

# DEPARTMENTAL REPORTS, 2012

## I. OFFICE OF THE CHIEF EXECUTIVE OFFICER

### STAFF:

- |    |                  |   |                                   |
|----|------------------|---|-----------------------------------|
| 1. | Dr. O. Homenauth | - | Chief Executive Officer           |
| 2. | Ms. M. Pooran    | - | Administrative Assistant          |
| 3. | Mr R. Sukhna     | - | Research Assistant                |
| 4. | Mr P. Beecham    | - | Research Assistant                |
| 5. | Ms. N. Hutson    | - | Information Technology Technician |
| 6. | Ms. N. Henry     | - | Senior Library Assistant          |
| 7. | Mr. J. Gonsalves | - | Farm Manager, St. Ignatius        |
| 8. | Mr. F. Benjamin  | - | Senior Research Technician, Ebini |

### (A) Spice Cultivation

The cultivation of spices has increased drastically due to the increased demand for spices by consumers in the market. NAREI continues to provide technical assistance and support and the supply of planting materials to farmers to establish their own farm based cultivation. In 2002, approximately 120 farmers and key stakeholders were trained and based on feedback assessment conducted there has been significant improvement in the knowledge and skills of participants.

Presently, NAREI continues to maintain Ex-situ germplasm conservation. These collections are preserved germplasm and improve quality seeds and disease-free propagules for farmers to facilitate higher productivity.

To date farmers from Region Nos 1-9 cultivated:

- 50 acres of turmeric
- 160 acres of ginger

- 20 acres of black pepper vines
- 1 acre of nutmeg

The cost for the cultivation of one-acre of Turmeric in Region # 1 in 2012 is shown in Table 1 below.

**Table 1: Cost of Production for One-Acre of Turmeric in Region # 1, 2012**

<b>ACTIVITIES</b>	<b>TOTAL (G\$)</b>
Land Preparation: Removal of trees, shrubs, grasses etc. plough, make beds.	35,000
Seed materials	100,000
Chemicals: Required to control pest and disease affecting turmeric cultivation and to treat fresh rhizomes.	7000
Labourers: applying of chemicals, sowing of turmeric rhizomes, maintenance of turmeric plot and harvesting.	35,000
Processing of fresh turmeric rhizomes	30,000
Transportation	10,000
<b>Total</b>	<b>217,000</b>

1 ac of turmeric = 15 tons fresh rhizomes / literature

1 ton = 1000 kg

1000 kg = 2,200 lbs

7 lbs fresh turmeric = 1 lb of processed turmeric

1 lb of processed turmeric = \$300.00

Here in Guyana farmers obtained 10 tons/ acre

10 tons = 22,000 lbs

22,000 lbs fresh turmeric = 3,142 lbs of processed turmeric

Therefore 3,142 lbs of processed turmeric x 300 = \$942,600

In reality cost of production = \$217,000

\$ 942,600 – 217,000 = \$725,600

The cost for the cultivation of one-acre of Ginger in Region # 1 in 2012 is shown in Table 2 below.

**Table 2: Cost of Production for One-Acre of Ginger in Region # 1, 2012**

<b>ACTIVITIES</b>	<b>TOTAL (G\$)</b>
Land Preparation: Removal of trees, shrubs, grasses etc. plough, make beds.	35,000
Seed materials	200,000
Chemicals: Required to control pest and disease affecting ginger cultivation and to treat fresh rhizomes.	7000
Labourers: applying of chemicals, sowing of ginger rhizomes, maintenance of ginger plot and harvesting.	35,000
Transportation	10,000
<b>Total</b>	<b>287,000</b>

1 ac of ginger = 12 tons fresh rhizomes/ literature

1 ton = 1000 kg

1000 kg = 2,200 lbs

Here in Guyana farmers obtained 7 tons/ acre

7 tons = 15,400 lbs

1 lb of fresh ginger rhizomes= \$350.00

15,400 lbs fresh ginger x \$350.00 = \$5,390,000

In reality cost of production = \$287,000

\$5,390,000 – 287,000 = \$5,103,000

## Achievements

1. Germplasm were developed at the Mon Repos, Hosororo & Charity Nurseries.
2. Scientific field trials of turmeric, ginger and black pepper were conducted at Mon Repos, Benab and Hosororo Nurseries and farmers plots in Region #1.
3. Planting materials of turmeric, ginger, black pepper and nutmeg were distributed free of cost to a number of farmers in nine of the ten Regions of Guyana. Detailed information capturing the names, locations, relevant dates of planting and harvesting, and amount of planting materials distributed were prepared.
4. Staffs of the Hosororo and Charity Nurseries were trained in grafting of nutmeg seedlings and multiplying black pepper cuttings.
5. Farmers of all nine Regions were trained on how to cultivate turmeric, ginger, black pepper and nutmeg. Some key aspects that were highlighted at the training sessions are soil type, land preparation, seed material, mulching, fertilizing, irrigation, earthing, diseases, harvesting, processing and preservation of seed, etc.
6. Several sensitization campaigns were conducted on spice cultivation and development through Exhibitions, TV Programmes and the distribution of brochures, etc.

7. The project was able to move from setting up pilot plots production to the semi commercial scale of spice production.
8. From June 2008 to present, farmers have harvested approximately 250,000 lbs of fresh turmeric rhizomes.
9. NAREI processed in excess of 4000 lbs of dried turmeric which were sold to E. B. Beharry Ltd. The price given to farmers for their produce (processed turmeric) was \$300.00 per pound.
10. Since the establishment of the project in 2008:
  - 395 farmers cultivating turmeric.
  - 343 cultivating ginger
  - 129 cultivating black pepper vines
  - 68 cultivating grafted and nutmeg seedling

## **(B) Water Management Studies on Vegetables**

NAREI in collaboration with Mc Gill University embarked on a water management study on vegetable crops in Guyana. Ten research plots (five in Parika and five in Black Bush Polder) were established in farmers' fields. The studies involved the use of drip irrigation to promote year round vegetable production. Three treatments (field capacity, 75% field capacity, control) were utilised. The crops targeted included bora, boulangier, peppers, watermelon, red peas and cabbage. By the end of 2012, recommendations would be made on the quantities of irrigation water needed as well as the timing of application to ensure maximum production is achieved for the various vegetables. The next season will combine drip irrigation with mulching.

### (C) Management of Black Sigatoka Disease (BSD)

The management of the Black Sigatoka Disease (BSD) affecting plantain/ banana production was given prominence. With the assistance of the FAO, an Action Plan was developed for the management of BSD in Guyana. Demonstration farms were established in the major plantain growing areas (Crabwood Creek, East Bank Essequibo) to illustrate the various management strategies to be employed. These included the use of IPM Strategies and cultural control. Results have shown that these strategies, once successfully employed would make a positive impact on plantain production. This programme will be further intensified in 2013 with the full implementation of the Action Plan.

### (D) National Mangrove Management Action Plan

The overall objective of the plan is to respond to climate change and to mitigate its effects through the protection, rehabilitation and wise use of Guyana’s mangrove ecosystems through processes that maintain their protective function, values and biodiversity while meeting the socio economic development and environmental protection needs in estuarine and coastal areas.

Objective	Achievements
<b>Administrative capacity for the management of mangroves in Guyana</b>	Commencement of Technical Assistance contract by Landell Mills Limited. Inception workshop completed in June 2012  ➤ Key expertise critical to ensure effective mangrove management fielded: <ul style="list-style-type: none"> <li>• Mangrove Specialist,</li> <li>• Coastal Engineer,</li> <li>• GIS Specialist</li> <li>• Biodiversity Specialist.</li> <li>• Community engagement Specialist</li> <li>• Mangrove Reserve Social surveyor</li> <li>• Ecological Mangrove Restoration Specialist</li> </ul>

	<p>Staff and rangers completed training in use of Global Positioning System (GPS), Introduction to Geographic Information System (GIS) and advance field to finish GIS.</p> <p>Assessment of achievement of Performance Criteria Year 2 &amp; 3 completed October 2012</p>
<p><b>Sustainable management of mangrove forest</b></p>	<p>Development of Mangrove Monitoring Plan</p> <p>Commence development of GIS based Mangrove Monitoring System. Acquisition of Satellite Imagery from partner agencies.</p> <p>Continued engagement of eight (8) Mangrove rangers to protect 24Km of coastal mangrove forest. Ongoing monitoring of 24Km of coastline by mangrove rangers.</p> <p>Establishment of permanent monitoring plots at restoration sites.</p>
<p><b>Legal framework for mangrove ecosystem management which encourages community-based participation</b></p>	<p>Five Village Mangrove Action Committees (VMACs) continue to promote mangrove awareness and management at a community level.</p> <p>Mangrove tourism product enhanced to increase mangrove awareness and community participation – The Mangrove Heritage Trail.</p> <p>Mangrove Reserve Producers win award Caribbean Tourism Organisation Biodiversity Conservation Award 2012</p> <p>Producers group registered as a Coop Society and business plan developed with support from Digicel.</p> <p>Buxton VMAC construct bleacher for the Buxton playfield with support from GMRP to promote mangrove awareness</p>

<p><b>Research and development of Guyana's mangrove forest</b></p>	<p>Eleven (11) research grant contracts signed with the University of Guyana to conduct research</p> <p>Four (4) research projects completed in the following areas:</p> <ul style="list-style-type: none"> <li>• An Exploratory Study of Residents Readiness to Advance Mangrove Restoration in Buxton/Friendship</li> <li>• Monitoring the level of accretion or erosion in mangrove forest in Annandale, using sediment macro invertebrates as bio-indicators.</li> <li>• An Assessment of the Loss of Mangrove Stands in Guyana's Coastal Zone at Mahaica – Berbice Region 5 and its Causes</li> <li>• An Examination of Mangrove Conservation Awareness amongst Secondary Schools Students in Region Four</li> </ul> <p>Facilitation of PhD research student from the University of Santa Barbara.</p> <p>Presentation of GMRP poster at the 6th National Conference on Coastal and Estuarine Habitat Restoration in Florida.</p>																												
<p><b>Effective protection and/or rehabilitation of mangrove ecosystems</b></p>	<p>Restoration/planting in excess of 217,000 black mangrove seedlings at three (3) locations along the coastline</p> <ul style="list-style-type: none"> <li>• Wellington Park, Corentyne Coast</li> <li>• Village #6-8, West Coast Berbice</li> <li>• Le Ressenouvenir/Felicity, East Coast Demerara</li> </ul> <p style="text-align: center;"><b><u>Summary Restoration</u></b></p> <table border="1" data-bbox="349 1591 1507 1894"> <thead> <tr> <th>Site no.</th> <th>Location</th> <th>Year Planted</th> <th>Length (m) planted</th> <th>Survival rate (%)</th> <th>Protected length (m)</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Mon Repos</td> <td>2010</td> <td>320</td> <td>6</td> <td>19</td> <td></td> </tr> <tr> <td>2</td> <td>Triumph/BV/Success</td> <td>2010</td> <td>518</td> <td>20</td> <td>104</td> <td></td> </tr> <tr> <td>3</td> <td>Chateau Margot/Success</td> <td>2011</td> <td>284</td> <td>85</td> <td>841</td> <td>Natural regeneration extending beyond</td> </tr> </tbody> </table>	Site no.	Location	Year Planted	Length (m) planted	Survival rate (%)	Protected length (m)	Comment	1	Mon Repos	2010	320	6	19		2	Triumph/BV/Success	2010	518	20	104		3	Chateau Margot/Success	2011	284	85	841	Natural regeneration extending beyond
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						plantation
4	<b>Le Ressouvenir/Felicity</b>	2012	1617	100	1,617	
5	<b>Section C Enterprise</b>	2011	253	0	0	
6	<b>Victoria / Belfield</b>	2011	458	0	0	
7	<b>Hope Beach</b>	2010	173	30	433	Natural regeneration extending beyond plantation
8	<b>Greenfield</b>	2011	168	75	441	Natural regeneration extending beyond plantation
9	<b>Village #6-8</b>	2011	357	40	275	Natural regeneration extending beyond plantation
10	<b>Village #6-8</b>	2012	563	90	1,898	Natural regeneration extending beyond plantation
11	<b>Wellington Park</b>	2011	225	70	1,162	Natural regeneration extending beyond plantation
12	<b>Wellington Park</b>	2012	654	15	98	
	<b>TOTAL</b>		<b>5590</b>			

### **Construction of Geotextile Breakwater at Victoria, East Coast Demerara**

Monitoring of Geotextile breakwater - Data collection on wave attenuation completed December 2012

Award of contract for the construction of a groyne field at Cane Garden, Leguan Island and a groyne at Mon Repos, East Coast Demerara.

Completion of training for GMRP, partner agencies and community members in Ecological Mangrove Restoration workshop.

	Completion of site visit and assessment of Regions 2-6.
<b>Public awareness and education on the benefits of the mangrove forest</b>	<p>Mangrove documentary “Holding Back the Sea” launched in collaboration with NCERD.</p> <p>Development of secondary school teachers resource manual and training of teachers in use of the manual</p> <p>Participation in national exhibitions</p> <p>Over 20 schools tour the Golden/Grove Mangroves reserve</p> <p>Tourism Month launched at Mangrove Visitor’s Center</p>

## **(E) Ebini**

Annual Report for the Intermediate Savannahs – Ebini 2012

1. Mr Floyd Benjamin - Officer in Charge
2. Mr Kevin Gonsalves- Technician
3. Mr N. Cumberbatch - Coordinator

### **(1) Programme: Special Project under the Direct Supervision of the Director**

The programmes that the Ebini Station was involved in during the 2012 reporting year, include seed production of crops that are critical to the food security programmes, germplasm evaluation and observation studies of introduced crops, managing plant genetic resources of coconut and mango, and during the first nine months of 2012 maintaining breeding stock for sheep and cattle.

The Ebini Station was plagued with machinery problems during the reporting year, the only working tractor on the station encountered engine problems and although efforts were made to effect repairs at Ebini, these efforts were not successful and the engine had to be taken out of the station for a complete engine overhaul. The machinery problems encountered resulted in reduced output from the station during the reporting year, however in spite of all the hindrances the station was able to transfer to the Mon Repos Unit 1,363 kg of red pea seed material as well as 43 breeding rams in 2012.

The station could however claim as one of the success stories for 2012, the commercialization of the cassava variety referred to as Alan D. Ebini. This variety is presently being used to make cassava (French) fries and cassava logs, two products introduced to the local market by the Mekdeci Investment Ltd. The cassava for which there is a high demand is currently is being sold fresh at the Linden Region 10 market. This cassava variety Alan D. Ebini was selected by NAREI Ebini as the best of the

varieties planted in the Intermediate Savannahs for human consumption. The variety was given to the Citrus Growers of Trinidad and Tobago to be planted on their farm in the Tacama savannahs for commercial purposes.

Additionally, two sweet potato varieties were also given to the Citrus Growers of Trinidad and Tobago for further commercialization. The NAREI Ebini Station received from the citrus growers of Trinidad and Tobago seed material of a pigeon pea variety (CG Pigeon pea 2012), the seeds are being multiplied at both the Mon Repos and the Ebini Station for distribution to the farmer community.

