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**CAPACITY DEVELOPMENT METHODOLOGY AND  
ACHIEVEMENTS IN CFC-FUNDED PROJECTS ON  
PROTECTED AGRICULTURE AND ROOTS & TUBERS  
IN THE CARIBBEAN**

**PROJECT REPORT**

**By**

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# **CAPACITY DEVELOPMENT METHODOLOGY AND ACHIEVEMENTS IN CFC-FUNDED PROJECTS ON PROTECTED AGRICULTURE AND ROOTS & TUBERS IN THE CARIBBEAN**

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[This report is an output of the Common Fund for Commodities (CFC) /European Commission (EU)-financed projects: “Increased Production of Vegetables and Herbs through the use of Protected Agriculture (PA) in the Caribbean” and “Increased Production of Root and Tuber (RT) Crops in the Caribbean through the Introduction of Improved Marketing and Production Technologies” being implemented by CARDI in Barbados, Dominica, Haiti, Jamaica, St. Vincent & the Grenadines and, Trinidad & Tobago].

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## **A. INTRODUCTION**

The PA project implemented by CARDI in Haiti, Jamaica and Trinidad & Tobago, under a financial agreement with the CFC/EU during the period 2010-2013, had as its goal: “To support the development and transfer of commercially viable and sustainable vegetable and herb production using adapted protected agriculture (PA) systems suitable for the Caribbean and so improve smallholder livelihoods, food security, traceability, yields and trade of regional food production”. It had among its components, the promotion and strengthening of production and cluster groups and the training of 300 stakeholders including 90 producers in PA Technology and Production Systems and increasing the capacity of trainers in such systems.

Objectives of the PA project included:

- Improvement of production knowledge and skills of smallholders and producer groups as well as the productivity through training in the principles of PA and also improvement of the capacity of trainers and sensitisation of other stakeholders involved in PA in specific agro-ecological zones.
- Provision of training in the principles of PA so as to improve the capacity of trainers and sensitise other stakeholders involved in PA.
- Strengthening of producer groups, both private sector and cooperatives, involved in PA, and formation and/or strengthening of clusters to ensure vertical integration among the stakeholders along the PA value chain. An organised producer group and cluster development approach based on proven training and facilitation is vital to the future development of the PA sector. Therefore, it was necessary to evaluate the roles of selected producer groups and clusters in the three countries, including an assessment of the needs of the PA sector and the groups/clusters outlining their potential roles and functions.

The RT project was implemented by CARDI under a similar financing agreement in Haiti, Jamaica and Trinidad & Tobago during the same time period as that of the PA project. It was also implemented in Barbados, Dominica and St. Vincent & the Grenadines during the period February 2010 to December 2011. This project had as its goal: “To support the development of a commercially viable and sustainable regional root and tuber crop industry that facilitates the improvement of livelihoods and overall food security/sovereignty” and had components that included the strengthening of existing producer groups and developing value chain clusters, forming and training competent producers, processors and marketers and, strengthening Institutional capacity to deliver quality planting material.

Objectives of the RT project included:

- Strengthening of existing production groups/organisations and the formation of agribusiness clusters that will improve the activities along the commodity value chain.

- Improving the knowledge and skill of 1550 stakeholders along the Industry value chain through training by demonstration of improved technologies in production, post-harvest, processing, and marketing. The training was end-oriented and learner-focused geared to resolve beneficiary-identified constraints and addressing issues that have immediate relevance to the beneficiaries' lives.

## **B. CAPACITY DEVELOPMENT METHODOLOGY (PA and RT projects)**

[Ref: Reid, R. 2012. Promoting and strengthening Producer Groups and Value Chain Clusters - methodologies and results. Paper presented at Information Dissemination Workshop of CFC-funded projects, Sept 2012. Internal circulation, CARDI, UWI St. Augustine Campus, Trinidad].

### **(i) Steps for Promoting and Strengthening Stakeholder Groups** (by Group Dynamics Specialist/Facilitator)

- Identify main commodity producing area(s) and review of the PA and RT value chains in the particular countries (See Figure 1).
- Prepare articulation with respect to rationale for Producer Group development in the context of modern agribusiness.
- Interview producers and community leaders and select stakeholders to be trained (in collaboration with Farmers Associations, Processors and National and Regional Institutions).
- Conduct group strengthening/training needs assessment in each country to determine the changes in knowledge and skills required and potential stakeholders to be trained at the various links of the value chains (via Focus Group Meeting and utilisation of needs assessment questionnaire).
- Identify level of group functionality and gaps in capacity (forming, storming, norming, performing).
- Establish linkages with regional and national training initiatives and evaluate existing training facilities and programmes.
- Develop training materials for the training sessions in the project countries with assistance of Specialist Consultants contracted to the projects and scientists from Collaborating Institutions.
- Develop and execute capacity building programme (Group dynamics training) ensuring that the approach is participatory, using demonstration sites established within the projects.
- Conduct post-training evaluation using developed format.
- Formulate Strategic and Action Plan for Group (Vision, mission, organisational structure, programmes, roles and responsibilities, operations, budget, articles of incorporation as legal entity, etc.)
- Implement group action [meetings (monthly/AGM), resource mobilisation, Project activities and, monitoring].

