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ALPART - ALUMINA Partners
ASTI - Agriculture Science Technology and Innovation
CAAS - Chinese Academy of Agricultural Sciences
CaFAN - Caribbean Farmers’ Network
CAMI - Caribbean Agro Meteorological Initiative
CARDI - Caribbean Agricultural Research and Development Institute
CCCCC - Caribbean Community Climate Change Centre
CFC - Common Fund for Commodities
CIAT - International Centre for Tropical Agriculture
CIMH - Caribbean Institute for Meteorology and Hydrology
CTA - Technical Centre for Agricultural and Rural Cooperation
CTV - Citrus Tristeza Virus
CMV - Cucumber Mosaic Virus
CPGCA - Christiana Potato Growers Cooperative Association
DTC - Demonstration and Training Centre
ECTAD - Eastern Caribbean Trading Agriculture and Development Organisation
FAO - Food and Agriculture Organisation of the United Nations
FAVACA - Florida Association for Volunteer Action in the Caribbean and the Americas
IICA - Inter-American Institute for Cooperation on Agriculture
IPGRI - International Plant Genetic Resources
MAFF - Ministry of Agriculture Forestry and Fisheries
MALFP - Ministry of Agriculture, Land Forests and Fisheries
MOU - Memorandum of Understanding
NEFO - North East Farmers Organisation
PVY - Potato Mosaic Virus Y
SFC - Sugarcane Feeds Centre
UNITAR - United Nations Institute for Training and Research
USA - United States of America
UWI - The University of the West Indies
WMO - World Meteorological Organization
HOT PEPPER

- CARDI Grenada Unit participated in the National Hot Pepper Programme; the Institute provided technical advice and supplied seeds and seedlings to farmers who supply Baron Foods, a manufacturer and exporter of Caribbean food products.

- The Institute signed a Memorandum of Understanding (MOU) with Caribbean Chemicals and Agencies Ltd. for the regional and global distribution of hot pepper seeds produced by CARDI. This MOU allows CARDI to concentrate on its core function – the development, adoption and transfer of technology and to place its seed production activities on a commercial and market driven basis.

- CARDI Trinidad and Tobago Unit established commercial seed production plots at the Sugarcane Feeds Centre (SFC) for the Moruga Red. This local landrace was selected due to high grower and market preference.

- In Barbados, the aphid transmitted poty viruses; Cucumber Mosaic Virus (CMV) and Potato Mosaic Virus Y (PVY) are a major problem in hot pepper production. *C. annuum* accessions PBC 161 and PP 997197 have been identified as being resistant to CMV and PVY. PBC 161 was successfully used in crosses with *C. frutescens* Cherry Wiri Wiri pepper towards generating a resistant progeny. The resultant hybrid seeds will be sown, virus resistant parents identified and then crossed to West Indies Red and other *C. chinense* cultivars. The development of virus tolerant or resistant cultivars will contribute towards increasing hot pepper production.

- Bukang a potential source of CMV and PVY resistance was introduced for field and nursery testing from Japan. This variety has a dominant resistant gene. CMV and PVY resistance are recessively inherited.

- Field testing of yellow berry accessions Phyllis and Joyce is ongoing in Belize. The demand for yellow berries from the niche markets in North America and Europe have been increasing.

- CARDI St. Kitts and Nevis Unit assisted the Department of Agriculture to test the feasibility of exporting Hot Pepper to the USA Market.

- CARDI St. Lucia Unit conducted a field training session for farmers on the production and post harvest handling of hot peppers.
ROOTS AND TUBERS

Sweet potatoes

- Preliminary results from sweet potato irrigation validation trials in Antigua and Barbuda showed that irrigating is not a cost effective option in the wet season. The yields obtained from the irrigated and non irrigated plots were comparable. The second phase of this project will continue in 2011.

- The effect of time of planting and zones on the performance of 10 of the most commonly grown sweet potato accessions in Antigua and Barbuda showed; the optimum planting dates for the highest yielding accessions, Catch Me and Hurricane were January and October. Comparisons between zones showed that Cades Bay and Green Castle were the post prolific locations.

