A. Summary

This case study in the development of hot pepper marketing in the Caribbean covers the period from the early 1980’s to 2000. During the period several partnerships were forged among a host of public and private research institutions, export agencies, private companies and farmer groups to solve major constraints along the commodity chain.

The objective of the study is to examine these partnerships that over time have developed the hot pepper commodity and taken advantage of specific niches in the marketplace in North America and the United Kingdom as farmers of the Caribbean strive to be competitive in the face of trade globalisation.

In this study, steps in the commodity chain approach are examined and the impact of partnerships assessed in terms of their effects on the marketing of hot pepper. These steps include genetic improvement, production systems, post harvest technologies and marketing. The partnerships are centred around the Caribbean Agricultural Research and Development Institute (CARDI), the region’s main agricultural research and development Institute. The research work which is on-going has spanned eight Caribbean countries but has been conducted mainly in Antigua, St. Lucia, Dominica, Jamaica and Barbados.

It is hoped that the presentation of this case study from the Latin American and Caribbean region within the Commodity Chain session of the GFAR 2000 Conference in Dresden will serve as a model for other sub-regional fora to follow and allow research and development agencies to assess the impact that partnerships can make on the marketing of agricultural commodities.

B. Stakeholders

Beneficiaries include the research institutions CARDI, UWI (The University of the West Indies), FAO (Food and Agriculture Organization of the United Nations), the University of Arizona and IPM CRSP Universities in the USA. They also include the export agencies Jamaica Export Agency (JEA); Dominica Export/Import Agency (DEXIA); Marketing Boards in Grenada, St. Vincent, St. Lucia, St. Kitts/Nevis and Antigua; and, the National Agricultural Marketing Development Corporation (NAMDEVCO) of Trinidad (Stewart, 2000).

Benefitting directly are over 240 farmers in eight countries of the Caribbean. In Jamaica alone over 100 farmers supply fresh hot peppers to Walkers Wood Caribbean Foods Ltd. (Mitchell, 1999).

In the development of marketing of hot pepper in the Caribbean, research partnerships were forged beginning 1985 when CARDI strengthened collaborative efforts with Ministries of Agriculture in several CARICOM countries especially Jamaica, Antigua, Trinidad, St. Lucia and Dominica for the genetic improvement of the crop (Figure 1). In this effort there were also research partnership arrangements with the FAO during 1995-96, and with the UWI. Export companies including JEA, Green Castle Estate in Jamaica, Walkers Wood Caribbean Foods Ltd. in Jamaica, and DEXIA also assisted CARDI in establishing desirable phenotypic characteristics to be used by the breeders.

Along the commodity chain, agronomic practices and important pests and diseases including the Gemini virus complex TEV and PYV caused by the whitefly (Bemisia tabaci), broad mite (Polyphagotarsonemus latus) aphid (Aphis gossypii), the mealybug (Pseudococcus spp. and Maconellicoccus hirsutus) and the gall midge complex (Contarinia lycopersci and Prodiplolosis longifila) have received the attention of research institutions including CARDI, the Ministry of Agriculture (MINAG) of Jamaica, UWI, IPM CRSP Universities of the USA, the Caribbean IPM Networks CIPMNET and CARINET, and the...
University of Arizona (Figure 2). The IPM approach also attracted partnerships from donors including the Canadian International Development Agency (CIDA) and the Organization of American States (OAS).

Since 1996 a number of regional networks have been established under the PROCICARIBE Networking system to address particular themes along the commodity chain. Their interactions and interrelationships are depicted in Figure 3.

The funding that has supported the research partnerships mentioned above has come from CARDI, Caribbean Governments, CABI, UWI, the University of Arizona, the US International Aid Agency (USAID) through IPM CRSP, IICA, IDB, CTA, CIDA, OAS, CGIAR, Green Castle Estate and JEA. Estimates of the level of funding for the period 1985-2000 are in the range of US$3 to 4 million.

B. Project Results and Impact

Prior to 1985 over 21 varieties of hot pepper were cultivated in the Caribbean (McDonald 1999c). However, the red types lacked flavour, had too high a water content and lacked a high percentage of solids while the yellow types suffered from virus infection and had poor shelf life making them poor competitors on the world market. Both types lacked uniformity in fruit colour, shape, quality and pungency and suffered from a host of pest and disease problems. It was clear that genetic improvement, disease and pest management, post harvest practices and marketing arrangements had to be addressed in an integrated multidisciplinary manner if the Caribbean region was going to compete internationally. Mexico was the main supplier to the North American market (99% of market share in 1997) while Spain and the Netherlands were the main suppliers to the UK market (50% of market share in 1997) (Medlicott, 1999).

