

**FAO International Technical Conference
on Plant Genetic Resources**

**CONSERVATION AND
SUSTAINABLE UTILIZATION OF
PLANT GENETIC RESOURCES IN
THE CARIBBEAN**
Sub-Regional Synthesis Report

**Annex 1 of the Report of the
Sub-Regional Preparatory Meeting for
Central America, Mexico and the Caribbean**

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This Sub-Regional Synthesis Report was prepared for the Sub-Regional Meeting for Central America, Mexico and the Caribbean, San Jose, Costa Rica, 21-24 August 1995, preparatory to the FAO International Technical Conference on Plant Genetic Resources, Leipzig, Germany, 17-23 June 1996. The meeting noted that this Report included the most important elements of the national reports and provided an accurate description of the current situation. It constitutes Annex 1 of the Report of the Preparatory Meeting. The Report is being made widely available by FAO as requested by the International Technical Conference.

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I. INTRODUCTION

a. The Subregion and its Agricultural Sector

1. The Caribbean Sub-Region, as defined in this report, comprises 13 independent island states, namely: Antigua & Barbuda, Bahamas, Barbados, Cuba, Dominica, Dominican Republic, Grenada, Haití, Jamaica, St. Kitts & Nevis, St. Lucia, St. Vincent & The Grenadines, and Trinidad & Tobago. It lies roughly between 28_ and 13_N Latitude and 61_ and 85_ W Longitude. Its diversity offers unique advantages. for the utilization and conservation of a plant genetic resources. Its population is highly involved in agriculture and only marginally exploits forestry (Annex 1).

2. The topography of the individual islands varies from mostly flat lowlands (a few meters above sea level) to very mountainous highlands (2,000 masl or more). Although in general the prevailing climate is tropical (typically hot and wet), relatively cool and dry areas are also found within the subregion. In the coastal low lands, the surrounding maritime environment has a moderating effect on average temperatures. The low lying areas, which usually show few soil groups and types, contrast with mountainous regions where the norm is conspicuous soil heterogeneity, mostly due to their volcanic origin. The geologic substrate in most parts has originated from volcanic activities, and where rainfall is not a limiting factor the natural vegetation is very lush and biodiversity abounds. The subregion is also prone to severe weather disturbances, such as tropical storms and hurricanes, which can cause severe damage to the agricultural sector.

3. The main farming systems range from relatively few large monocropped estates to countless small multi- or inter-cropped holdings. The former tend to depend heavily on external inputs, and to be commercially oriented towards export markets. The latter use more low-cash and unsophisticated technological inputs (family manual labour, rainfed cultivation, landrace planting materials, on-farm organic fertilizing materials, and environmentally benign pest and disease control means) and apart from the production of bananas for export, they are geared mainly towards household subsistence or local markets. Additionally, whereas the estates are generally owned by Government, companies and wealthy families or individuals, small farmers very often do not own the holdings which they occupy. Long-term preservation of plant genetic resources is generally more neglected on commercial monocrop plantations than on the small intercrop farms.

4. Most Governments in the sub-region recognize the importance of the conservation of forests, especially to protect water supplies and, increasingly,



to exploit eco-tourism. The main forestry management systems can be classified into undisturbed forests, national reserves, national parks, commercial silviculture, and deforested areas (especially in the drier ecozones).

5. In the Caribbean, agriculture and forestry occupy most of the land (Annex 2). In some of the countries agriculture (including forestry) is a major contributor to Gross Domestic Product. In both agriculture and forestry however, only a small number of commodities are produced on a commercial scale (Annex 3) and these are generally exported as raw materials. Their further exploitation, through processing, would require large and sustained investments in training and infrastructure, currently not available from the public or private sectors alone in most of the countries.

6. Many countries in the region rely upon a limited number of export crops, and their agriculture-based economies are therefore vulnerable to world price fluctuations. For example, banana and sugarcane, followed by cocoa and coconut, continue to be economically important for over half of the Caribbean countries. More recently these countries have been promoting diversification of their food and agricultural production. Vegetables, tropical fruits, root crops, spices, livestock and feed grains are increasingly becoming an integral part of their agricultural systems.

7. The need for diversification has prompted several Caribbean Governments to review their agriculture and forestry policies and to encourage the active participation of the private sector and non-government organizations in the formulation of national development plans and programmes for the utilization and conservation of indigenous plant genetic resources.

b. Plant Genetic Resources of the Subregion

8. The Caribbean region consists of many small tropical island states rich in endemic flora and diverse plant genetic resources. However, much of the indigenous vegetation of the islands in the region was cleared by early colonizers and others are presently much degraded. Annex 4 provides a list of some of the indigenous plants in the Caribbean sub-region. The most important threats to these resources today include:

- indiscriminate clearing of natural vegetation to establish rural and urban settlements or mechanized monocrop plantations;
- unsustainable deforestation to extract wood for food, fuel, fiber and construction materials;
- slash-and-burn shifting cultivation under unsustainable population pressure; and



- natural disasters, especially hurricanes and tropical storms.

