

COUNTRY REPORT ON THE STATE OF PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

SAINT VINCENT AND THE GRENADINES



**SECOND COUNTRY REPORT
ON THE
STATE OF PLANT GENETIC
RESOURCES
IN
ST VINCENT AND THE
GRENADINES**

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Note by FAO

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LIST OF ACRONYMS

ACP	African, Caribbean and Pacific
AVRDC	Asian Vegetable Research and Development Center
CAPGERNet	Caribbean Plant Genetic Resources Network -
CARDI	Caribbean Agricultural Research and Development Institute
CATIE	Centro Agronómico Tropical de Investigación y Enseñanza
CIAT	International Center for Tropical Agriculture
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo
CIP	Centro Internacional de la Papa
CIRAD	Centre International de Reseaux Agriculture et Development
EMBRAPA	Empresa Brasileira de Assistencia Tecnica e Extensao Rural
EU	European Union
FAO	Food and Agriculture Organization
FORAGRO	Foro Regional de Investigación y Desarrollo Tecnológico Agropecuario para America Latina y el Caribe
GCDT	Global Crop Diversity Trust
GDP	Gross Domestic Product
IAEA	International Atomic Energy Association-
IDIAF	Instituto Dominicano de Investigaciones Agropecuarias y Forestales
IICA	Instituto Interamericano de Cooperación para la Agricultura-
IITA	International Institute for Tropical Agriculture
IMU	Irrigation Management Unit
INIBAP	International Network for Improvement of Banana and Plantain
INIFAT	Instituto de Investigacion Fundamentales en Agricultura Tropicales
INIFAT	Instituto Nacional de Investigacion Fundamental en Agricultura Tropical
INIVIT	Instituto Nacional de Investigaciones de Viandas Tropicales
INRA	Institute National de la Recherche Agronomique
MAFF	Ministry of Agriculture, Forestry and Fisheries
MUSALAC	Musa Network for Latin America and the Caribbean
NORGEN	Plant Genetic Resources Network for North America
PROCICARIBE	Caribbean Agricultural Science and Technology Networking System
PROCISUR	Cooperative Research Program for the Technological Development of the Agro- food and Agro-industry in the Southern Cone
REDARFIT	The Andean Network on Plant Genetic Resources
REMERFI	Red Mesoamerica de Recursos Fitogeneticos
TM	The Taiwan Mission
TROPIGEN	The Amazonian Network on Plant Genetic Resources
WIBDECO	Windward Island Banana Exporting Company Limited
WTO	World Trade Organization



EXECUTIVE SUMMARY

Main findings of the analyses:

- **The total population** was 100 746 (Government Population Census of 2000).
- **The farming population** is aging, 79% being older than 35 years.
- **The climate** is ideal for tropical agricultural production and tourism. The average monthly temperatures range from 25 - 27°C. The rainfall pattern represents a marked wet (May – December) and a dry (January to April) season. The annual average rainfall is 231 cm (91 in).
- In 2004, the total **agricultural exports** were valued at US\$37 million whilst the food import bill was US\$225 million.
- The **banana industry** that was the mainstay of the agricultural sector and the rural economy for the past four decades, has fallen into a sharp decline since the preferential European market was brought to a halt in accordance with WTO regulations. The dominance of banana (for uncooked fruit) is being replaced by root crops (dasheen, tannia, eddo, yam, cassava and sweet potato) and plantain (*Musa spp* for cooking). These species, along with imported flours and rice, represent the major staple food of the populace.
- **The traditional arrowroot** (*Maranta arundinacea* L.) **industry** showed wide swings resulting in a decrease of acreage and output of starch for export.
- The majority of **the farm holdings**, 65%, is 0.2 - 2 ha in area.
- **Private ownership** covers 73% of the farm area whilst about 22% is rented.
- The **major crops for food security** number about 40. A wide genetic base supported the production of cassava (*Manihot esculenta* Crantz) and sweet potato (*Ipomoea batatas*(L.)Lam.), with 30 and 27 varieties, respectively. The aroids [(*Araceae* family – dasheen (*Colocasia esculenta* Schott), eddo (*Colocasia esculenta* Schott.var. *antiquorum*) and tannia (*Xanthosoma saggitataefolium* (L.) Schott.)] and yams (*Dioscorea spp*) stands on narrower genetic bases which are in need of strengthening. The extreme case is the arrowroot where production is based only on two varieties.
- **The perennial tree crops and major fruits** fall roughly into two groups: those species that originated in tropical Americas and those introduced. The obvious pattern is a narrower genetic base for the introductions (mango, coconut, breadfruit, citrus and ...) and a very wide diversity in the genetic base of the endemics (papaya, pineapple, passion fruit, avocado, annonas, soursop, sapodilla, star apple, carambola, bilimbi etc).
- There is a group of **under-utilised fruits**, medicinal plants, herbs, spices and condiments that has the potential of developing into important industries (bitter aloe – *Aloe vera* L., bois bandé – *Richeria grandis*, christophine – *Sechium edule*, wild yam – *Dioscorea spp*, seagrape – *Coccoloba uvifera* L., fat pork – *Chrysobalanus icaco* L., dunks – *Ziziphus mauritiana* Lam., pomeac – *Syzygium malaccense* Gaertn., guava – *Psidium guajava* etc)
- Over the past ten years no action has been taken on **inventorying and surveys** of plant genetic resources *in situ* as represented by wild plants for food and agriculture (medicinal herbs, wild fruits, forage grasses, forage legumes etc).
- Small **working germplasm collections** *ex situ* are managed on-farms of three institutions (the MAFF, CARDI and the TM) within their crop development programmes. These collections are maintained *in vivo*, as true seeds and *in vitro*.
- There is no comprehensive national programme to support **on-farm ex situ management of PGRFA**
- **Conservation of PGRFA in situ:** The under-utilised species in the wilds representing plant genetic resources for food and agriculture were protected and conserved as an indirect benefit from the Forest Conservation Act, No. 47 of 1992 and the National Parks Act of 2002. Currently there are one national park and nine forest reserves.
- Activities for the **utilization of PGRFA** were contained within crop development programmes; clean, vegetatively propagated, planting material from improved varieties of root crops (sweet potato, yams and aroids), citrus, mango, banana and plantain and pineapple, was multiplied and distributed to farmers on a regular basis.
- **Awareness programmes** for PGRFA have been implemented in the form of “eat local” and “buy local” campaigns.

- The **international agreements** which were being reviewed for implementation were the Cartagena Protocol on Biosafety, the Convention on Biological Diversity, the International Convention for the Protection of New Varieties of Plants and the International Plant Protection Convention.
- **Access to PGRFA from regional and international sources** was through *ad hoc* bilateral arrangements, regional organizations such as CARDI/CAPGERNet, the TM and the OECS. CARICOM and the FAO also facilitated this process.

Overview of key issues and challenges

The most important bottleneck to the development of the agricultural sector, and hence to the overall management of PGRFA, is the low level of industrialisation. The processing of agricultural commodities is in its infancy and most of the production is sold (locally or exported) as raw material with low prices and short shelf life. This situation is the direct result of low volumes of production, variable quantities and quality from small holdings located on steep hillsides where large scale mechanized farming is well-nigh impossible. The solution lies in developing the technologies (crops and production systems), finding the niche markets for tropical products and establishing the processing facilities to deliver products with high consumer appeal, high prices and long shelf life.

The existing crop production systems are also plagued with the following challenges:

- Praedial larceny
- Unavailability and high costs of qualified and skilled personnel
- Poor infrastructure (few processing factories, inadequate irrigation systems, too few feeder roads and weak marketing systems)
- Lack of significant investments into the agricultural sector (little credit and no crop insurance)
- Many pests and diseases and the high costs of inputs to manage them

Existing capacities and the needs to address the issues and challenges

The existing capacities are too weak in human resources and infrastructure.

The needs to address the above challenges are as follows:

- More efficient legal system
- A vibrant marketing system
- More developed infrastructure to support field and factory production
- Larger investments into the industrialisation of the agricultural sector
- Stronger Research and Development input by national, regional and international organizations to design appropriate, cutting-edge technologies

Proposed strategic directions

The main thrust by the government policies is to “diversify around banana” and increase production and exports of root crops, fruits and vegetables. The goals of PGRFA management within the crop development programmes, are to meet the challenges of life style diseases (obesity, diabetes, high blood pressure and certain types of cancer), of climate change and the changing tastes of the populace for home grown foods, herbs, spices and herbal medicines.