Results from the host of research partnerships to date indicate:

1) Increased marketing of hot pepper in North America and the UK. Exports of fresh and processed hot pepper have increased dramatically during the period 1991 to 1997 with fresh exports increasing 640% from 460 tons to 3416 tons; pepper sauce exports rose 74% from 190 tons to 331 tons (Table 1) (Stewart, 1999).

As less tastier fat-free and other diet foods caused both ethnic and mainstream markets to move towards hotter and spicier foods, Caribbean countries have begun to compete more within the North American and UK markets (Figure 4) given that Caribbean peppers (West Indian Red and Scotch Bonnet cultivars) appear to be superior in taste, pungency and quality (especially the Scotch Bonnet cultivar) (Medlicott, 1999).

During 1998 CARICOM countries exported 4,667 tons of fresh and processed hot pepper valued at US$10 million (CARICOM Secretariat, 2000). Jamaica was the main exporter (72%) followed by Trinidad (16%) and St. Lucia (5%).

2) Farmers have benefited directly from the research partnerships through increased incomes. Data from an IPM project in Jamaica which began in 1998 indicated that farmers made more money from growing hot pepper on 1 acre than from 10 acres of sugarcane (McDonald, 2000).

3) Improved cultivars of WI Red and Scotch Bonnet have been developed with improved fruit quality and yield making them more competitive on the world market. Technological packages for these varieties have been developed including practices for agronomy and IPM and post harvest management that respond to market requirements. These results are indicated in Figures 1, 2 and 3.
4) Increased institutional capacity of CARDI, UWI, MINAG Jamaica and several other Ministries of Agriculture enabling them to collaborate more strongly on further research work on hot pepper (and other crops). International institutions including Universities within IPM CRSP, the University of Arizona, IPGRI and AVRDC and the donor community including CIDA, OAS, FAO, CTA and CABI, have gained faith from the collaboration and are likely to increase their involvement in future research partnerships in the region.

Export agencies such as JEA and DEXIA as well as exporters of fresh and processed hot pepper such as Walkers Wood Caribbean Foods Ltd. and Grace Kennedy Co. Ltd. have recently developed joint partnership arrangements with research institutions such as CARDI and MINAG Jamaica to ensure quality control of their exports. (Mc Donald, 2000).

C. Partnerships

The various partnerships and the roles of the various institutions are shown in Figures 1, 2 and 3. The Agreement establishing CARDI in 1975 required this regional institution to collaborate with national, regional and international institutions/organisations for the improvement of the region’s agricultural sector.

The projects were designed by CARDI (Jamaica, Antigua, St. Lucia, Dominica and Barbados), UWI, and MINAG Jamaica and the scientists of those institutions were responsible for implementation and project management. Regional and international collaboration and donor funding were also the responsibility of the project managers. CIDA and the OAS approached CARDI and MINAG Jamaica in 1997 to support farmer participation in the production of the commodity.

Partnerships with IPGRI and AVRDC began in 1989 and were a result of the need of the region to increase its hot pepper germplasm base. FAO’s need to address seed supply systems for food security provided the raison d’être for their partnership arrangement with CARICOM countries on hot pepper improvement beginning 1995. The University of Arizona became a partner because of its interest in the control of the whitefly at the global level.

The IPM CRSP project was developed to enable exporting countries from outside of the USA to follow production and exporting protocols for the safeguard of the health of USA consumers. In 1995 the IPM CRSP/CARDI collaborative project was initiated in Jamaica. Focus of the project shifted to hot pepper in 1998 and it is now developing IPM strategies for the control of major hot pepper pests and diseases.

Since 1996 the Caribbean Science and Technology System (PROCICARIBE) has been developing partnership arrangements among public and private sector institutions, NGO’s, farmer organisations, exporters, agroprocessors and other stakeholders for the improvement of competitiveness within the region’s agricultural sector. Strong political and economic support by Caribbean Governments are enabling PROCICARIBE networks to bring together stakeholders of particular commodities for the purpose of improving the marketing of several agricultural commodities. So it is that the PROCICARIBE Networks CAPGERNET (Plant Genetic Resources), CIPMNET (IPM), CLAWRENET (Land and Water Resources), and CAPHNET (Post harvest) have been addressing hot pepper improvement among the many commodities within their list of priorities.