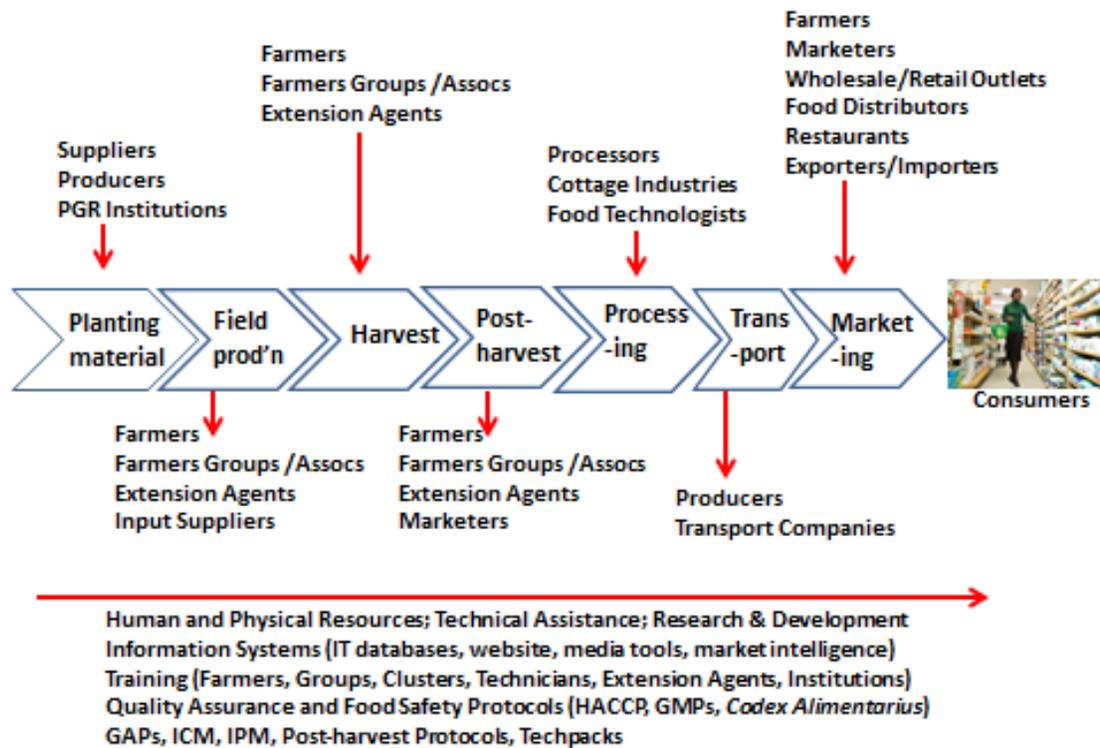
- Develop format for Group performance review- functionality and future capacity-building needs.

(ii) **Value Chain Cluster Development** (by Cluster Specialist/Facilitator)

- Prepare articulation with respect to context and rational Value Chain Cluster development linking producers to markets.
- Define broad economic region along country lines within which producer groups are located.
- Conduct stakeholders interviews to inform Value Chain/Cluster Analysis (to identify transactions, chain actors and business relationships).
- Prepare cluster maps and initial engagement (using industrial classification code-size and dominance, specialisation, linkages, etc).
- Conduct Cluster Analysis/diagnostics (product and market segmentation; SWOT; GAP analysis; Porter's Five Forces analysis; Value Chain analysis; market trend analysis; Competitive Positioning analysis).
- Implement Producer Group sensitisation and capacity building.
- Assess Institutional/Stakeholder support.
- Formulate Cluster Focus Group meeting(s) and strategy (increasing stakeholder understanding and commitment, activities, structure, etc).
- Launch Cluster Dialogue platform for action and establish formal Value Chain cluster (dialogue-action platform).
- Develop plan for monitoring and evaluation of cluster performance.
- Review Industry Development needs for each commodity.

Figure 1 provides an insight into the groups and clusters at each link of the PA and RT industry value chains and enables an analysis of the weakest links that should be targeted for improvement through training; factors operating along the entire chain are shown at the bottom of the diagram.