The number of landraces in most countries in the sub-region is on the decline due to two major reasons: (i) the introduction of high-yielding, improved varieties and hybrids has resulted in the displacement of traditional varieties and (ii) as the number of small farmers decreases so does the number of the custodians of existing landraces.

Moreover, the Caribbean islands, together with Central America, are an important centre of diversity of many cultivated plants. Annex 5 gives a list of some wild relatives and land races of crops found in the region. Some of the plant species which are indigenous or have developed important genetic diversity in the Caribbean include the following:

- (i) Roots and tubers: *Ipomoea batatas*, *Manihot esculenta*, *Dioscorea trifida*, *Calathea allouia*, *Canna edulis*, *Maranta arundinacea*, and *Xanthosoma sagittifolium*;
- (ii) Cereals: *Zea mays*;
- (iii) Legumes: *Phaseolus lunatus*, *Phaseolus vulgaris*, *Vigna unguiculata*, *Vigna sesquipedalis*; and *Cajanus cajan*;
- (iv) Oil crops: *Arachis hypogea*;
- (v) Palm species: *Acronomia spp.* and *Prestoea montana*;
- (vi) Species for industrial use: *Crescentia cujete*, *Gossipium barbadense*, and *Manilkara bidentata*;
- (vii) Aromatic, stimulant and spice species: *Bixa orellana*, *Capsicum spp.*, *Colubrina reclinata*, *Nicotina tabacum*, *Pimenta dioica*, *Polygala spp.*, *Theobroma cacao*, and *Vanilla plecti*;
- (viii) Pasture species: *Axonopus affinis*, *Bothriochloa pertusa*, *Panicum maximum*, *Paspalum spp.*, *Aeschynomene spp.*, *Desmodium spp.*, *Leucaena spp.*, *Macrotilium spp.*, and *Stylosanthes hamata*; and
- (ix) Fruit species: *Spondias spp.*, *Annona spp.*, *Carica papaya*, *Mammea americana*, *Persea americana*, *Hymenaea courbaril*, *Inga edulis*, *Malpighia punicifolia*, *Byrsonima spp.*, *Eugenia spp.*, *Psidium guajava*, *Coccoloba uvifera*, *Genipa americana*, *Melicocca bijuga*, *Talisia olivaeformis*, *Calocarpum mammosum*, *Chrysophyllum cainito*, *Manilkara spp.*, *Pouteria spp.*, *Monstera deliciosa*, *Opuntia ficus-indica*, *Cucurbita spp.*, *Passiflora spp.*, and *Solanum spp.*

9. The Caribbean also holds many important forestry and non-food plant species; however, as is the case for food crops, the lack of surveys and inventories of plant species in the sub-region means that a complete list of



these is presently not available, and more effort is needed in this area. Some examples of relevant non-food species are: (i) timber species, such as *Avicennia germinans*, *Laguncularia racemosa*, *Rhizophora mangle*, *Drypetes spp.*, *Hymenaea courbaril*, *Mastichodendron foetidissimum*, *Sloanea caribea*, and *Tabebuia pallida*, (ii) ornamental species, such as *Alloplectus cristatus*, *Petrea kohautiana*, *Tecoma stans*, *Byrsonima spicata*, *Lobelia conglobata*, *Charianthus alpinus*, *Marcgravia spp.*, *Heliconia spp.*; (iii) several species of Orchids, Cactaceae, Ferns, Aroids, and Palms; and (vi) medicinal plant species, such as *Aristolochia trilobata*, *Capraria biflora*, *Eupatorium triplinerve*, *Exostema caribea*, *Justicia pectoralis*, *Richeria grandis*, *Cassia spp.*, and *Sauvagesia erecta*.

II. ASSESSMENT OF PLANT GENETIC RESOURCES PROGRAMMES AND ACTIVITIES

a. National Programmes, Policies and Legislation

10. The plant genetic resources of the Caribbean islands are under serious threat of erosion due to increased tourism, changes in the land use patterns and natural disasters like hurricanes and tropical storms. Diversity, both at the ecosystem, and at the inter- and intra-specific levels, is under pressure as the population in the region increases. In addition, due to the lack of adequate financial resources, some of the important ex-situ collections in the sub-region, for example, the Cacao collection at UWI, Trinidad, are also threatened.

11. In many countries the lack of scientific capacity, insufficient professional capability and inadequate or missing infrastructure, facilities and operational funds are hampering genetic resources conservation and utilization.

12. In the subregion, only Cuba has a functioning integrated National Plant Genetic Resources System supported by legal instruments. It is also the only country that is conducting a deliberate training programme for specialization of its professionals, at the graduate and postgraduate levels (BSc, MSc, and PhD). Its National Plant Genetic Resource System (SNRF) involves 18 research institutions, two botanical gardens, five ministries, one service agency and one NGO. The latter is the National Small Farmers Association. The Ministries comprise those responsible for: i) Science, Technology and Environment; ii) Agriculture; iii) Sugar; iv) Higher Education; and v) Public Health. The System aims to: guarantee development of activities in prospection, conservation, reproduction, evaluation, documentation and



utilization of all genetic resources comprising both cultivated and wild plants. It operates through a National Expert Group on Plant Genetic Resources (GNRF), that serves as Advisory Council to the Ministry of Science, Technology and Environment (CITMA). The main responsibilities of the SNRF are to:

- Propose policies for developing the technical, material and structural basis for utilization and conservation of plant genetic resources.
- Evaluate, recommend and coordinate prospection activities.
- Advise on annual priorities regarding introduction of germplasm of cultivated crops and their related wild species.
- Secure adequate conservation of plant germplasm, *in situ* and *ex situ*.
- Support linkages and partnerships with other national or international organizations.
- Assess and propose national policy on legal aspects of international germplasm exchange.
- Facilitate professional training.
- Promote the undertaking of research aimed at PGR development.