Special efforts are invested into processing and exporting local products from hot pepper (*Capsicum chinense* Jacq.), cassava and herbs.

The agro-tourism linkage: The marketing of fresh agricultural produce to the tourism industry is a linkage that promises an expanded market located right in the hotels on the islands.



INTRODUCTION TO SAINT VINCENT AND THE GRENADINES AND ITS AGRICULTURAL SECTOR

St Vincent and the Grenadines located at Latitude/Longitude 13° 16" N/61° 23" W., are some 32 islands and cays stretching south (about 48 miles) to the country of Grenada. St Vincent and the Grenadines is a multi-island state with an area of 150 sq miles. St Vincent is the largest and main island with over 150 islands and cays to the south of it.

TABLE 1

Population distribution of St Vincent and the Grenadines

Island	Area (sq miles)	Population
St Vincent	133	92 211
Grenadines	17	8 535
Total	150	100 746

Source: Population Census 2000, Government of St Vincent and the Grenadines

The big island of St Vincent (volcanic in origin) has a rugged mountainous terrain, lush forests and many uncluttered beaches and inlets. The highest peak is La Soufriere reaching 4 048 ft (1 234 m), an active volcano which last erupted in 1979. Most of the country is sloping land and hill terracing is the main agricultural practice employed. The Grenadines are low-lying, ringed by coral reefs, and world renowned for its beaches and sailing conditions. The islands experience an all year round tropical climate, with an average temperature of 26°C (79°F). Highest temperatures occur during September with an average of 27°C (81°F); while the coolest month is normally January with an average temperature of 25°C (77°F). Annual average rainfall is 231 cm (91 in), however in the interior mountainous areas the annual average is more than 380 cm (150 in). The wet season normally begins in May or June and runs up to December.

1. The economy and agriculture

The economy of St Vincent and the Grenadines is traditionally based on agriculture. Up to 2001 agriculture contributed 8.5% to the GDP (Singh *et al.*, 2005); although, it still is the main source of income and employment for the bulk of the rural population. Banana was traditionally the main export crop, providing up to 60% employment in rural areas, but with challenges at the WTO against the EU's preferential access to ACP banana (to which St. Vincent belongs), there has been a steady effort to diversify around banana into other commodities such as root crops and the services sector.

In 2004 total exports stood at 37 million US dollars, while imports were 225 million US dollars. In that same year St Vincent and the Grenadines recorded an agricultural trade balance of -14.2% and this agricultural trade imbalance has been increasing as the population increased its taste for foreign food in items such as cereals and meat products. The livestock industry, particularly, small ruminants, has been declining. This was mainly due to problems associated with praedial larceny which was, maybe, the single biggest disincentive to farmers. However, other sub-sectors such as poultry have seen greater organization within the production system with measures such as the construction of a hatchery by the government to ensure that local farmers have good quality chickens to begin production. Still, imports of chicken meat were 5.6 million US dollars.

The bulk of agricultural activities in St Vincent and the Grenadines are carried out on small farmer holdings. The 2000 population estimate revealed that just over 27% of the total number of farms were under 0.2 ha, 23% between 0.4 and 1.0 ha, 14.9% between 1 and 2 ha while only 0.25% and 0.12% were between 20.2 to 40.5 ha and over 40.5 ha, respectively (Table 2). A proportion of 73% of farm area was privately owned, while about 22% was rented and a small percentage came under other agreements. The census also revealed an aging farmer population where only 0.16% was under the age of fifteen, while 79% was over 35 years (Table 3). Lands, both under temporary and permanent crops, were 1 080 ha and 3 021, respectively.

TABLE 2
Number and area of holdings by size

	Number of holdings	Area (ha)
Without land	876	–
< 0.2 ha	2 032	148
0.2 - 0.4	732	169
0.4 - 1	1 735	1 018
1 - 2	1 102	1 477
2 - 4	647	1 569
4 - 10.1	187	968
10 - 20.2	41	527
20.2 - 40.5	19	535
40.5 >	9	789
Total	7 380	7 199

TABLE 3
Age distribution of farmers

	Number of holdings
Total	7 346
< 15 years of age	12
15 - 24	299
25 - 34	1 054
35 - 44	1 943
45 - 54	1 583
55 - 64	1 192
65 >	1 134
Not specified	129

The level of food security was good for a root crop which was produced all year round. Vegetable supply was seasonal dependent on the rainfall pattern, whereas different fruits were available depending on their seasonality. Meat, milk and cereals formed the bulk of agricultural imports. There was self sufficiency in pork and eggs among livestock products.

A rural poverty assessment survey was being conducted and the results will soon be published. However, it is reasonable to state that rural poverty is generally and gradually decreasing.

Food shortages have never been experienced except for some shortfall in eggs especially at Christmas time during the 1990s. There were occasional shortages of sugar and flour due to importation problems in the past decade. The risks of further shortages were minimal and the entire country was equally exposed to all food supplies.

The arrowroot crop production showed wide swings disclosing a general decrease in acreages and output of arrowroot starch for export. Banana production has experienced a very sharp decline due mainly to heavy dependence on the unstable European banana market. The greatest stability and steady increase was shown by the root crops [yam, aroids (dasheen, tannia and eddo), cassava and sweet potato]. Plantain production also increased by about 200%; this was due to the fact that farmers logically replaced the banana plantations with plantain (*Musa* spp.). Adding impetus to the changes in the crop production systems were the new policy positions adopted by the government to “diversify around banana”.

Changes in the crop production systems were mainly driven by the government policy of diversification to achieve the following:

- Replace banana by niche- market crop products
- Increase the availability of more healthy, nutritious, safe, locally grown and lower-costing staples thereby reducing the food import bill



The major constraints to production were as follows;

- Praedial larceny
- Crop pests and diseases (such as tannia burning disease, Moko in *Musa* spp., pink mealy bug, mango seed weevil, viral diseases in vegetables, tuber weevils and grubs in sweet potato, anthracnose on yams, white fly, fruit fly on perennials, *Lepidoptera* on cucurbits, tristeza virus on citrus etc.)
- Lack of irrigation facilities
- Illimited feeder roads
- Spiraling costs of agricultural inputs
- Limited research capabilities (analytical diagnostic-soils, water, disease etc.)
- Unavailability and high cost of skilled labour
- Very limited processing facilities to create value added products and industrialize the agricultural sector
- Lack of access to agricultural credit and little or no crop insurance

The needs to address the above-mentioned constraints were as follows:

- More efficient legal system
- A comprehensive marketing system
- More developed infrastructure (feeder roads and irrigation) and processing factories
- More effective financing mechanisms
- Stronger research and development institutions

Plant genetic resources will be used to meet the challenges of changing climate, movement towards healthier eating habits and reducing the food import bill. This means that new varieties will have to be developed and/or introduced to combat drought, salinity, high/low temperatures and new diseases and pests. Over the next decade, we also have to cater for the taste of consumers who need to eat healthy food in order to prevent lifestyle diseases such as diabetes, obesity, certain types of cancer and high blood pressure, to name a few. The population has also gravitated towards home-grown, lower-costing staples and has also become more conscious of the medicinal value of local herbs, spices and other underutilized species found in the environment.

THE STATE OF DIVERSITY- THE MAIN VALUES OF PLANT GENETIC RESOURCES



1.1 Most important crops

Major crops for food security

The major crops that ensure the staple food supply to the population of St Vincent and the Grenadines are as follows in Table 4:

TABLE 4

A list of major crops for food security not in order of importance

Dasheen	Tannia	Peanut	Tomato	Pumpkin
Banana	Cassava	Pigeon pea	Lettuce	Carrot
Sweet potato	Eddo	Black eye pea	Cabbage	Egg plant
Plantain	Yam	Maize	Cucumber	Ochra
Cauliflower	String bean	Mango	Pineapple	Wax apple
Broccoli	Radish	Citrus	Avocado	Plum rose
Watermelon	Pakchoi	Coconut	Guava	Sugar apple
Soursop	Papaya	Passion fruit	Breadfruit	Golden apple

Musa spp (banana and plantain)

Banana, plantain and coconut are major components of the rural hillsides of St Vincent and Grenadines. There are currently 12 different cultivars of banana and plantain which are cultivated. Of these, nine (3 banana and 6 plantain) are used for commercial production and are exported weekly. Recently, a new cultivar was introduced as part of the banana replanting program after the devastating effects of the Moko disease.

