101	B 42231	Co453
DB 66113	CB 4176	PC	POJ 2878	PC		
DB 75159	B 74253	PC	B 6518	Mex 5217		
DB 7047	HJ 5741	B 63118	H40/1184	PC	B 4906	B 49119
B 41227	POJ 2878	B 35207	POJ 2364	EK 28		
DB 7160	S 17	B 63118	POJ 2725	F 28	B 4906	B 49119
D 15841	Co 421	D 16634	POJ 2878	B 3412	POJ 2878	Sorg.
B 47258	B 39254	B 34104	B 35271	Noble	B 2935	Co 281
BH10/12						
DB 70172	BJ 5924	B 63118	Co 421	B 4995	B 4906	B49119
D 8415	DB 7883	PC	B 69632	PC	SaNdoro	
DB 8033	DB 64461	BJ 63132	Co 421	W 11	B 4906	CP 44155
DB 8099	B 73405	UCW 5369	B 63118	HJ 5741	B 42231	Co453
DB 7532	B 70607	PC	Co 331	PC		
DB 8103	WI 7370	PC	B 69695	B 69674		
DB 82208	B 63118	Polycross	B 4906	B 49119		
BT 721239	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
D 8484	B 73348	PC	B 63118	HJ 5741		
DB 83184	BT 64440	PC	Unknown	Unknown		
DB 8506	B 73385	B 75137	B 63118	HJ 5741		

MGM Maternal Grand Mother
 MGF Maternal Grand Father
 PGM Parental Grand Mother
 PGF Parental Grand Father
 PC Poly-Cross
 Sorg. Sorghum



Appendix IV

Listing of forage grasses and legumes in the field collection at NARI research stations

Burma Field Station

Legumes

Flemingia macrophylla
Arachis pintoii
Pueraria phaseoloides 9900
Desmodium ovalifolium 350
Desmodium heterocarpum 3783
Desmodium ovalifolium 13089
Desmodium strigillosum 1315
Desmodium velutinum
Desmodium ovalifolium
Macrotilium atropurpureum

Grasses

Digitaria decumbens cv pangola
Digitaria swazilandensis
Digitaria decumbens cv Transvala
Hyparrhenia rufa
Pennisetum purpureum
Pennisetum purpureum x
P. Typhoides (Giant)
Pennisetum purpureum (Mott dwarf)
Setaria anceps
Brachiaria mutica
Brachiaria radicans
Brachiaria extensa
Brachiaria brizantha
Panicum maximum
Hemarthria altissima
Brachiaria himidicola (UF 717)
Brachiaria humidicola (Sheep grass)
Cynodon plectostachyus



Moblissa Field Station (now transferred to Ebini Field Station)

Legumes

Stylosanthes capitata
Stylosanthes guianensis
Stylosanthes leiocarpa
Centrosema pubescens
Centrosema brazilianum
Centrosema sp.
Desmodium ovalifolium
Zornia latifolium

Grasses

Brachiaria decumbens (CIAT 606)
Brachiaria humidicola (UF 717)
Brachiaria humidicola (sheep grass)
Brachiaria decumbens (local signal)
Pennisetum setosum
Pennisetum purpureum
Pennisetum purpureum x *P. typhoides*
 (giant elephant)
Pennisetum purpureum (Mott dwarf)
Panicum maximum
Andropogon gayanus
Melinis minutiflora
Cynodon plectostachyus
Digitaria swazilandensis
Hemarrthria altissima
Hyparrhenia rufa
Paspalum conjugatum
Imperata sp.

Source : CARDI - Guyana Unit. 1989/1990 Annual Technical Report, CARDI, Turkeyen, Guyana.



Appendix V

List of harvestable species approved by the Guyana Forestry Commission

Common Name	Scientific Name	Family
Greenheart	<i>Chlorocardium rodiei</i>	Lauraceae
Brown silverballi	<i>Licaria canella</i>	Lauraceae
Wabaima	<i>Licaria canella</i>	Lauraceae
Letterwood		
Dalli	<i>Virola michelli</i>	Myristicaceae
Mora	<i>Mora excelsa</i>	Caesalpiniaceae
Tauroniro	<i>Humiria balsamifera</i>	Humiriaceae
Dukali	<i>Parahancornia iasciculata</i>	Apocynaceae
Tatabu	<i>Diplotropis purpurea</i>	Papilionaceae
Hububalli	<i>Loxopterygium sagotii</i>	Anacardiaceae
Dukuria	<i>Sacoglottis guinensis</i>	Humiriaceae
Kurokai	<i>Protium decandrum</i>	Burseraceae
Manniballi	<i>Moronobea coccinea</i>	Clusiaceae
Maporokon	<i>Inga alba</i>	Mimosaceae
Suya	<i>Pouteria speciosa</i>	Sapotaceae
Korokororo	<i>Ormosia coutinhoi</i>	Papilionaceae
Saka	<i>Peltogyne venosa</i>	Caesalpiniaceae
Hoa-hoa		
Asepoko	<i>Pouteria guianensis</i>	Sapotaceae
Kamakushi	<i>Bombax flaviflorum</i>	Bombaceae
Aromata	<i>Clathrotropis brachypetala</i>	Papilionaceae
Limonaballi	<i>Chrysophyllum pomiferum</i>	Sapotaceae
Monkey pot	<i>Lecythis zabucajo</i>	Lecythidaceae
Suradan	<i>Hyeronima alchorneoides</i>	Euphorbiaceae
Koraro	<i>Andira inermis</i>	Fabaceae
Dukaliballi	<i>Brosimum rubescens</i>	Moraceae
Karohoro	<i>Schefflera decaphylla</i>	Araliaceae
Purpleheart	<i>Peltogyne sp.</i>	Caesalpiniaceae
Yellow silverballi	<i>Aniba hypoglauca</i>	Lauraceae
Bulletwood	<i>Manilkara bidentata</i>	Sapotaceae