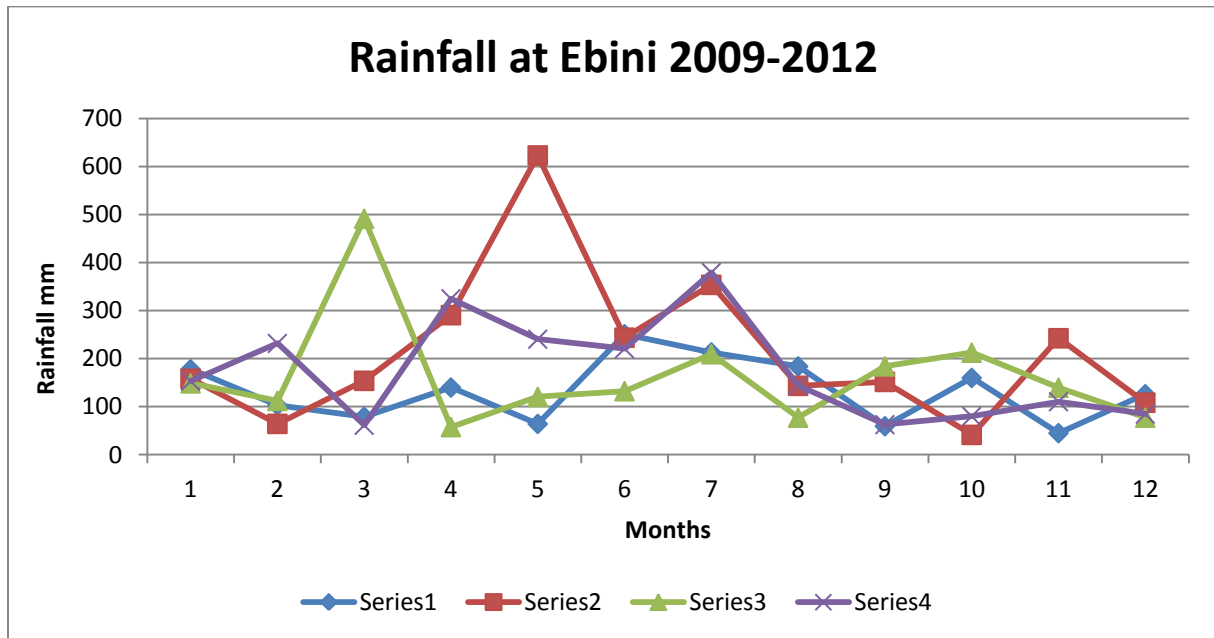
The rainfall at the Ebini Station in 2012 was 2094.mm as compared with 1963.3 mm of rain during the previous reporting year and while 2012 was considered as a relatively dry year, the rainfall in 2012 was the second highest rainfall total for the past four years as shown in Table 3.

**Table 3: Rainfall Data for the Ebini Station, 2009, 2010, 2011 and 2012**

Months	J	F	M	A	M	J	J	A	S	O	N	D	Total
Rainfall (mm) 2009	178	103	79.1	140	64.3	251	213	184	59.5	160	45	126	1602.9
Rainfall (mm) 2010	158.2	64.4	154.0	290.7	623.2	243.8	353.8	143.6	151.7	41.4	242.6	108.4 1-16 Dec	2570.4
Rainfall (mm) 2011	148.7	112.2	491.4	57.7	120.5	132.4	209.4	77.3	184.1	212.6	139.6	77.4	1963.3
Rainfall (mm) 2012	153.3	231.8	61.4	324.9	240.7	220.8	379.4	144.0	62.8	80.1	110.4	84.6	2094.0

Figure 1 shows the rainfall pattern for the past four years at Ebini, and in 2012 as represented by Series 4 in the figure, which showed that from July 2012, there was a marked decline in the total amount of rainfall. This lack of rainfall had a significant effect on crop production during the reporting year, with most of the crops suffering from water

stress during the critical harvest months of September and October and consequently resulted in decreased yields. Traditionally the month with the most predictable rainfall is during the May to July period however over the past four years only June and July seem to fit that pattern. The graph also shows that for the past four years the decline in rainfall from July to December appears more or less as a straight line. There were 200 rainfall days for the year.



*Figure 1: Rainfall Pattern for Ebini for the Years 2009-2012*

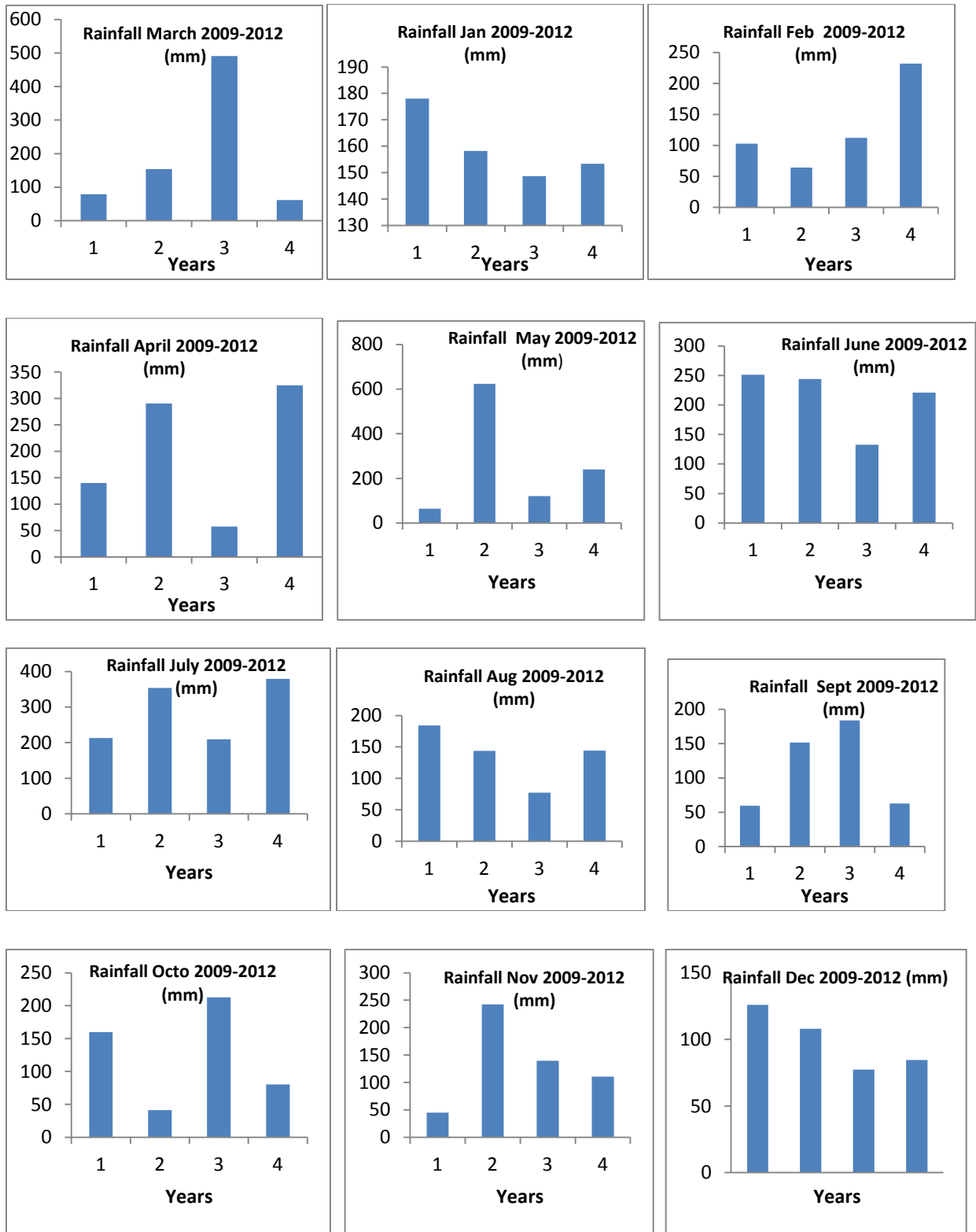


Figure 2: Rainfall amount per month over the past four years 2009-2012

The rainfall pattern as seen in Figure 2 for Ebini for the years 2009-2012 has showed no discernible pattern over the four reporting years except for the months of June and July, thereby making it extremely difficult to predict, and such erratic rainfall pattern has had serious consequence on our crop production efforts.

## (2) **Agricultural Systems at the Ebini Unit**

The work programme of the Ebini Unit encompasses the work programme of a number of different Departments of the Institute. These include:

- The Agronomy Department
- The Horticulture Department
- The Department of Plant Genetic Resources and Biotechnology, and
- The Department of Livestock and Pasture Production
- Special Projects which include, Rising Sun Ebini Beef Cattle breeding operation and the Intermediate Savannahs Agricultural Project (INSAP).

In the area of the Special Projects, a Memorandum of Understanding was developed between NAREI and BLUEWAVE Agricultural Company for the development of an agricultural complex in the Savannahs. The BLUEWAVE Agricultural Company was awarded approximately 44,000 ha of land in the Ebini Savannahs.

The Intermediate Savannahs Project (INSAP) project has the responsibility for ensuring the sustainable development of the Intermediate Savannahs, to which end the programme provided tangible scientific information to potential investors, make available to the investors seed material and other technical support and host exploratory visits and feasibility study tours for the investors.

### **(3) The Department of Livestock and Pasture Production**

#### **(a) Livestock programme**

With the advent of the formation of the Guyana Livestock Development Authority (GLDA) the NAREI Ebini Livestock Programme was transferred to that organization. The livestock programme of NAREI in the Intermediate Savannahs was implemented to investigate and develop improved production systems for small ruminants and cattle. This programme over the years has been instrumental in ensuring that the national livestock programme was enhanced by providing quality breeding animals to the farming community, but more importantly ensuring that the production technology for improved livestock production parameters in the Intermediate Savannahs was improved. The Ebini Station under the management of NAREI was the national repository for the Barbados Blackbelly breed of sheep, and efforts were made over the previous years to ensure that the flock remains to a greater extent mainly Barbados Blackbelly sheep. The Ebini Station in 2012 transferred to the GLDA Mon Repos Station, 36 Barbados Black Belly breeding males for sale and distribution to the farming community.

The stock was audited in February 2012 and the formal handing over of the stock to the GLDA was done on September 1 2012, however, because the GLDA does not have any personnel located on the Ebini Station, NAREI continue to provide daily management and support services to the livestock. The GLDA is responsible for all technical, veterinary as well as scientific issues.



The sheep stock number at the Ebini Unit as of September 1, 2012 is shown in Table 4.

**Table 4: Stock Number of the Sheep at the Ebini Unit at 01-09-2012**

<b>Sheep</b>	<b>Opening Stock 01-01-2012</b>	<b>(1) Audit count 10-02 2012</b>	<b>(2) Handover count</b>
<b>Animal class</b>	<b>Number</b>	<b>Number</b>	<b>Number</b>
Breeding males	<b>3</b>	<b>3</b>	<b>3</b>
Breeding females	<b>181</b>	<b>195</b>	<b>99</b>
Weaned males	<b>29</b>	<b>23</b>	<b>26</b>
Weaned females	<b>19</b>	<b>00</b>	
Male lambs	<b>37</b>	<b>49</b>	<b>61</b>
Female lambs	<b>31</b>	<b>31</b>	<b>60</b>
<b>Total</b>	<b>300</b>	<b>299</b>	<b>249</b>

1. The audit count was done on 2012-02-10 by the Ministry of Agriculture auditors in preparation to GLDA assuming responsibility for the animals.
2. The handover count was done by the GLDA technical staff, at which time the GLDA assumed technical responsibility for the animals.

**(i) The Goat Unit**

The goat flock is inbred and would require a renewed and sustained effort to attain meaningful data from this flock. The flock however serves a very useful purpose by providing milk to assist those lambs whose mothers do not have enough milk to rear their lambs.

The stock number for the goats is presented in Table 5.

**Table 5: Stock Number for the Goats at the Ebini Unit at 2012-09-01**

<b>Animal class</b>	<b>Opening stock 01-02-2012</b>	<b>Audit count 10-02- 2012</b>
Breeding male	1	2
Breeding females	10	13
Weaned males	4	
Weaned females	11	
Male kids		
Female kids		
Wethers		
Total	26	15

#### **(ii) The Beef Cattle Unit**

The Ebini beef cattle programme was initiated by rescuing the animals abandoned by the Livestock Development Company (LIDCO) and these animals became the NARI Ebini beef cattle herd. A number of these animals are in excess of 15 years old, however the strategy adopted was to attempt to acquire a calf from each animal; however there has been a number of deaths among the adult animals mainly as a result of the age of the animals.

With the advent of the Agricultural Export Diversification Programme it was envisaged that the breeding females would be used in the breed enhancement programme thereby providing a source of breeding animals for the livestock improvement programme. These animals were also handed over to the GLDA on September 2012. The stock number of cattle at handing over is presented in Table 6.

**Table 6: Stock Number of Cattle at the Ebini Unit at 2012-09-01**

<b>Animal class</b>	<b>Opening stock 01-01-2012</b>	<b>Audit Count 10-02-2012</b>	<b>Handover Count</b>
Breeding bulls	2	2	2
Breeding cows	52	56	54
Weaned bulls	10		6
Heifers	12		18
Male calves	9	8	2
Female calves	10	11	2
Steers		21	2
Total	95	99	86

#### **(4) The Ebini Crop Programme**

##### **(i) The Agronomy Programme**

The goal of the Agronomy Department of NAREI is to introduce new crop varieties, test improved varieties and promote the productivity of these crops by utilizing improved production systems.

The specific objectives of the seed programme of the Agronomy programme at Ebini are to:

- Maintain the genetic purity of seed material.
- Produce high quality seed material of selected crops.
- Make available to farmers good quality seed at a reasonable price, and
- Provide a sustainable seed supply system.

**(ii) Commercial Seed Production**

The Ebini Unit is one of the national repositories of orchard and other crop types; one of its principal tasks is to act as the primary seed production unit. The unit planted for commercial seed production purposes cowpea, peanut, corn, dwarf pigeon pea, sorghum and mung bean. These seeds are used for increased agricultural production as well as to ensure that adequate seed material is available for the various Government of Guyana programmes. The seeds produced at the unit were transferred to the Mon Repos Unit for storage and distribution as shown in Table 7.

**Table 7: Commercial Seeds and Seed Lines Produced by the Ebini Station in 2012**

<b>Crop Type</b>	<b>Variety and Planting Date</b>	<b>Area Planted</b>	<b>Remarks</b>
<b>Cowpea</b>	Minica (4 Feb 2012)	2.5 ha	1,360 kg transferred to the Mon Repos Unit
“	Minica (August 2012)	1 ha	Crop badly affected by drought conditions in the latter part of 2012. 150 kg of harvested seed used in the December 2012 planting season
<b>Cowpea</b>	Minica (3 December 2012)	2 ha	Seed production
<b>Peanut</b>	AK 62 (June 2012)	300 m <sup>2</sup>	Crop badly affected by drought conditions in the latter part of 2012. 40 kg of harvested seed used in the December 2012 planting season.
<b>Corn</b>	M92-A1 (29 Feb 2012)	375 m <sup>2</sup>	100 kg transferred to the Mon Repos Unit
“	M 92-A1 (July 2012)	475 m <sup>2</sup>	Crop badly affected by dry period in the latter part of 2012
“	M 92-A1 (Dec 2012)	200 m <sup>2</sup>	Seed maintenance
<b>Dwarf Pigeon pea</b>		95 m <sup>2</sup>	8.7 kg of seed harvested and transferred to the Mon Repos Unit
<b>Pigeon Peas</b>	CG 2012		Seed planted in the July 2012 planting

<b>(Citrus Growers)</b>			season is being harvested.
<b>Mung bean</b>	MB-95-A3 (29-02-2012)	500 m <sup>2</sup>	10.9 kg of seed harvested and transferred to the Mon Repos Unit
“	MB-95-A3 (9-06-2012)	125 m <sup>2</sup>	Crop badly affected by dry period in the latter part of 2012
<b>Sorghum</b>	Beharry	250 m <sup>2</sup>	3 kg of seed available at the Mon Repos seed storage unit
<b>Sorghum</b>	4001BF	500 m <sup>2</sup>	2.3 kg of seed available at the Mon Repos seed storage unit
<b>Cherry seeds</b>	Sweet		500 grams transferred to the Mon Repos Unit on 2012-03-30
<b>Guava seeds</b>			1 kg 500 grams transferred to the Mon Repos Unit on 2012-03-30

During the December 2012 planting season, the cowpea variety Minica 4 was planted , the crop area was limed at a rate of 1000 kg/ha (limestone was acquired from the former Guyana National Service stockpile. Additionally, maize and pigeon pea were also planted.

