CARDI

Antigua and Barbuda

Country Highlights 2009

CARDI's contribution to agricultural research and development, food production and the reduction of poverty and hunger

Improving lives through agricultural research

Caribbean Agricultural Research and Development Institute

COUNTRY HIGHLIGHTS 2009

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CARDI OFFICE IN ANTIGUA AND BARBUDA
September 2010

PSC # AN/001/10

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Acronyms and Abbreviations

APUA	Antigua Public Utilities Authority
CABA	Caribbean Agricultural Business Association
CARDI	Caribbean Agricultural Research and Development Institute
CDB	Caribbean Development Bank
CMC	Central Marketing Corporation
FAO	Food and Agricultural Organization (United Nations)
GARD	Gilberts Agricultural Research and Rural Centre
IICA	Inter-American Institute for Cooperation on Agriculture
IPM	Integrated Pest Management
MALHE	Minister of Agriculture, Lands, Housing and Environment
RWH	Rainwater Harvesting
US	United States (of America)
WIR	West Indies Red (Hot pepper variety)

1.0 FOREWORD

Technical and logistical support was given by the Government of Antigua and Barbuda through the Honourable Minister of Agriculture, Lands, Housing and the Environment, Mr. Hilson Baptiste; the Permanent Secretary Mr. Clarence Pilgrim and the Director and Deputy Director of Agriculture, Ms. Jennifer Maynard and Mr. Jedidiah Maxime. Without the Ministry of Agriculture Lands, Housing and Environment (MALHE) technical and logistical support, implementation of the CARDI work programme would be intrinsically more difficult and goals would be more difficult to achieve.

Special mention must also be made of Mr. Julius Ross, Technical Consultant to the Minister, the Research Officer Ms. Maudvere Bradford, the Coordinator of Agricultural Stations, Mr. Carlton Hampson, the Cades Bay, Green Castle and Central Cotton and Diamond Station Managers, Miss. Irose Henry, Mr. Ricky Christopher and Mr. Chester Samuel, who provided CARDI with materials, supplies, human resource and equipment support to establish the sweet potato experiments at Green Castle and Cades Bay Agricultural Stations and the West Indies Red hot pepper commercial plot at Central Cotton Station; also the Produce Chemist Laboratory and the Plant Protection and Extension Units, who provided soil analysis and routine plant health support. They can be assured that their contributions and interactions were invaluable to our success.

Other organisations / agencies / institutions / businesses with which the Unit had strong and productive relationships over the past year were the Central Marketing Corporation (CMC), Inter-American Institute for Cooperation on Agriculture (IICA) Gilberts Agricultural Research and Rural Centre (GARD), Antigua Farm and Garden, Bargain Centre Hardware and Caribbean Agricultural Business Association (CABA).

Last, but certainly not least, the Unit's technical and support staff, which provided management with efficient support under trying conditions. Their contributions and interactions were invaluable to the overall success of the Unit.

Dr. Gregory Robin
CARDI Representative in Antigua and Barbuda; and Technical Coordinator – OECS Programmes

2.0 EXECUTIVE SUMMARY

The Unit's motto for the year 2009, were simply, "to continue, build-on and improve on the good work of 2008".

The R & D activities of the Unit were focused on sweet potato, a commodity that CARDI has a mandate from CARICOM to exploit and develop an industry around. During 2009 the experiments examining the effect of planting dates (seasonality) and zones on the performance of the ten most commonly grown accessions were completed. The results to date showed that showed that accessions, time of planting and zones influenced marketable yields.

The Unit continued on its commercial seed production drive and a 0.5 ha results demonstration West Indies Red hot pepper plot was established in collaboration with the MALHE. The plot has yielded 3,000 kg of berries, 40 kg of seed, 1,000 kg of pulp as at the end of December 2009. Commercial corn and guinea grass plots have yield 273 kg and 2.4 kg of seed respectively. One hundred kilograms of corn seed were sold to Antiguan farmers and 6.9 kg of Guinea grass seeds was sold throughout the Region.

The commercial activities which supported the Ministry's food security drive were expanded to include papaya and a small commercial plot was established in February 2009.

Due to lack of funding, the Unit was unable to replace depreciated plant, infrastructure and equipment over the years. This has resulted in the Unit's inability to sustain its irrigation systems, hence the move to the MALHE Stations.

CARDI Antigua and Barbuda has received unwavering support from the MALHE re establishment of its on-station experiments and validation plots and during the latter half of 2009, the Unit received subvention payments totalling EC$200,000, a welcome re-start to the huge outstanding payments owed to the Institute. CARDI Antigua and Barbuda will continue to work closely with the MALHE and all affiliated national partners to secure the accelerated development of the local agricultural sector.

The interventions made in Antigua and Barbuda over the past 2 years have already begun to contribute to enhancing the Country's food and nutrition security. The Unit is now able to give more accurate sweet potato production data i.e. by location and planting season. This will enable producers and exporters to make more accurate food security and export pronouncements.

The results from the 0.5 ha West Indes Red hot pepper demonstration/ commercial plot are showing the true potential of hot pepper production in Antigua and Barbuda. Apart from the customary seed production, the plot will be used to demonstrate that Antigua and Barbuda has the ability to produce, in addition to the traditional hot sauce, dried pepper products and mash. Next year the Unit is planning in collaboration with the MALHE a hot pepper agro-processing workshop to included sessions on storage of pulp, dried pepper products and mash making.

