CARIBBEAN AGRICULTURAL RESEARCH AND DEVELOPMENT INSTITUTE

CARDI

ST. LUCIA

COUNTRY HIGHLIGHTS REPORT

2008

CARDI, P.O. Box 971, La Ressource, Dennery; St. Lucia

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1.0 Acknowledgement

The CARDI Unit takes the opportunity to thank farmers, exporters, the staff of the Ministry of Agriculture Lands Forestry and Fisheries, Agricultural Organizations and all other stakeholders who assisted the Unit in the successful execution of its 2008 Work Programme. Special mention must be made of the Unit's staff who overcame daunting challenges, and so allowed the Unit to make significant contributions to the improvement of the agricultural sector and rural livelihoods.

Ronald Pilgrim
Country Representative

2.0 OUTLOOK FOR AGRICULTURE AND THE RURAL THE SECTOR

The general performance of the agricultural sector in 2008 indicated a gradual increase in growth when compared to 2007. Bananas continued to be the major export crop and foreign exchange earner, as production moved from 28.5 thousand tones in 2007 to 32.2 thousand tones in 2008; a 13% increase. The banana industry still continues to play a vital role in the economy and the new Banana Production Management Unit (BPMU) which replaced the Banana Emergency Rehabilitation Unit has placed emphasis on increasing acreages.

The cocoa industry is being revitalized with the focus on propagation; to date ten thousand seedlings (ICS clones) have been distributed. .

Research on mushroom production is on-going and the Ministry of Agriculture continues to build its capacity in mushroom cultivation in order to support the establishment of a viable mushroom industry.

Construction of a tissue culture laboratory at the Union Agricultural Station has started. The aim of the laboratory is to provide clean planting material to farmers. CARDI has assisted in this endeavour in the provision of crop germplasm (yams and pineapple) from its germplasm bank.

Research work on the control of the red palm mite is on-going. CARDI has designed the field trials, carry out data analyses and continue to maintain trial plots at its Demonstration and Training Centre in Dennery. CARDI has also trained personnel of the Ministry of Agriculture and Banana Emergency Rehabilitation Unit in the identification of Moko and Black Sigatoka diseases of bananas and plantain.

The Ministry of Agriculture with assistance from the Taiwanese Mission continued its diversification thrust in the non-banana sector and in so doing, provided assistance to farmers in UC/PA vegetable production. It is expected that these efforts will reduce imports through improved vegetable production systems. So far 37 greenhouses have been installed and 35 farmers have been trained in UC/PA crop management. CARDI is also in the process of evaluating the performance of UC/PA systems at its DTC.

The Beausejour Livestock Station in the south of the island is being developed for the maintenance of quality breeding stock, training of farmers and other interest groups in livestock production. Talks are continuing with the Taiwanese Mission for the establishment of two agro-processing facilities. A ground breaking ceremony for a meat processing facility which was planned for December 2008 had to be had be postponed to 2009. The Ministry of Physical Development is currently reviewing the building plans for the meat facility in order to facilitate speedy approval.

Emphasis was also placed on the development of the fishing industry, through the creation of a young cadre of new and improved fishers, who are expected to improvement their livelihoods and in so doing become innovative leaders within the fisheries sector. Two workshops were held to facilitate the above. Twelve Fish Aggregate Devices (FADs) were also established in collaboration with fisherman's cooperative and site preparatory works for the proposed Japanese funded Anse

La Raye Fish Landing Facility and the establishment of five aquaculture ponds for shrimp and red tilapia fish breeding has been completed.

The implementation of the integrated watershed and coastal areas management (IWCAM) project is on-going. Meetings, workshops, installation of water harvesting systems and visits to a number of water shed areas, are some of the activities that have taken place

The agricultural sector though faced with the rising cost of inputs, low farm gate prices and high quality and safe food demands by most markets will need to improve its operation efficiency in order to better respond to customer demands, thus ensuring its survival. CARDI is well placed to assist the Ministry in achieving its goals and objectives for improvement of the agricultural sector and rural livelihoods.