- In St. Vincent and the Grenadines, CARDI with support from the Inter-American Institute for Cooperation on Agriculture (IICA) and in collaboration with the Ministry of Agriculture, Forestry and Fisheries (MAFF) and the Caribbean Farmers’ Network/Eastern Trading Agriculture and Development Organisation (CaFAN/ECTAD) validated the performance of 8 accessions selected for local consumption and 1 accession selected for export in the three major sweet potato producing areas. The results showed that the pink-maroon skin-white flesh variety Rasta for local consumption gave consistently poor yields irrespective of time and location whilst cream skin orange flesh Lovers for export gave consistently high yields.

- CARDI Jamaica in collaboration with the Christiana Potato Growers Cooperative Association (CPGCA), investigated mass propagating of sweet potato planting material in protected structures to determine the best practice for the production of disease free planting material from tissue cultured plantlets. Two methods were assessed vertical hanging and conventional flat bed. Yields from the flat beds were twice as much as those obtained from the vertical hanging baskets. The volume of the pots was identified as a limiting factor in the vertical system. Future work will look at varying pot size to improve yield as there are several advantages associated with this system such as ease of harvesting and optimizing the use of greenhouse space.

- Sweet potato weevil (Cylas formicarius) continues to be a major problem affecting production. In St Kitts and Nevis, a trial was conducted to determine the efficacy of traps and lures for the control of the sweet potato weevil. The Taiwanese lure gave the best results. Its wider entrance and more concentrated lure were identified as reasons for the higher success rates.

CARDI Resources
• CARDI Barbados evaluated the two biopesticide Naturalis-L® and the insecticide Lorsban™ to control the Scarabee weevil (*Euscepes postfasciatus*).

• Forty three cultivars of sweet potatoes were characterised at the CARDI Field Station in St Kitts and Nevis using the International Plant Genetic Resources (IPGRI) descriptors.

Cassava

• The government of Barbados has mandated that cassava replace 20% of the corn being imported into the country for the production of animal feed. It is envisaged that the acreage under cassava cultivation will increase from 400 to 1200 ha. In support of this the CARDI Barbados Unit established a multiplication plot at its field station in Graeme Hall to supply farmers, with improved disease free planting materials.

• Trials done in Barbados showed that the highest rate of establishment for cassava in the nursery was achieved for hard wood 1 node cuttings whilst semi hard and soft wood cuttings needed to have between 4-6 nodes for successful establishment.

• Production trials in St Vincent and the Grenadines for cassava showed that the varieties CM7514 – 7 and SM1565 – 15 introduced from the International Centre for Tropical Agriculture (CIAT) were higher yielding than local varieties: Print Stick, Butter Stick and White Stick. The CM 7514-7 showed the best Cassava: farine ratio. The SM1565-15 CIAT had a low cassava: farine ratio, but was high yielding and easiest to peel, this is a good quality for processing.

Yams

• The availability of quality planting material for yams was identified as a constraint to yam production in Dominica. A participatory training programme was conducted to demonstrate the mini setting technique to over 30 participants made up of extension workers, propagation personnel and agricultural science teachers and students.

• CARDI Grenada in collaboration with the Food and Agriculture Organisation of the United Nations (FAO) successfully trained 30 farmers from the North East Farmers Organisation (NEFO) in the production of tannia, yams, sweet potato and dasheen.

• St Lucia over the last year experienced a shortage of planting material for root crops; to address this the CARDI Unit initiated a multiplication drive to supply farmers with disease free planting materials.
CARVING COMMERCIAL PATHS

In October 2010, CARDI signed a MOU with Caribbean Chemical and Agencies Limited (CCAL), the largest input supplier for agriculture in the English speaking Caribbean to utilise its distribution network, in a novel way - termed reverse distribution - to market hot pepper seeds produced by the Institute.

Under the brand of CARI Seeds, Caribbean Chemicals will package and distribute hot pepper seeds of the following varieties
- CARDI Green
- West Indies Red
- Moruga Red
- Scotch Bonnet

These prolific varieties are in high demand and commands premium prices on the local and international markets. Apart from being utilised in their fresh form, these varieties are also quite popular in the processing and industrial sectors.