3.0 Review and Update of the Agricultural and Rural Sectors

The agriculture sector (food, natural resources and rural development)

The sector's role within the overall economy is primarily to enhance food security. To achieve this, the entire commodity chain must be addressed i.e. production, processing, marketing, nutritional quality and safety.

The sector is also concerned with the sustainable use and development of other natural resources, both land and marine. These encompass watersheds, forestlands, agriculture lands, and coastal resources: including fisheries, wetlands, coastal and reef systems. The conservation and sustainable use of the nation's natural biological diversity, including that of wild plants, birds, fish and mammals, as well as crop and livestock are also important concerns of the sector. Those persons living in the rural communities primarily carry out most of the sector's activities. Rural development is therefore a fundamental and natural focal area of the sector as it strives to maximise the potential of rural communities through all aspects of food production, processing, marketing and natural resources management.

In view of the above concerns, it was proposed that the MALHE should be renamed: The Ministry of Food, Natural Resources and Rural Development. This remains a suggestion.

Food imports

The climbing food importation bill is a continuous concern for the sector and as a result, activities to reduce food imports are accompanied by an increase in the local production of affordable food and the increased consumption of these foods locally. An immediate "spin-off" would be improvement in the food security index, the saving of foreign exchange and a re-circulation of money within the economy. Food imports related to the tourism sector will be given top priority. Activities to address food imports have already started and the commodities of focus are vegetables, vine fruit and salad crops, fish (including lobster) and sheep and goat meat. The MALHE is of the opinion that local production can contribute significantly to hotel consumption and thus the reduction of imports by 2% per annum.

Export potential

There are several locally produced commodities, which have good export potential. However, sustaining these commodities in the export market would require overcoming problems of consistent supply and quality deficiencies. This potential needs careful re-examination in the light of anticipated international market conditions and the level of resources for development and sustenance of such programmes. The re-examination must be done systematically and on a commodity-by-commodity basis.

Melons, Sea Island cotton, hot peppers and sweet potato are some of the commodities listed for initial evaluation. CARDI is assisting the process and is presently conducting zonal and seasonal trials on sweet potato. CARDI is also assessing the true potential of the hot pepper industry in Antigua and Barbuda. Such export directed programmes would be secondary in importance to import replacement efforts.

The Ministry's producer and entrepreneur roles

Scientific and technologically advanced food production and handling will be promoted, in order to increase productivity and reduce cost, while simultaneously achieving the required level of quality and food safety. Perhaps more importantly, is the need to promote a business approach to management and organisation of the food production and marketing system, as this is presently more constraining. Correction of this deficiency must involve producers adopting an integrated, businesslike approach to production and marketing. In order to improve production and marketing efficiency, co-operatives and other forms of farmer associations must be vigorously promoted and strongly supported by the MALHE. CARDI's work programme for 2010, to be executed in close collaboration with the MALHE would address most of the above. Also expected activities in hot pepper processing, and technical assistance to the small ruminant programme, augers well for the businesslike approach.

Retaining adequate land for agriculture

In order for the sector to achieve, the objectives set out above, it must address some of the critical constraints to land and water availability. The Ministry supports, in principle, the development of the National Land Use Plan and considers its adoption and implementation of great significance in the struggle to retain productive agricultural land for future generations. Another land issue relates to the ability of *bona fide* farmers to obtain long-term leases for their land. Long-term leases are one way of encouraging farmers to invest and manage their farms as a business as well as assistance to provide security for farmers seeking credit. Currently, lack of long-term leases is seriously hampering the entrepreneurial development of many business-oriented and progressive farmers.

Water resources for agriculture

More effective and sustainable produce-market linkages between hotels and suppliers are highly dependent on a stable production system. The same holds true for all agriculture export programmes, where continuity and consistent quality are pivotal to success. Such production, in turn, is critically dependent on an adequate water supply for the irrigation needs of key producers. At present, water supply is dependent on APUP, which has authority governing all water supplies for agriculture. Desalinated water, while probably affordable for domestic or commercial use, is not a long-term, viable option for agriculture.

The water needs of the nation, should be given serious attention in the National Development Plan, particularly as it relates to the development of water catchments and water storage facilities for housing and agriculture. In addition, the MALHE is calling for the establishment of a Water Resource Board, which would have as its mandate, the responsibility of providing water for all users. The Board would also be mandated to develop and manage all water resources in Antigua. Support for water needs was addressed in the FAO/CDB funded Rainwater Harvesting Workshop coordinated by CARDI in August 2009. The workshop addressed most aspects of rainwater harvesting in a small island states with topography and rainfall similar to Antigua.

Rural development

The dependence of rural communities on farming and fishing is supported by other economic activities such as home based food-processing, charcoal burning and fish pot making. In some communities, which are close to hotel or tourist facilities, opportunities for employment in tourism related activities also exist. Rural communities are frequently deprived of the support and amenities that are found in urban environment and therefore need to be given support in these areas. These communities need assistance to develop their potential and make a more significant contribution to national development. Such support should assist their traditional pursuits of fishing and farming; as a strong, more broadly based community will be better able to support investment in food production.

There is considerable potential for the development of additional micro-enterprises in these rural communities, some of which could provide significant support to the tourism sector. Manufacturing of handicraft for the tourist market and agro-eco-tourism are two areas worthy of mention. It will therefore be the policy of the Ministry, to assist and support rural communities in the above-mentioned areas.