Common Name	Scientific Name	Family
Red cedar	<i>Cedrela odorata</i>	Meliaceae
Kabukalli	<i>Goupia glabra</i>	Celastraceae
Kereti	<i>Ocotea wachenheimii</i>	Lauraceae
Shibadan	<i>Aspidosperma</i> sp.	Apocynaceae
Simarupa	<i>Quassia simarouba</i>	Simaroubaceae
Muneridan	<i>Qualea albitlora</i> (?)	Vochysiaceae
Locust	<i>Hymenaea courbaril</i>	Fabaceae
Wamara	<i>Swartzia leiocalycina</i>	Caesalpiniaceae
Determa	<i>Ocotea rubra</i>	Lauraceae
Fukadi	<i>Buchenavia ianshawei</i> (?)	Combretaceae
Wallaba	<i>Eperua falcata</i>	Caesalpiniaceae
Pakuri	<i>Platonia insignis</i>	Clusiaceae
Morabukea	<i>Mora gongrippii</i>	Caesalpiniaceae
Tonka bean	<i>Dipterys odorata</i>	papilionaceae
Calabash	<i>Crescentia cujute</i>	Bigoniaceae
Adabadan		
Crabwood	<i>Carapa guinensis</i>	Meliaceae
Manni	<i>Symphonia globulifera</i>	Clusiaceae
Kurahara	<i>Calophyllum lucidum</i>	Clusiaceae
Koraroballi	<i>Hymenolobium</i> sp.	Papilionaceae
Itikiboraballi	<i>Swartzia sprucei/benthamia</i> (?)	Fabaceae
Dakamaballi	<i>Aldina insignis</i>	Caesalpiniaceae
Kirikaua	<i>Iryanthera lancifolia</i>	Myristicaceae
Haiariballi	<i>Alexa imperatricis</i>	Fabaceae
Fetui	<i>Jacaranda copiaia</i>	Bignoniaceae
Iteballi	<i>Vochysia tetraphylla</i>	Vochysiaceae
Kuyama		
Ulu	<i>Trttinickia</i> sp.	Burseraceae
Baradan	<i>Ocotea tomentella</i>	Lauraceae
Baromalli	<i>Catostemma</i> sp.	Bombaceae
Burada	<i>Parinari campestris</i>	Chrysobalanaceae
Cow-wood	<i>Bagassa guinensis</i>	Moraceae
Darina	<i>Hymenolobium</i> sp.	Fabaceae
Puppy		
Sand box	<i>Hura pentandra</i>	Bombaceae
Duka		



Common Name	Scientific Name	Family
Kakaralli	<i>Eschweilera pedicellata</i>	<i>Lecythidaceae</i>
Maho	<i>Sterculia rugosa</i>	<i>Sterculiaceae</i>
Kautaballi	<i>Licania laxiflora</i>	<i>Chrysobalanaceae</i>
Ubudi		
White cedar	<i>Tabebuia insignis</i>	<i>Bignoniaceae</i>
Huruasa		
Sawari	<i>Ocotea canuliculata</i>	<i>Lauraceae</i>
Shine silverballi	<i>Ocotea sp.</i>	
Cabbage		
Washiba.		

Source: Guyana Forestry Commission 1994. Code of practice for forest management. GFC Georgetown Guyana. First Draft.



Abbreviations

CARDI	- Caribbean Agricultural Research and Development Institute
GAHEF	- Guyana Agency for Health Sciences Education, Environment and Food Policy
GAIBANK	- Guyana cooperative Agricultural and Development Bank
GFC	- Guyana Forestry Commission
GRDB	- Guyana Rice Development Board
GSA	- Guyana School of Agriculture
GUYSUCO	- Guyana Sugar Corporation
IICA	- Inter-American Institute for Cooperation in Agriculture
M of A	- Ministry of Agriculture
NARI	- National Agricultural Research Institute
NDDP	- National Dairy Development Programme
NGMC	- 'New' Guyana Marketing Corporation
NSC	- National Seed Committee
UG/FA	- University of Guyana - Faculty of Agriculture



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