CARDI realises that the breeding and exploitation of new varieties is a decisive factor in improving rural incomes and economic development in the Region. As such the Institute is set to expand its hot pepper seed production programme to include the CARDI Yellow, Hood, Bejucal, Faria, Scorpion and Seven Pod landraces.
1. Students participate at the CARDI Belize Unit’s Open Day
2. Viewing sweet potato germplasm at the CARDI Grenada’s Open Day
3. CFC Ambassador Ali Machumo on a field tour, Trinidad and Tobago
4. Engaging the media in agriculture: Minister of Agriculture Trinidad and Tobago, Hon. V. Bharath, CARDI Executive Director Dr. H.A.D Chesney and Associated of Caribbean Media Workers President, Mr. W. Gibbings at a Press Briefing during Caribbean Week of Agriculture Grenada
5. CARDI’s booth at the Cayman Islands Agricultural Show
6. Launch of CFC/EU Projects on Protected Agriculture and Roots and Tubers, Trinidad and Tobago (from left: K. Renner, Ambassador A. Machumo, Dr. F. Asiedu and Dr. H. A. D Chesney)
7. Enthusiastic children at the CARDI’s booth World Food Day Exhibition, Trinidad and Tobago
PROMOTING THE DEVELOPMENT OF THE PROTECTED AGRICULTURE INDUSTRY

Protected agriculture has enabled many countries to extend their food production capabilities. CARDI recognises that this system will play an important role in meeting the Region’s food security target. In 2010, CARDI made significant strides in facilitating the development of a sustainable regional Protected Agriculture industry.

- The Institute collaborated with FAVACA on a series of workshops in Dominica and St Vincent and the Grenadines aimed at addressing the constraints associated with protected structures, growing media and water management.

- A CARDI scientist visited China to undergo training in Protected Agriculture, observe production and marketing systems and identify possible areas for collaboration with the Chinese Academy of Agricultural Sciences (CAAS).

- CARDI was identified as the executing agency for the CFC/EU funded project “Increased production of vegetable and herbs through the use of Protected Agriculture in the Caribbean”. The objective of the project is to pilot and expand the use of Protected Agriculture systems through capacity building and infrastructure enhancement. A complementary goal of the project is to develop improved production and marketing tools. Trinidad and Tobago, Haiti and Jamaica will directly benefit from this project.
FRUITS AND VEGETABLES

- CARDI Grenada through the support provided by Florida Association for Volunteer Action in the Caribbean and the Americas (FAVACA) developed a Hot Water Treatment protocol to kill West Indian Fruit Fly larvae in mature green Golden Apple. This successful treatment would enable Grenada to once again ship fresh Golden Apple to the USA. Further testing will continue to determine the best temperature and time combinations so as to produce treated fruits of good quality whilst ensuring any fruit fly larvae within are killed.

- CARDI Grenada has been working on a dwarfing system for tall golden apples, which bear large fruits. On farm validations are ongoing for golden apples established from seedlings and grafted golden apple plants derived from scion from the tall type on to seedling rootstock of the dwarf type. Preliminary results for the grafted trees are showing a spreading, low growing habit. Fruiting is not expected for another 2 years.

- In St. Kitts, FAVACA volunteers Dr. Oscar Libur and Dr. Angeleah Browdy, assisted in the Integrated Pest Management for Diamond Back Moth control in cabbage and post harvest technology.

- An “improved passion fruit” demonstration production system was established at the CARDI St Lucia Demonstration Centre. This demonstration plot utilised local material in the construction of trellises and the application of control pruning. A guide to ‘Passion Fruit Production’ was published. Two validation trials were also conducted comparing the traditional farmer’s system versus an improved production system. The improved production system involves the application of proper management practices (pruning, training of vines, timely application of fertiliser, pest and disease control). Results showed that the improved production system outyielded the farmer’s system by 97%.

- The germplasm plot for pineapples at the St. Lucia DTC for locally grown pineapple varieties continued to be a source of planting materials for farmers. The explants were sent to the tissue culture lab at the Ministry of Agriculture, Land, Forestry and Fisheries (MALFF) for multiplication. These will be made available to farmers.

- In Antigua, an assessment on the productivity of 5 varieties of pineapples was conducted (Antigua Black, Local Smooth Cayenne, Smooth Cayenne, TN # 4 and TN #11). Results showed that Smooth Cayenne and Local Smooth Cayenne produced the heaviest fruit and the highest yields. TN#11 produced the lowest
fruit weight. Smooth Cayenne varieties were most susceptible to Pineapple Mealy Bug *Dysmicoccus brevipes* (Cockerell) whilst the Antigua Black was least affected.