The MALHE Extension Division will be organised and its staff will be retrained to be able to provide the necessary support.

Specific sector objectives (general considerations)

A number of specific objectives for the Sector have been developed and these will form the basis for development of work programmes and projects within the MALHE. These objectives are described on the following page and they embrace the long–standing aim of the Ministry: to provide some measure of food security and healthy nutrition for the nation.

The Ministry is committed to supporting the achievement of these objectives through the provision of human and financial resources and the adoption of appropriate changes in its organisation, plan, projects and procedures. However, the MALHE recognises that the achievement of these objectives lies primarily in the hands of the producers and entrepreneurs, who engage in food and natural resource enterprises. Therefore, it is of the greatest importance that there is effective and consistent collaboration between the private sector and the Ministry.

Specific sector objectives

1. To reduce food imports by 2% per year for the next 5 years
2. To increase foreign exchange through exports
3. To increase the competitive ability of the farmers, fishermen and others involving in natural resource use
4. To improve the economic development of rural communities,
5. To maintain the sustainability of Antigua and Barbuda's natural resources and biological diversity
6. To promote and support environmentally friendly pest, management methods and the adoption of an Integrated Pest Management (IPM) approaches
7. To integrate this sector with that of the environment
8. To promote the widest possible utilisation of local products
9. To promote the concept and practice of "value added" with respect to all food and natural products
10. To develop the sectors human resource

4.0 Implementation of the Medium Term Plan 2008 - 2010

4.1 Development of sustainable industries

4.1.1 Commodity development: crops

4.1.1.1 Sweet potato varietal, time of planting and zonal trial: Addressing food/ nutrition security and exports in Antigua and Barbuda

Farmers' and MALHE technicians have been observing that sweet potato accessions perform differently when cultivated during the different photoperiodic periods / seasons. In order to ensure that CARDI provides technologies that can support the Ministry's food security and nutrition thrust, experiments were conducted to examine the effects of seasonality and zones on the 10 most commonly grown sweet potato accessions in Antigua and Barbuda. Four quarterly plantings (1st quarter January 2009, 2nd quarter April 2009, 3rd quarter July 2008 and 4th quarter October 2008) were established in three different zones (Plates 1 and 2).

Plate 1: July to September, 3rd quarter planting at the MALHE Green Castle Agricultural Station

Plate 2: Sweet potato trial (October to December, 4th quarter planting) at CARDI field Station in Betty's Hope

The characteristics of the different locations (Green Castle Agricultural Station, Cades Bay Agricultural Station and CARDI's Research Station at Betty's Hope) are shown in Table 1.

Table 1: Agro-climatic parameters of the three agro-ecological zones in Antigua and Barbuda

Agro-ecological character	Location		
	Cades Bay	Green Castle	Betty's Hope
Elevation (m)	33	33	26
Annual rainfall (mm)	1,112	1,082	1,036
Rainfall pattern	December to May are dry months. September to November rainy season	December to May are dry months. September to November rainy season	December to May are dry months. September to November rainy season
Soil type	Blubber valley clay	Bandals clay	Fitches clay
Soil physical characteristics	Sandy clay loam	Clay	Sandy clay loam
Vegetation	Forest / Mangrove	Grass lands / forest	Shrub
Temperature (^{0}C)	Max: 29.0 Min: 24.0	Max: 29.8 Min: 24.0	Max: 29.5 Min: 25.4

The ten sweet potato accessions used in the trials were Blackrock (A1), Hurricane (A2), Catch Me (A3), Fine Num (A4), Tremont (A5), Mandela (A6), White Drill (A7), King Crown (A8), 1987 (A9) and CRO2 (A10)]. Tuber skin and flesh colour of nine accessions (A2-A10) are presented in Plates 3 to 11.

Plate 3: Hurricane (A2)

Plate 4: Catch Me (A3)

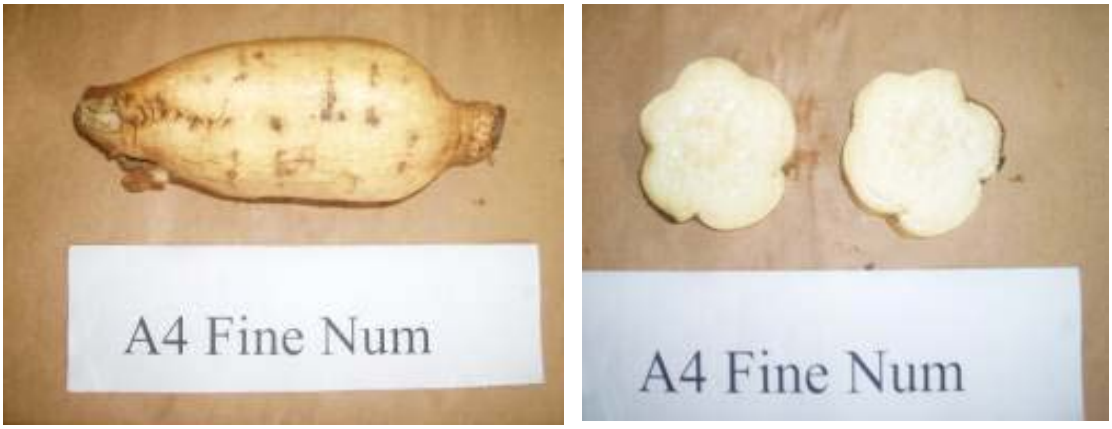


Plate 5: Fine Num (A4)