Root crops (aroids, cassava, yam and sweet potato)

The root crops are the main staple food in these islands. The genetic base consists of the following approximate number of varieties:

- Aroids –12
- Cassava –30
- Yam – 26 (*Dioscorea rotundata* 1, *Dioscorea cayenensis* 3, *Dioscorea alata* 20, *Dioscorea trifida* 1, *Dioscorea esculenta* 1)
- Sweet potato – 80 (34 local, others introduced from Nigeria, Trinidad, USA and Taiwan).
- The need is to identify genotypes that lend themselves to processing into marketable value-added products such as flour, chips, ice-cream, livestock feed, starch, baby food, invalid diets and so on. There is also the high priority need for early maturity, high yielding and low-input genotypes.

Fruit bearing vegetables (tomato, ochra, eggplant, cucurbits, sweet pepper)

These species are cultivated by commercial and subsistence farmers using imported commercial seed obtained from a large number of international seed houses. Thus we find a situation where a large number of varieties inclusive of hybrids, developed varieties, pure lines and landraces, are in circulation. Genetically, this is closest to the ideal situation.

At the same time this represents one of the greatest threats to food security especially in cases where these foreign multinational companies may become unable to maintain a steady seed supply. The other threat is the possible entry of technologies which will prevent the farmers from recouping viable seed from his previous crop (not referring to hybrids) and lead to contamination of the local landraces and wild types.

Leafy and flower bearing vegetables (cabbage, lettuce, cauliflower, broccoli, pac choi etc)

The situation with these species is the same as with the above group. One difference is the fact that seed cannot be recouped by farmers from the previous crop due to the ability of these plants to set seed in the temperate zone.

This group of vegetables represent high cost, healthy and nutritionally of high value products.

A major challenge is to breed cultivars or have access to germplasm with resistances to tropical pests and diseases.

Vegetables with edible roots and tubers (carrot, radish & beet)

Seed supplied by the same overseas seed companies with significant investments into genetic improvement. The future needs would also be the same as the above.

Fruits (mango, coconut, citrus, pineapple, guava, avocado, wax apple, breadfruit and dragon fruit)

The perennials fall roughly into two groups; one originating in the tropical Americas and the other introduced since the dawn of colonization that they have become endemic to the Caribbean.

The propagation of mango, citrus and avocado is mainly done through budding and grafting. Owing to the scarcity of land and planting material *inter alia*, one does not find any organized, large orchards of these species.

Many different varieties of mango exist in St Vincent and the Grenadines. The mainland of St Vincent host more than 80% percent of them. Two cultivars of mango are mainly used for export to Europe and North America. Some small amounts are consumed locally.

The pineapple is represented by about six commercial varieties. Propagation is done mainly through tissue culture and production systems are fairly well developed.

Breadfruit is seasonal and there are more than 10 genotypes originally brought by Captain Bligh. There is no organized system of propagation. There is room for much R&D work to develop more efficient propagation methods, shorten the time to flowering and bearing, create dwarf trees through crossing and selection or through the application of biotechnology. The whole process can be accelerated if high value, marketable, processed products can be developed. This assumes that there is all year round production or availability of the raw material.

1.2 Minor crops and underutilized species (arrowroot, medicinal herbs and spices, christophine, passion fruit, dragon fruit, wild yam, seaside grape, fat pork, star apple, dunks, pomerac etc)

Many different fruits are underdeveloped and unexploited. The plants are found in the wilds where, when in season, they are harvested by wild life, small children and other gatherers. Some entrepreneurs harvest herbs in the wilds, process and sell as herbal remedies. The arrowroot is one of the oldest crops; it is mainly grow for processing into starch for export. There have been efforts to mechanize field production with limited success. Yields remain low partly due to the non-selection of planting material. What is needed in terms of planting material, is selected rhizomes of the same size, age vigor and variety. These must be cleaned and treated to ensure their pest and disease free status.

The other underutilized species can be targeted with the aim of developing products destined for niche markets.

THE STATE OF *IN SITU* MANAGEMENT



2.1 Inventories and surveys - assessment and priorities

Over the past ten years no action has been taken to improve inventories and surveys of plant genetic resources, crop associated biodiversity and wild plants for food production.

2.2 The greatest constraints to carrying out inventories and surveys

The greatest constraints to carrying out inventories and surveys for PGR crop associated biodiversity and wild plants for food production are as follows:

- Lack of policy direction
- No allocation of financial resources
- Absence of adequate number of appropriately trained scientist

2.3 Ecological functions of crops and crop-associated biodiversity

The main agro-ecological functions played by crops and crop associated biodiversity are first and foremost to provide a vegetative ground cover to vast expanses of lands located on steep hillsides. These areas are thereby protected from the ravages of heavy rains that cause massive soil erosion, land slides and loss of significant quantities of water resources. The second important function is to provide food and feed for human and animal population. They also help in the entrapment and conversion of carbon dioxides into oxygen and helps in the reduction of greenhouse gases.

2.4 Priorities for future inventories and surveys for crop associated biodiversity and wild plants for food production

Emphasis will be placed on the following;

- Seagrape (*Coccoloba uvifera* L.)
- Medicinal herbs
- Dunks (*Ziziphus mauritiana* Lam)
- Legumes and grass forages

2.5 Capacity building needs and priorities to support inventory and surveys

In order to conduct inventories, the minimum personnel required will be the following:

- Taxonomist
- Botanist
- Biochemist
- Herbarium
- Chemical laboratory
- Legal frame work
- Field station

2.6 On-farm management and improvement of PGRFA - Extent of on-farm management of PGRFA within the country

Currently, CARDI [27 accessions of sweet potato (*Ipomoea batatas*) and 30 cassava clones (*Manihot esculenta*)] and the Taiwan Mission (TM) [(pitaya, *Hylocerus undatus*)- 4 accessions; Indian jujube (*Ziziphus jujuba* Mill.) -3; guava (*Psidium guajava*)-3; wax apple (*Eugenia javanica* Lamb.)-3; sugar apple (*Annona* spp L.)-2; pineapple (*Annanas comosus* (L.) Merr.- 6 ; *Musa* spp. 3; sweet potato-5; avocado - 3 and *citrus*-4)] farms are involved in the management of PGRFA in St Vincent and the Grenadines. These two institutional farms are involved in characterization and multiplication of these PGR for distribution to farmers. Limited management is practiced on the agricultural stations in Dumbarton (*citrus*-4; pineapple-5; mango-3) and Walliabout (mango-2). At Rivulet, 4 varieties of white yam (3 Portuguese and 1 Dominican); 1 variety of sea island cotton (V135); 12 varieties of sea grapes and 1 variety of sweet potato, are currently maintained, multiplied and distributed to farmers. In 1999, the Ministry of Agriculture, Forestry and Fisheries established a germplasm collection plot at Peters Hope on the South Western side of the island. This plot contains the following (Table 5):

TABLE 5
Type of crop and number of accessions collected

Crop type	No. of cultivar/variety
Plumrose	2
Avocado	3
Citrus	16
Mango	60
Indian jujube	2
Guava	2
Golden apple	2
Coconut	3
Carambola	2

2.7 Incentives used to promote on-farm management of PGRFA

There are currently no incentives offered to promote on-farm management of PGRFA in St Vincent and Grenadines.

2.8 Establishment of national/regional forum for stakeholders involved in on-farm conservation

There is no establishment of any forum for stakeholders involved in on-farm conservation by the National Programme. However, the regional forum that promotes PGR management is CAPGERNet on to which the country has nominated a National Coordinator.

2.9 Support for on-farm participatory plant breeding programmes

This activity has not been practiced in the country.

2.10 Support for the development of local planting material/seed multiplication

A programme for multiplication and distribution of planting material is carried out by three organizations at the following location: the Taiwanese Mission-Orange Hill (*Musa* Spp., pineapple, cassava, aroids, yams); CARDI-Orange Hill (sweet potato and cassava); Ministry of Agriculture, Forestry and Fisheries-Dumbarton and Walliabout (citrus and mango) and at Rivulet (yams, cotton and grapes).



2.11 Additional actions to support on-farm management

Facilitation of access to a wider range of planting material- Strategic collaboration between the government of St Vincent and the Grenadines and CARDI, CAPGERNET AVRDC and CIAT facilitated access to germplasm of cassava, sweet potato, Indian jujube, guava, pineapple etc.