3.0 ACHIEVEMENTS IN THE 2008 WORK PROGRAMME

3.1.0 CROPS

3.1.1 Evaluation of Watermelon Cultivars

Watermelon is a popular fruit that is in great demand by the hospitality industry. It is usually cultivated during the dry months of the year (January to May) when conditions are much more favourable. In order to cater for short falls in local production, large quantities are imported annually. Table 1 gives quantities and value of watermelons imported over 4 years. The Ministry of Agriculture (MoA) requested CARDI to evaluate six varieties of watermelon (Charleston Grey, Sentinel (PS3664), Jubilee, Sugar Baby, Lady D1 (PX4789) and Regency) for local production in support of its crop diversification programme.

Table 1 Quantities and value of watermelons imported over 4 years.

Year	Quantity (Tonnes)	Value EC$ '000)
2003	41	130
2004	63	164
2005	141	610
2006	59	59

The agronomic trial for watermelon was conducted during the rainy season (May – December). The total rainfall recorded for the period of the trial was 428.5 mm. Evaluation of shelf life was conducted in a controlled environment under ambient conditions. Quality measurements of fruit firmness, fruit rot and internal breakdown were done on a scale of 1 to 5, with a score of 5 being the worst case scenario.

From time of transplanting to first harvest, Sugar Baby was the first variety to produce mature fruit (64 days). Charleston Grey, Sentinel (PS3664), Lady D1 (PX4789) and Regency matured a little later (68-70 days) than Sugar Baby. Jubilee took the longest time (74 days) to get matured (Table 2)

Table 2 also shows the yield characteristics of the six watermelon varieties. Significant effects of variety were observed for number of fruits per plant, fruit weight and number of marketable fruit per plot ($P<0.05$). Sugar Baby and Lady D1 (PX4789) had the most fruit per plant with Jubilee the least fruit per plant. Charleston Grey had the highest fruit weight whilst Sugar baby had the least fruit weight. Sugar baby and Lady D1 (PX4789) had the highest number of marketable fruits per plot with Jubilee the least number of marketable fruits. The effects of variety on weight of marketable fruit per plot and on yield per hectare were not significant.

Table 2 Maturity and yield characteristics of six watermelon varieties

Variety	Days to maturity	Number of fruits/plant	Fruit weight (kg)	Number of marketable fruit/plot	Weight of marketable fruit/plot	Yield/hectare (tonnes/ha)
Charleston Grey	69	0.800	3.57	4.75	14.7	10.8
Sentinel (PS3664)	70	0.750	2.50	4.50	8.4	6.2
Jubilee	74	0.400	3.28	2.50	7.3	5.4
Sugar Baby	64	1.400	1.95	8.75	13.7	10.1
Lady D1 (PX4789)	68	1.200	3.15	7.00	17.0	14.2
Regency	68	0.750	3.20	4.75	9.0	6.6
P	-	0.037	0.009	0.031	0.199	0.181
LSD 5%	-	0.602	0.826	3.583	9.18	7.74

Table 3 shows the shelf life characteristics of the six watermelon varieties after 2 weeks of storage under ambient conditions. No significant differences were observed at the 5% level for weight loss. For fruit firmness, all three replications for each variety gave the same score for firmness. Hence there was no apparent variation. . The results indicated that Charleston Grey, Jubilee and Regency were firm varieties whereas Lady D1 (PX4789) and sugar Baby was less firm.

Shelf life evaluation also revealed significant differences for fruit rot with Sugar Baby showing more rotting than the other varieties. However, not much difference was observed among the other varieties. Brix varied from 5.67 to 8.57 %. Significant differences between the varieties were observed for internal fruit breakdown ($P<0.05$), with Lady D1 (PX4789) showing the highest score (2.6), as compared to the other varieties which had scores ranging from 1 to 2.

Table 3 Assessment of six watermelon varieties after two weeks of storage

Variety	Weight loss (%)	Fruit firmness	Fruit rot	Brix (%)	Internal breakdown
Charleston Grey	9.50	1.00	1.000	6.93	1.000
Sentinel (PS3664)	9.13	2.00	1.000	5.67	1.000
Jubilee	9.60	1.00	1.000	6.47	1.000
Sugar Baby	10.53	3.00	1.667	8.57	2.000
Lady D1 (PX4789)	10.07	3.00	1.000	6.60	2.667
Regency	9.53	1.00	1.000	6.33	1.000
P	0.70	0.00	0.023	0.128	0.001
S.E.D.	0.24	0.00	0.19	0.94	0.19
LSD 5%	0.92	0.00	0.4193	2.051	0.41933