13. The activities of the SNRF are financed by Government and donors. Each institution of the GNRF funds its own activities. The System is guided by the Convention on Biological Diversity.

14. In the other countries, individual institutions have conducted *ad hoc* activities in PGR, without actually establishing formal National Programmes or formulating official policies and legislation to normalize these activities. In some countries, the Plant Quarantine Act is the sole legal instrument closely related to PGR conservation and utilization.(Annex 6).

b. Subregional Programmes, Networks and International Collaboration

15. In the sub-region, the Caribbean Committee on Management of Plant Genetic Resources is the only network, albeit informal, which deals directly with plant genetic resources *per se*. On the other hand, individual countries in the Caribbean have been participating at different levels of intensity and commitment in some crop networks (Annex 7), such as the WINBAN Network which promotes the interests of the West Indies Banana Group and *ad-hoc* international collaborative activities related to PGR issues (Annex 8). Their actual impact on plant genetic resource management in the sub-region is however constrained by insufficient institutionalization of supportive



policies, legislation and programmes at the national level. There is also a lack of political, legal and technical agreements at the sub-regional level, which are specifically aimed at strengthening the conservation and utilization of plant genetic resources for food and agriculture.

16. The sub-region benefits from programmes carried out by sub-regional and regional organizations. For example, CARDI and UWI, which are institutions of regional scope under the CARICOM Secretariat, carry out different, PGR-related sub-regional activities which are decentralized as much as possible. Some CARICOM member countries maintain their own agricultural research infrastructure alongside the local CARDI Unit. Others simply relinquish the research function to CARDI while retaining rural extension responsibilities. Neither UWI nor CARDI engage in forest research. They both suffer from lack of funding and have insufficient trained professionals to undertake the tasks required of them.

17. Most Caribbean countries, primarily, but not exclusively, through CARDI have had access to other regional and international organizations which provide relevant PGR-related support, such as IICA, INRA, CIAT, CIMMYT, CIP, IRRI, ICRISAT, IITA, IPGRI and many universities mainly from the United States..

18. FAO carries out some important, PGR-related sub-regional/regional activities through projects, such as Project GCP/RLA/108/ITA "Improved Seed Production: CARICOM Countries". This project aims at (i) creating awareness in the area of seed technology through regional and national training; (ii) establishing a systematic regional information network on germplasm availability and description through the Caribbean Seed and Germplasm Resources Information Network (CSEGRIN); and (iii) preparing a regional seed quality standard for the CARICOM countries, namely Antigua & Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, St. Kitts & Nevis, St. Lucia, St. Vincent & the Grenadines, Montserrat, Surinam and Trinidad & Tobago. Other FAO projects of national scope are also important, such as the TCP/CUB/2354/A, which aims at strengthening soybean seed production in Cuba, and TCP/CUB/2359/A, which aims at establishing *in vitro* conservation of germplasm of vegetables and root and tuber crops in Cuba.

19. There are some sub-regional mechanisms for cooperation under institutional consideration, such as the Caribbean Committee on Management of Plant Genetic Resources which has been under formulation by the Inter American Institute for Cooperation on Agriculture (IICA). In the last five years, IICA has been a major institutional protagonist and a reliable partner of other sub-regional, regional and international organizations in the effort to create PGR networks throughout LA&C.



20. Although international collaborations are on-going in the Caribbean, these activities need to be improved. However, without institutionalized national PGR programmes or systems as well as sub-regional and regional PGR networks, such efforts might not deliver all their potential benefits.

c. Conservation Activities

21. Few countries in the region have well established plant genetic resource conservation activities. Most conservation is carried out through small field collections, botanical gardens and forest reserves or parks. Documentation is dispersed, when not completely lacking. The concept of *in situ* conservation is often misused by referring broadly to planting in the field germplasm from local or external origin. Insufficient emphasis is generally placed on preserving native cultivated and wild species, and the specific purpose of conservation is often not clear.

22. The exception in the region is Cuba which has a long tradition of conservation of PGR, and since the late 1970s has adopted a national approach to conservation and utilization. There are various national initiatives and institutional projects aiming exclusively at these activities, some of which are supported by international organizations such as FAO and IPGRI. Both *in-situ* and *ex situ* conservation of PGR includes crop and forest genetic resources. In the latter case, Cuba plans to create a national genebank for forest genetic resources, but further investment is needed for acquiring the material and equipment necessary as well as for training the personnel required for its operation and maintenance.

