



Caribbean Agricultural Research and Development Institute



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



Barbados

Country Highlights

Countdown 2008 highlights

CARDI

Improving Lives Through Agricultural Research

Caribbean Agricultural Research and Development Institute



RESEARCH AND DEVELOPMENT HIGHLIGHTS

2008

BARBADOS

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1.0 ACKNOWLEDGEMENT

The work done at the CARDI Barbados Unit during 2008 was accomplished with tremendous support from policy makers, collaborators and stakeholders.

The Government of Barbados, through the Ministry of Agriculture and Rural Development (MARD) provided financial resources through regular contributions during the year and CARDI expresses appreciation to Minister of Agriculture, Senator Haynesley Benn and the staff of the MARD for their support.

The assistance of collaborators, in-country and foreign, is also acknowledged. Many farmers, processors, the scientists of the Ministry of Agriculture of Barbados, the extension staff of the Barbados Agricultural Development and Marketing Corporation (BADMC), the Barbados Agricultural Society (BAS) and the Department of Chemical & Biological Sciences of the University of the West Indies (UWI) Cave Hill Campus, all played significant roles in helping us to focus on the issues in the agricultural sector and accomplish our resolved activities.

CARDI Barbados wishes to acknowledge the support of the International Institute for Cooperation on Agriculture (IICA), the Food and Agriculture Organization of the United Nations (FAO) and the CARICOM Secretariat for their assistance during execution of the Unit's work program in 2008.

Gratitude is also extended to CARDI's directorate and management at Head Office in Trinidad and Tobago for support and guidance during the year.

2.0 EXECUTIVE SUMMARY

The CARDI Barbados activities in 2008 were focused primarily on the commodities of hot pepper, sheep and citrus. The Unit is responsible for the maintenance of accessions in the Institute's hot pepper germplasm bank. Hybridization to produce new progeny resistant to Cucumber Mosaic Virus (CMV) and Potato Virus Y (PVY) viruses was initiated in the latter months of the year. The Ministry of Agriculture had requested work on sheep (in the past) and citrus (during the year) which was ongoing. The objective of the research on the Barbados Blackbelly is to develop a DNA fingerprint profile of the breed (for use towards possible intellectual rights), while on citrus the aim was to ascertain the status of Citrus Tristeza Virus (CTV) on the island.

The methodology followed for the hot pepper germplasm bank maintenance entailed growing of accessions, isolating plants (to avoid cross pollination) and harvesting berries for seed. Cultivar development in the first instance is effected by growing selected advanced lines in replicated yield trials (randomized complete block design). Secondly, CMV and PVY resistant parents PBC 161 and PP 977197 were crossed to West Indies Red towards generating new virus resistant progeny. With regard to CTV, samples of grafted young plants and tree stocks of citrus were collected from the MOA Haggatts Field Station and a private grower. These were assayed for the presence of the CTV via Enzyme Linked Immuno Sorbent Assay (ELISA). The methodology engaged with respect to the work on sheep, involved the use of previously identified primers to resolve purebred Barbados Blackbelly sheep versus other species (e.g. dog, pig, cow) and non-purebred sheep.

Eighteen (10 red and 8 yellow) advanced hot pepper lines were evaluated in two replicated yield trials. Two of the yellow berry lines, YT-6 and YT-7, yielded 30,730 and 30,146 lb/ac which was statistically (5% Level LSD of 1891) significantly higher than the Scotch Bonnet control at 24,459 lb/ac, while even though five of the red lines (RT-2, RT-5, RT-6, RT-8 and RT-9) outperformed West Indies Red (control) which yielded 31,220 lb/ac, none of these were statistically significant (5% Level LSD of 2673). Of the 61 germplasm targeted for rejuvenation 17 did not germinate. Between 10 and 20 g of seeds of the successfully grown 47 accessions were extracted, dried and stored. Berries and seed resulting from hybridization will be available for further work in 2009. None of the young citrus plants from Haggatts

Field Station tested positive for CTV while only one of the eight mature trees from the private grower tested positive. The primers previously identified as profiling a DNA fingerprint of purebred Barbados Blackbelly were used successfully to identify the purebred sample from among unknowns which included dog, pig, horse and goat.

In October, a highly successful Open Day was held. The feature address was delivered by Minister Haynesley Benn. More than seventy-five persons including farmers, hot pepper processors and tertiary institution students attended.

The services of three CARDI employees (one professional and two technical) technical staff at the laboratory were terminated in December 2008.