3.1.2 Improving Yields of Hot Pepper

Provision of technical support to farmers for hot pepper production

Low yields are obtained as a result of farmers not adopting all of the recommendations from the improved Technological Package by CARDI required for hot pepper production. The lack of technology adoption may be due to unavailability of the necessary inputs required to achieve optimum yields particularly with CARDI Green, which is the preferred hot pepper variety for the export market. CARDI Green is not as prolific as the traditionally grown West Indies Red (WIR) and may require more inputs (fertilizer, pesticides and irrigation) if satisfactory yields are to be obtained.

In order to improve the production and marketing system practiced by hot pepper farmers, CARDI provided technical support through the facilitation of a hot pepper production workshop held at the Sir Arthur Lewis Community College. The workshop was attended by farmers, students and extension officers in collaboration with SLMB. Field visits were also made to hot pepper farms in order to assess their production systems and to make recommendations for increasing their production.

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3.1.3 Interest in Dwarf Coconut Production Continues to Grow

Coconut used as fresh water nut is in great demand. Most fruits are harvested from the tall varieties traditionally used for copra production. These trees are no longer productive as they are very old, and invested with the red palm mites. As the demand for fresh water nuts increases, a support project with the objective to establish 120 hectares of dwarf coconuts over 3.5 years was enacted. The dwarf variety makes harvesting of nuts and red palm mite control much easier. This project is funded under the IICA/CARDI agreement. ,

An island wide survey was conducted to identify and select nuts from locally grown Malayan Green, Red/Orange and Yellow dwarf varieties (Plates 1, 2 and 3). Seedling propagation was conducted at the CARDI Demonstration and Training Centre (DTC). A rigid pest control programme was implemented for the control of red palm mite during the seedling production stage. Management of red palm mite will be extended to farms during crop establishment. Workshops will also be conducted to train farmers and extension officers in coconut production. Seedling distribution and establishment will be monitored to ensure agronomic practices are adhered to.

Plate 1 Malayan Green

Plate 2 Malayan Red

Plate 3 Malayan Yellow

During the period from May to December 2008, 7,000 seed nuts were collected from designated farms and planted out for seedling production at the CARDI's DTC (Plate 4). At the end of the year, 1,690 coconut seedlings (equivalent to 9.7 ha) were distributed to farmers (Plate 5) and a Coconut Production Guide was prepared to assist farmers in the establishment and production of the crop.

Plate 4 Ms. Una May Gordon – IICA Representative visiting coconut seedling nursery at CARDI's DTC

Plate 5 Farmer collecting coconut seedlings at CARDI DTC

3.1.4 Locally Grown Pineapple Varieties Being Tested

Traditionally, pineapples are produced both on a small and large scale and mainly for local consumption. Large-scale commercial productions on two large farms (River Doree holdings and Fond Estate) using mainly the Smooth Cayenne cultivar has now gone out of production. The small-scale farmers plant the Smooth Cayenne, Antigua Black and other "unimproved" cultivars. New pineapple varieties TN # 4 and TN # 11 introduced by the ROC to Dominica, were introduced to St. Lucia by CARDI four years ago.

Pineapples are grown seasonally in St. Lucia resulting in gluts and shortages with varied quality of fruit. The crop is grown on farms located in different agro-ecological zones. Some production is carried out in high rainfall areas with sloping terrain prone to erosion. Over the past five years, farmers have recognized that the crop is sustainable revenue earner; this has resulted in the number of small farmers' interest in pineapple production to increase.

Complaints have been received from Super Markets and Hotels about the quality of fruits purchased from farmers. The main problems have been identified as internal browning or blackening of the flesh during storage and the watery nature of the fruit. This project aims to identify existing cultivars on island that can be characterized as not having the above mentioned problems.

Five pineapple varieties Smooth Cayenne, Antigua Black, Giant Cayenne, TN # 4 and TN # 11 have been identified, collected and planted out at CARDI DTC. These varieties will be characterized and shelf life studies will be carried out at different maturity stages and storage temperatures, to determine the causes of black rot during storage.