Plate 6: Tremont (A5)

Plate 7: Mandella (A6)

Plate 8: White Drill (A7)

Plate 9: King Crown (A8)

Plate 10: 1987 (A9)

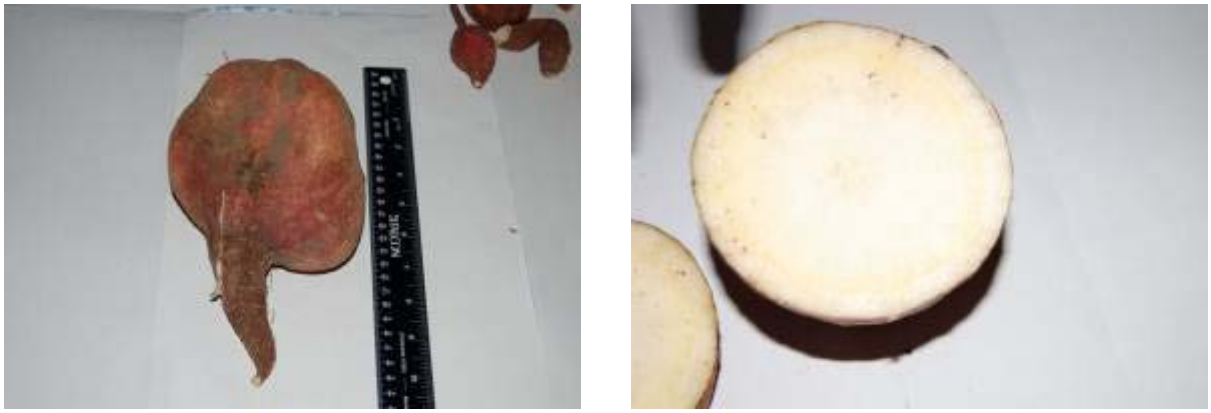


Plate 11: CRO2 (A10)

The experiments at each site were randomised complete blocks replicated four times, with the 10 sweet potato accessions randomised within each block. Data were collected on overall and marketable yield (tuber size, weight and the incidence of pest and diseases); the number and number of marketable tubers.

For the purpose of this report, discussion focuses on marketable yield, which is of most importance to exporters and consumers. A detailed technical / scientific paper on the experiment will be written for the CARDI Review.

Table 2 shows of the 10 accessions validated, Catch Me / A3 (20.8 kg/plot) and Hurricane / A2 (13.2 kg/plot gave the highest marketable yields in the Green Castle location (P<0.001). At Betty's Hope, differences in accession yields were not significant; however the accession Hurricane / A2 gave the highest yield (13.3 kg/plot). At Cades Bay, Catch Me /A3 (24.3 kg/plot) and Fine Num (16.1 kg/plot) gave the highest yields (P<0.001). Overall the highest yielding accessions were Catch Me (16.5 kg/plot) and Hurricane (11.5 kg/plot) P<0.001.

Table 2: Marketable yield parameters of 10 sweet potato accessions grown at the Green Castle, Betty's Hope and Cades Bay Stations, Antigua 2009

Parameter measured	Accessions										P	LSD 5%	df
	A1*	A2	A3	A4	A5	A6	A7	A8	A9	A10			
	(a) Green Castle												
Weight of marketable tubers (kg)	5.5	13.2	20.8	7.4	5.0	6.1	7.8	5.3	6.9	4.7	<0.001	6.3	27
	(b) Betty's Hope												
Weight of marketable tubers (kg)	7.0	13.3	8.5	8.6	1.3	9.3	9.0	3.6	8.2	5.0	0.270	8.7	9
	(c) Cades Bay												
Weight of marketable tubers (kg)	9.9	14.6	24.3	16.1	9.1	6.6	10.9	8.6	7.4	3.6	<0.001	6.1	27
	(d) Accession means												
Weight of marketable tubers (kg)	6.3	11.5	16.5	9.3	4.9	5.8	7.7	5.2	6.2	3.6	<0.001	2.9	54

*A1 = Blackrock, A2 = Hurricane, A3 = Catch Me, A4 = Fine Num, A5 = Tremont, A6 = Mandela, A7 = White Drill, A8 = King Crown, A9 = 1987, A10 = CRO2

Table 3 shows that at Green Castle, yields for the January (9.7 kg/plot), July (9.6 kg/plot) and October plantings (10.6 kg plot), were comparable; but were significantly higher that the April plantings (3.2 kg/plot) P<0.001.At Betty's Hope, the April and July plantings gave no yield and in Cades Bay, the highest yields of 17.1 kg/plot, were obtained for both the January and

October plantings. These yields were significantly higher than the April (6.8 kg/plot) and the July (3.5 kg/plot) plantings. Overall the highest marketable yields were obtained from the January (10.9 kg/plot) and the October (12.3 kg/plot) plantings.