Results have been disseminated through Annual Reports and stakeholder meetings reports of the collaborating institutions. Several Ministries of Agriculture, CARDI and other collaborating agencies have produced factsheets and technical reports on hot pepper based on the projects’ results. The research has been mainly farmer and exporter participatory thereby making for immediate transfer of developed technology.
D. Conclusion

The single most important lesson learnt is that for the competitive marketing of major agricultural commodities in the Caribbean, there needs to be strong collaboration among the various stakeholders along the commodity chain in a multidisciplinary integrated approach. Also, research must be demand or market-driven for it to be successful and meaningful.

Several partnership arrangements are continuing within the PROCICARIBE system with CARDI being the main collaborating research institution along with UWI and MINAG Jamaica. At the national and regional levels, strong linkages are being maintained with hot pepper exporters, marketing agencies and farmer groups. International partners such as FAO, IPGRI, AVRDC, IPM CRSP, the University of Arizona and IPM Europe will continue to join forces with Caribbean institutions. Donor funds from CIDA, OAS, IICA, USAID, CTA, among others appear to be secure for the immediate future.

A lot of work still needs to be done on achieving genetic uniformity within the main cultivars, WI Red and Scotch Bonnet. Leighton (1999) has reported that these cultivars still appear heterogeneous especially in WI Red and this has resulted in poor quality fruits that lack the specifications and standards required by the market. These cultivars are still susceptible (especially Scotch Bonnet) to the Gemini virus complex, gall midge, aphids and mites; therefore, IPM research must continue to address these problems. Leighton (1999) also cites quarantine protocols as another area requiring urgent attention by researchers and policy makers.

The lack of adequate market information is, perhaps, the most outstanding inadequacy in all of the research and development efforts to date (McDonald, 2000). A report from FINTRAC Inc. (1999) states that “ethnic” foods have become one of the fastest growing segments of the retail food industry in North America and the UK and that the outlook is for large supermarket chains in these regions to increase their demand for ethnic foods including hot pepper. The report further states that the niche ethnic market has strong potential to move into the mainstream market.

Crum-Ewing (1999) identified continuity of supply, quality control, customer requirements, basic infrastructure and research and development assistance to producers and exporters as major issues to be addressed for improved marketing of hot peppers in the Caribbean.
E. References

Adams, H. 1999. New hot pepper lines for the Caribbean. Internal publication, CARDI, UWI Cave Hill Campus, Barbados

Adams, H. 2000. Personal communication

CARICOM Secretariat. 2000. Personal Communication


McDonald F. 1999a. IPM requirements for increased marketing of fruits, vegetables, ornamentals and root crops in the Caribbean. Presentation at the 1st CAPHNET Workshop, 11-12 November, 1999, Grenada


McDonald, F. 1999c. Hot pepper (capsicum chinense) as an important export crop of the Caribbean and the research approach required to develop its competitiveness. Presentation at the IPM Collaborative Research Support Project Consultative Meeting, USDA Laboratories, Charleston, South Carolina, USA, June 20-30, 1999.

McDonald F. 2000. Personal communication


Stewart, V. 2000. Personal communication
Prior to 1985: Wide range of hot pepper types (over 21 varieties) cultivated in Caribbean (Red and yellow types highly heterogeneous in fruit characteristics)

1980-1985: Market demand for hot pepper increases in North America, and UK especially in ethnic communities

1985-1989: CARDI (Brian Cooper) collaborates with Ministries of Agriculture in Trinidad, Jamaica and Eastern Caribbean in selecting fruit types suitable to markets in N. America and UK

1989: Cooper bulked red and yellow population separately and plants populations at Betty’s Hope, Antigua

1990:
A. Red types (prolific; tolerant to pests and diseases)
   - Selections by CARDI Barbados (Adams)
   - Recurrent mass selection by Adams (CARDI)

B. Yellow types (Distinct flavour; very pungent; susceptible to foliar diseases)
   - Selections by Min. Agric. Jamaica (Mc Glashan)

1995/96: WI Red cultivar (grown by farmers esp. in Eastern Caribbean)
   - Recurrent mass selection by Adams (CARDI)
   - CARDI/FAO characterise accessions and enter into CSEGRIN database. (De Bac Diulgheroff)
   - Also, hot pepper germplasm collection in Caribbean by CARDI and MoA’s. with inputs from Mexico (CINEVESTAV), Taiwan (AVRDC) and NARI Guyana