3.0 REVIEW AND UPDATE OF THE AGRICULTURAL AND RURAL SECTORS

In January 2008 following national elections, the government of Barbados changed from one led by the Barbados Labour Party to the Democratic Labour Party. Towards the end of the year, the portfolio of agriculture was placed separately thus becoming the Ministry of Agriculture and no longer the Ministry of Agriculture and Rural Development. The thrust of the ministry's policies appeared largely similar to the previous administration with partial self sufficiency in a number of agricultural commodities and national food security being major goals.

Historically, the Barbadian economy had been dependent on sugarcane cultivation and related activities (sugar, rum and molasses) but in recent years the economy has diversified into financial services, tourism and light manufacturing. Tourism, offshore finance and information services are important foreign exchange earners. The services sector, the industrial sector and the combined agriculture, forestry and fisheries sector account, respectively, for 76 percent, 18 percent; and 6 percent of GDP.

Cricket World Cup 2007 was expected to fuel growth in the agricultural sector due to visitors demand for fresh produce. This expectation was realized in the first half of 2007. Increase in the overall production of vegetable crops and dairy was noted.

Prices for all major food and feed commodities increased in 2008 due to soaring oil prices as international freight and cost of inputs climbed.

The new administration has placed significant focus on encouraging youth participation in agriculture using 4H clubs as the engine. Emphasis is also being placed on undercover agriculture, modern technologies and the use of alternative energy (e.g. biofuels, solar) in the sector. Appeals are also being made to the banking sector to loan funds to entrepreneurs interested in agriculture.

4.0 IMPLEMENTATION OF THE MTP, 2008/2010

4.1 DEVELOPMENT OF SUSTAINABLE INDUSTRIES

4.1.1 CROPS

4.1.1.1 Hot Pepper Improvement for the Caribbean

2008 HOT PEPPER ADVANCED LINES PRELIMINARY YIELD TRIALS

There were two advanced selections yield trials in 2008 – a yellow berry trial comprised of eight lines and a red berry trial made up of ten lines - conducted at the Graeme Hall Field Station. The accessions used the trials are shown in Tables 1 and 2 are all hot in pungency and potentially high yielding. Each treatment was made up of 28 plants transplanted in double rows on five feet wide beds. Spacing between rows was 30 inches while within was 18 inches. Treatments were replicated three times in a randomized complete block design. Agronomic practices allowed for effective fertilization, adequate irrigation plus control of weeds, insects and diseases. Data was collected during the growing season on plant, berries and yield. The incidence of virus diseases (Cucumber Mosaic Virus and Potato Virus Y) was also recorded.

Table 1. Yellow berry hot pepper lines evaluated in replicated yield trials, Graeme Hall, 2008.

Code	Entry	Fruit Color	Source
YT-2	YC15-1-4-2-2-6-1	Yellow	Yellow Congo selection
YT-3	YC17-3-3-1-1-6-9	Yellow	Yellow Congo selection
YT-4	YC10-2-2-6-1-3-3	Yellow	Yellow Congo selection
YT-5	CAR81-1-2-13-17-5-2-2	Yellow	Scotch Bonnet x Bird Pepper selection
YT-6	CAR7-81-1-12-13-7-3-9-3	Yellow	Scotch Bonnet x Bird Pepper selection
YT-7	CAR6-98-6-6-2-3-3-9-5	Yellow	Scotch Bonnet x Bird Pepper selection
YT-8	YC22-8-4-1-1-2-5	Yellow	Yellow Congo selection
YT-9	Scotch Bonnet	Yellow	Control commercial variety

Table 2. Red berry hot pepper lines evaluated in replicated yield trials, Graeme Hall, 2008.

Code	Entry	Fruit Color	Source
RT-1	RC35-5-2-2-5-8-1	Red	Red Congo selection
RT-2	CAR6-81-1-2-1-8-3-5-3	Red	Scotch Bonnet x Bird Pepper selection
RT-3	RC30-1-1-4-7-1-3	Red	Red Congo selection
RT-4	CAR6-81-1-1-2-2-4-2-4	Red	Scotch Bonnet x Bird Pepper selection
RT-5	CAR6-81-1-1-2-2-4-4-5	Red	Scotch Bonnet x Bird Pepper selection
RT-6	CAR6-85-2-2-3-8-5-16-4	Red	Scotch Bonnet x Bird Pepper selection
RT-7	CARDI Bonnet	Red	Red Congo selection
RT-8	CAR6-81-9-1-3-2-4-2-1	Red	Scotch Bonnet x Bird Pepper selection
RT-9	RC18-10-3-7-2-2-5	Red	Red Congo selection
RT-10	West Indies Red	Red	Control commercial variety