Table 3: Marketable yield parameters of ten sweet potato accessions planted during four growing seasons, Antigua, 2009

Parameter measured	Planting season				P.	LSD 5%	df
	January	April	July	October			
	(a) Green Castle						
Weight of marketable tubers (kg)	9.7	3.2	9.6	10.6	0.002	3.9	27
	(b) Betty's Hope						
Weight of marketable tubers (kg)	5.7	**0***	**0***	9.1	0.082	3.9	9
	(c) Cades Bay						
Weight of marketable tubers (kg)	17.1	6.8	3.5	17.1	<0.001	3.9	27
	(d) Planting season means						
Weight of marketable tubers (kg)	10.9	3.3	4.5	12.3	<0.001	1.8	54

*No yields obtained

When comparisons were made between zones (Table 4), Cades Bay (11.1 kg/plot), and Green Castle (8.3 kg / plot) gave overall, the highest marketable yields (P<0.001).

Table 4: Means of marketable tuber yield compared between zones

Parameter measured	Zone			P	LSD 5%	df
	Betty's Hope	Cades Bay	Green Castle			
Weight of marketable tubers (kg)	3.7	11.1	8.3	<0.001	1.6	54

Conclusion

The experiments showed that accessions, time of planting and zones influenced yield; therefore, recommendations and yield projections on crop performance must be governed by these factors.

Follow-up research

Though marginal differences existed between the ago-ecological characteristics (Table 1), the results showed there was a zonal effect. Therefore a repeat experiment placing greater emphasis on the accuracy of the agro-ecological characteristics will be conducted in 2010. In this experiment, detailed soil physical and chemical analysis will be conducted and site specific climatic data will be collected

4.1.2 Development of seeds and seedling banks

4.1.2.1 Supplying of hot pepper seeds for the local, regional and international markets

The CARDI Antigua and Barbuda Unit continues to execute one of its mandates, which is to supply quality hot pepper seed locally, regionally and extra-regionally. Over the past 3 years, there has been a significant reduction in requests for the West Indies Red (WIR) seeds; however, there has been an increasing demand for seeds of the CARDI Green. The CARDI Green is presently the main hot pepper exported from the OECS and Trinidad to the US (Miami) markets and since production of hot pepper is primarily led by export demands, rather than by agro-processing, this trend is expected to continue. Jamaica seems to be the only country growing large acreages of West Indies Red for its agro-processors.

The importance of hot pepper to the Region, has also led CARDI to strategise its production of seed to avoid major catastrophes resulting from hurricanes and floods. Two countries (Antigua and Barbuda and Belize) are mandated to produce seed. Antigua and Barbuda focuses on the production of WIR seed with Belize providing back up; and for CARDI Green seed, CARDI Belize takes the lead and CARDI Antigua and Barbuda provides back up. After discussions with the hot pepper management team, it was agreed that the Unit should focus on the production of CARDI Green seed during the latter half of 2009. CARDI Antigua and Barbuda also produces seed of the Scotch Bonnet and the local land race Peggy Mouth.

In September/October 2009, a 0.5 ha commercial plot of WIR hot pepper was established in collaboration with the MALHE at Central Cotton Station. The plot was established with the anticipation that CARDI would have established contracts with two private companies.

Table 5 summarises the major cost items for berry production for seed, fresh berries and pulp. Production planting density was 10,000 plants/ha.

Table 5: Major cost items for establishing and maintaining a 1 acre (0.4 ha) of West Indies Red hot pepper at Central Cotton Station in Antigua

Activity	Cost (EC$)
Seedling production	1,244.07
Material inputs	3,716.44
Mechanical land preparation	700.00
Pest & disease control	1,449.19
Equipment (including irrigation lines)	6,193.59
Labour (including harvesting)	3,172.94
Total	**16,476.23**

A total of 80 (98 cell) seedling trays were set. This suggests that approximately 63% of the seedlings were actually transplanted to the field.

At the end of December 2009, 3,000 kg of berries were harvested; this yielded 40 kg of seed and 1,500 kg of pulp. Four hundred and sixty-two kilograms of berries were also sold to agro-processors. The process of land preparation to packaged seed is shown in Plates 12 to 21. Data collection continues on berry yield and all activities that are likely to support detailed cost of production issues. The plot will also be used as a CARDI / MALHE results demonstration plot and will be used to support the planned agro-processing and storage workshops in 2010.

Plate 12: Land preparation for West Indies Red hot pepper plot at Central Cotton Station, Antigua

Plate 13: Laying drip lines and plastic mulch for West Indies Red hot pepper plot at Central Cotton Station, Antigua

Plate 14: Transplanting West Indies Red hot pepper seedlings at Central Cotton Station in Antigua

Plate 15: Healthy West Indies Red hot pepper commercial plot at Central Cotton Station, Antigua

Plate 16: Harvesting hot peppers at Central Cotton Station, Antigua

Plate 17: Sorting and grading West Indies Red hot peppers at CARDI's Betty's Hope Research Station, Antigua

Plate 18: De-seeding West Indies Red hot peppers at CARDI's Betty's Hope Research Station, Antigua

Plate 19: Treating West Indies Red hot pepper seeds for grading at CARDI's Betty's Hope Research Station, Antigua

Plate 20: Drying West Indies Red hot pepper seeds at CARDI's Betty's Hope Research Station, Antigua

Plate 21: West Indies Red hot pepper seeds bagged and ready for storage at CARDI's Betty's Hope Research Station, Antigua

The amounts of pepper seed sold during 2009 and in store at the end of 2009 are shown in Tables 6 and 7.