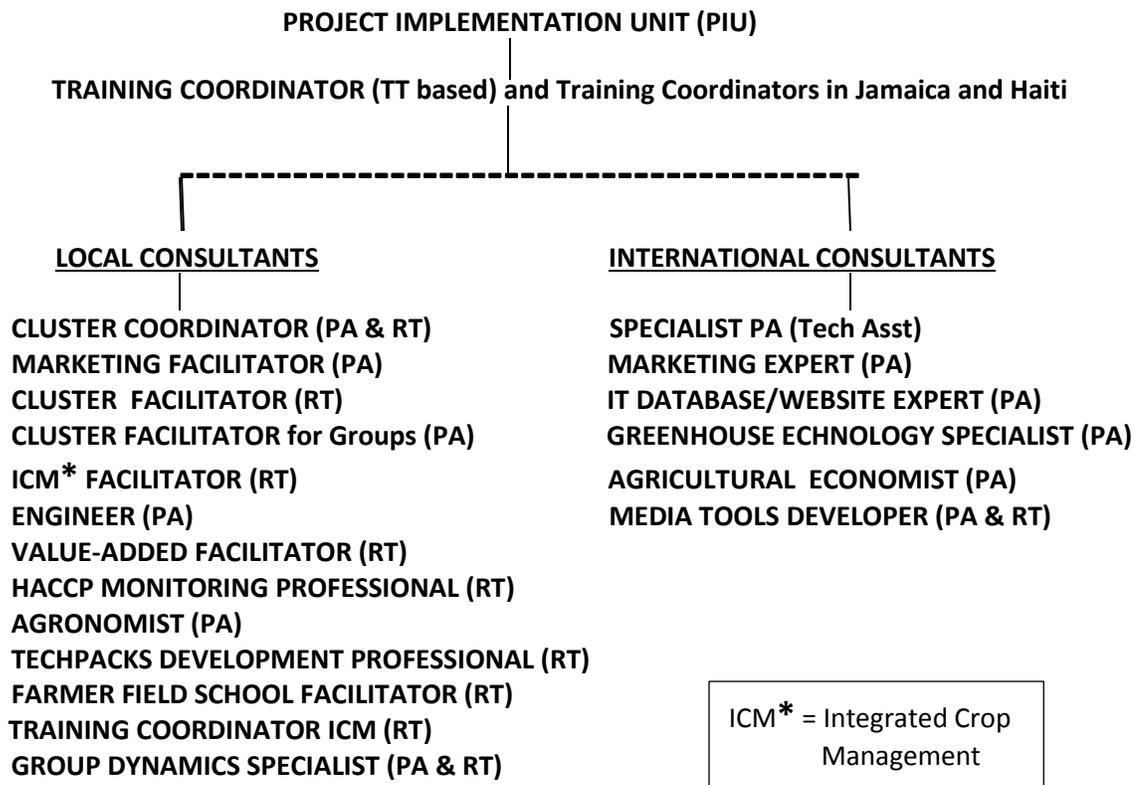
**Figure 1.** Generic Value chain for PA vegetables and Roots & Tubers.



### **C. CAPACITY DEVELOPMENT MANAGEMENT STRUCTURE**

The Capacity Development Management structure employed in the CFC-funded PA and RT projects in Barbados, Dominica, Haiti, Jamaica, St. Vincent & the Grenadines and, Trinidad & Tobago is shown in Figure 2.

**Figure 2.** The capacity development management structure employed in the CFC-funded PA and RT projects.



Implementation of the Group strengthening/Value Chain Cluster development and training was conducted by the following Consultants working with CARDI staff and Collaborators in the project countries:

- Compton L. Paul – Regional Coordinator PA project and Head of the Project Implementation Unit (PIU).
- Bradley Georges – Regional Coordinator of the RT project.
- Robert Reid – Agribusiness Specialist, Interamerican Institute for Cooperation on Agriculture (IICA) under CARDI/IICA Collaborative Agreement.
- Aurora Devers-Ramkissoon, International Training Coordinator.
- Denise Erskine-Jones, Group Dynamics Specialist, Jamaica, and International Training Coordinator.
- Shamela Rambadan, Cluster Coordinator, Trinidad & Tobago.
- Ronald Dyer, Group Dynamics Specialist, Trinidad & Tobago
- Kaye Wendy/Ann Trotman, Group Dynamics Specialist, Tobago
- Nickeisha Reid, Cluster Coordinator, Jamaica.
- Julian Douglas, Cluster Coordinator, Haiti.

Training in PA Technology was conducted by:

- Jervis Rowe, International Greenhouse Technology Specialist.
- Anthony DeGannes, International Greenhouse Technical Assistance Specialist.
- Simon Bidasie, Agronomist, Trinidad & Tobago.

Training in GAPs/ICM in the RT project was conducted by:

- Anthony Seesahai, Techpacks Development professional, Trinidad & Tobago.
- Ayoub Mohammed, Post-harvest Technologist, Trinidad & Tobago.
- Lloyd Johnson, ICM Training Coordinator in RT project, Jamaica, collaborating with the Rural Agricultural Development Authority (RADA).
- Jerome Garry, National RT Project Coordinator, collaborating with the Ministry of Agriculture, Natural Resources and Rural Development.