3.1.5 Reducing Shortages of Root Crop Planting Material

The unavailability of planting material for the sustainable production of root crops has resulted in shortages for local consumption and exports. This has been a major constraint affecting the agricultural sector over the last decade. This situation has resulted in the increased cost of planting material, which in turn has increased the cost production of root crops and prices on the market. To increase the availability of root crop planting material a project has been initiated jointly by CARDI, MALFF and IICA under the IICA/CARDI agreement.

Under the project, CARDI will establish at its DTC 0.25 hectares each of yams, dasheen, tannia, sweet potato and sweet cassava. The use of the mini-sett technique will be applied for the multiplication of yams and tannia, whilst for sweet potato slips, cassava sticks and dasheen suckers will be used as the preferred planting material for distribution to farmers.

Plots of sweet cassava (0.25 ha.) and tannia (0.1 ha.) have so far been established at the DTC. The tannia plot (Plate 6) will be used as a source planting material to further increase the existing 0.1 ha tannia plot to 0.25 hectares next year 2009.

Plate 6 Tannia plot at CARDI's DTC

3.2.0 Livestock

3.2.1 Improving Small Ruminant Production

In March 2007 funding for conducting a regional small ruminant project was approved under the Japan/CARICOM Friendship Agreement. A major activity within the framework of the project was the execution of a small ruminant survey in some of the Caribbean islands including St. Lucia.

Four survey instruments focused on the farmer marketing, policy and planning t and research and training. Before the survey was conducted information on the total number of livestock farmers in St. Lucia was provided to the Trinidad and Tobago (T&T) Unit in order to determine a statistical sample size. Enumerators were recruited from the Livestock Division of the MoA to carry out the survey. The completed questionnaires have been submitted to the T&T Unit for analysis.

3.2.2 Pasture Development

Over the past years, the unavailability of forage at Beausejour Livestock Station in the south of the island has resulted in reduction of livestock production. The existing grass species Pangola and Star grass at Beausejour Livestock Station have not been in the past fully exploited. Recently the MALFF has been upgrading the Beausejour Livestock Station and plans are afoot to increase livestock production through the establishment of six hectares of improved pasture with the existing grass species, to increase the availability of forage for livestock production.

To this end, CARDI provided Technical Assistance (TA), in sourcing grass seed material for establishing new and adaptable grass species (*Brachiaria humidicola, Bracharia hibrido cv. Mulato 11 and Stylosanthes guianensis*) to complement existing species. Seed material was ordered out of the US and is being tested by the Livestock Division of MALFF at the Beausejour Livestock Station in Vieux Fort.

3.3.0 Emerging Issues

3.3.1 Evaluating Open Air vs. Undercover/Protected Production Systems

Vegetable production in St. Lucia is traditionally seasonal. Most of the production is carried out mainly in the dry season (January to June). Wet season production (July to December) is plagued by a proliferation of weeds; pest and disease problems which seriously affect crop performance. In order to alleviate the wet season problem and thus sustain year-round vegetable production, Under Cover / Protected Agriculture (UC / PA) systems were introduced. However the introduction of poorly designed UC / PA systems has caused productivity to drop, due to the abnormally high temperatures which these systems tend to be pre-disposed to. Other problems include increase the population of mites and other destructive insects and the intensive use of pesticides to control these pests. Under the traditional open air system the proliferation of weeds is the major production problem, constant weed control increases production cost and weeds also serve as alternate host to a number of crop pests and diseases. The use of ground cover (plastic or polypropylene) is recommended as a weed control measure.

This study compares an open air production system using ground cover (plastic mulch) for the efficient control of weeds and an undercover/protected agriculture system (10m x 20m) [Plate 7] in the same location, using similar plot sizes and treatments. Vegetables (tomato, sweet pepper, cucumber, melons etc.) will be grown year-round using appropriate rotations and drip irrigation systems. IPM methods will be used to control pest and diseases. Yield and economic data will be collected and analysed in order to make a comparative study between the two production systems and to demonstrate to farmers and extension officers, effective and efficient alternative methods of vegetable production. This study is funded under the IICA/CARDI agreement and is managed by CARDI and financed by IICA.