Results from the trials revealed mature berry colors that varied from light green, green to dark green. In general plant type did not show excessive vegetative response to fertilizer application and nutrients were satisfactorily partitioned into yield. Examination of yield data (see Table 3) show that in the yellow trial, four accessions yielded more than Scotch Bonnet control (24,459.0 lb/ac) with two lines, YT-6 (30,730 lb/ac) and YT-7 (31,146 lb/ac) being statistically significant. Both lines are resultant progenies of the CARDI cross Bird Pepper x Scotch Bonnet, have some of the aroma and much of the pungency of Scotch Bonnet. They also did not display much viral symptoms in the plots during the growing season. Plate 1 shows pictures of the berries of these accessions.

Table 3. Plant, berry and yield characteristics of yellow berry yield trial, Graeme Hall 2008

Code	Average of 5 plants		Berry Color		Yield (lb per acre)
	Height (cm)	Canopy width (cm)	Mature	Ripe	
YT-2	60	68	Dark Green	Yellow	25834.3
YT-3	60	65	Green	Yellow	18215.3
YT-4	55	61	Green	Yellow	19652.5
YT-5	63	53	Dark Green	Yellow	26068.1
YT-6	57	78	Dark Green	Yellow	30730.2*
YT-7	50	73	Dark Green	Yellow	30145.7*
YT-8	62	70	Green	Yellow	23558.2
YT-9	42	67	Dark Green	Yellow	24459.0

* 5% Level LSD of 1891

Table 4. Plant, berry and yield characteristics of red berry yield trial, Graeme Hall 2008

Code	Average of 5 plants		Berry Color		Yield (lb per acre)
	Height (cm)	Canopy width (cm)	Mature	Ripe	
RT-1	64	75	Dark Green	Red	25087.5
RT-2	45	60	Light Green	Red	36341.3
RT-3	49	58	Dark Green	Red	17424.6
RT-4	71	65	Light Green	Red	30045.3
RT-5	43	67	Green	Red	33135.5
RT-6	51	68	Dark Green	Red	33231.8
RT-7	75	63	Dark Green	Red	27783.0
RT-8	50	70	Green	Red	33434.0
RT-9	58	62	Dark Green	Red	31219.8
RT-10	55	67	Light Green	Red	30892.5

5% Level LSD of 2673

Even though five of the red berry trial treatments (RT 2, RT-5, RT-6, RT-8 and RT-9) out-yielded the West Indies Red control (30,892 lb/ac) none of these were of statistical significance at 5% level LSD. Varyingly they do however display characters (tolerance to virus infection, response to fertilizer, berry pericarp thickness, pungency) that could make them competitive cultivars of the future assuming yield remains comparable to West Indies Red. RT-2 (CAR6-81-

1-2-1-8-3-5-3), RT-5 (CAR6-81-1-1-2-2-4-4-5) and RT-8 (CAR6-81-9-1-3-2-4-2-1) all shown in Figure 1 have thick pericarp (useful in prolonging shelf life during freight). RT-8 has an aroma very close to Scotch Bonnet.

As Figure 1 shows the mature berry of YT-7 is dark green in color a trait that is popular with many farmers and processors. YT-6 and YT-7 display ideotypes that responds to high nitrogen by partitioning into berries and not growing tall and “bushy”. Even though these trials will be repeated in 2009, due to the high interest in yellow berry cultivars, CARDI will be fast-tracking the development of YT-6 and YT-7 by immediate evaluation in Belize and Dominica in 2009.



YT-6



YT-7



RT-2



RT-5



RT-8

Plate 1. Outstanding mature and ripe berries comprising the yellow and red berry advanced lines selections from 2008 advanced selection yield trials

4.1.2 SEEDS AND SEEDLING BANKS

4.1.2.1 Germplasm Development

The Caribbean is part of the centre of diversity in the world for hot peppers. It is critical that the indigenous accessions of the Region be conserved for the future. CARDI Barbados houses a hot pepper germplasm bank consisting of accessions collected from some CARICOM member states and introductions from outside the Region. This genebank serves to conserve critical landraces found in the Region such that the inherent diversity would not be lost to future generations.