2.12 Establishment of mechanisms to replace plant genetic resources for food and agriculture after disaster

Most activities after disasters were centered on the conduct of damage assessment, but there was no formal mechanism in place for replacement of PGR. However, there is a regional organisation mandated to address rehabilitation after natural disasters. Its mandate also includes the supply of PGRFA to the farming sector of St Vincent and the Grenadines.

2.13 Major constraints to the establishment of effective plant genetic resources disaster response mechanisms

- Lack of policy framework
- Lack of awareness as to the importance of PGRFA

2.14 Needs and priorities to improve plant genetic resources disaster response mechanism

- Establishment of system of documentation of PGR
- Training of personnel
- Funding

2.15 Requirements for improving regional and international disaster response mechanisms

The main requirement is a network to move information rapidly between its members around the region.

There is a need for a mechanism to help prevent large scale destruction to PGRFA through timely action and assessment of the scope of the disaster.

2.16 Actions taken to encourage *in situ* conservation of PGR

There is no *in situ* conservation of wild crop relatives and wild plants for food and agriculture .

2.17 Limitations to *in situ* conservation of plant genetic resources, crop associated biodiversity and wild plants for food production

- No policy directive and limited public awareness
- Limited resources
- Inadequate land resources
- Praedial larceny and security
- Lack of infrastructure, human resources, and other capacities
- Weak collaboration and linkages in the region
- Unawareness of international protocols and lack of legal framework at the national and regional level
- Variable level of development between countries, disharmony vis-à-vis international protocols

- Lack of a uniform electronic documentation system
- Threats to agrobiodiversity from new developmental programmes
- Lack of security duplicates of collections eg local sweet potato and cassava, and pineapple collection in Martinique
- Rapid genetic erosion in Small Island States

2.18 Priorities and needs to enhance *in situ* conservation

Correct the points listed above at 2.17. Additionally the following should be done:

- Conduct inventories and surveys
- Put legal, financial and institutional mechanisms in place to strengthen *in situ* conservation of PGR possible

2.19 Research priorities to support *in situ* management

- Inventorying and characterization of plant genetic resources
- Develop marketable products
- Train stakeholders for operationalization of the programme
- Determine carrying capacity of natural pastures of indigenous forage species
- Assess the volume of available medicinal herbs and harvests of wild fruits in order to rationalize utilization plans

2.20 Priorities for policy development to support improved plant genetic resources *in situ* management

- Appropriate legislation for the efficient management of *in situ* plant genetic resources for food
- Develop and finance programmes for the efficient management of *in situ* plant genetic resources
- Facilitate free exchange of information and germplasm regionally and internationally

2.21 Methods employed to achieve *in situ* management of plant genetic resources for food and agriculture

The methods described below encompass entire ecosystems inclusive of plant genetic resources for food and agriculture such as the medicinal plants, forage species and wild fruits.

These methods have been applied at the national level for the conservation of natural resources. The Forest Reserves are established under the Forest Conservation Act, No. 47 of 1992 was established with the following objectives:

- Sustained production of timber and water
- Conservation of soils
- Public recreation
- Preservation of flora and fauna

According to the National Biodiversity Strategy and Action Plan, 2000, the main aim of the Act is to protect and conserve "...area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs" *inter alia*.

There are currently one natural park (Soufriere National Park) and nine forest reserves (Richmond Forest Reserve, Cumberland Forest Reserve, Dalaway Forest Reserve, Kingstown Forest Reserve, Camden Park Forest Reserve, Kings Hill Forest Reserve Natural Landmark, Colinarie Forest Reserve, and Mt. Pleasant Forest Reserve).

The National Parks Act, 2002 gave rise to the protection, management and development of the national physical and ecological resources and the historical and cultural heritage of St Vincent and the Grenadines. Among the criteria for selection of these sites is that the site in question must be "large enough to include one or more intact ecosystems" and provide opportunities for ecotourism.

The management objectives are as follows:

- Ecosystem or ecological maintenance
- Maintenance of heritage value
- Education and public awareness
- Recreation and tourism
- Scientific study and research

2.22 Obstacles to improving methods for *in situ* management of plant genetic resources

Although a legislative framework is already in place for *in situ* management of plant genetic resources, the following requirements must be met in order for the legislation to be fully effective:

- Provision of training and trained personnel at all levels (farmers, extensionists, research scientists, policy makers)
- Developing and funding programmes designed to carry out this function

2.22.1 How to overcome these obstacles

- Sensitize policy makers to the need to safeguard the available plant genetic resources and energize them to ratify relevant international protocols (UPOV, Plant Breeders Rights etc) and pass relevant laws to empower the local authorities (farmers)
- Design programmes, mobilize resources and establish programmes with the goals to analyze, assess genetic diversity, halt genetic erosion and deal with/remove the vulnerability of plant genetic resources and biodiversity in general.



THE STATE OF *EX SITU*

3.1 Actions taken to sustain *ex situ* plant genetic resources over the past ten years

The following institutions expended efforts in maintaining *ex situ* collections of plant genetic resources: The Botanical Gardens of St Vincent and the Grenadines, The Taiwan Mission, the Caribbean Agricultural Research and Development Institute (CARDI) and the Ministry of Agriculture, Forestry and Fisheries (MAFF). Some of the important collections that were maintained for food and agriculture, were sweet potato, cassava, pitaya, pineapples, herbs and spices, banana, plantain, citrus, avocado, guava, papaya, plumrose, mango, Indian jujube, golden apple, coconut, carambola and wax apple.

3.2 Greatest constraints to sustaining *ex situ* plant genetic resources collection over the next ten years

- Lack of funding
- Lack of training
- Lack of infrastructure human resources and other capacities
- Lack of facilities or irregular supply
- Disaster prone environment
- Lack of focused approach, no national programme
- Occurrence of pests and diseases
- Limited public awareness
- Praedial larceny and security
- Weak collaboration and linkages in the region
- Unawareness of international protocol and lack of legal framework at the national level
- Threats to agrobiodiversity from new developmental programmes
- Inadequate knowledge of native germplasm
- Rapid genetic erosion

3.3 Greatest constraints to expanding plant genetic resources *ex situ* collections over next ten years

- Lack of focused approach
- Competition for limited land space
- Inadequate trained human and financial resources
- Unawareness of populace and policy makers of the importance for expansion



3.4 Priorities for sustaining and expanding *ex situ* plant genetic resources over next ten years

Major crops

- Aroids
- Banana
- Sweet potato
- Cassava
- Yam
- Citrus
- Pineapple
- Mango
- Corn
- Cucurbits
- Papaya
- Avocado
- Guava
- Passion fruit
- Pigeon pea
- Ochra
- Tomato
- Egg plant
- Coconut

Minor crops

- Herbs and spices
- Cashew
- Forage crops
- Underutilized fruits (sea grapes, dunks, Plumrose, star apple)
- Cow pea (*Vigna* spp)
- Saem or velvet beans (*Dolichos niger*)

Wild plants

- Wild fruits
- Indigenous grass and legume forage crops

3.5 Safety duplications for unique accessions

Safety duplications have not been established for unique accessions; however, this is a priority activity and should be done as soon as the following obstacles can be surmounted:

- Inadequacy of trained personnel, land, funds and other essential capacities
- Inadequate infrastructure of laboratory, hardening nurseries, greenhouses and fields

3.6 Establishment of systems to better document *ex situ* plant genetic resources collections

Improved documentation systems for characterization and recording data for *ex situ* plant genetic resources collections, have not been put in place: however, this activity is of high priority and should be done as soon as the following needs are met

- Strengthen linkages with regional and international PGR network
- Put in place a mechanism with appropriate staffing and equipment to manage information (characterization, data base and information network)

3.7 Priorities for research to expand and improve *ex situ* PGR conservation for the next ten years

No national programmes exist to achieve conservation of PGRFA. The TM and CARDI have some small working collections that will develop according to the needs of the national crop improvement programmes.

3.8 Regional and international cooperative arrangements to enhance *ex situ* plant genetic resources

The national efforts are linked to international institutions via the regional PGR network of CAPGERNet which has established linkages with the PGR networks Genetic Resources for Food and Agriculture such as NORGEN, INIFAT, IDIAF, INIBAP, CATIE, REDARFIT, (REMERFI, TROPIGEN, PROCISUR), MUSALAC), and in the hemisphere and with Bioversity International, GCDT and FAO, IAEA, IICA, TM), FAO/AGPS, EMBRAPA, CGIAR centers (CIAT, CIP, CIMMYT), IITA etc, AVRDC, CIRAD and INRA, FORAGRO. Germplasm (cassava, banana, vegetables, sweet potato etc.) has been supplied to the region on a regular basis.