1999:
- 100 accessions and 3 Breeding lines (lines are prolific with uniform fruits)
  - Caribbean Green (line 1)
  - Caribbean Red (line 2)
  - Caribbean Purple (line 3)
- CARDI (Adams)/UWI (O’Garro)
  - DNA finger-printing and screening for resistance to pests and diseases
- Improved Scotch Bonnet cultivar (better fruit quality and tolerance to pests and diseases)

2000: Regional testing of improved cultivars (CARDI Dominica, Barbados, Jamaica, Antigua, Belize, Grenada, St. Lucia, St. Kitts/Nevis with Ministries of Agriculture, UWI Cave Hill, UWI Mona, farmers, private companies)
Cardi Barbados/Minag Jamaica/Uwi
- Germplasm collection, characterisation and conservation
- Genetic improvement of WI Red
- Development of new cultivars for pest and disease resistance and improved fruit quality
- Commercial seed production
Collaborators include IPGRI, FAO, NARI Guyana, CINVESTAV (Mexico), AVRDC (Taiwan), and CARDI Units in Antigua, Dominica, Belize, St. Lucia, Grenada, St. Kitts/Nevis.

MINAG Jamaica
- Breeding Scotch Bonnet for resistance to gall midge, Gemini viruses and improved fruit type and quality

Minag – Ministry of Agriculture, Jamaica
IPM – Collaborative Research Support Project (USAID/US Universities)
OAS – Organization of American States
CIDA – Canadian International Development Agency
- IPM strategies for the control of TEV/PVY complex; gall midge; mites; and, agronomic practices

CARDI (The Caribbean Agriculture Research and Development Institute)
- Coordination of regional IPM efforts on control of whitefly through CIPMNET, the PROCICARIBE IPM network. Main collaborators include IICA, Ministries of Agriculture in 18 Caribbean countries, Arizona State University, IPM CRSP, UWI, IPM Europe

Minag Jamaica
- Breeding Scotch Bonnet for resistance to gall midge, Gemini viruses and improved fruit type and quality

UWI – University of the West Indies at Mona, Jamaica and Cave Hill, Barbados
- DNA fingerprinting of hot pepper accessions in Caribbean, germplasm collection and conservation
- Molecular biology techniques for transferring genes resistant to Tobacco Etch Virus (TEV) and Poty Virus Y (PVY) to WI Red and Scotch Bonnet

CARINET – Caribbean Biosystematics Network
- Identification of disease and pest organisms
Collaboration with CABI and 18 Caribbean countries through focal points

Green Castle Estate JEA Jamaica
- Farmer participatory IPM research
- Joint agribusiness venture
- Quality assurance

Fig. 2: RESEARCH PARTNERSHIPS IN INTEGRATED PEST MANAGEMENT FOR THE DEVELOPMENT OF HOT PEPPER MARKETING IN THE CARIBBEAN (Mc Donald, 1999a, 1999b)
Fig 3: COMMODITY CHAIN APPROACH TO HOT PEPPER MARKETING IN THE CARIBBEAN
(Paul, 1999; Adams, 2000; McDonald, 1999a; Stewart, 2000; Medlicott, 1999)

TECHNICAL ASSISTANCE/INFORMATION SERVICES/STRATEGIC ALLIANCES

- Genetic Improvement
  - Accession
  - Characterization
  - Conservation
  - Breeding & selection
  - Seed production and testing

- Production Systems
  - Validation of production systems in farmers’ fields (socio-economic and agronomic feasibility)
  - IPM strategies for control of gall midge, gemini viruses, mites, aphids

- Post Harvest Technologies
  - Harvesting
  - Cleaning
  - Sorting & Grading
  - Packing
  - Storage
  - Transport
  - Processing
  - Quality control and standards
  - Rules and regulations
  - Shipping

- Marketing and Agribusiness
  - Market intelligence
  - Business plans
  - Business partnerships
  - Joint ventures
  - Enterprise development
  - Market infrastructure and function
  - Brokerage
  - Export/Import rules and regulations
  - Consumer requirements