- In an effort to revitalise the fresh water coconut industry in St Lucia, over two thousand Malayan Dwarf Coconut seedlings were propagated at the DTC and distributed to farmers.

4 CEREALS AND GRAIN LEGUMES

- CARDI Belize continued to identify yellow and white corn hybrids that perform better than those currently being planted by large scale mechanized producers and also yellow and white open pollinated corn varieties to meet the needs of small scale producers.

- Small red beans and black beans are becoming important crops for immigrants and indigenous groups in Belize and CARDI continues to identify and evaluate better varieties than those currently being planted.

- Belizean farmers were trained in the use of small mechanical agricultural equipment (corn sheller and thresher) for shelling, drying and storage of grain.
SMALL RUMINANTS

- In an attempt to stimulate the small ruminant subsector, CARDI Barbados introduced two hardeners (Cement and MagoxR, 93 Block Grade) for the making of multi-nutrient block as well as a silage press. A special farmers’ group was formed to manufacture and sell blocks locally as a means towards improving feeding during the dry season.

- A site for the handling and storage of milk at a facility in Telescope, Grenada was constructed. The milk will be used for the manufacture of goat cheese.

- A region wide characterisation of the Agriculture Science Technology and Innovation (ASTI) system that supports the small ruminant industry was conducted. The findings will be used to seek resources for the fashioning of interventions to develop a viable and sustainable industry in the Region.

- The focus of the livestock programme in Trinidad and Tobago was the development of forage based feeding systems. Based on preliminary data collected the forage Mulatto II (Brachiaria hybrid CIAT 36087) is superior to local Tanner Grass (B. arrecta). The highest dry matter yield per cut for each grass was obtained at 9 weeks regrowth.

- Twelve goat houses were constructed as pilot demonstration sites and four breeding units were established in Grenada.

- The efficacy of hormonal manipulation in the reproduction of goats showed that animals exposed to hormone treatment completed their kidding cycle in a maximum of 8 days, whilst it took as much as 55 days in some cases for untreated animals to kid after the commencement of the kidding period. This trial was conducted in Jamaica.

- CARDI Jamaica collaborated with ALUMINA Partners (ALPART), the Ministry of Agriculture and farmers in Jamaica in improving goat production by the introduction/re-introduction of improved breeds of Boer, Nubians and Alpines. Sixty improved goat stocks were made available for distribution to farmers in Jamaica.

- Over 500 producers in Jamaica received training in improved production practices for small ruminants. In Grenada 30 farmers were trained in the management of internal parasites.

CARDI Resources


Goat houses constructed in Grenada and adopted by the Ministry of Agriculture, Fisheries and Forestry as a demonstration model.

Mulatto an imported improved variety of grass is very adaptable to local conditions.

Compared to the locally grown Tanner grass in Trinidad and Tobago Mulatto has:
- Higher dry matter yield
- Higher leaf to stem ratio
- Higher nutrient content
- Higher resistance to pest and diseases
- Excellent regrowth after grazing
NATURAL RESOURCE MANAGEMENT

Soil and Water Management

• CARDI Jamaica and its partner ALPART embarked on a programme to develop sustainable practices for cultivating crops on reclaimed bauxite soils and to transfer the technology to farmers.

• Vermi – composting production continued in Jamaica. Three new bins were constructed to increase the production of this product and the technology was demonstrated to farmers, students and other stakeholders.

Climate Change

• CARDI collaborated with the Caribbean Institute for Meteorology and Hydrology (CIMH) and the World Meteorological Organization (WMO) for the implementation of the Caribbean Agro Meteorological Initiative (CAMI). The objective of CAMI is to increase and sustain agricultural productivity at the farm level in the Caribbean through improved dissemination and application of weather and climate information. A CARDI scientist will lead the development of an effective pest and disease forecasting system.

• Under the Caribbean Community Climate Change Centre (CCCCC) agreement with the United Nations Institute for Training and Research (UNITAR) 10 CARDI field stations will be furnished with equipment to record meteorological data.

Invasive species

• Citrus Tristeza Virus (CTV) is a disease that can be controlled through the use of tolerant resistant rootstocks. The CARDI St. Lucia DTC has a germplasm of 3 CTV tolerant rootstock varieties (Volkameriana, Swingle Citremelo and Carizzo Citrange). Seeds were extracted from these lemon rootstock varieties and handed over to the Ministry of Agriculture, Land, Forestry and Fisheries for propagation of the CTV tolerant rootstocks.