Training in Food Safety/HACCP in the RT project was conducted by:

- Helen Kennedy, International HACCP Monitoring Professional.

Training in Marketing in the PA and RT projects was conducted by:

- Lennox Sealy, International Marketing Expert.
- Aziz Mohammed, Marketing Facilitator, Trinidad & Tobago.
- Wayne Lawrence, Marketing Facilitator, Jamaica.

Training in IT Systems in the PA and RT projects was conducted by:

- Christopher Keller, International IT Database/Website Specialist

Group strengthening and training in GAPs/ICM/Food Safety were conducted in Dominica and St. Vincent & the Grenadines in collaboration with the Ministries of Agriculture with assistance from the International Training Coordinator (Devers-Ramkissoon) and the IICA Agribusiness Specialist (Reid).

## **D. ACHIEVEMENTS**

### **1. TRAINING IN INFORMATION SYSTEMS (PA AND RT)**

- Two PA training videos produced: “Structures/environmental management” and, “Growth media & fertigation systems” and uploaded to project-developed website.
- Four RT training videos produced: “Minisett preparation and trellising of Yam”, “Post-harvest, VA products and marketing of RT crops”, “Quality planting material for Sweet Potato” and, “Propagation of Cassava planting material” and uploaded to project-developed website.
- All training materials used in the six countries published and placed on projects’ website hyperlinked to CARDI website.
- Nine Technicians from Barbados (1), Dominica (1), Haiti (1), Jamaica (1), St. Vincent & the Grenadines (1) and, Trinidad & Tobago (4), were trained in website and database management.

## **2. CAPACITY DEVELOPMENT UNDER THE PA PROJECT**



### **Objectives:**

1. Promotion, training and strengthening of various stakeholder Groups and Clusters involved in PA and strengthening of PA value chains that include key stakeholders.
2. Establishment of training facilities and provision of training for stakeholders in the PA sector including producers, trainers, technical support personnel, extension workers, consumers and other stakeholders in the value chain.

### **Outputs required:**

- At least six PA vegetable Producer Groups and three Value Chain Clusters formed and strengthened in Trinidad & Tobago, Jamaica and Haiti, facilitating comprehensive information flows.
- 300 stakeholders (including 90 producers) trained in PA Technology and Production Systems and increase in the capacity of trainers in such systems.

### **RESULTS**

#### ***i. Group Dynamics and Cluster Development***

##### **Trinidad & Tobago:**

- Cluster of T&T Tropical Greenhouse Operators Association (TTTGOA) and Mayaro Greenhouse Growers Association (MGGA) formed. The two Groups were trained in group dynamics, business planning, strategic planning, action planning, marketing, GAPs, assistance in development of PA databases and, NGO registration. Six members of the TTTGOA paid a one-week visit to Jamaica and received hands-on training by Jervis Rowe, Greenhouse Technology Consultant, in collaboration with the Jamaica Greenhouse Growers Association (JGGA).

##### **Jamaica:**

- The JGGA and the United Greenhouse Growers Cooperative Association (UGGCA) were trained in group dynamics, time management, business planning, strategic planning, marketing, Food Safety, GAPs and, development of PA databases.

Haiti:

- Needs assessment of the embryo cluster formed with the Hydroponics Gardens of Haiti, the Haitian Farmers Coop (REMUSOV) and, private farmer Myriam Duret, was conducted. PA technology training of production Groups within the embryo cluster and the Haitian Association of PA Producers (formed by project) began in July 2013 when 16 producers, technicians and University students received hands-on training by Jervis Rowe in Haiti.

***ii. Greenhouse Technology training of Stakeholders (Trinidad & Tobago, Jamaica, Haiti)***

- Since project start-up to end July 2013, a total of 824 stakeholders along the PA value chain have been trained in several aspects of PA technology (368 in T&T; 273 in Jamaica; and, 183 in Haiti).

Training topics covered:

Structural design and management, seedlings and crop establishment, crop care, growth media and plant nutrition, fertigation systems, managing the greenhouse environment, pest and disease management, water management, harvesting and post-harvest operations, marketing, food safety and, business management.

**3. CAPACITY DEVELOPMENT UNDER THE RT PROJECT**



***(i) Strengthening of existing producer groups and development of value chain clusters***

**Outputs required:**

- Six organised, functional producer groups
- Six recognised, effective agribusiness clusters

**RESULTS**

**Trinidad & Tobago**

- The Rio Claro Cassava Group of 80 farmers was assisted with needs assessment and strategic/action/business plans.

- The Tobago Cassava Producers Association (TCPA) of 22 farmers was formed, a needs assessment carried out and, a business plan developed.