### **(iii) Germplasm maintenance**

During 2012 the Ebini Unit maintained in the field, a number of cowpea lines. These lines were maintained for the Agronomy Department. The lines have niched well in the savannah ecosystem, however, acceptance of these lines by the farming community is not encouraging. The seeds available from the lines are recorded in Table 8.

**Table 8: Yield Components of Cowpea Lines Acquired and maintained at Ebini, 2012**

<b>Accession No</b>	<b>Area planted</b>	<b>Date planted</b>	<b>Seed available (g)</b>
IT97K-461-4	25 m <sup>2</sup>	2012-02-29	57
IT98K-128-4	50 m <sup>2</sup>	2012-02-29	111
IT98K-491-4			
IT99K-1122	25 m <sup>2</sup>	2012-02-29	50
IT99K-316-2	125 m <sup>2</sup>	2012-02-29	196
IT00K-1236	38 m <sup>2</sup>	2012-02-29	67
IT99K-529-1			
IT99 K-491-7			
IT99K-429-2			
IT96D-610	25 m <sup>2</sup>	2012-02-29	48

## **(5) ORCHARD CROP PROGRAMME**

### **(i) The Department of Plant Genetic Resources and Biotechnology**

The orchard crop programme maintains some of the activities under the Plant Genetic Resources Department (PGR). As a consequence of the PGR programme, a project was developed to establish on-farm and out-station depositories of some specific crops. These include coconut, mango, citrus, guava, sweet potato and cassava.

The objectives of the programme are:

- To establish basal collections of local mango varieties to serve as the national basal gene pool.
- To establish basal collections of local coconut varieties representing the diversity of riverain and coastal ecologies.
- To establish basal collections of local cassava and sweet potato varieties, and

- To evaluate the growth and production of dwarf cashew varieties.

As part of the Orchard Crop programme, the PGR activities in the Intermediate Savannahs are highlighted and these include the establishment and maintenance of the repositories for the economic crops, namely mango, coconut and sweet potato. All plots were maintained and cleaned during the reporting period, the plants were fertilized with 12-12-17-2 fertilizer and organic matter was applied to the roots of the trees.

**(a) Mango**

There are two blocks of mangoes planted at Ebini. There are 24 rows (varieties) in block 1 and 23 rows (varieties) in block 2; each mango row should have 5 plants of the same variety. In Table 9, the number in the mango row represents the number of plants in each row. During the reporting year 12-12-17-2 fertilizer was applied to the plants twice and some of the plants blossomed and set fruit for the first time.

**Table 9: Field Plan for the Ebini Mango Germplasm Plot, 2012**

R	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
B1	5	1	4	5	4	4	5	5	5	5	5	3	1	1	2	1	1	1	1	0	0	0	3	1
B2	4	2	3	3	5	4	4	5	4	4	5	4	4	3	5	4	3	5	3	4	4	3	3	

**(b) Coconut**

Approximately 100 coconut varieties were collected from the area formerly occupied by the Guyana National Service, Kimbia. These varieties formed the nucleus of the coconut germplasm which is located in the (No-till field) in the Kasarama Savannahs. In addition, approximately 50 coconut varieties were collected from the Pomeroon and were taken to Ebini to be part of the germplasm collection. In 2010 two additional plots were established, the coconuts were planted on the 11 and 12 May 2010. The coconuts were collected from the Pomeroon Region. The coconut field now has six plots. As shown in Table 10, there are 22 rows per plot and in each plot there are supposed to be 5 plants. The number in the coconut row represents the coconut plant in the collection.

In 2012 all plants were fertilized with 12-12-17-2 fertilizer twice and some of the first plantings have begun to set fruit.

**Table 10: Field plan for the Ebini coconut germplasm plot, 2012**

Rows	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
<b>Plants /plot</b>						
<b>1</b>	5	5	1	4	5	5
<b>2</b>	3	Nil	4	Nil	5	5
<b>3</b>	5	1	Nil	5	5	5
<b>4</b>	5	4	5	4	5	5
<b>5</b>	4	5	5	3	5	5
<b>6</b>	5	5	Nil	Nil	5	5
<b>7</b>	2	4	4	5	5	5
<b>8</b>	3	1	4	4	5	5
<b>9</b>	5	4	Nil	1	5	5
<b>10</b>	Nil	5	5	5	5	5
<b>11</b>	5	5	5	5	5	5
<b>12</b>	4	5	5	Nil	5	5
<b>13</b>	5	5	4	5	5	5
<b>14</b>	2	5	4	4	5	5
<b>15</b>	1	5	Nil	Nil	5	5
<b>16</b>	4	5	2	2	5	5
<b>17</b>	2	5	1	5	5	5
<b>18</b>	Nil	5	Nil	4	5	5
<b>19</b>	2	5	5	5	5	5
<b>20</b>	5	5	4	Nil	5	5
<b>21</b>	5	5	5	5	5	5
<b>22</b>	5	5	5	5	5	5



### **(c) Sweet potato**

The sweet potato germplasm collection which is a part of the PGR activity at Ebini was badly affected by the drought conditions in 2012 and the collection would have to be re-established.

#### **(ii) The Horticulture Department**

The orchard crops, such as the citrus, mango, guava, pineapple, cherry, golden apple and rambutan all form part of the orchard crop programme of the Ebini Unit. One of the main activities of this programme activity is to provide propagation material to the tissue culture as well as the nursery programme of the Institute. A new area is being developed and seed material has been propagated for the new orchard crop area.

#### **(iii) The Intermediate Savannahs Project (INSAP)**

The INSAP project was very active during the reporting year. The programme hosted a number of visits from potential investors and would be signing a Memorandum of Understanding with the Blue Wave Company of India, for the joint development of the Ebini Savannahs for commercial agricultural purposes

#### **(iv) Rising Sun Beef Breeding Operation**

The Rising Sun Beef breeding operation has completed fencing of a 500 acre plot and has fully occupied the plot of land. The plot stretches from the NAREI compound to the Berbice River Agro-forest Company boundary. Additionally a corral has been constructed and bulls which were reared at the Ebini location were shipped out of the Ebini location and made available to the farmers on the coast as breeding animals.

## **II. FRUITS, VEGETABLES AND OTHER CROPS**

### **Project Staff:**

1. Dr. R. Chandranauth, Research Scientist
2. Ms A. Peters, Research Assistant
3. Ms I .Persaud, Research Assistant
4. Mr R. Raghunauth, Research Assistant
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6. Ms D. Greene, Research Assistant
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### **Project Title 1: The efficacy of using Monty's plant food on the yields of cabbage**

#### **Abstract**

Samples of Monty's plant food were obtained from the Manufacturer of the products. The products (Monty's 4-15-12 and Monty's 8-16-8) were evaluated on the yields of cabbage. Two cabbage varieties (KK-cross and Salvation) were used to test the product. The trial was conducted at Mon Repos Field 17, under the shade house. A Randomized Complete Block Design (RCBD) was used for the trial with four replications. The results revealed that the traditional treatment of inorganic fertilizer - NPK produced the highest yield of cabbage. Monty's plant food produced a significantly lower yield.

## **Project Title 2: Sweet potato weevil (*Cylas formicarius*) management**

### **Status**

Sweet potato weevil is a major pest of sweet potato in Guyana. The insect damage the root or “tubers” which honey combed by numerous legless white grub with pale brown heads. Roots that are infested with the weevils are not suitable for human consumption. Chemical control of the pest is difficult and inapplicable because chemicals will concentrate in the tubers, while resistance varieties are limited. The use of pheromones, to trap insects is a well- researched method of non – chemical control.

Sweet potato sex pheromones can be used to trap male weevils present in the sweet potato plot (Janet Lawrence, Peters Myers – Facts Sheet CARDI). In 2009, NAREI has successfully demonstrated the effectiveness in managing the pest with the use of pheromones, both at NAREI Field 17 and on three farmers’ plots in Parika Backdam.

During 2012, a follow up demonstration plot was implemented at Mon-Repos, field 17 to monitor weevil population. Approximately 1100 m sq. was cultivated with sweet potato and two pheromone traps were set-up approximately 25m apart on the plot.

A low population of weevils (17) was captured from both traps, and the tubers harvested were 98% free from weevil damage. It is recommended that all sweet potato farmers be aware of this technology and adapt same where is necessary. NAREI continues to promote this technology.

### **Project Title 3: Seed purification and multiplication of legumes and solanaceous crops**

This project commenced in April, 2012 and will continue in 2013 because of variations (length of pods, fruit size, shape and weight).

Seed purification is done mainly to obtain pure seeds (genetic purity). Pure seeds refer to that species which is stated by the sender or found to be dominant in the seed lot. Yard long bora and hot pepper (miwiri red) are of economic importance since they are the commodities that are in demand for both the local and export markets. In addition, these varieties have cross pollinated or the seeds have being mixed with one or more varieties and have alter the original genetic makeup, thus resulting in significant variation. This leads to significant decline in crop uniformity, size, shape, low quality seeds and ultimately poor production. Efforts are currently being made to have these two varieties purified through proper agronomic practice, selection, maintenance, seed treatment and storage.



**(a) Selected yard long bora pods**



(b) Selected Miwiri pepper fruits

*Figure 3 (a) & (b): Selected Yard Long Bora Pods and Miwiri Pepper.*

### Results and Discussion

The data were obtained by visual observation of plants and selection of pods and fruits. Seed purification of yard long bora pods shown in Table 11 and miwiri red shown in Table 12 for two production cycles each.

**Table 11: Number of long and short yard long bora pods for two crop cycles.**

Length of pods	Crop cycle 1	Crop cycle 2
Long pods	965	2577
Short pods	428	1104

Table 11 showed that there was a significant increase in the number of long pods and short pods for crop cycle two than crop cycle one. In the second crop cycle there were twenty one pods per plant while in crop cycle one only sixteen pods per plant. However, in crop cycle one twenty five percent of plants were affected with cowpea mosaic virus while there was five percent in cycle two. In addition, there were longer and uniform pods in the second crop cycle and the seeds were of a higher quality also. This was as a result of more selectable plants observed in crop cycle two.

**Table 12: Number of round and other shaped miwiri red hot pepper for two crop cycle**

<b>Shape of fruits</b>	<b>Crop cycle 1</b>	<b>Crop cycle 2</b>
Round	4306	6037
Other shaped	921	3110

Table 12 showed that there was a sharp increase in the second crop cycle for round and other shaped fruits than crop cycle one. In the second crop cycle there were forty fruits per plant while in the first cycle was thirty four fruits per plant. In addition, the average weight of pepper fruits was 2.92g for the second crop cycle and 2.0g in the first cycle. However, there was fifteen percent plant that has off shape fruits in crop cycle two and six percent plant that has off shape fruits. Moreover, there were more round fruits in the second crop cycle and the seeds were of a higher quality. This was as a result of more selectable plants observed in crop cycle two. It can be concluded that proper seed selection leads to uniform crop stands, increase in fruit size and weight or pod length and weight and high quality seeds were achieved. However, there were still signs of variation for both yard long bora and miwiri red hot pepper. Seed selection must be done for each crop that reused seeds in order for it to be successful and to increase crop production and productivity significantly.

**Project Title 4: Evaluation of agronomic parameters of the West Indian red hot pepper under shaded and open field cultivation using different fertilizer regimes**

In Guyana, hot pepper is grown throughout the low coastal plain. Based on market studies conducted hot pepper is one the commodity targeted for expansion under the agricultural diversification program. The West Indian Red Pepper is reputed to be one of the world’s hottest peppers. This pepper falls in the “extreme” category on the Scoville Scale. West Indian red pepper has a Scoville rating of 200,000 to 260,000 Scoville units. Bright red, wrinkled fruits are about 1-1/2 inches deep and 1 inch wide and have

flavour with fruity overtones. This project aims to evaluate the West Indian Red pepper to increase hot pepper production and productivity to reach the target by 2015.

### **Status**

This project commenced in November 2012 and will continue in 2013. This was due to the unavailability of seeds.

The West Indian red pepper was transplanted at 1m between rows and 1m apart under the shade house and open field conditions at NAREI commercial farm. There were four treatments. The first fertilizer application is as follows (Trt1 : 3g N/ plant, 3.3g P<sub>2</sub>O<sub>5</sub>/ plant and 4.8g K<sub>2</sub>O/ plant: Trt2 3.6g N/ plant, 3.5g P<sub>2</sub>O<sub>5</sub>/ plant and 5.2g K<sub>2</sub>O/ plant and Trt3: 4.8g N/ plant, 3.9g P<sub>2</sub>O<sub>5</sub>/ plant and 6g K<sub>2</sub>O/ plant and Trt4: Okg/ha).

### **Project Title 5: Evaluation of pineapple stems cuttings for rapid multiplication of “seed” suckers**

### **Status**

This project was established in October 2012 at the Mon Repos Nursery.

It was conducted with the objective of producing more suckers from mother stems of pineapple as planting materials. They were sliced and grown in a medium that consisted of paddy husk, black sand and filter press. Bin was treated one week before with Carbendazim to deter fungal growth. The suckers were dipped in rooting powder (Stim root) and then placed at a depth of 2.5-5cm and spaced 10cm apart. They were watered daily.

Presently, they are approximately 2-3 plantlets from one cutting, ranging from 8-20cm in height. They will be transplanting into bags.

## **Project Title 6: The effects of micro nutrients on all year production of Papaya**

### **Status**

This project was established in June 2012 at the NAREI Commercial Farm.

This study was conducted with the objective to establish the optimum levels of micro nutrients that are required for papaw production. It is being carried out at the NAREI Commercial Farm.

Eighty papaw plants were planted on two dams (60 plants on one dam and 20 on the other dam) at a spacing of 2.5 x 2.5m. Based on the soil analysis, limestone (1 lb) and triple super phosphate (TSP) (15g) were applied before planting. After transplanting 15 g of 15:15:15 were applied to plants.

A total of 60 plants are in flowering stage approximately 5 months after planting. Presently plants have approximately 4-5 small fruits.

## **Project Title 7: Yield and yield component inter relationships among 12 drought tolerant accessions of cassava on marginal soils**

### **Status**

This project was started in April 2012. It was initiated to identify cassava accessions, the multiplication of planting materials and to maintain germplasm that are adaptable to marginal soils in Guyana, and is being carried out at the NAREI Commercial Farm where five varieties have been planted. They are: MCol, Uncle Mac, Bitter cassava, M15, M16. These accessions were acquired from Fort Wellington and Kairuni Nurseries and Parika Backdam. Sticks were cut in pieces of 30cm long and planted at a spacing of 1m x 1m.

After the 4months (August) plants are being evaluated for girth of stem, height of plants, and width of canopy.



Plants are presently 1.5m in height, canopy is 60cm, and stem girth are 5cm.

### **Project Title 8: Evaluation of a fertilizer regime for pineapple.**

#### **Status**

This project was established in May 2012. This study was initiated with the objective of achieving a micronutrients fertilizer regimen for pineapple, because a fertilizer package was already developed for pineapple but did not include micronutrients. This trial is ongoing at Kairuni Nursery on the Soesdyke Linden Highway. A randomized complete block design will be used to evaluate data collected. The treatments are: 12:12:17:2, 15:15:15 and a control. A total of 267 pineapple plants were planted at a spacing of 1.5m between rows and 0.6m apart for the plants. Applications of 20g of 12:12:17:2 and 15g of 15:15:15 per plant were applied in June and August of the year 2012. To date from observations, in replicate#1 the plants were larger in size (in terms of plant height) as compared to the other replicates.