Introductions thought to be useful as sources of genetic traits potentially useful in hybridization in the hot pepper improvement programme are also maintained. During the period under review, 10 to 20 g of seeds from 47 accessions have been extracted from berries harvested from successfully grown plants. These seeds were extracted, dried and now stored in CARDI's temperature and humidity controlled seedroom. Germination of the seeds of the rejuvenated accessions will be monitored annually, but they are expected to remain viable for three to five years before the need to repeat this activity.

4.1.3 BIOTECHNOLOGY

4.1.3.1 Molecular Identification of the Barbados Blackbelly Sheep

If given blood samples of a dog, horse, goat, pig and a sheep, can you tell which sample belongs to what specie? Suppose there were more than one sheep sample included – purebred Barbados Blackbelly, West African, Sugarland Black and offtypes Barbados Blackbelly? This was the task assigned to CARDI during 2008 and using the microsatellite primers identified as defining the purebred Barbados Blackbelly DNA fingerprint profile, it was possible to accurately identify which samples belong to the purebred Barbados Blackbelly sheep! This work has shown that the Barbados Blackbelly sheep population is genetically distinct from other hair sheep present in the Caribbean –

West African, Virgin Island White or St. Elizabeth. Further the Barbados population of the sheep is different to Blackbelly populations present in St. Croix or Virginia, USA.



Plate 2. Clockwise – horse, dog, pig, sheep...if given only blood samples of each can you tell which is the purebred Blackbelly sheep?

The next phase of work would be to test the “fingerprinting tool” to identify which sheep in a flock are purebred. The animals so identified should be managed in a structured manner to allow for the conservation and development of the breed. Attempts can also be

made to further strengthen the tool to allow for the possible selection among purebred Blackbelly sheep for prolificacy, rate of growth and disease resistance.

4.1.3.2 Hybridization Towards Virus Resistance

Cucumber Mosaic Virus (CMV) and Potato Virus Y (PVY) are the predominant viruses affecting hot pepper production in Barbados. Yields can be reduced by as much 80% in very susceptible varieties. Field screening of the CARDI germplasm bank did not identify any regional accession as being resistant to these viruses. West Indies Red is tolerant in that once the vectors (aphids) spreading the diseases are managed and the crop optimally fertilized, then some recovery is achieved. CARDI introduced new accessions from the US and Taiwan in an attempt to identify virus resistant donor parents. Enzyme Linked Immuno Sorbent Assay (ELISA) screening has confirmed two introductions from AVRDC (Taiwan), PBC 161 and PP 977197, as being resistant to CMV and PVY viruses prevalent in Barbados. Crosses have been made between these parents and West Indies Red towards generating new resistant progeny. Resultant progeny will be evaluated in 2009.



Plate 3. West Indies Red (blocky berry) was hybridized with PBC 161 (CMV/ PVY virus resistant parent) towards generating new virus resistant progeny

4.2 DEVELOPMENT OF STRATEGIC LINKAGES

4.2.1 EXHIBITION

4.2.1.1 Open Day

CARDI Open Day 2008 was held on 31 October 2008 at the Graeme Hall Field Station. The day's proceeding was chaired by Mr. Julian Dottin, President of the National Union of Farmers. The Minister of Agriculture, Mr. Haynesley Benn gave the feature remarks. CARDI staff prepared exhibits to showcase different activities (e.g. seed preparation, germination testing, seedlings, hot pepper germplasm, virus testing and hot pepper products). A number of information posters were also on display. The CARDI Representative did a Microsoft PowerPoint presentation highlighting aspects of the year's work programme following which the audience made comments or asked questions of the speaker. There were approximately 75 persons in attendance at the Open Day. The audience comprised of farmers, hot pepper processors, staff of the Ministry of Agriculture, BAS, BADMC, IICA, Association of Women in Agriculture, National Union of Farmers, students and teachers of the Samuel Jackman Prescod Polytechnic. After the formal presentations and questions, those in attendance engaged in lively informal discussions while partaking of snacks available.



Plate 4. Senator Haynesley Benn, Minister of Agriculture giving feature remarks at CARDI Open Day 2008

4.3 INSTITUTIONAL STRENGTHENING

4.3.1 TECHNICAL ASSISTANCE

4.3.1.1 Plant Pathology

There are no large citrus farms in Barbados and those that do exist cannot be considered as truly commercial cultivations. The Ministry of Agriculture orchard at Haggatts is the source of all citrus rootstock planted in Barbados. It is critical that all the stock materials used in young citrus plants production are free of transmissible diseases. A survey was undertaken to ascertain if Citrus Tristeza Virus (CTV) was present in Barbados. Citrus samples were taken from root stock materials and young grafted plants at the Haggatts Field Station in 2007 and 2008. Mature trees from the station at Haggatts, St Andrew and a private grower from the parish of St Andrew were also tested. Grafted plants sampled in 2007 were of the following varieties: Seedless Lime, Marsh, West Indies Lime, Lisbon Lime, Jaffa Orange, Parson Brown, Rough Lemon, Pomelo, Valencia and Wavel Orange. A second set of samples was taken in 2008. These varieties included Choronga Orange, Parson Brown, White Grapefruit, Lisbon Lime, Rootstock, Triumph, Navel Orange, Seedless Lime, Pink Grapefruit, Tangerine, Valencia, Ortnique, Tangelo and Shaddock.