#### Jamaica

- A needs assessment, strategic/action/business plans, administration/accounting practices, leadership, team building and, conflict resolution, developed with six groups (producers of cassava, sweet potato and, yam). The Groups were St. Thomas Women's Agric. Initiative (St. Thomas), 90 Acres (Clarendon), Warsop (Clarendon), Tate (Clarendon), Bernard Lodge (St. Catherine) and, Coco Walk (Manchester).
- An RT value chain Stakeholders meeting was held in June 2012 to examine challenges facing the Industry in Jamaica and possible solutions.
- All groups were assisted with marketing links to the two processors Twickenham Bammy Industries and Central Food Packers.

#### Haiti

- Group strengthening exercises (needs assessment, strategic planning, leadership, team building and, conflict resolution) were conducted with cassava Groups in Levy, Les Cayes and Salagnac.

#### Dominica

- Cassava producers and processors were formed into a commodity group in the Good Hope and Kalinago Territory and the project has provided assistance to develop an action plan to improve the cassava industry in Dominica.
- In Sept 2011, the IICA Agribusiness Specialist and the Training Coordinator assisted in group strengthening exercises with 24 stakeholders in a cluster of cassava producers, packhouse operators, processors and, Extension Officers.

### **(ii) Formation of competent producers, processors and, marketers**

#### **Outputs required:**

- At least 1550 trained stakeholders in various RT sub-disciplines including 300 skilled, GAP-certified producers and 60 HACCP-compliant processors.
- ISO 22000 ready products associated with the project.

## **RESULTS**

### **Trinidad & Tobago**

- A GAPs course was developed on marketing record keeping, growth and development of RT crops, propagation techniques, crop care, harvest and postharvest, food safety management systems and value-added product development. This course was delivered at twenty GAPs training workshops at which 246 producers were trained (132 cassava; 114 sweet potato). Assessments indicated an increase in knowledge and skills. Cassava and sweet potato plots were

- used for field demonstrations. Cassava yields (variety “M Col 22”) in demonstration plots were 38,618 kg/ha compared to 18,386 kg/ha from a farmer’s plot with a local variety. Sweet potato yields in demonstration plots were 21,119 kg/ha (variety “Chicken foot”) compared to 10,374 kg/ha in a farmer’s plot with a local variety.
- Two hundred and eighteen processors/workers in processing plants of Trinidad & Tobago Agribusiness Association (TTABA), the Tobago House of Assembly (THA) Marketing Division and, farine producer groups in Tobago were trained in aspects of HACCP/GMPs and appropriate Food Safety Management Systems (FSMS) identified (with gap analyses) for these plants.
  - Four videos have been prepared (uploaded to CARDI website) by two Expert Media Tools Developers from still photography and video filming in the project countries:
    - Video #1: Minisett Preparation and Trellising of Yam.
    - Video #2: Post Harvest, Value-added Products and Marketing of Roots and Tubers.
    - Video #3: Quality Planting Material of Sweet Potato.
    - Video #4: Propagation of Cassava Planting Material.
  - In the project countries, GAPs and ICM training is being facilitated by techpacks available in CARDI and collaborating Institutions (The University of the West Indies, the Interamerican Institute for Cooperation in Agriculture, the National Agricultural Development Company of Trinidad & Tobago, the Jamaican Rural Agricultural Development Authority, Ministries of Agriculture, etc.).
  - Also, project consultants have developed GAPs and ICM training modules.
  - Altogether, since project start-up, 303 producers and marketers have been trained in Trinidad & Tobago in GAPs/ICM and 297 in HACCP/GMPs (project target is 350 producers in GAPs/ICM and 14 processors in HACCP/GMPs).

### Jamaica

- ICM training in collaboration with RADA was conducted for seven Producer Groups from Tate (Clarendon), Warsop (Trelawny), 90 Acres (Clarendon), Coco Walk (Manchester), Airy Castle (St. Thomas), Twickenham Industries and, Bonham Heights. Topics included land preparation, crop establishment & care, yam trellising, IPM, harvest/post-harvest, food safety, marketing and, business development.
- In April 2012, three Processor Groups (Twickenham Industries, Bomacks and the United Greenhouse Growers Cooperative Association) were trained by the Jamaica Bureau of Standards in “Elements of Food Safety”.
- In August 2012 and March 2013, a total of 57 personnel from Twickenham Industries, Mello Bammies and, Central Packers and were trained in GMPs; Food Safety gap analyses were conducted in the two factories.
- Altogether, 635 producers and marketers have been trained in Jamaica in GAPs/ICM and 105 in HACCP/GMPs (project target is 350 producers in GAPs/ICM and 20 processors in HACCP/GMPs).