### **Project Title 9: Response of established coconut palms (varieties: dwarf and tall) to fertilizer regimes**

#### **Status**

This project Phase I was initiated in May, 2012 and will continue in 2013 with Phase II and Phase III fertilizer applications. An experimental trial is presently ongoing to improve the yield of mature coconut palms (5 and 3 years). This is being done at three locations Pomeroy (Region 2), Wakenaam (Region 3) and Mon Repos (Region 4). The experiment was arranged according to randomized complete block design (RCDB), with three treatments (15:15:15; 12:12:17:2, Control) and their replication. There were two plants per treatment.

Phase I the first treatment of NPK 12:12:17:2 was applied at a rate of 3.75kg/palm and NPK 15:15:15, at 3 kg/palm along with 0.3125kg of Muriate of Potash (MOP) in a circle

band method by digging a narrow trench of 30cm width, 15cm depth. This was done for both 5 year old palms in the Pomeroun, and 3 year old palms at Mon Repos.

Preliminary measurements of number of fruits on a bunch, number of bunches, total number of fruits, weight of fruits, diameter of fruits and thickness of the endosperm and fertility of soil at 15cm, 30cm and 45cm. were taken before fertilization as shown in Tables 13 and 14.

### Preliminary Results

**Table 13: Coconut Palm 3 years before fertilization with NPK 15:15:15 + MOP**

<b>Parameters Evaluated</b>	<b>Mon Repos NAREI Plot I</b>	<b>Pomeroun Plot I</b>
Average water content	250.7 ml	427ml
Average no. of bunches	9	
Average no of branches	30	18
Average no. of nuts/bunch	10	
<b>Average nut size</b>		<b>25cm</b>

**Table 14: Coconut Palm 3 years before fertilization with NPK 12:12:17:2**

<b>Parameters Evaluated</b>	<b>Mon Repos NAREI Plot II</b>	<b>Pomeroun Plot II</b>
Average water content	285ml	570ml
Average no. of bunches	8	
Average no of branches	38	18
Average no. of nuts/bunch	8	
Average nut size		25cm

## **Project Title 10: Evaluation of the yield of two varieties of Okra: Clemson Spineless and Emerald Green.**

This project commenced in September, 2012 and will continue in 2013 so as to fulfill the necessary data being collected. Okra, a commonly grown vegetable in Guyana, is a heat loving vegetable; it is among the most heat- and drought-tolerant vegetable species in the world which belongs to the family Malvaceae and its scientific name is *Abelmoschus esculentus*, hence it was planted in the dry period being experienced in Guyana at the said time (from August 29th), where water was only demanded during seedling stages. It is cultivated for its fibrous fruits or pods containing round, white seeds.

The Emerald Green variety was planted on nine beds with an area of 6.3m x 12.4m and the Clemson Spineless variety was planted in Field 17 in an area of 151.5m x 3.9m for both varieties the seedlings emerged in four days. Parameters to be measured are the mean number of days to germination, flowering, fruiting, and maturity (seed) 100 seed weight, plant height, leaf length, and leaf width as shown in Table 15.

### **Results to Date**

**Table 15 shows the mean number of days to germination, flowering, fruiting, and maturity (seed)**

<b>Variety</b>	<b>No. of days to germination</b>	<b>No. of days to flowering</b>	<b>No. of days to fruiting</b>	<b>No. of days to fruit maturity (seed)</b>
Clemson Spineless	4	33	43	30
Emerald Green	4	48	65	To date not mature

## Project 11: Corn, Soy Beans and Red beans seeds multiplication in Region 6

### Status

Vegetable seeds were produced by the department to ensure high quality seed of adapted varieties reach farmers. In Table 16 (a, b & c) show the following crop seeds produced, packaged and distributed for 2012.

**Table 16 (a): Seed Production and Distribution Data, 2012**

<b>Crop Type</b>	<b>Quantity(g)</b>
Bora (Yard Long)	2195.0
Tomato (Cherry)	73.4
Wirwir	10.0
Miwiri Red	1361.1
Boulangier (Long purple)	246.4
Red Beans	6450.0
Ochro (Clemson spineless)	1432.3
<b>Mixed bullnose</b>	<b>15.0</b>
<b>Total</b>	<b>11, 783</b>

The following crop seeds were packaged for 2012.

**Table 16 (b): Crop Seeds Packaged for 2012**

<b>Crop Type</b>	<b>Number of packages</b>
Bora (Yard Long)	1603
Bora (Yard long) Lbs	109
Miwiri Red	264
Boulangier	1220
Red Beans	945
Ochro	733
Corn	300
<b>Total</b>	<b>5159</b>

Seeds Distributed for 2012

**Table 16(c): Crops Seeds Distributed for 2012**

<b>Type of seeds</b>	<b>Quantity</b>
Bora	706pks
Bora	27lbs
Red beans	253lbs
Corn	180lbs
Boulanger	418pks
Cabbage	164pks
Poi	985pks
Cucumber	296pks
Ochro	379pks
Celery	37pks
Lettuce	592pks
Tomato	166pks
Sweet pepper	238pks
Hot pepper	134pks
Pak choy	614pks
<b>Total (pks)</b>	<b>4982</b>
<b>Total (lbs)</b>	<b>460</b>

### **III. PLANT PATHOLOGY DEPARTMENT**

#### **Staff:**

- |                           |                            |
|---------------------------|----------------------------|
| 1. Mrs. S. Pooran-DeSouza | Research Scientist         |
| 2. Mr. C. Bissessar       | Research Assistant         |
| 3. Ms. C. Deonarine       | Research Assistant         |
| 4. Ms. L. Persaud         | Research Assistant         |
| 5. Ms. S. Brotherson      | Research Assistant         |
| 6. Ms. S. Nanku           | Research Assistant         |
| 7. Mr. R. Mohabir         | Senior Research Technician |
| 8. Ms. M. Stuart          | Research Technician        |
| 9. Ms. R. Brehaspat       | Research Technician        |
| 10. Ms. S. Nicholson      | Research Technician        |
| 11. Ms. M. Sommerset      | Laboratory Attendant       |
| 12. Ms. N. Moses          | Laboratory Attendant       |
| 13. Ms. S. Kellman        | Laboratory Attendant       |

#### **Project Title 1: Evaluation of an Integrated Pest Management System for the control of Sigatoka Diseases of Plantain and Banana in Guyana**

#### **Abstract**

Black Sigatoka (*Mycosphaerella fijiensis* Leach.) and Yellow Sigatoka (*M. musicola* Leach) are the two main leaf spot diseases that affect plantain and banana production resulting in significant losses in the absence of suitable control systems. In Guyana, no resistant cultivars are available and Integrated Pest Management (IPM) practices along with fungicides are the only available means of control these diseases. This study focused on an IPM system under field conditions and investigates the role of sanitation,

minimum fungicide applications and plant spacing in controlling Sigatoka diseases. Rehabilitation and spacing trials were conducted using various treatments. Data were collected on the number of leaves, disease incidence and severity using Gauhl's modified Stover's severity scoring system. IPM practices led to a reduction in the number of leaves to levels that cannot sustain healthy bunch weight. IPM + fungicide help to maintain a high number of leaves despite high disease infection. Fungicides alone were not effective in controlling Sigatoka diseases. Plant spacing did not have a significant impact on the number of leaves and disease infection. To maintain a healthy crop and control Sigatoka diseases any management program should include plant nutrition, irrigation, IPM practices, and appropriate fungicides applied at the right time and rate during the critical phases of crop growth.

## **Project Title 2: Investigation of the causative agents of Gummosis on Pineapple (Ananas spp.)**

### **Abstract**

Gummosis, gumming or gum disease of pineapple is a major disease that affects pineapple production in Guyana. Gummosis affects the pineapple fruit quality, thus causing it to deteriorate before it reaches the fresh market. This study was aimed at isolating and identifying the causative organisms that caused Gummosis. Diseased samples were collected from Linden Soesdyke Highway and Canals #1 and 2 Polder and cultured on Potato Dextrose Agar. Diseased pineapples showing symptoms of gummosis were not affected by insects or mechanical damages. Three genera, *Fusarium* (Linden-Soesdyke), *Collectotrichum* and *Pestalotia* (Canal#1&2) were isolated from diseased fruits with symptoms of gummosis. Although, pathogenicity tests were not conducted it may be assumed that gummosis was caused by the fungus and that their occurrences in the field varies depending on the location.

### **Project Title 3: Evaluation of an integrated management system for the control of the ant- mealybug complex of pineapple**

#### **Abstract**

An investigation was conducted to develop an integrated management system for the control of the ant-mealy bug complex of pineapple. The treatments included the use of Imidacloprid, trap crops (sorrel and ochro) and the farmer's practice (control). Imidacloprid and trap crops were significantly different from the farmer's practice in controlling ant-mealy bug populations to very low levels. Trap crops were difficult to establish in the Yarrokabra area mainly due to the hot/dry weather conditions and soil type. In an integrated management system the use of insecticide Imidacloprid may be implemented to reduce ant mealy bug populations but the time interval between applications should be reduced for more effective control. Farmers should be advised to have a schedule for applying insecticides for effectively controlling ant and mealy bug populations.



### III. PLANT BIOTECHNOLOGY AND GENETIC RESOURCES

#### Project Officers:

1. Mr C. Paul, Research Scientist
2. Ms E. Willabus, Senior Research Assistant
3. Mr R. Raghunauth, Research Assistant

#### Project Title 1: Guyana-CARDI-GCDT project for the conservation of targeted crop species-cassava

The four-year project was superimposed upon the Kairuni Cassava gene bank. During this period approximately 87 accessions were ear-marked for safety duplication at CIAT but only an initial 24 were trans-shipped. This project was brought to an end last September 2012 with the submission of a final report.

#### Project Title 2: Establishment of On-farm and Out-station Depositories of Targeted Crop Species

1. **Kairuni Cassava:** The gene bank accommodated 87 accessions. Delayed Plot preparation missed the replanting window. Extended retention of the regeneration cycle exposed a majority of the plots to extreme pilfering of several accessions and 14 accessions (at last October monitoring) were lost to this effect and drought intolerance. Specifically, most of the accessions from the Rupununi and two accessions from Corentyne were obliterated.
2. **Kairuni Avocado:** An attempt was made to patch-plant the new gene bank in September 2012. As of the following October only 12 plants of the accessions Walden, and Donaldson had survived. These accessions were putatively

adjudged as drought tolerant. All of the approximately remaining unplanted 90 saplings died during the in-field hardening period. This reduced establishment rate was in the main due to persistent drought conditions and the then absence of an applied irrigation system at the Station.

3. **Kairuni Sweet Potato:** Persistent drought conditions did not allow for any planting window. Approximately 57 accessions were temporarily housed at Mon Repos.

**Project Title 3: Establishment of a National Information Sharing Mechanism (NISM) on the Global Plan of Action (GPA) and Compilation of a the Second Report on the Status of Plant Genetic Resources for Food and Agriculture (PGRFA) in Guyana**

This collaborative effort was successfully completed in May 2012.

**(a) Security in Diversity**

The agriculture sector is the pulse of Guyana's economy and the stability of the industry has contributed significantly to the economic and social stability of the country. Guyana has very little experiences in responding to disasters that threaten national food security. During the reporting period there have been some menacing episodes but none has had cause to activate any emergency food security plan. It should be more obvious than apparent that the stability of our national food security status is directly related to our tradition of sustainable use of plant genetic resources for food and agriculture. A cursory look around the country would reveal that the population density is concentrated within and close to the plant-based agricultural industries. For this reason, Guyanese have a traditional inseparable co-existence with agricultural systems. It is therefore logical to deduce that if the future of agriculture is threatened, so too should be the Guyanese people. Security in diversity is therefore an appropriate

characterization of the state of use of plant genetic resources for food and agriculture in Guyana.

**(b) Status of Diversity**

Sugarcane and rice are the twin pillars of our agriculture sector. Barring only recent setbacks in the sugar industry, the sustainable use of plant genetic resources for food and agriculture in these two industries has combined to guarantee food security for all and provide an income for more than 20% of the Guyanese population that obligately must depend upon agriculture for a sustainable livelihood. The diversity among non-traditional crop species is an important complement guaranteeing our food self-sufficiency needs are met. With a new paradigm shift towards the sustainable use of plant species diversity for food and agriculture, the nontraditional sub-sector has assumed an important complementary role for food security assurance. The agriculture economy occupies approximately 161 874 hectares of irrigated land, hosting major crops, including sugarcane and rice; a diverse range of other important non-traditional crops, including coconut, cassava, a wide diversity of orchard species, green vegetables, and foraged botanicals in and around homesteads; a ubiquitous diversity of herbals; and an expansive 19 forested ecologies. Except for cassava, all agricultural products, important for food security and commercial exports are harvested within the narrow strip of coastal plains.

**(c) Status of in situ diversity**

Plant species diversity for food and agriculture is an integral part of our national patrimony; an entitlement that is associated with an ingrained social culture of co-existence with plants. This custom is strongly manifested in homestead cultivations and subsistence farming communities. The homestead cultivation of plant species diversity for food and agriculture represents an informal but significant depository of in situ diversity. This paradigm is particularly appropriate because the PGRFA diversity found in homestead communities undisputedly represents the greatest diversity of PGRFA assembled in Guyana; accounting for more than 80% of the plant species diversity for food and agriculture that we see all over our country. Government policies strongly

encourage this art form of 'in situ homesteads' because to date it has been successful in so far as it supports a culture of food self-reliance and the economic benefits it brings to lower-income households. It should be an objective of research to unravel and document the extent of this diversity in homestead communities and foraging grounds. The audit could then be extended into an ethno-botanical context for pepper, cassava, coconut, and wild botanicals, and put non-traditional crop species diversity into its appropriate commercial, social and food security perspective.

#### **(d) Management of ex situ diversity**

The tissue culture facility at NAREI has the only dedicated laboratory in the country capable of crop species conservation in vitro. Over the years, protocols for local accessions of plantain, banana, pineapple, yams, and sweet potato were established. The tissue culture facility has a mandate to provide disease-free planting materials for in-house research and to complement farmers' 'seed cuttings' requirements. But in the main, the lab seeks to adapt in vitro tissue culture protocols to facilitate the trans-boundary transfer of exotic crop species that must obligately depend on this avenue of germplasm exchange.

BRRS maintains a rice core collection of approximately 43 parental lines used in pedigree breeding, and currently four released commercial varieties. About 20 of these parental lines were bred on-station while the others were sourced from rice breeding networks of research institutions such as IRRI, CIAT, FLAR, and from the national rice breeding programmes of India. In addition to parental breeding lines, several thousands of pedigree lines are seasonally evaluated. The entire BRRS core collection of rice diversity is duplicated in regional and international PGRFA networks.

GARC maintains a field core collection of 43 commercial sugarcane varieties. Of these 12 are under industrial cultivation. Production is often coupled with varietal evaluation on a seasonal basis. One such evaluation is a twice-yearly rankings of varietal performance. These frequent 'ranking' evaluations are part of an intensive surveying

and monitoring system across all of the Guyana Sugar Corporation's (GUYSUCO) eight sugar estates. It enables GARC to detect varietal performance regressions as well as ascension, and where appropriate apply strategies for varietal replacement or agronomic adjustments.

NAREI is designated as the main depository of ex situ collections for seed-regenerated crop species. NAREI's mandate is for all crops (approximately 70 agricultural crops species) other than rice and sugarcane. During this reporting period a small nucleus of crop species were maintained on a seasonal basis. These were mostly for green vegetable crop species comprising a core collection of mostly exotic introductions of tomato and Brassica species. Local accessions of tomato, bora, pepper, eggplant, and poi are routinely maintained on a seasonal basis. Ex situ conservation, carried out at Mon Repos and Ebini Research Stations, is strategically transient because the storage capacity at Mon Repos Research Station was markedly reduced. The seed technology facility has recently been upgraded. NAREI has several ex situ field gene banks, inclusive of pineapple, avocado, cassava, yams, mango, West Indian cherry, passion fruit, cashew, coconut, Citrus species, and an array of minor orchard crop species. NAREI field gene banks are spread throughout the country at all of NAREI's research stations, plant propagation nurseries, and other smaller satellite stations. The number of species conserved in field gene banks is restrained by NAREI's capability to manage these depositories. Considering the distribution of root and tubers, and orchard crop species cultivation in Guyana, both intra- and inter-specific diversity represented in NAREI's field gene banks are under-sampled. There are extensive evaluation and characterization data for sweet potato, and a good start was made for vegetables. That similar data for other vegetatively-propagated field crop species have been hard to come by may be an artifact of a management bottle neck.