Table 6: Hot pepper seed (kg) sold by the CARDI Antigua and Barbuda Unit in 2009

Country to which seed sold	West Indies Red	CARDI Green	Scotch Bonnet
Antigua & Barbuda	0.4		0.1
Barbados	3.2		
Belize	2.3	1.0	
Dominica	0.5	0.5	
Grenada		1.9	
Jamaica	9.1		
St. Kitts/Nevis	0.2		
St. Vincent and the Grenadines		0.5	
Trinidad and Tobago	0.2	0.2	
Total	**15.9**	**4.1**	**0.1**

Table 7: Hot pepper seed in stock at CARDI's Betty's Hope Station at the end of December 2009

Varieties	Amounts (kg)
West Indies Red	5.9
West Indies Yellow	3.6
Scotch Bonnet	0.57
CARDI Green	9.0
Local Peggy Mouth	0.06

4.1.2.2 Corn seed production

Introduction

ICTA 7728 field corn is used mainly for roasting and occasionally for animal feed. Half a hectare of the ICTA 7728 field corn was planted (late 2008) for the production of seed material for the local farming community (Plates 22 and 23).

Materials and methods

Land preparation, planting (using corn planter at the rate 18 kg/ha) and weed control (tractor using tines harrow between rows) were all done mechanically. Some manual weeding was done to remove weeds within the rows.

Fertilizer N-P-K (12-12-24) at the rate of 98 kg/ha was worked into the soil at planting. Sulphate of ammonia was applied at the rate of at 120 kg/ha 3 weeks after planting.

Plate 22: A plot for seed corn production at CARDI's Betty's Hope Research Station, Antigua

Results

The ICTA 7728 corn plot harvested in January 2009 yielded 273 kg of seed; of which 106 kg were sold to farmers in Antigua and 4.5 kg to farmers in Grenada.

Plate 23: ICTA FM 7728 selected seeds at CARDI's Betty's Hope Research Station, Antigua

4.1.2.3 *Forage seed production: Guinea Grass (Panicum maximum)*

Introduction

Due to the increasing request for forage seed from the Region, the CARDI Antigua and Barbuda Unit decided to re-establish its forage seed production plots at CARDI's Betty's Hope Research Station.

Materials and methods

Herbicide was applied to the plots (Plate 24) to clear the area of other grass types. Vegetative material was then collected from perimeter of the station and cuttings (plugs) were planted at a spacing of 0.50 m x 0.50 m within the rows which were spaced 1 m apart (Plate 24). Based on the seed requests during 2008, the Unit established 0.25 ha of guinea grass to augment grass seeds already in stock.

Plate 24: Local Guinea grass (*Panicum maximum)* plots, plugs at planting (left) and established plot (right) at CARDI's Betty's Hope Station, Antigua

Results

In 2009, 2.5 kg of guinea grass (*Panicum maximum)* seed were harvested. Guinea grass (*Panicum maximum*) seed distribution is shown in Table 8. The quantity still in store at the end of 2009 was 26 kg; there was also 3.0kg of chrysopogon grass seed in store.

Table 8: Guinea grass (*Panicum maximum)* seed distribution by the Antigua and Barbuda during 2009

Country	Guinea grass seed (kg)
Antigua	5.5
Dominica	0.5
Montserrat	0.3
Nevis	0.3
St. Kitts	0.3
Total	**6.9**

4.1.3 Development of strategic linkages

4.1.3.1 Building and maintaining relationships

CARDI on behalf of the Food and Agricultural Organization (FAO) and the Caribbean Development Bank (CDB), coordinated a workshop on Rainwater Harvesting (RWH) in the Caribbean at the Verandah Hotel and Spa in Antigua and Barbuda, from the 22–26 June 2009.

Twenty-one participants attended the Workshop. Included were technicians from extension, research and development and irrigation units within the various Ministries of Agriculture and Water Authorities in CARICOM. The four workshop facilitators originated from Gansu Research Institute for Water Conservancy in China. The local coordinating team was lead by CARDI, the executing agency, who collaborated with the MALHE and the IICA Office in Antigua and Barbuda to execute the workshop.

Plates 25-30 are some examples of appropriate RWH systems suitable for Antigua and Barbuda and the wider Caribbean:

(a) Tanks: Surface tanks both opened and sealed (Plate 25) can be used in protected agriculture systems.

(b) Ponds: Ponds (Plate 26) as a means for storing surface runoff, is a practical RWH solution for Countries with both flat and hilly terrain. Over the past 3 years, Antigua has made significant progress in developing new ponds for storing water harvested from rainwater runoff from open fields and roads.

(c) Run-offs: A simple system for backyard production involves water "run-off" from roofs, channelled by guttering into concrete tank / drums, for storage (Plate 27). Water can be supplied to crops by gravity flow or pumped through drip lines or micro-sprinklers. This system can be used in the open field where water will be supplied from the roof of a shed.

Other systems that can be applied in the Caribbean are dams (mini and road-crossing, Plates 28 and 29) and the use of movable plastic sheets (Plate 30).