3.9 Management practice employed to prevent genetic erosion in collections during regeneration

- Limited subculture and low dosage of plant hormones
- Ensure against loss by storing true seeds and plantlets in tissue culture
- Regeneration of core collections as required

3.10 Priorities for maintaining viability and preventing genetic erosion in *ex situ* plant genetic resources collection over the next ten years

Top priority is assigned to maintaining viability and preventing genetic erosion in major crops listed in Article 3.5. The constraint of inadequately trained and small numbers of scientific personnel and weak infrastructure (such as seed storage facilities, unreliable power supply, autoclaves, growth chamber etc) are the main challenges.

3.11 Priorities for regional and international cooperation and assistance for maintaining viability and preventing genetic erosion

Technical assistance would be sought first among regional and international organizations and countries such as Cuba (INIVIT, INIFAT), Guadeloupe (INRA,) and Martinique (CIRAD), CARDI, IICA, TM, FAO, AVRDC, EMBRAPA CIP and Bio diversity International.

3.12 Collecting activities undertaken over the past ten years to improve *ex situ* plant genetic resources coverage

Over the last decade, the following species were collected by three organizations as follows:

- Ministry of Agriculture Forestry and fisheries/Taiwan Mission: Dasheen-3, Mango- 58 and citrus 13 accessions, 3 species of yam; 80 sweet potato accessions, 4 varieties of arrowroot, 1 variety sea island cotton, 12 varieties of sea grape.
- CARDI: 27 sweet potato and 6 thyme accessions

This coverage of the total diversity in fruit crops, is minimal.

3.13 Identification of major gaps in *ex situ* plant genetic resource

Gaps were identified within the categories of major crops, minor crops, underutilized species, forages and wild plants.

The gaps identified are as follows:

TABLE 6

Estimates of the gaps in collected and uncollected PGR for food

Species	Percentage collected	Percentage uncollected
Papaya	0	100
Avocado	0	100
Guava	2	98
Mango	40	60
Cashew	0	100
Breadfruit	15	85
Banana and plantain	40	60
Hot pepper (<i>Capsicum chinense</i>)	0	100
<i>Annona</i> spp	0	100
Cucurbits	0	100
Aroids	25	75
Yam	15	85
Sweet potato	68	32
Cassava	8	92
Passion fruit and wild relatives	5	95
Herbs and species	10	90
Grass and leguminous forage species	Grass and legume forage bank at Rabacca livestock station 1	99
Tomato	0	100

3.13.1 Overcoming the identified gaps will be addressed by implementing the following:

- Greater public and political awareness of benefit of PGR conservation
- Create an inventory of all PGR germplasm in country
- Web-based access to information on PGR for the 20 priority crops
- Develop systems that will enable greater utilization by farmers, processors and breeders. For instance exploitation of the PGR to develop agric-food industries
- Greater state and private sector funding to support PGR management
- Capacity building programmes - specific short term training and more structured tertiary level capacity building
- Develop national mechanism for conservation-the role of national institutions
- Research and development leading to innovative technologies for conservation

3.14 Greatest constraints to collecting missions in the next ten years

- Lack of comprehensive national programmes
- Reduced accessibility to hinterland because of reduced security
- Difficult terrain due to rugged hilly mountainous topography
- Lack of a comprehensive system (human resources and physical capacities) for the management of PGR germplasm after collection
- Lack of an efficient system that will enable greater utilization of PGR by farmers, processors and breeders in order to create agric-food industries and generate wealth.



3.15 Collecting priorities and needs for major and minor crops, underutilized species, forages, wild plants for food production, and wild relatives

A comprehensive national programme needs to be developed. The present efforts are scattered, uncoordinated and mostly *ad hoc*.

3.16 Research and development needs and priorities in relation to enhancing collecting of PGR for food and agriculture

- Technology to develop marketable products from collected PGR
- Research and development infrastructure and equipment
- Trained personnel at all levels
- Marketing system for developed products from PGR
- Linkages with successful cutting-edge regional and international institutions

3.17 Priority needs and measures

- Rationalizing collections through regional and international collaboration and sharing facility
- Sharing the burden of the costs of conservation
- Improved germplasm management
- Filling gaps in collection
- Low cost conservation technologies
- Complete safety duplication
- Develop pathogen-tested collection

3.18 Other strategic direction

- Inventorying and assessment of PGR biodiversity vis-à-vis rate of genetic erosion

3.19 Methods employed for *ex situ* conservation of PGR

- *In vitro* conservation
- True seeds
- *In vivo*

In vitro conservation techniques represent the latest innovative technique utilized in PGR conservation.

3.20 Obstacles to obtaining and using available *ex situ* methods for conservation of PGRFA

- No mandated national programme and limited public awareness
- Inadequate land availability, ill equipped laboratory, inadequate weaning nurseries and lack of other essential resources
- Praedial larceny and reduced security
- Inadequately trained human resources, and other sub-standard capacities
- Weak collaboration among regional institutions eg with the UWI and INRA
- Lack of security duplicates of collections eg local sweet potato and cassava, and pineapple collection in Martinique

The above mentioned obstacles are not exhaustive.

THE STATE OF USE



4.1 Established mechanisms to record the distribution of samples of conserved PGR to breeding programmes

No institution distributes PGR germplasm to breeding programmes. Planting material in the form of true seeds or hardened plantlets are distributed to farmers *gratis* for commercial production purposes (Table 7).

TABLE 7

Number of plantlets distributed in 2008 by Orange Hill Tissue Culture Laboratory

Species	Number of plantlets distributed
Banana	42 000
Dasheen	2 600
Tannia	13 000

4.2 Recent improvements in crop production through use of particular varieties

Tissue culture produced plantlets provide improvements in productivity owing to the clean state of planting material; all planting material test negative for presence of pathogens except viral particles. This performance is repeated every season in all crops in various districts. For example, trials conducted by the IMU showed that tissue culture bananas gave a yield of 22 tons/acre/year while the traditional planting material yielded 18 tons/acre/year.

4.3 Constraints to increased use of PGRFA

- Lack of characterization and evaluation
- Lack of access to samples of commercial planting material
- Insufficient capacity for plant breeding
- The long-term nature of pre-breeding activities required to broaden the base of breeding materials
- Lack of capacity-qualified personnel, funds, training and facilities
- Weak policy development
- Lack of coordination among researchers, breeders, gene bank managers and farmers

4.4 Activities undertaken to enhance the use of PGRFA

- In the case of hot pepper (*Capsicum chinense* Jacq.), marketing opportunities have been exploited for products of local varieties and diversity-rich products. Hot pepper processing has moved from a stage of cottage industry to at least two modern factories with sophisticated marketing. Other examples are cassava for farine; aroids for vacuum-pack products; banana, plantain and sweet potato for chips; herbs and spices for bottled seasonings; corn for corn meal; vacuum pack pigeon pea; bottled coconut water; coconut oil and mango for dried mango candy.
- All the three major institutions MAFF, TM and CARDI managing PGR are directly involved in the production of commercial planting material for farmers utilizing the landraces from their collections.

4.5 Current priorities and needs to implement them

- Strengthening capacity and improved training in plant breeding
- Increased collaboration among researchers, breeders, gene bank managers and farmers
- Exploring marketing opportunities for products of local varieties and diversity-rich products
- Facilitate the direct use by farmers of landraces/farmers varieties and other genetic material conserved in gene banks
- Improve the regulatory and policy frameworks to facilitate greater use of plant genetic resources

4.6 Characterization and evaluation and evaluation of PGR for food and agriculture

Characterizing and evaluation were not essential since most of the germplasm multiplied to produce commercial planting material came from landraces or modern cultivars with proven and superior performances. Information systems are still in the developmental stages.

However characterization and evaluation of the landraces and varieties are routing activities.

4.7 Obstacles to utilization of PGRFA owing to non-characterization and non-evaluation

Characterization and evaluation are not limiting utilization of PGRFA.

4.8 Core collection establishment

There are positively no obstacles to the establishment of core collections.

4.9 Plant breeding capacity and plant breeding goals of St Vincent and Grenadines

St Vincent and the Grenadines has limited capacity in plant breeding due to the small number of persons who received training in this field. There are two plant breeders on the island. Skills can be requested from regional and international organizations. Plant breeding goals are limited to tannia- for disease resistance to tannia burning disease; banana for resistance against Moko disease and arrowroot for shorter bearing cycle.