With a strong regional networking component, the conservation management of ex situ gene banks has placed GARC and BRRS on a very strong research foothold. NAREI's comparative capability, on the other hand, was constrained by the absence of sufficient

technical competencies in gene bank management and its inability to make effective use of crop germplasm exchange networks.

**(e) The state of use**

Conventional plant breeding programmes have been the only source of varietal diversity in rice and sugar. On a seven-year basis, the 'rice and sugar' sector uses a succession of a combined average of five modern varieties in commercial production. The varieties used at a given point in time are few but their genetic base is ever widening. The non-traditional sector, in the main, attempts to impose modern agricultural systems to optimize productivity from an unwieldy diversity of crop species for commercial gains. Both GARC and BRRS have a seasonal schedule of continuous crop performance evaluations. In a collaborative shuttle-breeding programme with other national programmes and coordinated by germplasm resources exchange networks, such as WICSBS and WISBEN for sugarcane and FLAR, IRRI, CIAT and the national rice breeding programmes of India for rice, GARC's and BRRS's plant breeding clones and lines are evaluated at multiple locations under diverse ecological conditions with national programmes. Rigorous evaluations carried out by local and overseas collaborating programmes have continued to guarantee stable field performance of commercial varieties. Every growing season at BRRS, field days are held on-farm where varietal demonstration plots would usually double as seed production demonstration plots. BRRS is the only agricultural research institution in the country that has a dedicated policy on farmer-participatory breeding.

Diversification of crop growing systems has historically been the main focus of Guyana's agricultural research interventions. NAREI'S strongest research capability has traditionally been in the area of crop nutritional ecology. During the reporting period, a number of green vegetable species and land races varieties were the main target of adaptation to a diverse range of improved agricultural production systems. To date, NAREI has to its credit the successful purification and adaptation of pineapple and sweet potato landrace complexes. But the efforts on vegetables were less sustainable. Generally, the response to synthetic nutritional amendments of most landrace crop

species has been generally recalcitrant. In recent years, an agricultural diversification programme has been promoting increased exports of non-traditional agro-commodities. But there are marketing limitations directly attributable to an uncontrollable admixture of varietal diversity in crop harvests. This militating diversity is mainly an artifact of foraged and homestead harvests. The contradiction is that the very wide genetic diversity that we so crave is an obstacle to the economic benefits we advocate for deserving farmers. Small farms, homesteads and foraging grounds shall continue to evolve along with its people counterpart. But for the specific purpose of commercialization, Guyana's gamut of landrace varietal diversity, for the most part, may at best be relegated to crop improvement efforts.

#### **(f) Underlying factor driving the state of diversity**

During the reporting period Guyana has entered into several international agreements. GARC and BRRS strengthened their regional PGRFA networking capacities. BRRS in addition, benefitted the greatest from training components of these agreements. Networking has elevated the sugar and rice industries on a sustainable research foothold. In common with the state of diversity of several other crop species, we have been unable to extract the necessary and adequate information about the diversity residing within our non-traditional crop germplasm pools. Generating reliable characterization and evaluation data is critical to utilizing plant genetic resources more effectively. NAREI's technical limitations in conservation, documentation, characterization and evaluation militate against its ability to proactively collaborate with other national programmes, and regional and international germplasm exchange networks. It is not surprising therefore, that NAREI has been unable to export significant numbers of its own landrace accessions and reciprocally, is restricted in its efforts to import significant numbers of improved accessions. Perhaps more than any other reason, NAREI's low-key participation in regional and international PGRFA networks militated against the country's making more effective use of the opportunities and benefits to be accrued from networking.

**(g) The International Treaty on PGRFA**

The recent implementation of the NISM for the sustainable management of PGRFA and the preparation of the Second Guyana Country Report on the Status of PGRFA would effectively serve to generate baseline information to guide food security assurance policies. Part of this food security policy will depend upon the access or exchange of local and external sources of PGRFA. Benefits accruing to Guyana would entail networking with other national, regional and international agencies. For this reason, Guyana's 2008 ratification of the Cartagena Protocol on Biosafety, the passage of legislation for the National Plant Quarantine Act of 2011 and National Seeds Act of 2011 are strategically supportive of the National Policy on the Access to Plant Genetic Resources and the Sharing of the Benefits Arising from their Use. Accordingly, the way could not be clearer for Guyana to ratify the International Treaty on PGRFA.



## **IV. SOIL MANAGEMENT AND FARM MECHANIZATION**

### **Project Officer:**

1. Mr D. Fredericks, Research Scientist
2. Mr R. Pelegrin, Research Scientist
3. Ms T. Persaud, Research Assistant
4. Mr R. Sullivan, Research Assistant
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### **Project Title 1: Investigating the Effectiveness of Locally Available Liming Material**

#### **Abstract**

A laboratory study was conducted using three soil types: Unit 11d (Corentyne Clay), Unit 21 (Mara Clay) and Unit 810 (Kasarama Loamy Sand) and three liming materials: calcium carbonate, low grade rock phosphate and AGRICAL (a 10 % liquid calcium organic product. Soils were treated with liming material at rates based on chemical analyses, maintained at 75 % field capacity and analysed for pH, electrical conductivity (Ec) and exchangeable acidity (Exch-acid) over a 13 week period.

After 5 weeks, the liming materials generally lowered the exchangeable acidity on all soils. Limestone and Low Grade Rockphate raised the pH, while AGRICAL generally lowered the pH on all soils. The EC of all soils was raised by the liming materials with AGRICAL having a significant effect.

After 9 weeks, the effects of the liming materials would have optimised with the minimising of exchangeable acidity and the optimising of the pH and Ec on all soils.

Thereafter, the effects of the liming materials declined with rising of exchangeable acidity and lowering of Ec. However, pH values remained stable.

In this study, calcium carbonate was most effective on soils types Mara Clay (Unit 21) and Kasarama Loamy Sand (Unit 810) to raise the pH to desired levels for optimum plant growth. Low grade rock phosphate was most suitable on Corentyne Clay drained phase (Unit 11d) having similar results to calcium carbonate. AGRICAL was useful in increasing the electrical conductivity of the soil and making soil nutrients available to plants. However, it should not be recommended as a liming material.

### **SOIL AND LAND USE SURVEYS SECTION**

The Soil and Land Use Surveys Division was engaged in several activities during 2012. These included: Crop Production to support Agricultural Diversification In Kato Village, Pakaraima Mountains Administrative Region 8, Guyana, and Crop Production On Minespoils In North East Kara – Kara Linden.

In addition, the division participated and contributed to:

- i. Study tour to Embrapa Brazil to support Guyana/ Brazil Project- Transfer of Techniques for the establishment of Production and Utilization of Soya in the Intermediate Savannahs of Guyana.
- ii. Community Owned Best Practices for Sustainable Resource Adaptive Management in the Guiana Shield (COBRA) Workshop to support the developing of alternative future socio-economic and environmental scenarios for Guyana in 2030.
- iii. The Ministry of Natural Resources and Environment (MNRE) 'Inception Meeting on the Draft National Policy on Geographic Information'.
- iv. MNRE committee on landscape restoration and replanting/rehabilitation of areas subjected to mining. Support was given to the creation of Flow Chart for the Re-Vegetation/Rehabilitation and Post Plantation Management of Mined Spoils.

- v. FAO's Sustainable Crop Production Intensification (SCPI) Workshop (SCPI) Stakeholder Consultation. Recommendations were made for (a) the formation of a crop development (IICA/FAO) Caribbean Network of Countries on Irish potato, garlic, chickpea and onions, (b) The formation of networks (Linkages between regional producers) for country visits to farms, and (c) Placing on the CARICOM Agenda issues affecting Trans-boundary movement of planting materials and breeding.
- vi. Training of Regional Extension Coordinators in aspects of land management for optimal crop production.
- vii. Giving technical advice to community sorrel growing at Long Creek on the Linden/Soesdyke Highway, in support of Dr. Faith Harding's 'Quick Impact Programme (QIP) for that community.
- viii. Advised Region 4 RDC on approach to collate available backlands for agricultural crop production.
- ix. Introduced Ghanian red pea to farmers (referred to as dwarf pigeon pea in 2011 report): Terry Fletcher-Georgetown; Thurston Riehl – Pearl, EBD; Desmond Saul-Victoria, ECD; Errol Luke-Victoria, ECD; Bert Jones –Tuschen, EBE; Ivan Carter, Garden of Eden, EBD; Marjory McCaskey, Supply EBD; Abraham David – Belladrum WCB; Orrin Gordon – Linden, Upper Demerara; and Roy George – Dartmouth Essequibo Coast.
- x. Address launch and facilitated judging of IICA-FAO Annual School Hydroponics Competition.
- xi. Initiate trial on micronutrient nutrition in Cherry production.

**Project Title 2: Agricultural Diversification in Kato and Paramakatoi Villages, Pakaraima Mountains Administrative Region 8, Guyana.**

**Strategic Objective: Sustainable Use of Natural Resources**

**Key Result: Increase Agricultural Production and Productivity**

**Programme: Agricultural Diversification**

### **Justification**

This project presents a unique opportunity for the diversification of cropping patterns in Region 8 and Guyana as a whole. This region is heavily dependent on cassava as its main staple. Unfortunately, the volume of produce is small and unable to sustain the communities throughout the year. This coupled with limited purchasing power of communities, makes food relief efforts to these communities an annual occurrence. In addition, the production of legumes as a source of low cost protein is limited in this region. Thus, communities are dependent on high priced meat and chicken for the protein in their meals.

### **METHODOLOGY**

#### **Field Trials and Crop Production**

Field crops including Irish potato (commercial source), pigeon pea (sourced from Trinidad and Tobago), garlic (commercial source), chickpea (commercial source), oats and millet were tested under shaded and open cultivation at NAREI Experimental Plot Field 17, Mon Repos, East Coast Demerara. This location is situated on soil type Onverwagt Clay - Unit 41d.

Planting material will be generated and communities will be organized for commercial farming and the institutional framework developed for the functioning of this enterprise.

## RESULTS

### ACTIVITY 1: Production of Irish Potato

**Specific Objective:** Develop a technical package for the growing of potatoes in Region 8

#### Status of Output:

This crop was successfully propagated from sprouting whole potato material both in the shade house and open field. 40 and 302 potato plants are being maintained in the shade house and open field respectively.

- Plant height of potato 77 dap is 54 cm
- Number of shoots/plant is 4.
- First appearance of tubers 70 dap.

#### Lessons Learnt

- Washing planting material with detergent and treatment with fungicide (Karbenazim - 5ml/3 litre of water) reduce losses to fungal infection during setting and infield.
- Planting on cambered beds (30 – 60 cm above furrow) significantly reduced (to <1%) mortality in field results from fungal disease owing to low beds and high soil moisture retention on clay beds.
- Crop production resulting from seedlings generated from gouging growing eyes and potato cuttings resulted in smaller tubers and higher losses to fungal infection.
- Untimely weed management results in spiny plant growth.

#### Future Plan

- Fertilize potatoes at planting with mixed fertilizer
- Plant only on flat topped ridges of 30 cm or more above furrow.
- Weekly monitoring of soil moisture content.
- Plant only seed potatoes having between 43 – and 57g.
- Use pre-emergent weed killer immediately after planting.

- Use of organic mulch (acacia cuttings) to conserve moisture, enhance weed management and enhance coolness of the soil.
- Replicate observation trials at Kairuni and Kato School garden.

## **ACTIVITY 2: Production of Pigeon Peas**

**Specific Objective: Develop a technical package for the growing of potatoes in Region 8**

### **Status of Output:**

This crop was successfully propagated from seed sourced from cropping at NAREI's Holding in the Intermediate Savannahs of Guyana. The pigeon pea plot was planted with spacing of 0.70 m between plants and 1 m between rows.

- 700 pigeon pea seedlings established in Field 17 of NAREI Mon Repos
- 50 % flowering was recorded initiated 7 months after planting.
- Conversion factor of dry pods to 'grain' is 56 %.
- Harvested mature pods showed four varieties based on seed colour.
- 100 seeds weight of different seed types are as follows:
  - White/cream - 13.80g
  - Brown - 14.44g
  - Red - 13.44g
  - Striated - 12.88g
- Plant height 1.95 m.

### **Lessons Learnt**

- The pigeon pea plot planted with spacing of 0.70 m between plants and 1 m between rows has caused plants to have excessive overlapping and exhibits uneven flowering patterns.
- Uneven pod filling patterns was observed in favor of plants closest to drains.

- The closed canopy significantly reduced plants ability to optimize benefits from rainfall.
- The quality of produce is severely affected by moisture during the rainy season resulting in fungal infection on plants and produce. This is enhanced by humid atmosphere under closed canopy.

### **Future Plan**

- To evaluate the yield response of pigeon pea to planting distance
- To evaluate the effects of plant spacing on the quality of produce in a pigeon pea orchard.
- To evaluate the pigeon pea germplasm for identification, maintenance and multiplication of superior lines or varieties in the country using the International Board for Plant Genetic Research (IBPGR).

### **ACTIVITY 3:                      Production of Garlic**

**Specific Objective:              Develop a technical package for growing of potatoes in Region 8**

#### **Status of Output:**

This crop was successfully propagated from sprouting clove garlic in the shade house. 383 garlic plants are being maintained in the shade house. Bed preparation was done with organic matter and filter-press mud for improvement of soil tilth. Cloves germinated 15 dap, and plant height 49 dap is 41 cm.

#### **Lessons Learnt**

- Crops exhibited stunted growth (plant height 25 cm – 84 dap) when planted on low beds with high clay content in rainy season.

### **Future Plan**

- Plant crop in open fields on ridges 30 – 60 cm above furrow.
- Weekly monitoring of soil moisture content.

- Use of organic mulch (acacia cuttings) to conserve moisture, enhance weed management and enhance coolness of the soil.
- Replicate observation trials at Kairuni and Kato School garden.

#### **ACTIVITY 4: Production of Chickpea**

**Specific Objective: Develop a technical package for the growing of potatoes in Region 8**

#### **Status of Output**

This crop was successfully propagated both in the shade house and open field. 1050 chick pea plants (Kabuli variety) and 70 (Desi variety sourced from India) are being maintained in the shade house, and 3912 chick pea plants (Kabuli variety) are being maintained in the open field.

- 50% germination 7 dap;
- Plant height (Desi) 70 dap 28.0 cm with 20 leaves and 6 branches, and 100 % flowering.
- Plant height (Kabuli) 70 dap 38 cm, with 14 leaves and 6 branches, and 10% flowering.
- Average rhizobium nodules – 10 (not active).

#### **Lessons Learnt**

- Crops suffered from high mortality owing to fungal disease when planted on low beds with high clay content in rainy season.
- In the period between flowering and pod formation, many plants wither and die.
- Mulching with acacia cuttings decreased crop productivity.
- Washing planting material with detergent and treatment with fungicide (Karbenazim - 5ml/3 litre of water) reduce losses to fungal infection during setting and infield.



### **Future Plan**

- Plant crop in open fields on ridges 30 – 60 cm above furrow.
- Weekly monitoring of soil moisture content.
- Replicate observation trials at Kairuni and Kato School garden.

## **ACTIVITY 5: Institutional Support**

### **Specific Objective: Training in Diversified Crop Production.**

**Status of Output:** The long dry season at Kato resulted in many farms including the pilot farm to cease operations. The pilot farm is now in a grass fallow period. However, the AFA stationed at Kato continue to give technical support on a routine basis.