23. *In situ* conservation in Cuba is carried out through (i) the National Network for Protected Areas (there are 58 of these areas), which is intended to promote conservation at the level of ecosystems, and (ii) on-farm practices, which involves the participation of small private farmers who are willing to conserve their traditional varieties of crops and medicinal plants. *In situ* conservation activities in most of the other countries in the sub-region are carried out through systems of national parks/protected areas which are generally administered by the relevant Forestry Departments. *In situ* conservation programmes aimed specifically at PGRFA have not been developed.

24. *Ex situ* conservation collections in Cuba include (i) active field genebanks, (ii) traditional seed genebanks, (iii) *in-vitro* collections, and (iv) cryopreservation. Cuba maintains about 18,688 accessions in its *ex situ* genebanks spread in the various specialized agricultural research institutions. In general, PGR collections in Cuba hold indigenous PGR or genetic material



from species which have acquired important genetic variability in the country. There is however, also a large amount of introduced germplasm. With the exception of the sugarcane, citrus and tobacco collections, all existing germplasm collections are duplicated in other parts of the country. Besides the use of genebanks, Cuba has a National Network of Botanical Gardens for conservation of PGR. An important characteristic of Cuba's approach to conservation of PGR is that it is aimed at supporting utilization primarily by national breeders. Additionally, the country has exchanged germplasm with other countries all over the world.

25. *Ex situ* conservation activities in the other countries in the sub-region are limited in scope and are based mainly on field genebanks. A number of important collections do however exist, e.g. the Cacao collection in Trinidad & Tobago and the sugar cane collection of the West Indies Central Sugar Cane Breeding Station (WICSCBS) in Barbados. *In vitro* laboratories exist in a number of countries and are used for conservation purposes in Barbados and Trinidad & Tobago, and to a limited extent in St. Lucia and Dominica. Seed storage facilities are presently available in Antigua & Barbuda, Barbados, Dominican Republic, and Trinidad & Tobago, but these are suitable only for short-term storage. A number of countries in the sub-region also have Botanical Gardens, and that of St. Vincent & the Grenadines is the oldest in the Western Hemisphere.

d. Uses of Plant Genetic Resources in the Subregion

26. With few exceptions, the utilization of PGR for food and agriculture in the Caribbean is in an even more precarious position than that of conservation. Most countries, except for Cuba, do not have structured, national breeding programmes. Although a few countries hold some tradition in agricultural research in general, none has a strong capacity for plant breeding, crop improvement or seed production.

27. CARDI is still the major force in agricultural research in general and in plant breeding in particular, except in Cuba and the Dominican Republic. As CARDI was created to support Caribbean countries in such agricultural research and development, most Governments in the region prefer to rely almost totally on CARDI's work for improving their countries' agricultural sector than to invest in developing a minimum national capability. The Caribbean countries themselves must establish a minimum national capacity in order to improve their capability in plant genetic resource conservation and use.

28. Except for Cuba, the few relatively strong breeding programmes in the region are based in regional [CARDI, UWI, WICSCBS] and international



[CGIAR Centres, FAO, ORSTOM, CIRAD] institutions. Only a few Ministries of Agriculture (MOAs) support national breeding activities. Moreover, some countries prefer, or have no other option but to import improved or finished materials, such as St. Lucia, St Vincent & Grenadines, St Kitts & Nevis and Haiti. Another major feature of utilization of PGR in the Caribbean is the fact that the overwhelming majority of breeding activities focus primarily on export-oriented crops; banana and sugarcane accounting for the bulk of the effort, followed by coffee, cocoa and citrus. These activities have generally been supported financially by the private sector through the relevant commodity groups. Efforts aimed at national food security however, do not attract such private sector support and will therefore need financial support from other sources

29. In most Caribbean countries both PGR conservation and utilization (i) do not receive significant national political and financial support, (ii) are not articulated in a comprehensive national programme or system, (iii) are not guided by national policy and legal frameworks, (iv) are not backed up by a national institutional framework for their implementation, and (v) are not carried out by a significant number of national professionals specialized in PGR-related conservation and utilization disciplines and activities. Unfortunately, the most striking feature of PGR conservation and utilization in the Caribbean is that both aspects are still in an incipient stage of development *vis a vis* other sub-regions in LA&C. In Cuba, however, the number of well trained professionals makes it the most prepared in the sub-region and among the best in the whole LA&C for tackling PGR conservation and utilization. Additionally, Cuba has a sound biotechnology programme, with a set of various techniques and methods which draw from a very broad array of disciplines from several fields, including PGR conservation and utilization.

III. IDENTIFICATION OF NEEDS, OPPORTUNITIES AND CONSTRAINTS

30. In general terms, with the exception of Cuba, the conservation and utilization of plant genetic resources for food and agriculture has yet to become a concrete, national priority in Caribbean countries. However, the preparatory process for the Leipzig Conference is contributing to strengthening an already growing consciousness of the importance of these activities. In this context, the Global Plan of Action may be the most important instrument to promote actions which will (i) assess the "state of diversity" in the sub-region, (ii) promote sub-regional access to the "state of



art", and (iii) strengthen the "state of capacity" at the national and sub-regional levels. Furthermore, it is clear that all other elements of the FAO Global System on PGR also hold the potential for supporting this sub-region to improve its overall performance in the conservation and sustainable utilization of PGRFA.