4.10 Future research priorities for enhance use of PGR

- Establishment of an efficient of information system which accurately defines farmers needs in terms of type of varieties, quantities and planting schedules. Moreover there is need for the creation of a feedback mechanism on the performance of PGR.

4.11 Constraints to achieving diversification and broadening genetic base of crops

- Policy and legal obstacles
- Marketing/commercial obstacles
- Limited capacity to produce increased volumes of planting material



4.12 Strategies to address genetic vulnerability in farming system

The strategies to address genetic vulnerability in farming systems include the following:

- Collaboration with MAFF and FAO/IAEA to do mutation breeding for disease resistance and earliness in banana, tannia and pitaya. At the local level there is a programme of breeding utilizing somaclonal variation in banana and tannia for resistance to Moko disease and the tannia leaf burning disease.

4.13 Seed supply system and role of markets

Both sectors are involved in seed production and distribution.

4.14 Constraints to the availability of good quality seeds of a wide range of plant varieties

The current system of planting material production and distribution is not fully efficient in that the farmers fail to access quality planting material at the right time; sometimes, low germination through seed that is supplied later than required is a cause; however, the main reasons are the absence of consultation between farmers and suppliers of seed/planting material.

4.15 Priorities to improve seed production and distribution over the next ten years

- Establish an information system for smooth flow of farmer needs to the planting material/seed suppliers
- Establish a national regulatory body to monitor inputs supplied to farmers by the private and public sector services

4.16 Major constraints in making seeds of new varieties available in the market place

- Prohibitive costs
- There is no conscious search and acquisition of new and improved varieties of different crop by the current private sector seed suppliers. However, the public sector (MAFF) does perform this function to a limited extent. In the case of vegetative planting material, multiplied and distributed by MAFF, TM and CARDI, there is an efficient and successful mechanism in place; efforts are always made to utilize superior germplasm.

4.17 Effects of the location of market

Different varieties are cultivated for the local and export markets for the following crops: Tannia, Dasheen, Eddoes, Bananas, yam, citrus and Mango. However, there is no differentiation between varieties for all the other crops.

4.18 Measure undertaken to support development of new markets for local varieties and diversity rich products

Activities undertaken include but not limited to the following:

- Promotion of products at trade shows
- National and international exhibitions
- Consultation with foreign importers of tropical products
- National and regional workshops
- Establishment of agro processing laboratories and training in processing

4.19 Constraints to increase markets for local varieties and diversity-rich products:

- Inadequate facilities for development and marketing of new products
- Limited investments into processing and the industrialisation of agricultural production

4.20 Strategies to better link small-scale producers with markets – local and export markets

Recently, the government has created a Lauders Agro processor which is a subsidiary of National Properties Inc. which is charged with getting the farmers closer to markets or creating markets. There have been innovations where WIBDECO has been purchasing other non-banana agricultural commodities.

The agro-tourism linkage is an effort to market fresh produce to the hotels and cruise liners on the islands in order to replace the food imported by the tourism sector.

4.21 Other strategic directions relevant to improving the state of use of plant genetic resources, including minor and major crops and underutilized species (legal/policy, research and management actions at the national, regional and global levels)

- “Eat local” and “buy local” campaigns have generated significant interest by consumers to consume locally produced products and by extension the use of more indigenous crops by farmers
- Creation of workshops and symposia for teaching participants on ways of utilizing local germplasm

4.22 Description of the state of crop improvement programme

- Basic formal-sector crop improvement programme in place, germplasm identification, and evaluation programmes.

4.23 Crops which benefited from improvement programmes

- Citrus
- Sweet potato
- Yam
- Mango
- Banana
- Aroids

4.24 Contribution of crop improvement to food security

All the crops listed above in Article 4.24 form part of the basic diet of all Vincentians. Bananas are consumed both ripe and green and are available all year round. It is consumed fresh (in the case of ripe banana) and cooked and form integral part of many side dishes, desserts and pastries. Citrus is available on a seasonal basis and are available at general markets and in supermarkets. Sweet potato, yam and the aroids have been at the center of the government’s diversification thrust and are considered as major staples. Mango, though seasonal in production, is a major part of the fruit staple of both the rural and urban people and is also supplied to the local tourism market.



4.25 Development of breeding programmes to increase crop resistance to pests and diseases

There have not been any breeding programmes to increase crop resistance to pests and diseases. Most diseases are treated by fumigation or use of tissue culture material to give farmers a clean start. An effort is being initiated to breed for resistance to the tannia leaf burning/root rot disease (*Pythium myriotylum*), through MAFF/TM collaboration.

4.26 Implementation of participatory crop improvement programmes

There has been no implementation of participatory crop improvement programmes; most activities pertaining to crop improvement are done by government agencies like the MAFF or other organizations such as CARDI or TM.

4.27 Expectation of significant changes in the use of plant genetic resources in your country in the next 10 years

There will be an improvement in the use of PGR as the international prices of food continue to escalate; people will have to resort to the consumption of local PGR. Also local "eat local" and "buy local" campaigns should increase the demand. Furthermore as the concern about genetically modified organisms continue to be of interest, many people will resort to using local PGR.

4.28 Methods being employed for plant breeding in country

The following plant breeding techniques are done for the following commodities

- **Citrus:** citrus have gone through numerous breeding programmes which range from introduced varieties such as Washington navel, Valencia etc. Most breeding activities are carried out on government agricultural stations. The main techniques used are budding and grafting.
- **Sweet potato:** sweet potato has been selected for their taste and yield, maturation time and to a very limited extent resistance to grubs and sweet potato weevil. To date, 27 varieties are held by CARDI under in a core *ex situ* germplasm collection and characterization programme.
- **Yams:** The five commercially grown yam species or about 28 varieties have been mainly introduced with a few indigenous cultivars being domesticated and utilized by a small number of people for both food and for medicinal purposes: two varieties namely, Portuguese and white yams.
- **Mango:** most breeding programmes are carried out on two varieties of mangoes namely, Imperial and Julie. Although there is a large number of other cultivars available, much work is not being done on them, except that they were collected at the MAFF germplasm collection plot at Peters Hope.
- **Banana:** banana are mainly propagated to meet market demand and most activities are carried out from tissue culture. International centers such as INIBAP supply improved varieties for evaluation, on demand.
- **Aroids:** have been collected and domesticated and may represent the most in-depth characterization of crops which have been carried out, though not on a formal basis. Most propagation activities are market oriented and offer tissue culture plantlets; despite this, farmers still use suckers as planting material.

4.29 Description of other state of the art methods for utilization of plant genetic resources for food and agriculture through plant breeding

The orange hill tissue culture laboratory will be involved in a mutation breeding programme utilizing gamma irradiation with the FAO/IAEA laboratories. The goal is to breed disease resistance into tannia, in the first instance.

THE STATE OF NATIONAL PROGRAMMES, TRAINING AND LEGISLATION

5.1 Establishment of National Programme for Plant Genetic Resources

There is no established programme for plant genetic resources; PGR programmes are formulated and implemented on an *ad hoc* basis which is not well coordinated.

5.2 Involvement of national stakeholders in planning and implementing national programmes

There is limited participation from the farming community when overall planning of national agricultural programmes is done through the MAFF extension division. This participation may have some influence of the PGR programmes.

5.3 Establishment of a legal framework for plant genetic resources strategies, plans and programmes

There is no legal framework for PGR. However a bill on plant breeders' rights is being currently reviewed.

5.4 Cooperation between PGR programme and other related areas (e.g. other agriculture, biodiversity, development, environment programmes)

There is limited cooperation that could be described as a loose arrangement between PGR programmes and other related areas. However most activities between these programmes are dependent on persons using their own initiative in the absence of a formal, comprehensive, national strategic plan.

5.4.1 "Mainstreaming" of PGR programmes into other development related areas

A PGR programme is not a major concern for these other related areas and the connection is very limited.

5.5 Change in trends for support for the National Programme for plant genetic resources changed over the past 10 years

Support for PGR programme has been increasing over the last ten years. This support is mainly geared towards improving the tissue culture laboratory in areas of capacity building and infrastructure.