The building identified for housing the resident AFA is currently being rehabilitated and works are expected to be completed in the first quarter 2013.

Irrigation water requirement for food crop production on the soils at Kato was supplied to support the design of the mini-hydro facility at Kato. This was determined as:

- Optimum: 1217.4 m<sup>3</sup>/ha/day or 1217400 L/ha/day.**
- Minimum: 298.82 m<sup>3</sup>/ha/5 days (298824 L/ha/5days).**

A team led by the Honorable Prime Minister of Guyana visited Kato and held sensitization meetings with the community on the construction of a mini-hydro to support agricultural enterprise in the region. The team including representatives of the Ministry of Amerindian Affairs, Ministry of Education, the Office of the Prime Minister Rural Electrification Programme and NAREI.

## **Lessons Learnt**

- Community responds quickly to trained personnel if local. Every effort should be made to identify and train local personnel during the community sensitization phase of the project.
- Farmers applied training gained to their farms but few participated fully in the community farm project citing insufficient economic returns.

## **Future Plan**

- Advertise using posters GSA entry application forms in Kato.
- Provide preferential scholarships to GSA for residents with minimal entry requirement.
- Provide ATV to AFA to improve mobility of AFA and services to farmers in the community.
- Resuscitate, as a matter of urgency, the school farm at Kato.

**Project Title 3:** Community Crop Production On Minespoils In Kara – Kara Linden

**Strategic Objective:** Sustainable Use of Natural Resources

**Key Result:** Crop Production On Re-vegetated Minespoils at Kara-Kara linden, Region 10.

**Programme:** Land Reclamation

## **JUSTIFICATION**

Bauxite mining activities in Linden has resulted in landscapes characterized by unproductive infertile minespoils. NAREI has successfully re-vegetation six (6) hectares of minespoils at Kara Kara, and successfully cultivated economic crops including cashew nuts, citrus, fatpork (an endemic), pasture grass and legumes.

The inherent low fertile nature of minespoils requires that crop cultivation is conducted with costly inputs of fertilizers and organic matter and moisture conservation. Acacia

cuttings can act as manure and supply the nutrients and organic matter needed for crop production on mine-spoils.

## **METHODOLOGY**

### **Optimizing Groundcover**

Ground cover at the site was optimized through the maintenance of a pasture grass *B. humidicola* and the legume *Glycerida spp.* In the fan areas of the gulley runoff *Acacia* was planted and maintained. Cashew nuts, citrus and fat pork will constitute other vegetative covers.

### **Crop Production**

Cassava, pineapple, pumpkin and other crops will be planted and cuttings from acacia plants applied as mulch to conserve moisture and supply nutrients needed for sustainable crop production.

## **RESULTS**

**ACTIVITY 1:**                      Infrastructural Support

Specific Objective:              **Establishing security and worker friendly conditions at the site.**

**Status of Output:**              The Region 10 Farmers Association (RTFA) has secured independent funding to support perimeter fencing to deter ruminants from accessing the site and secure produce. Guard hut and change promised by LinMine is not forthcoming.

### **Lessons Learnt**

- Crops suffered from high mortality from marauding animals owing to infrequent visits and lack of secure fencing.

## **Future Plan**

- Complete improved perimeter fencing.
- Install change room/rest area on site.

**ACTIVITY 2:** Maintenance of acacia orchard

**Specific Objective:** Optimizing ground cover in gulley areas.

### **Status of Output**

An acacia orchard is established on this site. There are over 700 plants each being greater than 3m in height. These plants are pruned and used as mulch on crops planted at the site. Also, material is transported to NAREI Mon Repos and used in crop production trials in Field 17.

### **Lessons Learnt**

- Cut stems left in field are not being propagated as some other locations (e.g. Mahdia) have experienced. This may be owing to non-accumulation of biomass under the canopy owing to its removal.

## **Future Plan**

- Implement Alley Cropping System when conditions are favourable.

**ACTIVITY 3:** Crop Production Using Acacia

**Specific Objective:** To cultivate cassava, pineapple and pumpkin on rehabilitated minespoils.

### **Status of Output**

Plots were established for each commodity on the upper and low terraces. Soil chemical status of mine-spoils before plot establishment: pH 5.8 - 6.0, low OC (.39), good BS (97%), low K (.07 meq), high Mg (7.6), low Ca (1.5% CEC) and low P (12 ppm).

Stunted growth was observed in plots on upper terrace. Plots were treated with acacia cuttings harvested from the site.

Only the pineapple plots established at the site have survived the apparent intrusion by cows. 300 pineapple side shoots and 125 crowns growing on upper and lower terraces.

### **Lessons Learnt**

- The upper terrace bears the brunt of run off forces during a rainfall event. This makes it more susceptible to erosion resulting in poor crop growth.
- Small ruminants feed on young pumpkin and cassava plants.

### **Future Plan**

- Expand plots for planting on lower terraces.

**Project Title 4:** Soil Chemistry Services  
**Strategic Objective:** Sustainable Use of Natural Resources

**Key Result:** Maintenance of Environmental Quality

**Programme:** Efficient Use Of Agro-Chemicals

## **JUSTIFICATION**

The steep increase in fertilizer prices demands that fertilizer application be strategically to soil analysis. Also, prolonged dry spells with uncertain rainfall patterns makes the demand for salinity testing a high priority for farmers. There is, also, a growing demand by private institutions for physical analysis of soils that the laboratory continues to facilitate. Farmers, students and researchers continue to make demands for a wide range of analysis, namely, N, K, P, Ca, Mg, Na, Fe, Mn, Zn, Cu, pH, KCl-acidity and electrical conductivity.

## **METHODOLOGY**

Standard Operational Procedures using AOAC Methods of Analysis continued as the principal approach to soil analyses.

**ACTIVITY 1:** Analysis of Soil Samples

**Specific Objective:** To provide technical support for research and the farming sector.

## **Status of Output**

Seven hundred and seventy two (772) soil samples were received in 2012. All samples received were analyzed for the analyses requested.

- Farmers: 453 (pH, electrical conductivity, organic carbon and exchangeable acidity)
- Researchers: 143 samples (pH, electrical conductivity, organic carbon and exchangeable acidity); 38 water samples received and tested for salinity.
- Mc Gill University: 122 samples (pH, electrical conductivity, organic carbon, exchangeable acidity, moisture content and bulk density).
- Guyana Forestry Commission: 31 samples (organic carbon).
- Guyana Mangrove Restoration Project : 23 samples ( pH, electrical conductivity, moisture content and bulk density) );
- 38 water samples received and tested for salinity.

The Analytical Laboratory of GUYSUOCO assisted with the analysis of K, Ca, Mg, Na, Cu, Mn, Fe, P and Zn, to facilitate the requests of the clients.

There is an urgent need for a chemical storage room, and protocol for disposing expired chemicals.

### **Future Plan**

- Rehabilitation of electrical system and retooling for a functional Laboratory with improved range of services.

**ACTIVITY 2:** Maintenance of Digital Databases for Soils

**Specific Objective:** To generate baseline supporting technical information for the farming sector.

### **Status of Output**

A database with Results of Analyses was created (in 2007), and is regularly updated. It contains results from year 2000 to present. The database of soil samples entering the division continues to be maintained.

**ACTIVITY 3:** Soil Microbiology Services

**Specific Objective:** To reduce crop production dependence on chemical fertilizer

**Status of Output**

During 2012, the inventory of Rhizobium strains was updated. There are 8 strains on Cold Storage (Slants), namely: TAL 169, TAL 022, TAL 178 (contaminated), TAL 420, TAL 173, TAL 169 (contaminated), TAL 173 (contaminated), and THA 301 (contaminated). 10 strains are stored on Porcelain Beads, namely: TAL 420, 072, THA 301, 022, 174, 022, 173, 178, 086 and 169.

NB: Contamination could have occurred due to long storage period, frequent blackouts or movement of materials to and from the Microbiology lab.

- 27 strains stored on slants were tested for viability.
- Preparation of two new strains from the sesbania plant for the inoculation of chick pea.

**Lessons Learnt**

- The Rhizobia strains in stock are unsuitable for effective inoculation of chickpea.

**Future Plan**

- Identification and harvesting of nodules from field for the growth, multiplication and field evaluation with chickpea crop.



## **Project Title 5:** Protected Vegetable Seedling Production

**Strategic Objectives:** Sustainable Use of Natural Resources.

**Keg Result:** Increase Agricultural Production and Productivity

**Programme:** Technology Development

### **Justification:**

Traditional seedling production techniques can present limitations in output, because the majority of seedlings are produced during the wet season. Owing to heavy rains, which occur with frequency and intensity in Guyana seedlings production is subject to excessive moisture, physical damage as well as inefficient pest and disease control. Another factor to take into account is high solar radiation.

Protected seedling houses are economically designed structures using plastic film as roofing materials to reduce high levels of sunlight and rainfall that affect seedling production.

### **Methodology**

The protected seedling Production House located at Mon Repos field 19 was utilized for seedling production

### **Results**

A total of 20182 seedlings were produced for the year 2012. Most of the seedling were used in NARE's hydroponic, shade house and Commercial Farm facility and organoponic facilities at Mon Repos, while the remainder were used for production at Mon Repos. Table 1 gives details of crop types and the number of seedling produced.

- Pak –choi – 2176
- Lettuce – 768
- Bunching onion – 896
- Cabbage – 1048
- Hybrid Brussels – 24
- Poi – 563
- Celery – 1024
- Broccoli – 88
- Sorrel – 5999
- Water Melon – 43
- Parsley – 256
- Hot Pepper – 128
- Cucumber – 256
- Cauliflower – 472
- Sweet pepper – 1592
- Hybrid Collard – 24
- Tomatoes – 1536
- Chick Pea – 3912

**Project Title 6:** Investigating the Effectiveness of Locally Available Liming

**Strategic Objective:** Sustainable Use of Natural Resources

**Key Result:** Increase Agricultural Production and Productivity

**Programme:** Agricultural Diversification

### **Justification**

There are a number of liming agents available locally with varying costs. They are being recommended based on availability and not suitability to a particular soil type. There is a tendency by farmers to apply large amounts of limestone regardless of the soil type which could result in toxicities and deficiencies of micro-nutrients. Consequently, there is a great need to evaluate these various liming materials on some common soil types in Guyana on which vegetables are cultivated.

## **METHODOLOGY**

### **Laboratory Pot Study**

Soils were treated with liming material, maintained at 75 % field capacity and analysed for pH, Ec and Exchangeable acidity over a 13 week period. Soils types used

are: Units 11d (Corentyne Clay), 21 (Mara Clay) and 810 Kasarama Loamy Sand). Liming materials under test are: calcium carbonate, low grade rock phosphate and agrical (a 10 % liquid calcium organic product).

Liming Rates were determined for each soil type as: limestone, LGRP and AGRICAL- was applied at rates: 1485, 2970 and 1515 kg/acre; 1575, 3150 and 1515 Kg/acre; and 1545, 3090 and 1515 kg/acre to Units 21, 810 and 11d respectively.

Moisture requirement for 75% field capacity were determined and applied at rates: 272, 136 and 318 m<sup>3</sup>/acre to Units 21, 810 and 11d respectively.

## RESULTS

**ACTIVITY:** Measuring Soils' pH, Ec and Exchangeable Acid after Treatment with liming material.

**Specific Objective:** Determining optimal time of liming application to soil.

### Status of Output:

**After 5 weeks:** Agrical has lowered the soil pH (below original value) and exch. Acidity (below original), and raised EC (from below 0.2 to 2.5) in all soil types under treatment. Limestone and LGRP had a marked rising of pH and lowering of exch. acidity on all soils, but no marked effect on Ec was recorded.

**After 9 weeks:** Optimal rising of Ec for all treatments on all soils. pH values have optimized and started to decline. Exch-acid value has started to rise sharply.

**After 13 weeks:** Electrical conductivity value is declining for all treatments and soils. pH value have stabilized above original soil pH. Exch-acid values are raising sharply approaching original value.

## **Lessons Learnt**

- Agrical – Liquid Calcium is marketed as an alternative to Agri-Lime. However, this study showed its action facilitates increased availability of cations present in soils.
- Optimum effect of Liming Material was obtained within the First Four (4) Weeks of Application.

## **Future Plan**

- The next step is to take this approach to open field conditions, while continuing laboratory studies with other soil types.

## V. CROP DEVELOPMENT AND SUPPORT SERVICES

### (a) Farmers' Register

An electronic farmer's database was implemented and data was collected from approximately 3486 farmers throughout the ten regions. Data are collected on pre-printed forms then sent to the office for processing. This is an on-going process.

### (b) Farmers Diagnostic Clinic

These are held on a regular basis at fixed locations to cater for farmers who could not have been visited for one reason or another across the country. A total of 1962 farmers made use of the service for 2012.

### (c) Farm Visits

As shown in Table 17, a total of 22,088 farm visits were conducted throughout the country against a budgeted amount of 20,000 reflecting an increase of 10 percent.

**Table 17: Number of Farm Visits Conducted in the Ten Regions for 2012**

Activity	Parameter	Regions										Total
		1	2	3	4	5	6	7	8	9	10	
Farmers Clinic	Farmers	171	404	484	429	126	245	43	11	41	8	1962
Field visits/ interviews	Farmers	849	3495	3518	2448	2516	4782	534	322	3031	593	22088
Farmers training	Farmers	505	612	854	511	541	504	512	2	258	251	4550
Meeting/Outreach	Meetings	21	35	61	40	45	73	29	20	69	1	394
Acoushi ants management	Farms	16	25	26	777	0	2	218	36	588	92	1780
Farmers registration	Farmers	323	686	1115	221	461	474	297	0	0	0	3486
Sigatoka surveillance		0	5	0	14	8	0	0	0	0	5	32

#### **(d) Transportation**

The regions were equipped with five vehicles, six boats with six engines, five ATV (one under repairs) and fourteen 125 cc motorcycles to satisfy its transportation demands to effectively service farmers in the region. However, there is still need for more vehicles (4), ATVs (5), motor cycles (6) and boats (3) to improve the services offered by the Institute.

#### **(e) Communication**

The communication of the Regions were improved with the provision of phone services, internet access and wireless equipment.

#### **(f) Demonstration Plot**

During the reporting period three (3) demonstration plots were established one at One and Half Miles Potaro Road Agriculture Station, one at River View's, and One at Lethem St Ignatius Secondary School, which will be used as a training facility for farmers, School children and the public as whole.

#### **(g) Rice Assessment Committees**

The Regional Coordinators for Region 2, 3, 4 ,5 and 6 continued to serve on their respective Rice Assessment Committees in the year under review.

#### **(h) Fairs and Exposition**

A farmer exhibition was held at Moruca Sub District at part of 2012 Agriculture Month Activity where the Extension personnel of the Institute participated.

The Extension Department of Region 7 participated in Amerindians Heritage Celebrations in Region 7, which was held at Karrau. Various forms of new farm

technology (Shade House Technology) were displayed to farmers who attended the celebration.

### **(i) Training Programmes**

During period under review 4550 farmers were trained in various forms of agronomic practices and new techniques involving modernisation of the crop production. This reflected a 91 percent achievement for the reporting year.

Two (2) gardeners from the Prime Minister's Office underwent 2 days training at the Mon Repos Nursery and were involved in the Budding and Grafting of plants, preparation of seed bin, sowing of seeds, and weed control in the Nursery.

Mr. Edward Francis, Crop Extension Assistant Region #8 was attached to Mon Repos Nursery for one (1) week training and his training consist of the same activities as above

### **(j) Staff Training**

87 extension agents and crop extension assistants were trained in current and new agriculture production techniques and management practices.