31. **Major Needs.** The sub-region as a whole needs support in most PGR-related dimensions. The most pressing needs include :

- National PGR programme/system for all countries [except Cuba].
- PGR policy, legal and institutional framework for all countries [except Cuba].
- Trained professionals in PGR-related disciplines and activities [except Cuba, which identifies the need for training professionals mainly for *in situ* conservation and for education activities focusing on *in situ* conservation of PGR].
- National priority for agricultural diversification with a focus on fruit, tuber and root crops, especially those which are not emphasized by the private sector at present.
- Networking at the sub-regional, regional and international levels.
- National PGR information system for all countries [except Cuba].
- Access to sub-regional, regional and international PGR information systems.
- Funding.
- Inventory of native PGR for all countries [except Cuba, which only needs to expand the existing effort in this field].
- Sub-regional, regional and international cooperation in PGR-related matters.
- Institution building for most countries [the major exception being Cuba, where the major needs are for expansion and modernization of existing infrastructure].
- Development of a sub-regional capability to hold base collections of germplasm.
- Public awareness campaigns highlighting the importance of PGR, including forest genetic resources at the national and sub-regional levels .
- Further integration between the formal and informal sectors related to agriculture in general and with PGR in particular.



- Development of the Sub-regional capacity in agricultural biotechnology.
- Reliable energy supply to assure the functioning of genebanks.

a. Opportunities and Comparative Advantages

32. The sub-region is rich in indigenous plant genetic resources on and around its territories. This endowment offers an enormous potential opportunity for the sustainable socioeconomic development of the countries in the sub-region.

33. Agriculture is still a major economic sector in most of the countries, although in relative terms its contribution to GDP is declining in some. This is due mainly to the expansion of other sectors, especially tourism, industry and services. However, the strengthening of forward and backward linkages between these sectors and agricultural production could promote overall socioeconomic development, including increased employment opportunities and foreign exchange savings. Furthermore, agricultural exports from the subregion have historically been dominated by a few raw commodities, mainly banana, sugar cane, and tropical fruits. There is ample room to expand the range of species utilized, to include spices, condiments, rare fruits, medicinal herbs, and materials for handicraft. Also, the selection of crops for production in currently under exploited areas would push back the agricultural frontier in many countries. This applies especially to dry and hilly ecosystems. Through modern breeding methods, productivity of both the traditional and new crops could be increased dramatically, boosting economic attractiveness and market competitiveness of agriculture and forestry. Furthermore, transformation of fresh agricultural produce into convenience products, through processing would extend market opportunities and increase income from farming.

34. But the greatest potential for the economic development of plant genetic resources lies in their use for producing non-traditional agricultural commodities. Application of biotechnology could result in developing not only improved varieties of agricultural and silvicultural crops but also new processes and products which would surpass in economic value and profit those obtained directly from agriculture and forestry.



35. Some other opportunities in the sub-region are:

- Agriculture in most Caribbean countries is based on a few introduced crops, grown specifically for the export market. The sub-region is therefore dependent on access to foreign PGR and on international cooperation in exchange of germplasm. It is therefore important that the countries of the sub-region make every effort to facilitate access to PGR relevant to the agricultural sector.
- CARDI and UWI already have a regional scope and mandate to carry out their present, and undertake new, PGR-related activities.
- Most Caribbean countries are giving priority to agricultural diversification, which requires concrete investments also in PGR-related activities.
- IICA is working, along with other regional and international institutions, on the creation of a sub-regional PGR network for the Caribbean.
- Many Caribbean countries are interested in agricultural biotechnology, and some already have tissue culture laboratories.
- Cuba is willing to offer its institutional capability and training capacity to support national and sub-regional PGR-related initiatives in the Caribbean.
- The Caribbean already has some crop networks which could support PGR-related initiatives.
- The Caribbean already has political networks which could support PGR-related policy initiatives.
- CATIE has offered the Caribbean the possibility of using its facilities for storing germplasm and of using its PGR-related training capacity.

36. Major Constraints.

- Agriculture has been declining in the Caribbean since early in the 1980s, as a result of the growing tourism industry. Today, tourism already contributes more to the GNP than agriculture in many Caribbean countries.
- Many policy makers in the Caribbean do not, at present, support greater investment in agricultural research in general or in PGR-related activities in particular.
- Most Caribbean countries do not have, and have never had, programmes in agricultural research or in PGR-related activities.



- Financial resources are scarce throughout most of the sub-region, especially, and ironically, in those countries where agriculture is one of the [or the] most important economic activities.
- There is a lack of information and trained professionals to assist Governments in the Caribbean in the development of relevant national policies and legal and institutional frameworks for the implementation of programmes for PGRFA conservation and utilization.