Plate 7 Undercover/Protected Agriculture structure established at DTC

3.4.0 Development of Seed and Seedlings Bank

3.4.1 Sustaining Crop Diversification

CARDI has over the years maintained the germplasm of various tree and food crop species at its Demonstration and Training Centre for use by stakeholders and farmers whenever the need arises. There has always been the tendency for farmers to use or sell their entire crop and not retain any for planting material. This situation is further exacerbated by increase food shortages as the cost of food continues to increase at an alarming rate. There is the need therefore for the maintenance of crop germplasm as a sustainable source of planting material (Table 4), that would be available whenever required by the farming community and other agricultural organizations. CARDI is providing that service and in so doing generates revenues for the Institute. During the year a total of EC$ 22,267 was generated from the sale of planting material and other commercial crop production enterprises (Tables 5 and 6).

Table 4 Germplasm plots maintained at DTC

CROPS	Scientific Name	CULTIVARS	QUANTITY (ha)
Pineapple	*Ananas comosus* Merr.	Smooth cayenne, TN # 4 and TN # 11	0.20 ha
Citrus	*Citrus jambhiri*	Tristeza resistant lemons	0.11 ha
Passion fruit	*Paciflora edulis* Sims.	Columbian, pink, local yellow	0.23 ha
Plantain/Banana	*Musa spp.*	Dwarf horn, Dwarf Maricongo, Dwarf French, Cent livre, Bluggo and Red banana	1.50 ha
Carambola	*Avohorra*	Sweet and Sour	15 trees
Papaya	*Carica papaya* L	Local	10 trees
Coconut	*Cocos nucifera* L.	Dwarf	25 trees
Mango	*Magnifera indica* L.	Julie, Tommy Atkins	0.50 ha
Golden apple	*Spodias purpurium*	Dwarf	0.15 ha
Sour sop	.Annona municata	Sweet and Sour	0.15 ha
Wax apple	*Syzygium samarangense*	Sweet	0.15 ha
Cashew	*Anacardium occidentale* L.	Brazilian	1 tree
Yam	*Dioscoria spp.*	Plimbite, Kinabayo, Florido, Oriental, Kabousa, Langie, Portugese and Chinese	0.50
Cassava	*Manihot esculanta* L.	M Col 22	0.20 ha
Sweet potato	*Ipomea batatas* L.	Zabwico, Tomorrow, Caten, St. Vincent	0.05 ha
Tumeric	*Curcma longa*	Local	0.05 ha
Lemon grass	*Cympobagon citratus*	Local	0.10 ha

Table 5 Planting material sold and revenues earned during 2008

Planting material	Quantity	Revenue ($EC)
Passion fruit	2218 plants	4,510
Golden apple	17 plants	140
Pineapple	520 plants	700
Plantain	225 plants	250
Yams	324 lbs	785
Coconut	1316 seedlings	1,316
Pumpkin	900 seedlings	1,180
Rosemary	65 seedlings	65
Total		**8,946**

Table 6 Revenues earned from other crop sales at the DTC during 2008

Crop	Weight (kg)	Revenue ($EC)
Spinach	311	1,015
Golden apple	445	67
Okra	476	2,088
Passion fruit	278	277
Mango	94	93
Plantain	534	93
Chinese yam	61	668
Wax Apple	213	469
Pineapple	154	521
Bodi bean	301	1,691
Pumpkin	892	2,639
Tannia	131	495
Amaranthus	236	1,260
Cassava	349	770
Cucumber	135	166
Chives	7	14
Watermelon	278	814
Avocado	50	101
Corn	36	80
Total		**13,321**

3.5.0 Invasive Species

3.5.1 Protection is better than cure

Tristeza is primarily a disease of citrus trees budded on sour orange rootstocks. It is transmitted through grafting and the brown citrus aphid (the main vector). Tristeza symptoms are due not to the susceptibility of the scions, but to harmful effects of the virus on the phloem cells of the rootstock just below the union. Control of the disease on existing plantings is difficult. In new citrus plantings control of the disease is achieved through the use of certified scion grafted on resistant rootstocks.

In an effort to protect new plantings of citrus from the virus, CARDI has established and maintained at its Demonstration and Training Centre (DTC) three varieties of Citrus Tristeza Virus (CTV) tolerant rootstocks (Volkameriana, Swingle citremelo and Carrizzo citrange) to produce seed material for the production of CTV tolerant root stock. Seeds have been extracted from mature fruits and passed on to the Ministry of Agriculture for the production of CTV tolerant rootstock (Plate 8).