### **(k) Acoushi Ant Treatment**

A total of one thousand seven hundred and eighty Acoushi ants nest were controlled during the reporting period

### **(l) Spice Programme**

A total of seven hundred (700) Black Pepper plants and one hundred (100) Nut Meg plants were distributed to farmers in keeping with the expansion of the spice programme in Region 1.

**(m) Educational Visits**

The number of schools visiting the Plant Nurseries totaled 60. This reflected an increase of 100 percent over the programmed amount. The visit encompassed the daily operations of the nurseries as well as budding and grafting of plants and visitors were allowed to perform a limited number of procedures.

**(n) Seedling Production**

As shown in Table 18, during the year under review, the nine (9) Nurseries were responsible for the sale of 97,422 plants reflecting an income of \$11,669,091. This surpassed the previous year's figure by 15 percent.



**Table 18: Seedling Production and Income from Various Nurseries for 2012**

MONTHS	BARTICA		BENAB		CHARITY		FORT WELLINGTON		HOSORORO	
	Plants	Value (\$)	Plants	Value (\$)	Plants	Value (\$)	Plants / Seeds	Value (\$)	Plants	Value (\$)
January	21	2,420	1,486	166,260	526	67,100	576	22,420	132	21,120
February	22	2,200	593	64,420	802	63,120	524	12,820	76	11,680
March	10	1,000	1,285	234,120	1,002	41,800	379	39,900	11	1,500
April	44	5,800	1,213	209,380	1,354	68,440	282	33,520	57	7,360
May	30	5,200	585	81,280	1,663	180,400	306	20,480	263	3,170
June	36	4,400	402	57,360	351	31,180	466	29,580	7	1,160
July	304	8,360	1,441	197,140	883	56,220	353	31,280	142	16,540
August	21	2,300	818	100,280	765	97,420	270	19,160	20	3,100
September	32	3,320	845	116,940	87	37,100	443	14,420	141	16,440
October	25	13,960	264	33,200	477	73,080	645	15,680	142	17,600
November	58	7,420	744	92,440	1,038	129,800	630	31,290	399	65,480
December	126	14,840	2,182	307,340	672	82,860	552	20,640	138	23,040
<b>TOTAL</b>	<b>829</b>	<b>71,220</b>	<b>11,858</b>	<b>1,660,160</b>	<b>9,820</b>	<b>928,520</b>	<b>5,426</b>	<b>291,190</b>	<b>1,528</b>	<b>188,190</b>

MONTHS	MON REPOS		POUDEROYEN		TIMEHRI		ST. IGNATIUS	
	Plants	Value (\$)	Plants	Value (\$)	Plants	Value (\$)	Plants	Value (\$)
January	3,524	421,640	893	109,360	129	14,490	56	11,200
February	5,080	668,020	869	92,220	225	33,600	222	44,400
March	2,842	358,820	2,109	240,240	593	73,930	144	16,200
April	2,434	279,220	1,372	166,940	695	88,180	59	11,800
May	3,272	389,150	1,444	202,890	654	77,000	221	44,200
June	3,123	402,520	1,517	175,520	907	104,110	233	46,600
July	2,012	251,520	1,175	142,240	465	56,380	200	40,000
August	1,773	222,870	571	83,960	908	103,640	67	13,400
September	3,820	482,200	877	125,100	738	86,950	60	12,000
October	3,053	402,200	1,609	211,540	692	88,760	42	8,400
November	4,758	586,300	2,937	372,000	1,578	186,440	140	2,411
December	4,281	529,690	3,205	404,480	344	37,280	39	7,800
<b>TOTAL</b>	<b>39,972</b>	<b>4,994,150</b>	<b>18,578</b>	<b>2,326,490</b>	<b>7,928</b>	<b>950,760</b>	<b>1,483</b>	<b>258,411</b>

### **(o) Major Issues**

**Flooding:** In February, 2,338 farms totalling 6048.5 acres of cultivated land were affected by flooding. The estimated loss exceeded 350 million Guyana dollars. Some of the areas affected were Canals Polder on the West Bank of Demerara, Mahaica and Mahaicony on the East Coast of Demerara and Black Bush Polder ( Joanna and Yakusari). The damages were not limited to cash crops but included permanent crops as well.

- High population of Acoushi ants in Amerindians communities.
- Wild animals damaging crops in Regions 1, 7 and 8.
- No secured market for farmers in Amerindian communities

### **(p) Demonstration Farms**

The Rural Enterprise Agriculture Development in collaboration with NAREI established nine demonstration farms across the country, six equipped with shade houses. At the end of the year all have been established and handed over to farming groups across the country. They are now being used for training purposes.

### **(q) Black Sigatoka**

Black Sigatoka disease has devastated plantain cultivations throughout the country. It is estimated that close to seven hundred farms comprising 3358.5 acres are affected.

### **(r) Outreach**

A total of three hundred ninety four out reach programme were accomplished during the reporting period.

## **(s) Distribution**

### **(i) Acoushi ant's baits**

A total of six thousand (6000) packets of Acoushi ant baits were distribute to farmers in various Amerindian communities in the Hinterland Regions.

### **(ii) Fastac/ Bestac**

Two hundred and seventy six liters of Fastac were distributed to communities in Region 7 and 9.

### **(iii) Other Chemical**

Other chemical such as Caprid (acetamiprid), Bellis (boscalid + pyraclostrobin), and Gramazone (paraquat) were distributed in Regions 7 and 8.

### **(iv) Other Planting Materials/ Seeds**

A total of twenty (20) bags of (25 lbs) of corn seeds were distributed to farmers in the Central Lethem, this initiative was part of the development of corn production in Region 9.

### **(v) Swing Fog Machine**

Four swing fogg machines were distributed, two to Region 7 and two to Region 9.

## **(t) Finance and Accounts**

A total of Five hundred and thirty eight million, nine thousand dollars (\$538,009,000) was received in 2012. An additional amount of Twenty two million, three hundred and ninety five thousand, four hundred and eighty dollars (\$22,395,480) was approved in December, 2012. This amount represented the 5% increase in salaries for employees.

## CAPITAL PROJECTS

The 2012 Capital Budget Profile are as follows:

No	ACTIVITIES/ITEMS	Amount \$
1	Acquisition of (3) 4*4 double cab Pick up	13,200,000
2	Rewiring of Electricals	4,000,000
3	Acquisition of Fiberglass boat and 45HP Outboard Engine	1,950,000
4	Rehabilitation Of Admin Office, Living Quarters (Kato) and Central Stores (Mon Repos)	10,000,000
5	Rehabilitation of Infrastructure in Bartica and Kamarang	3,100,000
6	Acquisition of Furniture and Equipment	2,750,000
	<b>Total</b>	<b>35,000,000</b>

All 2012 capital projects with the exception of number 2 have been awarded; the rewiring of electrical project has to be retendered.

### **(u) Human Resource Management and Administration**

On the 11th of August, 2012, the building that housed the NAREI extension staff in region #10 was destroyed by fire. All records, files and relevant information were destroyed.

### **(v) Human Resource Manual**

The compilation of the Human Resource Manual has been completed and is currently under review by the Board of Directors.

## **VI. NATIONAL PLANT PROTECTION ORGANIZATION (NPPO)**

### **(a) Introduction**

The National Plant Protection Organization (NPPO), being the National Plant Protection Service, has been entrusted with the overall responsibility for enforcement of the Plant Protection Act 2011. The NPPO continued its programmed activities during the reporting period in the areas of pest and diseases surveillances, prevention of the entry of exotic pests and diseases, formulation of Phytosanitary measures as related to international trade, implementation of Trading Partners Protocols and issuance of Phytosanitary Certificate (PC) for export of agricultural commodities and Plant Import Permits (PIP).

The Plant Quarantine Services, being the first line of defense, operates at all official points of entry in Guyana, i.e. Boathouse, Stabroek; Springlands, Moleson Creek; Mon Repos; Lethem; Ogle and Timehri Airports on a 24-hr basis 7-day a week.

The NPPO is currently hosting the SPS Enquiry Point and acts as an information desk for reception and dissemination of WTO/SPS matters, and is also the Contact Point for the International Plant Protection Convention (IPPC) as per our international obligation under the WTO.

### **(b) Programme of work**

The activities planned for the period included: -

Import/Export Inspections; Surveys and surveillance; Carambola Fruit Flies; Pink Mealybug; Papaya Mealybug; Giant African Snail; Farm Certification; Nursery Certification; Monitoring of illegal imports; Training; Updating of Import/Export Register for 2012.

### **(i) Import/Export Inspections**

The Plant Quarantine Service (PQS) of the NPPO, ensured a 24-hr all year round control and disease/pest surveillance at all official points of entry (airport, sea port, post office etc) in connection with inspection of incoming flights and ship vessels, examination and clearance of incoming agricultural consignment, implementation of Trading Partners Protocols and interception of illegal and/or nonconforming items of plant origin.

### **(ii) Issuance of Phytosanitary Certificates (PCs)**

The NPPO is mandated to deliver Phytosanitary certificates (PC) at all points of entry/exit to respective exporters and passengers carrying agricultural commodities and regulated articles with them. Commercial and non-commercial PCs were issued for vegetables, fruits, rice and rice products, sugar and sugar products, lumber, medicinal herbs, sand and wheat flour.

A total of three thousand six hundred and thirty one (3,631) Phytosanitary Certificates were issued for export consignments. A total of two hundred and ninety three (293) non-commercial exports were recorded for the period under review, while a total of three thousand six hundred and thirty-one (3631) were recorded for commercial exports for the same period. A total of two hundred and ninety (290) containers of Dried Coconut, Fruits and Vegetables were shipped to countries within the Caribbean region: Antigua – 2; Barbados – 18; Dominican Republic – 236; Grenada – 1 ; Trinidad & Tobago – 25; Suriname – 8 .

### **(iii) Inspection of Ships/vessels and Aircraft**

Quarantine inspections were conducted on cargo and passenger's baggage during the arrival and departure of vessels and aircrafts at the major ports of entry. The various

vessels (cargo and passenger) and aircrafts (local and international) boarded were all in conformity with national and international requirements as regards quarantine. Garbage was disposed of in accordance with international standards.

A total of seven hundred and seventy (770) ships were boarded and inspected primarily at the Georgetown Sea Port, Stabroek. Inspections were conducted in accordance with Quarantine requirements for ships entering the territorial waters of Guyana.

For the same period, a total of twenty one thousand three hundred and sixty five (21,365) flights were inspected at both the Cheddi Jagan and Ogle International Airports. The numbers of flights recorded were three thousand nine hundred and thirty eight (3938) International Flights and seventeen thousand four hundred and twenty seven (17427) Domestic Flights.

**(iv) Issuance of Phytosanitary Import Permits (PIPs)**

For the purpose of importation, a total of one hundred and forty two (142) Phytosanitary Import Permits were issued for the importation of fruits and vegetables and cut flowers. These represented imports from countries such as the USA, Chile, India, and China.

**(v) Issuance of Wood Packaging Materials Certificates**

For the period under review a total of forty (40) Wood Packaging Materials Certificates were issued.

**(vi) Issuance of Destruction Certificates**

For the period under review seven (7) Destruction Certificates were issued for the destruction of a consignment of carrots that had begun to rot during shipment.

**(vii) Quarantine Treatment**

The supervision of quarantine treatment as per request from importing countries continued at recognized packing facilities. Inspectors continued to supervise quarantine treatment of agricultural and regulated articles before export. These treatments included

and were not limited to fumigation, heat treatment, insecticidal dips, contact/ surface sprays and chlorine treated water bath/ wash.

#### **(viii) Interception of Agricultural Commodities**

Non-conforming and illegally imported agricultural commodities were intercepted from incoming passengers at Moleson Creek, Guyana Suriname ferry crossing. Confiscation receipts were issued for the intercepted items which consisted mainly of fruits and vegetables and ornamental plants.

#### **(ix) Surveys and Surveillance**

Surveillance and surveys activities were conducted within Regions # 2, 3, 4, 5, 9 and 10 primarily for Carambola Fruit Flies and its complexes. Passive Surveys continued for Papaya Mealybug (*Paracoccus marginatus*), the Pink Mealybug (*Maconellicoccus hirsutus*), and the Mediterranean fruit fly (Med fly) (*Ceratitis capitata*), while active surveillance activities were maintained for the Carambola fruit fly (CFF) (*Bactrocera carambolae*).

#### **(x) Carambola Fruit Fly**

During the period under review Carambola Fruit Fly activities were conducted within Regions 2, 3, 4, 5, 9 and 10.

#### **Region 2**

Activities within this Region concluded with the distribution of 38 Jackson traps stretching from Charity to Zorg En Vlight (along the coast) and from Jacklow to Martindale along the Pomeroon River. Control activities were also conducted in the form of baiting (distribution of fiber board blocks impregnated with Mythel eugenol) along the Pomeroon River with a total dissemination of 1,015 blocks. From readings obtained from Jackson traps distributed within this Region it was observed that the CFF is mainly concentrated along the river banks where fruit farms are in abundance.



### **Region 3**

A total of 157 Jackson Traps are presently distributed in this Region. The area under surveillance stretches from La Kabu (EBE) to Sisters Village ((WBD). Servicing of these traps revealed a positive identification of the CFF in, La Kabu, Hubu, Parika Back, Naamryck Back, Orangestein and Philladelphia. The Parika Back-dam farming areas continue to have the highest recorded CFF capture. The Unit commenced baiting of the Parika Back areas with a distribution of 510 fiber board blocks.

### **Region 4**

At present, the Unit has distributed 89 Jackson Traps creating a trapping line from Timehri to Agricola. The last positive detection of the CFF was observed in the Garden of Eden Village, EBD. The Unit initiated baiting (distribution of fiber board blocks) for the Carambola Fruit Fly in the Timehri area of Region 4. A total of 841 blocks were distributed in the areas surrounding the Cheddi Jagan International Airport, Ice House road and the Alliance Farming Area. Most residents were willing to cooperate while others expressed their dislike to the smell of the chemicals used.

### **Region 5**

This Region continues with a trapping line of 61 Jackson Traps stretching from Chelsea Park, Mahaica to Ithica Village. No positive detections of the CFF were made in this Region thus far.

### **Region 9**

The PPU was able to conduct one CFF activity within this Region. The opportunity was used to reestablish the CFF trapping line previously created in 2010. A total of 36 Jackson traps were disseminated within the following villages; Central Lethem, Moca Moca, Parishara, Nappi, St Ignatius, Kumu, Culvert City. The residents of the mentioned villages were very cooperative during the activities.

## **Region 10**

With collaborative efforts of the Inter American Institute on the Cooperation on Agriculture (IICA) and Farmer to Farmer, Mr. Ansel Todd narrated a Carambola Fruit Fly video which is intended to be used at outreach activities of the NPPO. The video was created at one of the residential sites located in the mining town of Linden. The PPU was enabled to conduct CFF activities in Ituni and Kwakwani on 2 occasions during the period under review. From readings obtained from a total of 30 Jackson traps it is clear that the CFF pest is present in both Kwakwani and Ituni in high numbers.

Overall the CFF has decreased in Regions 3, 4 & 10 by 15-20% whereas in Region 2 the CFF population has shown a 5% increase. Region 5 continues to be pest free of the CFF. At present because of the limited information collected from Region 9 the pest status could not be determined; however data shows the absence of the pest in areas surveyed. Pest status in Regions 7 and 8 could not have been determined due to surveys not being conducted. These Regions are important since they are areas bordering Guyana and Brazil more so since the pest was detected in villages on the Brazilian side.

## **Pink and Papaya Mealybug Surveys**

Passive surveys were conducted for the Pink and Papaya Mealybugs within Regions #3 (Parika back, Canal 1 and 2), 4 (Queenstown, Belair) and 5 (from Mon Repos on the East Coast of Demerara to Ithica village. Region #5). The areas surveyed remains areas of Low Pest Prevalence (ALPP) for the two pests. Signs of *Cryptolaemus* and *Anagrus kamali*, biological control agents used in their control were observed.