37. **Priorities/Proposals.** Most Caribbean countries need support for establishing PGR-related activities in the various aspects of conservation and utilization. However, drawing upon country reports and other sources, it is possible to identify a few relevant priorities for the sub-region. These are as follows:

- A *Public Awareness campaign* in the Caribbean regarding the socio-economic relevance of PGR; focusing on different key actors, especially policy makers.
- Publication of *guidelines* for countries willing to establish a national PGR programme/system, including the conceptual and operational bases for it.
- Publication of *guidelines* for countries willing to establish their policy, legal and institutional frameworks in an integrated manner.
- Development of *sub-regional workshops* on the FAO Global System and its elements, in order to inform and educate agriculture-related scientists, managers and policy makers regarding the links between the system elements and national and sub-regional PGR-related initiatives.
- Development of *sub-regional workshops* on the linkages between *in situ* and *ex situ* conservation and between conservation and utilization of PGR.
- Development of *sub-regional workshops* on participatory breeding.
- Development of *sub-regional workshops* on critical PGR-related issues in order to create expertise in most countries, primarily [but not exclusively] on the legal and policy dimensions of PGR.
- Extension of the Caribbean Seed and Germplasm Resources Information Network (*CSEGRIN*) to all countries in the Caribbean.
- Creation of a *sub-regional PGR network* based institutionally in CARDI, which should liaison with IICA in order to interact with other PGR networks in the Americas and improve international collaboration in general.



- Creation of a *sub-regional PGR training and education network* based on the strengths of CARDI, UWI, CATIE and Cuba.
- *Strengthening of existing sub-regional and regional PGR-related institutions*, primarily [but not exclusively] CARDI, UWI and CATIE.
- Creation of a *sub-regional project* for strengthening *agricultural biotechnology* capacity in the Caribbean.
- Support for *capacity building* through the creation of two *base collections* of germplasm to serve the sub-region.
- Creation of a *sub-regional project* to collect the *PGR for staple food crops* which are declining or disappearing in the Caribbean.
- Creation of a sub-regional fund to support the conservation and sustainable utilization of PGR, including forest genetic resources.



APPENDIX 1. POPULATION AND OCCUPATION IN CARIBBEAN AGRICULTURE AND FORESTRY

Country	Population		Occupation	
	TOTAL	Annual growth rate (%)	Agriculture (%)	Forestry (%)
1. Antigua & Barbuda	66 000	N/A	N/A	N/A
2. Bahamas	264 000	1.9	12.0	N/A
3. Barbados	258 800	0.3	13.0	N/A
4. Cuba	11 000 000	N/A	25.0	N/A
5. Dominica	71 794	N/A	N/A	N/A
6. Dominican Republic	7 459 000		39.0	N/A
7. Grenada	92 000		30.0	N/A
8. Haiti	6 445 000	1.6 (2,0)	75.0	N/A
9. Jamaica	2 460 500	1,1	21.0	N/A
10. Saint Kitts & Nevis	46 000	1.3	N/A	N/A
11. Saint Lucia	140 000	1.5	25.0	N/A
12. St. Vincent & The Grenadines	109 000	N/A	39.0	N/A
13. Trinidad & Tobago	1 265 000	1.3	10.0	N/A
TOTAL	29 677 094			



APPENDIX 2. AGRICULTURE AND FORESTRY LAND USE IN THE CARIBBEAN

Island	Area (ha)		
	Total	Agriculture	Forestry
1. Antigua & barbuda	28 000	N/a	N/a
2. Bahamas	1 300 000	95 000	146 000
3. Barbados	92 400	N/a	N/a
4. Cuba	11 066 000	6 674 900	2 581 700
5. Dominica	75 000	N/a	52 000
6. Dominican republic	4 873 000	N/a	N/a
7. Grenada	31 000	N/a	N/a
8. Haiti	2 775 000	N/a	N/a
9. Jamaica	1 142 4000	N/a	N/a
10. Saint kitts & nevis	26 900	N/a	N/a
11. Saint lucia	61 600	12 000	21 692
12. Saint vincent & the grenadines	38 900	N/a	N/a
13. Trinidad & tobago	512 700	N/a	N/a



APPENDIX 3. ECONOMIC AGRICULTURE AND FOREST PRODUCE FROM THE CARIBBEAN

Economic Level		Source and market		
	Agriculture	Forestry		
	Export	Domestic	Export	Domestic
Major	Bananas Cane Sugar Coffee Tobacco Ornamental plants Coconuts Cocoa Avocados Mangoes Nutmeg Arrowroot Cotton	Citrus Vegetables Bananas Plantain Drybeans Pigeon peas Cassava Rice Yam Sweet potato Edible aroids Potato Fruit tree crops Maize (corn)	N/A	Charcoal Ornamental plants
Minor	Hot peppers Plantain Yam Sweet potato Dasheen Ornamental plants Cutflowers Breadfruits Pineapple	Medicinal plants	Ornamental plants	