5.6 Gaps in the current level of financial support necessary to achieve the country's plant genetic resources goals

- Infrastructure development (building and equipment)
- Capacity building (human resources)

5.7 Main challenges, needs and priorities faced to maintain or strengthen the National Programme for plant genetic resources over the next 10 years

- Policy/legal framework
- Infrastructure development (building and equipment)
- Capacity building (human resource development)
- Marketing/commercial obstacles
- Limited research
- Rapid genetic erosion
- Pests and diseases

5.8 Development/enhancement of national networks for plant genetic resources over the past 10 years

There has not been development of any national PGR network. As mentioned before, collaboration is from personal initiative.

5.9 Needs and priorities for education and training to support the sustainable use, development and conservation of plant genetic resources

- Taxonomist
- Botanist
- Biochemist
- Agronomist
- Marketing personnel

5.10 Main obstacles to providing required education

- Lack of policy framework
- Lack of funding
- Lack of training opportunities

5.10.1 Main methods to address obstacles to providing education and training

Provision of a policy framework and a strategic plan will highlight the need for sustainable use, development and conservation of plant genetic resources leading to the mobilization of the required resources and the creation of training opportunities.

5.11 Existence of a strategy to address education and training needs for plant genetic resources

Although PGR issues are addressed within other overarching programmes (Research and Development work program 2008-2009), there is no direct strategy to address training needs for PGR.

5.12 Opportunities identified for education and training outside the country – within or outside the region

While there is general identification of training opportunities outside and inside the country, there is none specifically designed to address PGR needs.

5.13 Establishment of legislation or regulations relevant to plant genetic resources over the past 10 years (phytosanitary, seed production, plant breeders rights, others)

Currently there is discussion over the Plant Breeders' Right legislation, but this has not been passed into law as yet.

5.14 Identification of obstacles to developing legislation and regulations relevant to plant genetic resources

- Lack of policy framework

5.14.1 Needs and priorities to address the obstacles

- Sensitization of policy makers as to the importance of developing suitable legislation for PGR

5.15 Development of adequate national information management systems to support efforts to sustainably use, develop and conserve plant genetic resources

There may not be a formal information management system to conserve PGR, however most of the MAFF stations (Dumbarton, Rivulet, Walliabou and Perseverance), CARDI and Taiwan Mission do multiply and conserve different food crops species.

5.16 Computerization of documentation systems with standard formats to facilitate data exchanges

The limited information system that exist for PGR has generated very limited data and so does not lend itself for data exchange using computerized systems.

5.17 Main challenges, need and priorities for developing or enhancing the information management systems for plant genetic resources and seeds

- Development of policy framework for the establishment of a PGR system
- Funding for equipment (computers etc.)
- Training of personnel to manage information system



5.18 Description of the level of awareness of the roles and values of plant genetic resources in St Vincent and the Grenadines

Most people have a satisfactory level of awareness as to the roles and values of plant genetic resources. Recent efforts in both “eat local” and “buy local” campaigns, coupled with high international prices of food, have generated significant awareness among the local populace.

5.19 Development of awareness programmes for plant genetic resources

Awareness programmes for PGR for food and agriculture has been in the form of “eat local” and “buy local” campaigns as well as campaigns targeting health benefits of some locally developed products like coconut oil. On a more general basis, the forestry division is constantly involved in programmes such as seminars, workshops and television advertisement to raise public awareness.

5.20 Identification of constraints to developing public awareness programmes for plant genetic resources

Public awareness programmes for PGR, although existent are most times seasonal and lack sustainability. In order for these programmes to be more effective, the following item must be provided:

- Funding for chemical and other analyses to determine nutritive and medicinal values of PGR and advertisement campaigns geared at reaching different sectors of the population.

5.21 Methods being employed to assess the value of plant genetic resources

Limited testing for assessing nutritive value of PGR is being done. However more testing on an ongoing basis needs to be carried out so as to determine optimal conditions for field production, post harvest handling and processing.

5.22 Financial incentives and other funding measures for the conservation and sustainable use of PGRFA

Different measures exist for crop improvement but no direct incentives address the conservation and utilization of PGRFA.

5.23 Methods used to assess the contribution of plant genetic resources to the economy

The contribution to gross domestic product (GDP) measures the annual monetary value of the production of food and other derivatives of PGR. For example from 1997 to 2001, banana alone contributed an average of 8.58% while other crops contributed an average of 2.3 % (Table 8).

TABLE 8
Agricultural crops contribution to GDP

Item/year		1997	1998	1999	2000	2001
Bananas	\$EC Millions	11.3	20.4	23.8	26.9	21.0
	% GDP	1.4	2.4	2.7	3.0	2.3
Other crops	\$EC Millions	32.9	34.0	34.8	34.2	34.5
	% GDP	4.1	4.0	3.9	3.8	3.8

Data Source: IMF Country Report No. 02/25, Feb. 2002 <www.imf.org/external/pubs/ft/scr/2002/cr00225.pdf>

5.24 Description of any other state of art legal and economic methods being employed to achieve plant genetic resources goals

There are other methods employed to achieve PGR goals.

THE STATE OF REGIONAL AND INTERNATIONAL COLLABORATION



6.1 Participation in regional, sub-regional, crop-based or thematic networks for plant genetic resources

Currently the country has participation in the networks mentioned in 3.9 and has benefited from the introduction of Cassava, banana, sweet potato, Pitaya, jujube and wax apple germplasm.

6.2 Needs and priorities to develop or strengthen international networks for plant genetic resources

- Enhancing training and legislation
- Enhancing information management
- Establishment of local PGR system
- Strengthen the work of the National Coordinator as part of the regional Caribbean Plant Genetic Resources Network (CAPGERNet)

6.3 Benefits of international programmes for plant genetic resources

- Collaboration with FAO: mutation breeding and funding
- Collaboration with CIAT: access to 30 clones for local evaluation
- Collaboration with Taiwan mission: introduction of wax apple, Pitaya and Indian jujube
- Collaboration with CARDI/CAPGERNet: collection of 27 accessions of sweet potato and introductions of high yielding cassava clones

6.3.1 Changes in international financial support for plant genetic resources

Over the past 10 years there has been little movement for funding for PGR systems owing to the fact that there has not been any structured, unified or comprehensive, national PGR programme.

6.4 Needs and priorities for future international collaboration

- Understanding state of diversity
- Enhancing *in situ* management
- Enhancing *ex situ* management
- Enhancing use of plant genetic resources
- Enhancing training and legislation
- Enhancing information management and early warning system for plant genetic resources
- Enhancing public awareness

6.5 Subscription to international agreements, treaties, conventions, or trade agreements over the past 10 years which are relevant to the sustainable use, development and conservation of plant genetic resources

- The Cartagena Protocol on Biosafety to the Convention on Biological Diversity (CBD). The protocol seeks to address the use of LMOs and GMOs. However, laws governing the protocol have not yet been passed. Therefore, the impact of this agreement cannot be measured.
- The Convention on Biological Diversity: the objectives for the convention “are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding”. A national Biodiversity strategy and action plan has been developed. However, it is still being administratively revised in preparation for its implementation.
- The International Convention for the Protection of New Varieties of Plants (UPOV): -legislation is pending for the passing into law of the plant breeders’ rights which is an instrument of this particular Convention.
- International Plant Protection Convention: the objective of this treaty is “to secure common and effective action to prevent the spread and introduction of pests of plants and plant products and to promote measures for their control and to provide a framework and forum for international co-operation, harmonization and technical exchange in collaboration with regional and national plant protection organizations”.

ACCESS TO PLANT GENETIC RESOURCES AND SHARING OF BENEFITS ARISING OUT OF THEIR USE, AND FARMERS' RIGHTS



7.1 Subscription to any international agreements relevant to access to plant genetic resources and sharing of benefits arising out of their use

- Convention on Biological Diversity
- UPOV
- IPPC
- Cartagena Protocol on Biosafety

Although the above conventions have not been fully ratified nor local laws fully passes, they still facilitate the safe accessing and movement of PGRFA into the region and the country through the CAPGERNet/PROCICARIBE/CARDI conduit.

7.2 Development or modification of national legislation and policies or action taken in terms of providing access to plant genetic resources within the country and sharing of benefits arising out of their use

The National Parks Act, 2002, gave rise to the protection, management and development of the national, physical and ecological resources and the historical and cultural heritage of St Vincent and the Grenadines. Among the criteria for selection of these sites the element of scientific research is included so that sustainable use of PGR could be initiated through research.