Plate 25: Water tanks made from drums used for protected agriculture systems

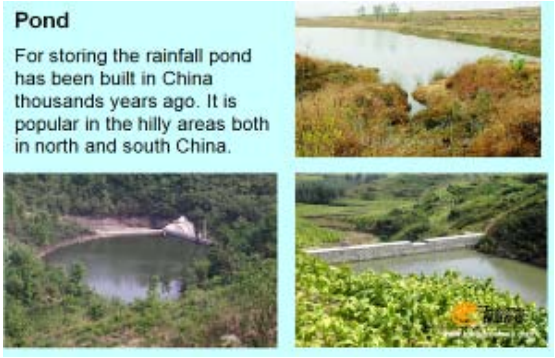
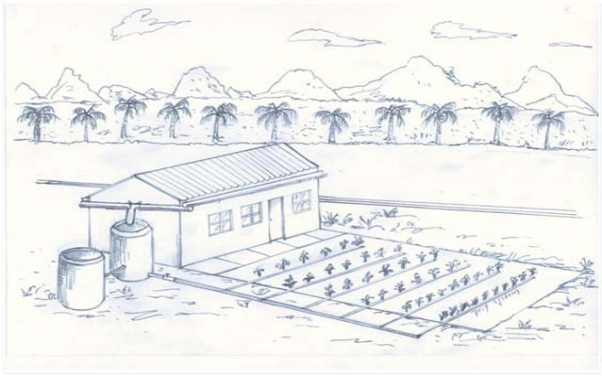


Plate 26: Displays of various types of ponds



Layout of RWH for irrigation of backyard crop

Layout of Mini Rooflet RWH system for vegetable irrigation

Plate 27: Collection of rainwater in drums from roof run-offs

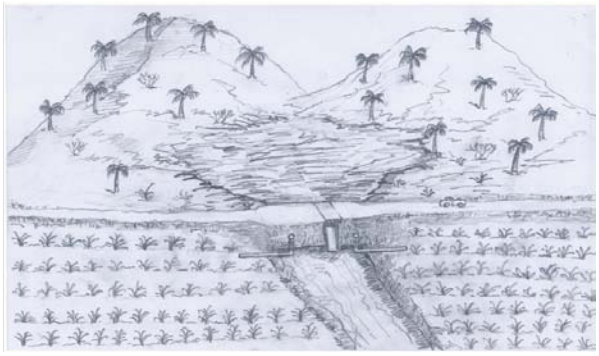
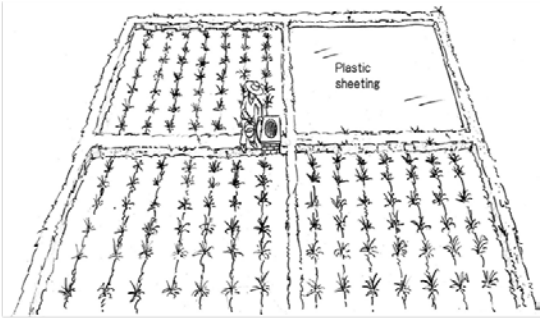


Plate 28: Use of mini-dam

Plate 29: Road crossing dam in Antigua



Layout of plastic sheeted field catchment

Plate 30: Plastic spread out to aid run-off

4.1.3.2 Participation in exhibitions/ field days / open days

On 2 December 2009, CARDI Antigua and Barbuda held its 2nd CARDI Annual Open Day. This year the Open Day was an organised bus tour to showcase CARDI's R&D activities around the Island. The sites visited were, the 0.5 ha hot pepper plot at Central Cotton Research Station and the sweet potato zonal trials at the MALHE Cades Bay and CARDI's Betty's Hope Stations.

At the Central Cotton Research Station, Dr Robin stated the objectives of the Hot Pepper Work Programme in Antigua. He emphasised that CARDI Antigua and Barbuda is mandated to produce seed for the other CARICOM countries. He also pointed out that Antigua's strengths (ability to mechanise and suitable climatic conditions) made it suitable for agricultural production. Dr Robin then elaborated on the support provided by the MALHE while establishing and maintaining the plot.

Mr. Delvin Bachelor who is responsible for the management of the plot on a daily basis then gave an overview of the work done and the challenges faced during the establishment and management of the crop.

Plate 31: Dr Robin giving a brief to The Hon. Minister Hilson Baptiste and stakeholders at the hot pepper commercial seed plot at Central Cotton Research Station

Plate 32: Stakeholders gather besides the commercial hot pepper plot at Central Cotton Research Station

The next stop on the tour was the Cades Bay Agricultural Station, one of the sites of the Sweet Potato Zonal trials. Cades Bay is located In the southern part of the Island, which is volcanic and usually has higher rainfall than the other zones. Dr Robin gave a brief overview of the importance of CARDI's role in sweet potato production in Antigua and the wider Caribbean. Some of the areas of interest for the stakeholders were (1) the level of pest damage during the crop life, (2) marketable size / yield in the selected production seasons and (3) characterisation of the accessions. Dr. Robin pointed out that in 2010 more work will be done in the area of characterisation of the local sweet potato accessions for comparison with those grown in other CARICOM Countries. Mr. Bradbury Browne gave an overview of the actual agronomical work done on the sites. During the refreshment break at Cades Bay Agricultural Station, Dr. Robin was interviewed by a journalist from the Daily Observer re the role of CARDI in Antigua and Barbuda and the 2010 Work Programme.

Plate 33: Mr. Bradbury Browne and Dr. Gregory Robin discussing the sweet potato experiment at Cades Bay Agricultural Station in Antigua with The Hon. Hilson Baptiste, Minister of Agriculture and senior agricultural officials

At CARDI's Research Station at Betty's Hope (the last stop), Dr. Robin took the opportunity to introduce the CARDI Staff to the Hon. Minister Hilson Baptiste. Mr. Batchelor gave an overview of the Unit's role in seed production and then gave a step by step demonstration of the hot pepper seed extraction process to the stakeholders. The Minister suggested, that the pulp produced from the extraction process should be packaged by the Central Marketing Corporation (CMC) and retailed to individuals and / or processors.