New improved cultivars of WI Red and Scotch Bonnet

CAPGERNET (Caribbean Plant Genetic Resources Network)
CIPMNET (Caribbean Integrated Pest Management Network)
CLAWRENET (Caribbean Land and Water Resources)
CAPHNET (Caribbean Post Harvest Network)
CAMID (Caribbean Market Intelligence Network)
Figure 4: PARTNERSHIPS (indicated ① - ⑧) WITHIN A BUSINESS SYSTEMS APPROACH DEVELOPED BY CARDI FOR PRODUCTION AND MARKETING OF HOT PEPPER IN JAMAICA (Stewart, 2000; Mc Donald, 2000)

1. CARDI/JEA
   - Market Analysis

2. CARDI/MOA
   - Commodity Systems Analysis
   - Value Chain Analysis

3. CARDI/MoAs/UWI
   - Selection of genetic material
   - Breeding
   - Multiplication

4. CARDI/MOA
   - IPM
   - NRM
   - PHT

5. CARDI/Caribbean Chem Ltd.
   - Distribution
   - Promotion

6. CARDI/PROCICARIBE
   - IPM
   - NRM
   - PHT

INDUSTRY ANALYSIS

Foundation Seed Production

Foundation Seeds

Hot Pepper Industry Association
- Advocacy
- Promotion
- Supply & demand monitoring

Retailers
- Wholesalers
- Importers
- Exporters
- Market Intermediaries

Processes
- Formulation
- Processing
- Marketing
- Investment

Fresh hot pepper

Hot pepper products development & production

Mash production

Farmers/Processors
- Operations Mgt.
- Quality Mgt.
- Investment

Farmers/MoAs
- Production Mgt.
- Post-harvest Mgt.
- Investment

Fresh hot pepper production

Technologies, Operations and Business Manuals; Fresh Pepper
COMMODITY/SUCCESS/1_2_6.doc

Figure 5: MARKET NICHEs for hot pepper in the United Kingdom and the USA supplied by Caribbean Countries
(Ref: Medlicott, 1999)

**United Kingdom**
Non-EU Suppliers of Fresh Hot Peppers to the United Kingdom, 1997
(Spain and the Netherlands (EU) supply 50% of the EU market with mainly Cayenne cultivars)

![Pie chart showing hot pepper suppliers to the UK](chart1)

* Main suppliers from the Caribbean. Other Caribbean suppliers of small quantities include Jamaica, Belize, Trinidad, St Vincent, Dominica and Grenada

**USA**
Non-Mexican Suppliers of Fresh Hot Peppers to the USA, 1997
(Mexico supplies 99% of the USA market with mainly Jalapeno, Habanero, Fresno, Poblano and Serrano cultivars)

![Pie chart showing hot pepper suppliers to the USA](chart2)

CARICOM: St Lucia/St Vincent/Jamaica/Trinidad/Barbados/Dominica/Grenada/Belize
- supply West Indian Red (Eastern Caribbean) and Scotch Bonnet (Jamaica) cultivars
Table 1: Exports (kg) of Fresh and Processed (pepper sauce) Hot Pepper from Caribbean (CARICOM) countries to markets in North America and the UK, 1991-1997 (Ref: Stewart, 1999)

<table>
<thead>
<tr>
<th></th>
<th>1991</th>
<th>1993</th>
<th>1995</th>
<th>1997</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fresh Peppers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jamaica</td>
<td>316,354</td>
<td>471,405</td>
<td>495,547</td>
<td>2,832,913</td>
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<tr>
<td>St. Lucia</td>
<td>1,159</td>
<td>50,528</td>
<td>233,122</td>
<td>183,024</td>
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<td>Barbados</td>
<td>74,663</td>
<td>360,737</td>
<td>248,886</td>
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<td>Belize</td>
<td>-</td>
<td>-</td>
<td>31,741</td>
<td>161,917</td>
</tr>
<tr>
<td>St. Vincent</td>
<td>-</td>
<td>-</td>
<td>26,153</td>
<td>43,698</td>
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<tr>
<td>Grenada</td>
<td>481</td>
<td>-</td>
<td>-</td>
<td>15,655</td>
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<tr>
<td><strong>Pepper Sauce</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jamaica</td>
<td>384,917</td>
<td>386,978</td>
<td>440,298</td>
<td>2,682,435</td>
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<td>Dominica</td>
<td>-</td>
<td>299,453</td>
<td>364,334</td>
<td>1,143,252</td>
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<td>190,406</td>
<td>243,583</td>
<td>256,214</td>
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<td>-</td>
<td>33,140</td>
<td>91,487</td>
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<td>24,240</td>
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<td>St. Vincent</td>
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