Plate 8 Orange scion budded on CTV tolerant rootstock

3.5.2 Red Palm Mite Investigations Continues

The existence of red palm mite, *Raoiella indica*, a leaf damaging mite, and a pest of coconut in the Caribbean, has been confirmed in Dominica, Dominican Republic, Guadeloupe, Martinique, Puerto, Saint Lucia, Trinidad and Tobago, Grenada, Haiti, and Jamaica,

Extensive yellowing of lower leaves is symptomatic of red palm mite feeding (Plate 9). Infection results in extensive chlorosis of the lower leaves and the presence of dense populations of a red mite visible with the naked eye on the abaxial surfaces of older foliage. The exuviae (cuticle tissue discarded at molting) of red palm mites may be present as scaly patches on the leaf surface.

Investigations conducted by the MALFF for controlling the mite, consisted of a trial which examined the efficacy of 4 chemicals on mite infestation in coconut palms at seven trial sites on island. The chemical treatments included GCMite, Kumulus, banana mineral oil and lime sulphur. CARDI's Biometrician Bruce Lauckner was responsible for designing the trial and carrying out the data analysis for the Research Division of the Ministry of Agriculture. CARDI's also manages one of the trials at Demonstration and Technical Centre.

Preliminary results indicate that banana mineral oil seems to be the most effective, (lowest mite counts for most of the treatments). However its extensive use seems to cause phytotoxicity. The effects of lime sulphur seem to have marginal significance over Kumulus, however both are slightly less toxic when compared to the banana mineral oil.

Plate 9 Red Palm Mite identification
(Source: the Florida Department of Agriculture and Consumer Affairs)

4.0 Development of Strategic Linkages

4.1 Improving the Image of CARDI

The Unit participated in one of World Food Day activities ogranised by the MALFF. Poster displays were in keeping with the theme "Careers in Agriculture. Some of the Unit's activities were also displayed (Plate 10).

Plate 10 Permanent Secretary of MALFF viewing display at World Food Day

The Unit held its first ever CARDI Open Day on the 31st October, 2008 at its Demonstration and Training Centre (DTC) with the theme ***"Increasing Productivity of the 'New' Agriculture to Enhance Food Security".*** The invitees to the Open Day included the CARDI's collaborators, farmers and other stakeholders including school children. The welcome address as given by the Country Representative (Plate11) and the feature address was given by the Minister of Agriculture, Lands, Forestry and Fisheries (Plate 12).

Plate 11 Country Representative and visitors at CARDI Open Day

Plate 12 Minister of Agriculture Ezekiel Joseph at CARDI Open Day

4.2 Banana Is Better

The CARDI Unit in an effort to portray goodwill in the area where it operates in La Ressource, Dennery and to assist in improving the dietary and health of school children, embarked on a programme to provide ripe bananas to schools (1-2 cartons/ school) in the area on a weekly basis during the last quarter of 2008. Bananas were obtained from farmers in the Mabouya valley and Sir Arthur Lewis Community College and CARDI and ripened at CARDI's ripening facility (Plate 13). Given the quantity of bananas that are left back in farmers' fields during the harvesting period, CARDI recommended that this venture be pursued and replicated in all banana producing areas on the island.

Plate 13 CARDI technician carrying out ripening inspections in banana ripening room

5.0 Technical Assistance and Training

5.1 Improving Breadfruit Export Quality

Under the USAID funded Caribbean Trade Expansion Project (C-TEP) import quality assessment reports from Miami have indicated that most of the fresh produce exported arrives in a poor state and importers have expressed dissatisfaction with the product quality. Most of the produce imported was immature, undersize and poorly graded. Though training has been conducted in the past with successful results, there is the need to continue the training of new entrants who continue to come on board without the knowledge of the market expectations

To alleviate these problems, CARDI post-harvest technologist provided "on-hands" training at the CARDI pack house between January and June 2008, to eight pack house operators from the St. Lucia Marketing Board (SLMB) during five consecutive shipments of breadfruit, hot pepper and dasheen to Miami. . Quality assessment reports on these shipments indicated a marked improvement in quality, particularly for breadfruit (Plate 14).