Seeds and Seedling Banks

• CARDI stations in Antigua and Barbuda and Belize are the centre of the Institute’s seed production programme. The former focus is on the production of hot peppers whereas the latter focus is on producing seeds of cereals and grain legumes of commercial importance as well as the maintenance of nucleus and stock seeds.
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EMERGING ISSUES

Protected Agriculture

- The CARDI Dominica Unit with the assistance of FAVACA conducted training sessions for Youths and Farmers on Protected Agriculture Systems using the Farmers Field School Approach.

- In Montserrat, persistent volcanic activity has resulted in acid rain and ash, conditions which are not conducive to growing crops. Three low cost hoop houses were constructed and used to demonstrate how crops such as sweet potato, vegetables and seasonings can be grown.

- In St Lucia an evaluation on Protected Agriculture vs. Open Field vegetable production systems was conducted for tomato, cucumber and sweet pepper during the wet season and dry season. A higher cost of production was associated with the Protected Agriculture system, when compared to the Open Field. The net return was higher for Open Field. The lower rate of return under the Protected Agriculture system may be due to the presence of Tomato Leaf Curl virus which affected Tomatoes. This disease was most prevalent under the Protected System.

- A training programme in Protected Agriculture for extension officers and small farmers was conducted in St Vincent and the Grenadines. Some of the areas the programme addressed were composting, sustainable farming systems, organic agriculture, soil preparation and irrigation.

- In Jamaica, economical ventilation systems were evaluated for their potential to reduce high temperatures within protected structures being experienced at low elevations. Two systems passive and active were assessed. The results indicated that growing conditions in terms of temperature, relative humidity and ventilation under each system was not deleterious to vegetative growth and productivity.

CARDI Resources

CARDI 2010, Protected Agriculture: A New Alternative (Video).

COUNTRY CONTACTS

ANTIGUA AND BARBUDA
Betty’s Hope
P.O Box 766, St. John’s
Tel: 1-268-463-3755
Email: cardi@candw.ag

BARBADOS
Cave Hill Campus
The University of the West Indies
St. Michael, P.O Box 64
Bridgetown
Tel: 1-246-425-1334
Email: cardibdos@cavehill.uwi.edu

BELIZE
Central Farm, Western Highway
Cayo District
P.O Box 2, Belmopan
Tel: 011-501-824-2934
Email: cardi@btl.net

DOMINICA
NDC Building, Valley Road,
Bath Estate, P.O Box 346, Roseau
Tel: 1-767-448-2715
Email: cardi@cwdom.dm

GRENADA
Westerhall, St. David’s
P.O Box 270, St. George’s
Tel: 1-473-443-5439
Email: cardignd@spiceisle.com

GUAYANA
National Agricultural Research Institute
(NARI) Compound
Mon repos
East Coast Demerara
Building D29
Tel: 011-592-220-6527/6537
Email: cardiguyana@gmail.com

JAMAICA
2 Belmopan Close
The University of the West Indies
Mona Campus
Mona, Kingston 7
Tel: 1-876-927-1231/0652
Email: cardi2@cwjamaica.com

MONTSERRAT
P.O Box 272
Plymouth

ST. KITTS AND NEVIS
P.O box 479
Fortlands, Basseterre
Tel: 1-869-465-1498/2846
Email: cardiskn@sisterisles.kn

ST. LUCIA
La Ressource, Dennery
P.O Box 971
Castries
Tel: 1-758-453-3317
Email: cardi@candw.lc

ST. VINCENT AND THE GRENADINES
Rivulet, P.O Box 594
Kingstown
Tel: 1-784-457-1535
Email: cardisvg@caribsurf.com

TRINIDAD AND TOBAGO
P.O Bag 212
Frederick Hardy Building
The University of the West Indies
St. Augustine Campus
Tel: 1-868-645-1205/6
Email: ttunit@cardi.org

TOBAGO OFFICE
Blenheim, Mount St. George
Tel: 1-868-660-2237
Email: carditgo@tstt.net.tt

Headquarters
P.O Bag 212
Frederick Hardy Building
The University of the West Indies
St. Augustine Campus
Tel: 1-868-645-1205/6
Email: infocentre@cardi.org
www.cardi.org

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