7.3 Management action undertaken in the last 10 years to maintain or enhance access to plant genetic resources located outside the country

Efforts have been made through CAPGERNet and CARDI to forge closer alliances with CIAT, CIMMYT, CIP, BI, GCDDT/FAO, AVRDC, IITA, NORGEN, REMERFI, PROCISUR, PROCIANDINO, PROCITROPICOS, EMBRAPA, COGENT, INIBAP and other related networks. A National Coordinator was nominated to represent the country on CAPGERNet.

7.3.1 Strategies and priorities

Thirty clones of cassava, most originating from Latin America, were received from CIAT, Colombia. Sweet potato clones were accessed from CIP.

7.4 Evaluation of gaining of access to plant genetic resources

Access to PGR has improved over the last ten years.

7.5 Trend in accessibility to PGR outside the country over the last ten years

Generally, access to PGR outside country has been increasing especially to fruits like pitaya, Indian jujube, wax apple and cassava germplasm.

7.5.1 Adequacy of access to PGR outside the country to support agriculture, food security and development goals

Access of PGR to support agriculture, food security and development goals, is generally good. However some germplasm like purple flesh potato are difficult to access mainly because there are no well established, local programme despite the loose arrangements made at the international level.

7.5.2 Obstacles to accessing plant genetic resources

- Lack of policy/legal framework
- Lack of a comprehensive, organized, local PGR programme
- Lack of stronger collaboration with international germplasm repositories and networks

7.6 Restriction of access to certain types of plant genetic resources

Restriction of access to PGR is exercised based on the tenets of International Plant Protection Convention. Thus the reasons are related to plant quarantine regulations.

7.7 Benefits arising from the use of plant genetic resources in the country

Quantitative benefits from the use of PGR can be gleaned from table 8. Qualitatively the use of PGR ensures a supply of various types of vitamins, energy and other essentials nutrients to the population from the consumption of fruits and vegetables which are important towards sustaining a healthy labour force for the productive sector.

Major sources of macro-nutrients can be obtained from aroids, for example, a boiled dasheen can provide 53.42 g of carbohydrates along with other minor nutrients. Moreover, local PGR have been integrated into the tourism sector as a way to lessen the dependence on the importation of foreign foods.

It can be said that there is no starvation for food in St Vincent and the Grenadines. Apart from this single most important benefit, the populace gains employment on-farms and earn incomes from the sale of farm produce. The country earns foreign currency through the export of agricultural products to the Caribbean, North America and Europe.

7.8 Beneficiaries of the use of plant genetic resources:

- Farmers
- Consumers
- Traders (importer/exporters)
- The national treasury from various taxes



7.9 Establishment of mechanisms for sharing benefits arising out of the use of plant genetic resources

There is no structured mechanism in place. However, most benefits are garnered directly from the use of PGR by production, consumption and marketing. Local laws are supposed to protect private property inclusive of farm products so that the farmers may benefit from the harvest of their crops.

7.10 Identification of obstacles to achieving or enhancing the fair and equitable sharing of the benefits of the use of genetic resources

Obstacles to the achievement of fair sharing of the benefit of the use of PGR are, viz.:

- Praedial larceny (inefficient application of local laws)
- Lack of policy framework
- Lack of information system
- Lack of a structured programme for PGR management

7.11 Importance of maintaining or enhancing access to plant genetic resources and benefit sharing

Maintaining or enhancing access to PGR is important in the following ways:

- Increase crop diversity
- Broaden the export market base
- Increase access to improved nutrition of the population
- Development of germplasm which may be more tolerant/resistant to pests and diseases and adverse environmental factors (high temperature, salt, cold, drought and water logging)
- Replenish depleted genetic base

7.12 Subscription to international agreements relevant to the implementation of Farmers' Rights

Legislation on Plant Breeders Right (UPOV) is being reviewed at the moment. However it has not been passed into law. There was only some initial debate on Farmers' Rights.

7.13 Developed or modification of national legislation and policies to achieve or enhance the implementation of Farmers' Rights over the last ten years

The most relevant and pertinent actions taken at the policy level was the discussion on the Plant Breeders Right (UPOV). No action was taken on Farmers' Rights.

7.14 Identification of obstacles to achieving or enhancing the implementation of Farmers' Rights

Lack of a PGR management system leads to delayed awareness of the importance of such legislation.

THE CONTRIBUTION OF PGRFA MANAGEMENT TO FOOD SECURITY AND SUSTAINABLE DEVELOPMENT

8.1 Contribution to agricultural sustainability

In St Vincent and the Grenadines the genetic base for food may be considered fairly large for some crops while for other it is relatively small. However the proper use of these PGR has led to a sustainable agriculture in some areas while in others there is need for considerable strengthening. Owing to the steep hillside terrain of St Vincent and the Grenadines, the use of aroids using minimum tillage has led to the sustainable use of these hillsides over quite a number of years.

The plants of citrus on slopes have also contributed to less soil erosion while at the same time providing a good source of vitamin C for both the rural and urban populations. However, the decline in banana production has dealt a serious blow to sustainable agriculture since clean and bare fields appeared throughout the islands including on hillsides.

This practice has led to an increase in soil erosion and the contamination of water ways with pesticide residues. It must be added, though, that most of those practices are beginning to subside since the turmoil in the banana market in the European Union.

8.2 Contribution to food security

Over the years the use of PGR has contributed significantly to food security in St Vincent and the Grenadines. There has been steady production of staples like banana, aroids, yam, cassava, breadfruit, sweet potato, peanuts and fruits and vegetables. However, since the diets of Vincentians have been changing towards more foreign food, the production of these foods had lapsed over the last five years or so.

However, owing to growing global food prices, there has been a rapid escalation in the production and consumption of these foods and this drive has been aided by "eat local and buy local" campaigns.

8.3 Contribution to economic development

Since most of the use of PGR is done in the rural areas, there has been significant transformation of the rural infrastructural landscape. During the glory days of banana, known at that time as green gold, persons were able to afford better houses and some of these monies have also been used to provide better social services such as roads and clinics (at one time bananas contributed over EC\$100 million to the GDP).

This trend has been changing since the banana dispute at the WTO and now banana contributes only 1.08% of the total agricultural sector's contribution of 9.33% according to 2007 estimates. This greatly contrasts to its contribution in 1990 of 10.94% when the total agricultural sector's contribution was 21.19%.

Moreover, the ravages of the Moko disease has significantly affected banana production with over 200 large plantations already eradicated by the MAFF due to the incidence of this disease.

So gradually, people have been responding to the government's thrust towards agricultural diversification and where banana was once produced, those places have now been taken over by root crops such as aroids, arrowroot and cassava.

8.4 Contribution to poverty alleviation

According to the Poverty Assessment Report (Kairi Consultants Ltd) on St Vincent and the Grenadines, “30.6% of households and 37.5% of the population were poor, and 20.4% of households and 25.7% of the population were indigent”. The report went on to highlight that most poverty were within rural areas and that one of the causes of poverty was the decline in the banana industry. Since the fallout of the decline of the banana industry has led to significantly less monies flowing into the rural communities, the use of non-banana PGR is critical towards achieving poverty alleviation.

Although farmers have been making earnings from the sale of non-banana crops, these receipts are substantially less than those collected on a regular basis, for banana. Hence, a proper programme for the most efficient use of PGR which includes research into different farming systems for the available PGR and the introduction of new PGR which is most appropriate for these environments, are critical towards achieving greater poverty alleviation.

8.5 Priorities

The management, conservation and utilization of St Vincent and the Grenadines’ plant genetic resources could be improved if the following conditions are satisfied.

More training opportunities for persons involved in plant genetics and biotechnology, botany, taxonomy and chemistry. The following activities must also take place:

- Establishment of a system of updating the plant genetic resource inventories
- Establishment of a policy/legal framework
- More emphasis on germplasm collection and conservation
- Research into proper exploitation of local germplasm for maximum returns to the population

8.6 Opportunities

Greater collaboration with the networks mentioned in Article 3.9 will offer tremendous advantages to developing the PGR system for St Vincent and the Grenadines and the introduction of new PGR for the benefit of all. Potentials exist in areas such as agro-tourism, agro-forestry and nature tourism.

The industrialisation of agricultural production whereby processed products are mostly exported, should be most seriously considered. Resources should be invested to bring this about.

Benefits can also be obtained from the proper exploitation of underutilized PGR like yams and income could be generated from their proper identification and characterization using molecular biotechnological techniques such as DNA fingerprinting. The potentials for marketing of such products through niche marketing, as health foods, need to be explored nationally, regionally and internationally.



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