During the closing ceremony, Dr. Robin gave a brief of the objectives of the Open Day, indicating that it was an initiative of Dr. Arlington Chesney /

Executive Director and that the Open Day was an annual event where the Country Unit in each CARDI Country gave an account of their achievements to all stakeholders. Dr. Robin then thanked the Minister and his staff for their unwavering support over the past 2 years.

Plate 34: The Junior Minister of Agriculture, Mr Chanlah Codrington (left), The Hon. Minister of Agriculture, Hilson Baptiste and Mr Delvin Bachelor, CARDI Technician discuss the possible uses of hot pepper pulp

In his remarks at the closing ceremony, the Deputy Director of Agricultural Mr Jeddiah Maxime talked about the historical relationship between CARDI and the Ministry over the past 30 years. He stressed the importance of CARDI to the sector and mentioned some of the many areas CARDI had made significant contributions i.e. in the areas of publications/factsheets, livestock, irrigation, introduction of new/improved varieties and breeds and training. Mr Maxime commended the CARDI Unit for their achievements over the past 2 years.

The Minister of Agriculture, Hon. Hilson Baptiste delivered the feature address. The Minister thanked CARDI for its contributions to the agricultural sector, especially over the past 2 years, and pledged his continuous support to the Institute. He requested that during the National Consultation carded for the 7th December 2009 that some focus be given to the development of business plans for small farmers. The Minister also expressed the need for greater collaboration between the MALHE and other Agencies.

Plate 35: The Hon. Hilson Baptiste Minister of Agriculture standing, flanked by Dr Gregory Robin (right) and Messrs Jedidiah Maxime / Director of Agriculture and Clarence Pilgrim / Permanent Secretary (left) addressing stakeholders at the closing ceremony of the 2nd CARDI Open Day

Mr. Delvin Batchelor (Officer in Charge) gave the vote of thanks on the behalf of the Executive Director, CARDI Representative and the staff of the Antigua and Barbuda Unit. He thanked the Minister for coming to his first CARDI Open Day and for his support to the Institute. Mr. Batchelor also thanked the rest of the stakeholders for spending time with CARDI on its second Open Day.

4.1.3.3 Meeting with Minister, Junior Minister and Permanent Secretary

The Executive Director Dr. Arlington Chesney visited Antigua and Barbuda on the July 2010 in response to an invitation from the Honourable Minister, Hilson Baptiste. Dr. Chesney was accompanied to Antigua by Dr. Ardon Iton, Head Marketing Unit CARDI and Dr. Gregory Robin / CARDI Representative for Antigua and Barbuda. The CARDI Team met with the Minister and his senior technical staff. CARDI updated the Ministry on all aspects of CARDI's national and regional programmes. The Minister and his staff were very thankful for what they considered an extremely useful session. (Plate 36)

Plate 36: CARDI and senior technical staff from MALHE in discussions

4.1.4 Institutional strengthening

4.1.4.1 Revenue generation and technical assistance

The Unit boosted its local revenue account through the sales of seeds, vegetable and obsolete equipment and parts (Table 9). The local revenue account provides emergency fiscal support to the CARDI's work programme.

Table 9: Revenues (EC$) generated from sales of various commodities and obsolete equipment in 2009

Month	Hot pepper seed	Hot pepper pulp and berries	Other seed (cucumber, pumpkin, corn, guinea grass)	Vegetables	Equipment	Total revenues earned (EC$)
January	-	396.75	-	-	-	**396.75**
February	1,895.75	195.00	54.00	-	-	**2,144.75**
March	52.50	355.00	10.00	400.00	-	**817.50**
April	5,515.33	172.50	18.00	224.00	-	**5,929.83**
May	70.00	-	558.00	29.75	-	**657.75**
June	305.00	1,090.00	437.00	200.00	-	**2,032.00**
July	35.00	-	1,422.50	-	-	**1,457.50**
August	-	-	-	-	7,000.00	**7,000.00**
September	35.00	-	258.00	-	2,000.00	**2,293.00**
October	70.00	-	125.00	-	-	**195.00**
November	1,621.11	-	104.00	60.00	-	**1,785.11**
December	35.00	275.00	740.00	-	-	**1,050.00**
Total revenues earned (EC$)	**9,634.69**	**2,484.25**	**3,726.50**	**913.75**	**9,000.00**	**25,759.19**

5.0 STAFF MEMBERS

Professional staff

Dr Gregory Robin
Country Representative/
Technical Coordinator OECS

Technical staff

Delvin Batchelor
Technical Assistant / Seed Production

Bradbury Browne
Technical Assistant / Irrigation / Agronomy

Administrative/field staff

Donnet Bowman
Administrative Assistant

Sylvester Adams
Field Assistant

Carol Josiah
Lab Assistant

Calvin Crogman
General Worker

Tyrone Martin
General Worker

6.0 CONTACT INFORMATION

CARDI
P.O. Box 766,
Betty's Hope
St John's
Antigua and Barbuda

Tel: (1-268) 463-3755
Fax: (1-268) 462-0661

Email: cardi@candw.ag
Website: www.cardi.org