## Haiti

- *Sweet potato*: Five demonstration plots were established in Salagnac for GAPs training of nine farmers in collaboration with district Agric. Res. Centre.
- *Yam*: Dec 2012, minisett preparation was demonstrated and a video of the process produced to assist further training programmes. Ten of the farmers have since established minisett demo plots. Trellising, as validated for increased yields of yam in Dominica, was introduced in three of the demonstration plots; the system was found to be cheaper, more production-efficient, more environment-friendly (less deforestation) and, more profitable than the previous wood staking method.
- Twenty farmers from Salagnac received GAPs training in sweet potato and cassava; four farmers have maintained demonstration plots of yellow yam.
- Since HACCP training for RT value-added production in Haiti was recognized as critical, in Aug 2012, a GMP training needs assessment was conducted in August 2012 with small processing groups in Les Cayes and Salagnac by the HACCP Consultant and 19 processors were trained in GMPs.
- The project assisted bakers in producing breads and cakes using mixtures of wheat and cassava flour in an effort to substitute for wheat which is increasing in price in the global and local markets; evaluations are being carried out on the palatability and nutritional quality of the final products.
- Altogether, 424 producers and marketers have been trained in Haiti in GAPs/ICM and 31 in HACCP/GMPs (project target is 350 producers in GAPs/ICM and 20 processors in HACCP/GMPs).

## Dominica

- The project has trained a total of 250 stakeholders (farmers, technicians, extension officers, packhouse operators, exporters) in various RT sub-disciplines (GAPs/ICM) with the assistance of the Ministry of Agriculture and Forestry (MoAF).
- Rapid adoption of demonstrated GAPs (including yam trellising) for yam and sweet potato has been observed.
- In September 2011, the Dominica Bureau of Standards collaborated on two food safety training sessions for 18 cassava producers and processors focusing on the following:
  - Food safety GMPs and Quality Management.
  - Fundamentals of packaging and labelling of agro-processed foods.
- Two farine processing factories (Dispax and Josephine Gage) and one cassava bakery (Daniel Fredericks) were assisted in upgrading (reconstruction and processing equipment installation) toward GMP standards. The upgrades have enabled the facilities to increase their outputs by 50% and, at the same time, increasing employment in the community. It was also noticeable that the owners of the facilities required less firewood from the surrounding forests (less environmental damage) since their energy source had shifted to gas.
- Forty processors were trained in GMPs with the assistance of the Bureau of Standards. Participants included workers from the project-upgraded facilities of Dispax, Gage and Fredericks facilities as well as a group of cassava processors formed in the Kalinago Carib territory.

- Altogether, the project has trained 308 producers, processors and marketers in Dominica in GAPs/ICM and HACCP/GMPs.

#### St. Vincent & the Grenadines

- A total of 245 persons (70 farmers, 20 extension officers and, 155 other stakeholders) have been trained in various RT sub-disciplines using demonstrated GAPs/ICM technologies previously developed by CARDI.
- Under arrangement by the project, twenty-five (25) processors were trained in Food Safety by the St. Vincent Bureau of Standards.
- Five value-added cassava Farine processing facilities of Percy Dean, Garnet Dean, Cecelia Jack, Malcolm Knight and, Fancy Cooperative were upgraded (reconstruction and equipment installation) to GMP standards and have since increased their outputs by over 40%.
- Marketable yields (12,592 lb/ac) of sweet potato (Variety CARDI K84-7) on project demonstration plots were significantly greater than on farmers' plots (average = 8,242 lb/ac).
- Altogether, the project has trained 275 producers, processors and marketers in St. Vincent & the Grenadines in GAPs/ICM and HACCP/GMPs.

### **(iii) *Strengthening institutional capacity to deliver quality planting material***

#### **Outputs required:**

- Four Propagation Centres
- Five Hardening facilities
- 1,600,000 plantlets per year
- 6,400 acres of roots and tubers
- Varietal storage capacity in three countries

## **RESULTS**

### **Trinidad & Tobago**

- A sweet potato propagation shed was established in Cunupia during 2011/2012 and a cassava hardening facility constructed in Rio Claro in 2013.
- Hardening facilities were constructed at Goldsborough in Tobago.
- A germplasm bank was established in Tobago with 12 sweet potato and 11 cassava varieties; collections of local varieties were catalogued and, four local technicians trained in germplasm collection techniques. A new germplasm conservation plot was established in 2013, and the number of cassava varieties increased to 13, with the inclusion of Pickney Muma, a commonly grown variety on the island. Twenty cassava sticks per variety were distributed to the Tobago Cassava Producers Association (TCPA) for propagation and multiplication in their recently-constructed propagation facility.

- Characterisation of ten sweet potato varieties in the germplasm conservation plot at Cunupia was conducted using descriptors outlined by the International Potato Centre (CIP).
- Cassava variety HYV was multiplied for distribution to farmers from the Rio Claro Cassava Group in collaboration with the University of the West Indies (UWI), the Trinidad & Tobago Agribusiness Association (TTABA) and, the Ministry of Food Production (MFP).
- Plantlets of 15 varieties of sweet potato were ordered from the project-constructed tissue culture laboratory in St. Vincent.
- Three technicians were trained at the Latinamerican Cassava Consortium (CLAYUCA) in Colombia in propagation and conservation techniques.
- The project facilitated a training attachment of the Manager of the tissue culture laboratory from the Tobago House of Assembly (THA) in the hardening of RT plantlets at the Tissue Culture laboratory constructed under the project in Orange Hill, St Vincent & the Grenadines.