All grafted young plants, root stock and tree samples from the Haggatts Field Station of the Ministry of Agriculture tested negative for CTV. Only one of the eight samples taken from the private grower tested positive for the virus. The survey thus revealed that CTV is not present at Haggatts thus only clean citrus plants are distributed from the field station.

5.0 STAFF MEMBERS

Dr. Cyril Roberts	CARDI Representative/Breeder/Biotechnologist
Dr. Litta Paulraj	Plant Pathologist
Mr. Collin Scantlebury	Tissue Culture Scientist
Mr. Ashton Pollard	Senior Lab Technician
Ms. Barbara Wood	Laboratory Technician
Ms. Marcia Niles	Administrative Assistant
Mr. Paul Best	Field Assistant
Ms. Jennifer Waithe	Laboratory Assistant

Mr. Paul Best was appointed as a Field Assistant in the Unit in January 2008.

Ms. Jennifer Waithe was appointed as Laboratory Assistant in the Unit in January 2008.

Dr. Litta Paulraj resigned her position as Plant Pathologist in August 2008.

Collin Scantlebury, Ashton Pollard and Barbara Wood formerly staff at the Biotechnology Laboratory in Diamond Valley were severed on 5 December 2008.

6.0 WORKSHOPS/SEMINARS/MEETINGS

1 February 2008. Meeting between BWU represented Technical Staff of CARDI Barbados and Dr. Cyril Roberts, CARDI Representative. CARDI Field Station, Graeme Hall.

14 February 2008. Caribbean Hot Pepper Industry Development Planning Meeting. CARDI Head Office, University of the West Indies, St. Augustine Campus, St. Augustine, Trinidad and Tobago.

20 March 2008. Regional Small Ruminant Industry Development: Strategic Planning 2008-2010. Room 27, Sir Frank Stockdale Building, University of the West Indies, St. Augustine Campus, St. Augustine, Trinidad and Tobago.

5 May 2008. Meeting between CDB and Invited Representatives of Government and Agencies to Discuss Undercover Agriculture. CDB, Wildey, St. Michael.

18 July 2008. Meeting between CARDI and BWU. Solidarity House, Harmony Hall, St. Michael.

21 August 2008. GEF SGP Sheep Project Advisory Committee. BAS, The Grotto, Beckles Road, St. Michael.

10 September 2008. Meeting between CARDI and BWU. Solidarity House, Harmony Hall, St. Michael.

11 September 2008. GEF SGP Sheep Project Advisory Committee. BAS, The Grotto, Beckles Road, St. Michael.

16 September 2008. Seminar on Developing Cassava for Food & Feed in Barbados. Sherbourne Conference Centre, Two Mile, St. Michael.

30 September 2008. Meeting to Discuss Issues Relating to Biotech Lab at Diamond Valley. MARD, Graeme Hall, Christ Church.

14 October 2008. National Forum on World Food Security: the Challenges of Climate Change and Bioenergy. Sherbourne Conference, Two Mile, St. Michael.

13-15 November 2008. CARDI 2008 Planning Workshop. Cascadia Hotel and Conference Centre, Arapita Road, St. Anns, Port of Spain, Trinidad and Tobago.

21 November 2008. First Meeting of the Agriculture Sector Sub-Committee. FAO Offices, UN House, Marine Gardens, Hastings, Christ Church.

22 November 2008. Barbados Agricultural Society Sheep Farmers Seminar. Grand Barbados Hotel.

13 December 2008. Meeting at the Ministry of Agriculture on CARDI Barbados 2009 Program of Work. M of A, Graeme Hall, Christ Church.

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Our Mission

To contribute to the sustainable economic well being of Caribbean people by the generation and transfer of appropriate technology through agricultural research and development

*Country Highlights
2008*

Our Vision

To be the centre of excellence in the Caribbean for the provision and application of research and development in agriculture and rural enhancement