APPENDIX 4. PARTIAL LIST OF IDENTIFIED INDIGENOUS PLANTS IN THE CARIBBEAN SUBREGION

Family	Species
-	<i>Pinus caribaea</i> var <i>bahamensis</i>
<i>Magnoliaceae</i>	<i>Talauma dodecaptala</i>
<i>Lauranceae</i>	<i>Ocotea leucoxylon floribunda</i>
<i>Sterculiaceae</i>	<i>Sterculia caribaea</i>
<i>Malpighiaceae</i>	<i>Brysonima martinicensis</i>
<i>Euphorbiaceae</i>	<i>Hieronyma caribaea</i> <i>Sapium caribaeum</i>
<i>Rosaceae</i>	<i>Xanthoxylum martinicense</i>
<i>Mimosaceae</i>	<i>Pithecellobium jupunda</i>
<i>Papilionaceae</i>	<i>Andira inermis</i>
	<i>Ormosia monosperma</i>
<i>Simarubaceae</i>	<i>Simaruba amara</i>
<i>Burseraceae</i>	<i>Dacryodes excelsa</i>
	<i>Protium attenuatum</i>
<i>Sapotaceae</i>	<i>Manilkara bidentata</i>
	<i>Oxythece pallida</i>
<i>Rubiaceae</i>	<i>Chimarrhis cymosa</i>
<i>Bignoniaceae</i>	<i>Tabebuia pallida</i>
	<i>Crescentia cujete</i>
<i>Palmae</i>	<i>Euterpe globosa</i>
	<i>Aiphanes luciana</i>
	<i>Coccthrianas barbadensis</i>
<i>Faboideae</i>	<i>Ormosia monosperma</i>
<i>Thymeleaceae</i>	<i>Daphnopsis macrocarpa</i>
<i>Passifloraceae</i>	<i>Passiflora</i> sp.
<i>Cyatheaceae</i>	<i>Cyathea arborea</i>
<i>Leguminosae</i>	<i>Haematoxylon campechianum</i>
<i>Myrtaceae</i>	<i>Pimenta racemosa</i>
<i>Fabaceae</i>	<i>Gliricidia sepium</i>
<i>Anarcadiaceae</i>	<i>Spondias mombin</i>
<i>Moraceae</i>	<i>Ficus Aurea</i>



APPENDIX 5. CROPS WITH WILD RELATIVES AND LAND RACES FOUND IN THE CARIBBEAN SUBREGION

Common name	Species	Common name	Species
Sweet potatoes	<i>Ipomoea batatas</i>	Bananas	<i>Musa</i> spp.
Yams	<i>Dioscorea</i> spp.	Citrus	
Cassava	<i>Manihot esculenta</i>	Grapes	<i>Vitis</i> spp.
Dasheen	<i>Colocasia esculenta</i> var. <i>esculenta</i>	Passion fruit	<i>Passiflora</i> spp.
Tannia	<i>Xanthosoma</i>	Papaya	<i>Carica papaya</i> L
Jabba	<i>sagittifolium</i>	Pineapples	<i>Ananas comosus</i>
Eddoe	<i>Xanthosoma</i> spp. <i>Colocasia esculenta</i> var. <i>antiquorum</i>	Peppers	<i>Capsicum</i> spp.
Potatoes	<i>Solanum</i> spp.	Okra	<i>Hibiscus esculentus</i>
Maize	<i>Zea mays</i> L	Cotton	<i>Gossypium barbadensis</i>
Sorghum	<i>Sorghum</i> spp.	Tobaco	<i>Nicotiana</i> spp.
Rice	<i>Oryza perennis</i>	Ginger	<i>Zingiber officinale</i>
Pigeon pea	<i>Cajanus cajan</i>	Coffee	<i>Coffea arabica</i>
Beans	<i>Phaseolus</i> spp.	Nutmeg	<i>Myristica fragrans</i>
Sesame	<i>Sesamum</i> spp.	Coconuts	<i>Cocos nucifera</i>
Beans	<i>Phasertus</i> spp.	Cocoa	<i>Theobroma cacao</i>
Vigna	<i>Vigna</i> spp.		<i>Prunus</i> spp.
Tunas	<i>Opuntia</i> spp.		<i>Rubus</i> spp.
Icacos	<i>Chrisobalanus icaco</i>		<i>Anona</i> spp.
Amaranthus	<i>Amaranthus</i> spp.		<i>Cucurbitaceae</i> spp.
Pennisetum	<i>Pennisetum</i> spp.		<i>Lycopersicon</i> spp.
Eleusine	<i>Eleusine</i> spp.		
Agave	<i>Agave</i> spp.		



APPENDIX 6. MAJOR INDICATORS OF PGR NATIONAL PROGRAMMES IN THE CARIBBEAN

INDICATOR	Countries ¹												
	AAB	BAH	BAR	CUB	DOM	DRP	GRE	HAI	JAM	SKN	SLU	SVG	T&T
National strategic plan (5-8 years)	N/A	No	N/A	Yes	No	N/A	N/A	No	No	No	NO	N/A	N/A
Decision-making Body ²	DOA	DOA	DOA	CITMA	DOA	SEA	DOA	MARNDR	MOA	DOA	DOA	DOA	MOA
Advisory Body	No	No	No	Yes	No	No	No	No	No	No	No	No	No
Sustainable funding (for 5 years)	No	No	No	No	No	No	No	No	No	No	No	No	No
Linkages: P=Private U=University	N/A	N/A	N/A	U	N/A	N/A	N/A	N/A	N/A	N/A	P/U	N/A	N/A
Seed Law	No	No	No	Yes	No	No	No	No	Being drafted	No	No	No	No
Quarantine Regulation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Forest Law	N/A	Yes	N/A	Yes	Yes	N/A	N/A	N/A	Yes	Yes	Yes	N/A	N/A
Policy on access & exchange of PGR	N/A	N/A	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Legal/inst'it. status of national programme	No	No	No	Yes	No	No	No	No	No	No	No	No	No
Environment Protection Law	N/A	N/A	N/A	Yes	Being drafted	N/A	N/A	N/A	Yes	Yes	N/A	N/A	N/A
CBD Ratified	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	No
CPGR Member	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Adhered to Int'l Undertaking on PGR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes

¹ AAB = Antigua & Barbuda, BAH = Bahamas, BAR = Barbados, CUB = Cuba, DOM = Dominica, DRP = Dominican Republic, GRE = Grenada, HAI = Haiti, JAM = Jamaica, SKN = St. Kitts & Nevis, SLU = St. Lucia, SVG = St. Vincent & Grenadines, T&T = Trinidad & Tobago.

² = Referred to institutional base of Focal Points (See List of Acronyms for acronyms)

N/A = not available



APPENDIX 7. PGR RELATED NETWORKS INVOLVING CARIBBEAN COUNTRIES

Network	Main focus
1. Inter-American Citrus Network (RIAC)	Germplasm management
2. Network of Technical Cooperation in Plant Biotechnology (REDBIO)	Information exchange on plant tissue culture.
3. Regional Bean Programme (PROFRIJOL)	Germplasm evaluation
4. Regional Maize Programme (PRM)	Germplasm evaluation
5. Regional Potato Cooperative Programme (PRECODEPA)	Germplasm evaluation
6. Group of Cane Sugar Producing Countries of Latin America and the Caribbean (GEPLACEA)	Germplasm exchange
7. WINBAN Network	Promotes interests of West Indies Banana Group



APPENDIX 8. INTERNATIONAL COLLABORATION ON PGR IN THE CARIBBEAN

Main pgr management areas	Type of collaboration by	
	Main sources of support to countries	
	Technical	Financial
1. Conservation	CARDI, UWI, IPGRI	IPGRI, CIDA, EDF, FAO
2. Seed production and handling	FAO	FAO
3. Tissue culture	OAS	OAS
4. Germplasm technological utilization	FMC, ATM, CIRAD, INRA	FMC
5. Introduction, evaluation and exchange of germplasm	CARDI, UWI, INRA, CIRAD, ADCU	ADCU, FMC
6. Information exchange	CARDI, CIAT, ICRISAT, IITA, FHIA, UOF, UOR, UOG, IICA, IRRI, CIMMYT, CIP	
7. Forestry development	FAO	
8. Training	UWI, CARDI, IPGRI, INRA, CIRAD	
9. Multiplication of germplasm	CARDI, INRA, CIRAD	GTZ
10. Policy setting and programming	ICA, IPGRI, CATIE, CARDI, INRA, CIRAD, UWI, FAO, USDA/TARS	
11. Infrastructure	OAS, FAO	FAO, OAS



ABBREVIATIONS

ADCU	Agricultural Diversification Coordination Unit
ATM	Agricultural Technical Mission of the Republic of China (Taiwan)
AVRDC	Asian Vegetable Research and Development Centre
CARDI	Caribbean Agricultural Research and Development Institute
CARICOM	Caribbean Community
CATIE	Tropical Agriculture Research and Training Centre
CIAT	International Center for Tropical Agriculture
CIDA	Canadian International Development Agency
CIMMYT	International Maize and Wheat Improvement Center
CIP	International Potato Center
CIRAD	Center of International Cooperation on Agricultural Research for Development
CITMA	Ministry of Science, Technology and Environment
CMPGR	Caribbean Committee on Management of Plant Genetic Resources
CRU	Cacao Research Unit
CSEGRIN	Caribbean Seed and Genetic Resource Information Network
DEC	Decree
DOA	Department of Agriculture
EDF	European Development Fund
FAO	Food and Agriculture Organization of the United Nations



FHIA	Honduran Agricultural Research Foundation
FMC	French Mission for Cooperation
GTZ	German Agency for Technical Cooperation
ICRISAT	International Crop Research Institute for the Semi Arid Tropics
IICA	Inter-American Institute for Cooperation on Agriculture
IITA	International Institute of Tropical Agriculture
INRA	National Agronomic Research Institute
IPGRI	International Plant Genetics Resources Institute
IRRI	International Rice Research institute
MARNDR	Ministry of Agriculture, Natural Resources and Rural Development
MOA	Ministry of Agriculture
OAS	Organization of American States
PGR	Plant Genetic Resources
RES	Resolution
SCMA	Standing Committee of Ministers Responsible for Agriculture
SEA	Secretaria de Estado de Agricultura (Ministry of Agriculture)
TARS	Tropical Agricultural Research Station
TCP	Technical Cooperation Project
UOF	University of Florida
UOG	University of Guyana
UOR	University of Reading
USDA	United States Department of Agriculture



UWI University of the West Indies

WINBAN Windward Islands Banana Growers Association