Plate 14 Breadfruit ready for shipping by SLMB at CARDI's pack house

5.2 Sprayer Evaluation

CARDI assisted Renwick & Company to evaluate a new type knapsack sprayer (Kawazar – NEPTUN 15) (Plate 15). The sprayer was evaluated by applying herbicide over flat and sloping terrain that were overgrown with weeds. Data was collected on the following: ease of operation, suitability, durability, robustness and flexibility.

Plate 15 Sprayer - Kawazar – NEPTUN 15

Applicators found that the light weight of the sprayer made it easy to carry and operate over the different terrain. The durability and robustness of the sprayer lent itself to the rigours of the farm. The Kawazar – NEPTUN 15 was also found to be very flexible as it was operated easily by both right and left-handers, which in turn gives the sprayer an advantage over other models

These encouraging comments, ensures that the Kawazar – NEPTUN 15 type sprayer can be used as an effective alternative for other sprayers currently being used for application of agricultural pesticides.

5.3 Seeking an Alternative Herbicide- A private Sector Initiative

The effective control of a number of weed species found in banana fields such as *Commelina spp*. shown in Plate 16, *Borreria spp*, *Elusine indica*, *Amaranthus spp*, *Cynodon dactylon*, *Cyprus rotundus*, *Cleome spp*, *Impomea spp*. etc.) has been carried out by the application of the herbicide Basta 200 LS at the rate of 3 litres per acre (75 ml/4.5 L of water) and Touchdown (1.3litres/acre). Basta is a broad-spectrum, non-selective, contact herbicide, which contains the active ingredient glufosinate-ammonium at 200g/L as an aqueous solution. It is also made up of 30% surfactant. Touchdown is a broad spectrum non-selective systemic foliar herbicide containing the active ingredient glyphosate trimesium used at a rate of 2-4 litres per hectare (34 ml/4.5liters of water). Other herbicides used in the past include paraquat and Roundup; others have been discontinued due to their negative effects on the environment. Recent shortages of Basta due to the non-production by the manufacturer have prompted a local agricultural input supplier[1] to seek for alternatives. Finale 15 SL was found to be a potential substitute for Basta. Finale contains the active ingredient glufosinate-ammonium, but at a lower concentration (150 g/ L as an aqueous solution) when compared with Basta. The recommended rate of application is 12.5 ml / L of water or 3 - 3.7 L / ha. The trial was conducted to evaluate the effect of different rates of application of Finale 15 SL against Basta 200 LS and Touchdown, on the control of weeds in banana cultivations.

[1] Renwick &Company LTD

Plate16 Dominant weed species: water grass (*Commelina Spp.*) in banana fields

The trial was conducted over a four week period. After the first week of application, weed control using the different rates of Finale 15 SL was moderate, with a mean score of 2 for all the treatments. Touchdown (T1) treatment had no control. At the end of the second and successive weeks, all the treatments with the exception of Touchdown were very effective in controlling weeds, with each having a mean score of 3 (Table 7 and Plates 17-22).

Table 7 Mean scores for herbicide treatments after fourth week of application

Treatment	***Mean Score**
Finale – 4.9L/ha. (F2)	3
Finale – 7.4L/ha. (F3)	3
Finale – 9.8L/ha (F4)	3
Finale – 12.3L/ha. (F5)	3
Basta – 7.4L/ha. (B3)	3
Touchdown –3.2L/ha. (T1)	2

*Mean scores: 0 = no control; 1 = very little control 2 = moderate control; 3 = total control.

Plate 17

Plate 18

Plate 19

Plate 20

Plate 21

Plate 22

Plates 17-22 Weed status for each herbicide treatment after fourth week of herbicide application

The various rates of Finale 15 SL used in the trial were effective in the control of all weed species identified in the banana plots. From an economic perspective the lower rates of 4.9–7.4 litres of Finale 15 SL per hectare should be used for effective weed control. The re-establishment of weeds in treated plots began five weeks after the treatments were applied. In situations of high weed density, particularly during the rainy season, the highest rate should be applied. For effective control complete coverage of weeds is required.

6.0 Staff Members

6.1 Professional Staff

Ronald Pilgrim – Post Harvest Specialist/ Country Representative

Technical Staff

Sylvester Frederick – Field Station Supervisor
Jacob Thomas – Field Assistant

Administrative Staff

Sharon O'Brien - Administrative Assistant
Sherma Prince – Administrative Assistant (Ag.)