#### Jamaica

- The project rehabilitated the tissue culture laboratory of the Christiana Potato Growers Cooperative Association (CPGCA) doubling its floor space to 1,200 sq.ft and installing new shelving.
- The project constructed four propagation sheds on the property of the CPGCA in Devon and the facilities were being fully utilized by the Association.
- *In situ* collections of sweet potato, cassava and yam varieties were maintained at CARDI's Demonstration and Training Centre at Mona. Twelve miniset yam plantlets produced under the project were supplied to the Scientific Research Council (SRC) for multiplication; in return, the SRC supplied a cassava variety to the CARDI germplasm bank at Mona.
- The CPGCA tissue culture laboratory began elimination of bacteria from commercial sweet potato cultivars Uplifter, Fire-on-land, Clarendon, Brandol, Dor, Ganja, Big Leaf and, Blue Bud. Four new sweet potato cultivars (Black Slip, Yellow Coby, Cock-up, LA44) introduced from the International Potato Centre (CIP) in Peru were multiplied and ten introduced varieties of cassava and two of yam were being conserved in the laboratory.
- In 2013, a large plot was maintained at Bernard Lodge, St. Catherine, to demonstrate GAPs using high yielding cassava varieties MCOL22 and CM516 vs. the Group's Blue Bud variety.
- A demonstration plot was established in 2013 with four high-yielding cassava varieties MPER 183, CM 3306, CM 3299 and MCOL22 weaned and hardened from tissue culture acquired from the Jamaica SRC and ministem-propagated plantlets of two varieties (MCOL22 and CM516).
- Two hundred yam plantlets were maintained in the germplasm bank at the CARDI Mona DTC and 700 plantlets were distributed to the Tate Farmers Group in Clarendon.

- Three Jamaicans were trained at the SRC and one at CLAYUCA, Colombia, in micropropagation techniques.

### Haiti

- Propagation facilities were completed at Salagnac and Levy in the south of Haiti.
- The project assisted the University of Haiti in an assessment of its needs in *in vitro* (tissue culture) conservation of national RT germplasm.
- Five Haitian Technicians were trained at the SRC in Jamaica in micropagation and conservation techniques.
- 35,000 cuttings of sweet potato distributed to farmers at Les Cayes.
- Eight resistant varieties of taro (*Colocasia esculenta*) received from Vanuatu were being adapted to Haitian agro-environmental conditions in collaboration with the Research Centre for Agricultural Development of the Ministry of Agriculture.

### Barbados

- A virus testing laboratory was fully equipped at the CARDI Cave Hill office and was collaborating with the project-constructed tissue culture laboratory in St. Vincent in the screening of germplasm at the Regional level.
- One fully-equipped shadehouse for rapid propagation was built at Graeme Hall and had produced 56,000 cassava plantlets from 1-node and 2-node cuttings planted in seedling trays; these were distributed to farmers for planting 10 hectares of farmland.
- One Technician was trained at CLAYUCA in rapid propagation methods for root crops.

### Dominica

- A hardening facility was constructed at Portsmouth and the project team in Dominica was collaborating with the project-constructed tissue culture laboratory in St. Vincent and the virus-testing laboratory in Barbados to ensure quality planting material distribution to farmers in the Caribbean Region. Local elite cassava, sweet potato and yam varieties were being maintained in the propagation facilities.
- Twelve yam, three sweet potatoes and two cassava demonstration plots were established around the island in farmers' fields and used for GAPs and ICM training of the Farmer Groups in collaboration with the Ministry of Agriculture and Forestry (MoAF), the Dominica Export/Import Agency (DEXIA) and, the Bureau of Standards. The demonstration plots utilized the best production practices that would optimise farmers' marketable yields.
- The use of mini-sett for the propagation of yam planting material was demonstrated to farmers; this practice has enabled them to produce uniform marketable yams thus increasing their marketable yields. The project prepared 8,800 yam mini-setts at its new facilities at Portsmouth and distributed them to farmers; one farmer then

- prepared 2000 mini-setts on her own farm and sold them to other farmers in her group.
- A yam trellising system using wire and rope was introduced to yam farmers as an alternative to the expensive and forest-destructive wood staking. The new system allowed for better and more efficient management of the crop, in particular fertility management and weed control, thus saving time and labour; several farmers reported increased profitability from the system that has since been introduced and adopted by farmer groups in the other project countries of Jamaica and Haiti.

#### St. Vincent & the Grenadines

- One tissue culture laboratory was constructed at Orange Hill and equipped with an ELISA virus detection machine. The Government of St. Vincent and the Grenadines is providing financing within its annual budget for the future operation of the facility and collaborating with CARDI in sourcing new improved varieties of cassava, sweet potato and yam from International Institutions.
- A hardening shed was constructed at Perseverance and an adjoining worker /storage facility was renovated. Local elite cassava, sweet potato and yam varieties were being stored in the propagation facilities.

### **E. CONCLUSIONS**

#### **PA project (Table 1)**

- Six PA vegetable Producer Groups and three Value Chain Clusters were formed and strengthened in Trinidad & Tobago, Jamaica and Haiti, in accordance with the project's target.
- The target of training 300 stakeholders of which 90 are producers in aspects of PA systems had been surpassed as at 31 July 2013. A total of 824 stakeholders (including more than 600 producers) were trained under the project (368 in T&T; 273 in Jamaica; and 183 in Haiti).
- Additionally, nine technicians from Barbados (1), Dominica (1), Haiti (1), Jamaica (1), St. Vincent & the Grenadines (1) and, Trinidad & Tobago (4), were trained in website and database management.

**Table 1.** Total number of stakeholders trained in various aspects of PA (including IT systems) to 31 July 2013.

<b>Country</b>	<b>PA technology</b>	<b>IT systems</b>	<b>Total</b>
Haiti	183	1	184
Trinidad & Tobago	368	4	372
Jamaica	273	1	274
Dominica	-	1	1
St. Vincent	-	1	1
Barbados	-	1	1
<b>TOTAL</b>	<b>824</b>	<b>9</b>	<b>833</b>

**RT project (Table 2)**

- More than six producer groups were formed and strengthened in the project countries thereby exceeding the project’s target.
- The target of training 1550 stakeholders in various RT sub-disciplines has been exceeded with 2,393 (Barbados 1; Dominica 309; Haiti 460; Jamaica 744; St. Vincent & the Grenadines 275 and Trinidad & Tobago 604) having already been trained in GAPs/ICH, HACCP/GMPs and micropropagation and an additional 150 expected to be trained in Haiti by the end of the project. However, the lack of GAP, HACCP and ISO 22000 certification in the Agricultural sector in Caribbean countries prevented such certification of the stakeholders trained.
- Additionally, 14 Regional Technicians were trained in micropropagation techniques (Barbados 1 at CLAYUCA; Haiti 5 at the Jamaican Scientific Research Council (SRC); Jamaica 1 at CLAYUCA and 3 at SRC; Trinidad & Tobago 3 at CLAYUCA and 1 at the St. Vincent Tissue Culture Laboratory).
- The propagation centres and hardening facilities required by the project were constructed and being effectively utilized for the conservation, production, multiplication and, distribution of quality planting material in the Caribbean Region. However, the extremely high acreage increase target of 6,400 ac established in the project document could not be achieved and, it is doubtful if a later impact assessment could verify such a high increase since agricultural land availability in Caribbean countries is very restricted; a productivity increase target using the quality planting material generated by the project could have been a better indicator of project success.

**Table 2.** Total number of stakeholders trained in GAPs/ICM, GMPs and micropropagation in the RT project to 31 July 2013.

Country	GAPs/ICM	GMPs	Micro-propagation	Total
Haiti	424	31	5	460
Trinidad & Tobago	303	297	4	604
Jamaica	635	105	4	744
Dominica	250	58	1	309
St. Vincent	250	25	-	275
Barbados	-	-	1	1
<b>TOTAL</b>	<b>1,862</b>	<b>516</b>	<b>15</b>	<b>2,393</b>

## **F. LESSONS LEARNT**

- All training sessions required strict coordination across the several countries to ensure that the weakest areas along the PA and RT value chains in each country were targeted for strengthening. However, better work could have been done in identifying such weak links early in the projects' implementation schedule.
- Development of the training materials in each country should have been done with a regional focus thereby facilitating their subsequent use by CARDI in all of its member countries (sustainability issue).
- Future training needs include food safety aspects especially for value-added products as well as marketing and business plans for Industry development.
- In the PA project, it was found that the fledgling nature of the Industry not yet adequately supported by Regional Governments, could not yet facilitate the achievement of a coordinated and harmonised Industry under the project.
- In the case of the RT Industry, cottage industry and individual value-added entrepreneurs were reluctant to change their habits after training in food safety aspects since they were fearful of increased production costs and claimed that they had no problem marketing their products with "business as usual".
- In both projects, 18 to 24 months were required to construct greenhouses and plant propagation structures such as tissue culture laboratories, propagation sheds and hardening facilities, due to design needs, tendering procedures, governmental regulations affecting buildings, contractual arrangements and, the non-availability of materials and equipment at the

local level. This did not permit the use of the facilities for a long enough period within the project to achieve the desired outputs in many cases.