## **Giant African Snail**

Passive surveillance activities were carried out at all Official Ports of Entry where Quarantine Officers are present to conduct inspections on all cargos, passenger luggage,

shipping vessels, etc. To date no interceptions have been made nor have any reports taken regarding this Quarantine pest.

### **Farm Certification**

- Farm certification process was conducted with visits being made to a total of 70 farms in Regions 3, 5 and 10. In Region 3, 23 farms were visited in the Parika back farming area and Canal 1 and 2. Region 5, 22 farms were visited from Bath Settlement to Bush Lot. It was noted that some farmers were reluctant to change and were not that willing to cooperate.
- Region 10, 25 farms were visited within the Kwakwani and Ituni areas. It was noted that the farms in this location would only do small scale production in order to satisfy the demands of the village.
- Essequibo Islands, namely, Wakenaam, karabaro, Truli and Tiger Island, 50 farms were inspected with the overall aim of certification. Farmers on the Essequibo Islands are in need of Good Agricultural Practices workshops and training in the safe and effective use of chemicals.

### **Nursery Inspection**

- The Unit visited thirteen nurseries during the period under review, eight belonging to Region 3, four for Region 4 and one for Region 5. It was observed that most nurseries under inspections had improved their standard and level of production whilst there are some who have failed to make any changes for the better.

### **Monitoring of illegal Imports**

- Several visits were made to vending sites of Region 4, 5 and 6 by Officers of the NPPO's Head Office for illegally imported bananas from Suriname. Active monitoring conducted in Region 6 by NPPO's Regional Quarantine Inspector for illegally imported bananas from Suriname. Monitoring activities conducted in Region 4 for illegally imported watermelon from Brazil.

## VII. HUMAN RESOURCES DEPARTMENT REPORT, 2012

### RECRUITMENT:

Forty-two (42) persons were recruited in 2012 as follows:

#### A. CROP DEVELOPMENT AND SUPPORT SERVICES

Name	Designation	Date of Employment
1. Teisal Kamaludeen	Crop Extension Assistant (Region # 3)	2012-02-13
2. Mandrakar Ramotar	Crop Extension Assistant (Region # 3)	2012-03-12
3. Durjesh Ramkishun	Crop Extension Assistant (Region #6)	2012-04-02
4. Vonetta Ramcharran	Crop Extension Assistant (Region # 6)	2012-04-10
5. Frannis Edwin	Crop Extension Assistant, Reg. # 8	2012-09-01
6. *Tyon Phillips	District Crop Ext. Officer, Reg. # 4	2012-09-10
7. *Howard London	District Crop Ext. Officer, Reg. # 10	2012-09-10
8. *Deryck Collins	District Crop Ext. Officer, Reg. # 7	2012-09-10
9. *Mark Henry	District Crop Ext. Officer, Reg. # 6	2012-09-10
10. *Marvin Richmond	District Crop Ext. Officer, Reg. # 8	2012-09-10
11. *Eon Sampson	District Crop Ext. Officer, Reg. # 5	2012-09-10
12. *Shamein Peters	Crop Extension Assistant (Reg. 10)	2012-09-10
13. Gomatie Jurdodhan	Crop Extension Asst., Region # 7	2012-12-01

\*Represent Bonded Scholars – Paid by Ministry of Agriculture

#### B. GENERAL ADMINISTRATION AND FINANCE

1. Rudolph Jaundoo	Security Guard (Mon Repos)	2012-01-16
2. Latchman Murugayya	Farm Manager (Mon Repos)	2012-03-01
3. Harripaul Arjoon	Security Guard (Mon Repos)	2012-07-03
4. Deoranie Outar	Data Entry Clerk (Mon Repos)	2012-08-01
5. Charles Finlayson	Office Assistant/Driver	2012-09-03

**C. GENERAL SERVICES**

1. Phulmattie Kakahai	General Worker (Mon Repos)	2012-01-16
2. Ramesh Ramlakhan	General Worker (Mon Repos)	2012-03-01
3. Ramroop Balroop	General Worker (Mon Repos)	2012-03-15
4. Emelda Calder	General Worker (Mon Repos)	2012-04-01
5. Rohanie Leonard	General worker (Mon Repos)	2012-04-05
6. Sherina Francis	General Worker (Region #1)	2012-05-16
7. Sasar Ramgobin	General Worker (Timehri)	2012-06-25
8. Chavez Jabar	General Worker (Boat Opr. Region # 2)	2012-07-03
9. Bivendra Budhoo	General Worker (Lesbeholden)	2012-07-04
10. Sasenauth Ramsarran	General Worker (Mon Repos)	2012-07-16
11. Sasenarine Deonarine	General worker (Timehri)	2012-07-25
12. Evorn Edwards	General Worker (Charity)	2012-08-07
13. Kevin Balgobin	General Worker (Fort Wellington)	2012-08-02
14. Mithun Hetram	General Worker (Benab)	2012-08-06
15. Margaret Romascindo	General Worker (Region No.# 1)	2012-10-15
16. Roopnarine Benny	General Worker, (Region # 9)	2012-12-01

**D. GUYANA MANGROVE RESTORATION PROJECT**

1. Selena John	Secretarial Assistant (Mon Repos)	2012-10-09
2. Susan Singh	Admin/Finance Off. (Mon Repos)	2012-11-01

**E. NATIONAL PLANT PROTECTION OFFICE**

1. Sherwyn Phillips	Driver (Mon Repos)	2012-02-10
2. *Ramsngh Taijbally	Plant Quarantine Officer, Reg. # 2	2012-09-10

**F. RESEARCH AND DEVELOPMENT**

1. Samantha Brotherson	Research Assistant (Mon Repos)	2012-01-03
2. Roberto Mendez Pelegrin	Research Scientist (Mon Repos)	2012-08-02
3. *Leelawattie Persaud	Research Assistant, (Mon Repos)	2012-09-10
4. Chitradai Deonarine	Research Assistant (Mon Repos)	2012-10-15

\*Represent Bonded Scholars – Paid by Ministry of Agriculture

**3. RESIGNATION – Four (4) persons tendered their resignations as follows:**

**A. GENERAL SERVICES**

<b>Name</b>	<b>Designation</b>	<b>Date of Resignation</b>
1. Mr. Mohamed Hamid	General Worker (Mon Repos)	2012-01-18

**B. GUYANA MANGROVE RESTORATION PROJECT (GMRP)**

1. Aditya Persaud	Project Co-ordinator (Mon Repos)	2012-08-05
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**C. NATIONAL PLANT PROTECTION OFFICE**

1. Mr. Alvin Lewis	Driver (Mon Repos)	2012-01-31
2. Linden Roberts	Quarantine Inspector	2012-05-01

**4. TERMINATION OF SERVICE – Four (4) persons' services were terminated in 2012 as follows:**

**A. GENERAL ADMINISTRATION AND FINANCE**

<b>Name</b>	<b>Designation</b>	<b>Date of Termination</b>
1. Ms. Merlyne Hercules	Security Guard (Mon Repos)	2012-01-15

**B. GENERAL SERVICES**

1. Rajnarine Mangal	General Worker (Benab)	2012-07-01
2. Margaret Romascindo	General Worker (Reg. # 1)	2012-08-27

**C. RESEARCH AND DEVELOPMENT**

1. Chanderdatt Thakoordeen	Research Assistant (Reg. # 5)	2012-07-01
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DISMISSAL – One (1) person was dismissed in 2012 as follows:

**GENERAL ADMINISTRATION AND FINANCE**

<b>Name</b>	<b>Designation</b>	<b>Date of Dismissal</b>
1. Rudolph Jaundoo	Security Guard (Mon Repos)	2012-05-01

**RE-EMPLOYMENT** – One (1) person was re-employed as follows:

**GENERAL SERVICES**

<b>Name</b>	<b>Designation</b>	<b>Date Re-Employed</b>
1. Margaret Romascindo	General Worker (Region #1)	2012-10-15

**NON RENEWAL OF CONTRACT** – Four (4) persons' contracts were not renewed as follows:

**A. GENERAL SERVICES**

<b>Name</b>	<b>Designation</b>	<b>Date of non-Renewal</b>
1. Nadia Hussaine	General Worker (Nursery Sup.)	2012-05-15
2. Haitram Singh	General Worker	2012-06-08

**RESEARCH AND DEVELOPMENT**

1. Egbert Ralph	Research Scientist (Reg. # 9)	2012-05-01
2. Amied Rafeek	Research Assistant	2012-10-23

**7. TRANSITIONING OF LIVESTOCK STAFF TO GLDA** – Four (4) persons were transitioned to GLDA as follows:

**A. GENERAL SERVICES**

<b>Name</b>	<b>Designation</b>	<b>Date of Transition</b>
Benson Peters	General Worker (Region #9)	2012-05-01
Priscilla Edwards	General Worker (Region #9)	2012-05-01
Richard Alleyne	General Worker (Mon Repos)	2012-06-30
Rameshwar Sankar	General Worker (Mon Repos)	2012-06-30

8. **PROMOTION–One** (1) person was promoted in 2012 as follows:

**A. GUYANA MANGROVE RESTORATION PROJECT**

<b>Name</b>	<b>Designation</b>	<b>Date of Promotion</b>
1. Kene Moseley	Project Coordinator (Mon Repos)	2012-07-23



## TRAINING

## OVERSEAS

### Workshops/Meetings/Training Courses/Seminar/Conference

#### Workshops:

1. **Ms. Somwattie Pooran-Desouza, Research Scientist**, participated in a workshop on **“Scientific Writing for Agricultural Researchers in the Caribbean,”** held in Trinidad during the period February 26, 2012 to March 02, 2012.
2. **Dr. Oudho Homenauth, Chief Executive Officer**, participated in a FAO workshop on **“Urban and Peri-Urban Agriculture,”** held in Cuba during the period May 15 to 17, 2012.
3. **Ms. Zareefa Bacchus, Plant Quarantine Officer**, participated in the **“International Plant Protection Convention Regional Workshop for the Review of Draft International Standards for Phytosanitary Measures”**, held in Port-of-Spain, Trinidad, during the period September 18 to 20, 2012.
4. **Mr. Premdat Beecham, Research Assistant**, participated in a regional workshop on **“Enhancing the Value Added Processing of Roots and Tubers in the Caribbean through the Transfer of Improved Technologies,”** held in Trinidad and Tobago during the period September 18 to 20, 2012.
5. **Mr. Cleveland Paul, Research Scientist**, participated in a workshop on **“Improving the Policy Framework for Developing Climate Change Resilient Agricultural Systems in the Caribbean: The Role of Plant Genetic Resources,”** held in Antigua during the period October 13 to 15, 2012.
6. **Messrs. David Fredericks, Dr. Raghunath Chandranauth, Research Scientists, and Laurence Louis, Hinterland Coordinator**, participated in a training workshop on **“Modern Techniques of Soya Production,”** held in Parana, Brazil, during the period November 26 to 30, 2012.

#### Meetings

1. **Mr. Brian Sears, Assistant Chief Executive Officer**, participated in a Technical Meeting for the **“Carambola Fruit Fly Control and Eradication Supporting Project,”** held in Brazil during the period June 21 to 22, 2012.
2. **Mr. Rohit Singh, Coastal Crop Extension Coordinator**, participated in the **“Third Meeting of the Technical Working Group – Palm Pest Complex,”** held in Trinidad and Tobago, on July 19, 2012.

3. **Mr. Royden Glen, Senior Plant Quarantine Officer**, participated in “**The 18<sup>th</sup> Meeting for the Tephritid Workers of the Western Hemisphere**,” held in Panama, during the period, July 30 to August 03, 2012.
4. **Dr. Oudho Homenauth, Chief Executive Officer**, participated in the Second Project Steering Committee meeting on “**Improving the Nutrition and Health of CARICOM**”, held in Trinidad during the period August 22 to 23, 2012.
5. **Mr. Brian Sears, Assistant Chief Executive Officer**, participated in a meeting of the “**Carambola fruit Fly Control and Eradication Supporting Project**” held in Brazil during the period November 19 to 23, 2012.

### **Training Courses**

1. **Mr. Brian Sears, Assistant Chief Executive Officer**, participated in a training course on “**Internship on Agricultural Matters (Sanitary and Phytosanitary Measures (SPS))**”, held in Santiago, Chile during the period April 23 to 26, 2012.
2. **Mr. Premdat Beecham, Research Assistant**, participated in a training course on “**Internship on Agricultural Matters (Science and Technology for Enhancing the Contribution of Tropical Crops to Development in ACP countries)**,” held in Port-of-Spain, Trinidad, during the period April 23 to 27, 2012.
3. **Mr. Basudeo Dwarka, Deputy Chief Executive Officer**, participated in the second Caribbean Regional Training course on “**Centre for Agricultural bioscience International (CABI’s) compendium as a tool for managing invasive species in the Caribbean**,” held in St. George, Grenada, during the period September 12 to 14, 2012.
4. **Dr. Oudho Homenauth, Chief Executive Officer and Ms. Somwattie Pooran-DeSouza, Research Scientist**, participated in “**The Regional Stakeholder Consultation Training**,” held in Barbados, during the period September 19 to 20, 2012.
5. **Mr. David Fredericks, Research Scientist**, participated in a two-day Regional Consultation training on “**Sustainable Crop Production Intensification (SCPI) in the Caribbean**,” held in Barbados, during the period October 4 to 5, 2012.

### **Seminar**

1. **Mr. Aaron Ramroop, Regional Crop Extension Officer (ag)** participated in a regional seminar on “**Best Practice in Pest risk Analysis**”, held in Port-of-Spain, Trinidad, during the period October 10 to 12, 2012.

### **Conference**

1. **Dr. Oudho Homenauth, Chief Executive Officer**, participated in “**The Global Food Security Conference**,” held in Canada, during the period October 16 to 18, 2012.

## LOCAL

### Workshops/Training Courses

#### Workshop

The under-mentioned employees of NAREI participated in a one day workshop on “**Post Harvest Quality and Control of Losses**” held AT NAREI’S Board Room on February 21, 2012.

1. Mr. Khemraj Khandai, District Crop Extension Officer
2. Mr. Brijesh Singh, District Crop Extension Officer
3. Mr. Kawal Mangal, Regional Crop Extension Officer
4. Mr. Aaron Ramroop, Regional Crop Extension Officer (ag)
5. Mr. Rohit Singh, Coastal Crop Extension Coordinator
6. Mr. Laurence Louis, Hinterland Crop Extension Coordinator
7. Ms. Sherilyn Perry, Regional Crop Extension Coordinator
8. Mr. Ameid Rafeek, Research Assistant
9. Mr. Chanderdat Thakoordeen, Research Assistant
10. Mr. Ramnarace Sukhna, Research Assistant
11. Mr. Premdat Beecham, Research Assistant
12. Mr. Naimodeen Hussain, Senior Crop Extension Assistant
13. Mr. Lavendra Deonarine, Senior Crop Extension Assistant
14. Ms. Candy Thomas, District Crop Extension Officer
15. Ms. Mahadai Motielal, Research Assistant
16. Ms. Indira Persaud, Research Assistant

#### Training Courses

The under-mentioned employees of NAREI, participated in the “**Agromet Training Course**”, held in NAREI’s boardroom, during the period March 26 to 27, 2012.

1. Mr. Amied Rafeek, Research Assistant
2. Mr. Chanderdat Thakoordeen, Research Assistant
3. Ms. Devica Singh, Research Technician
4. Mr. Ronn Sullivan, Research Assistant
5. Mr. Jean Paul Santos-mendez, Research Assistant
6. Ms. Tracy Persaud, Research Assistant
7. Mr. David Fredericks, Research Scientist
8. Mr. Adrian Mangar, Research Assistant

The under-mentioned employees of NAREI participated in a Service Provider Training on “**Climate Smart Agriculture**”, held in NAREI’s Boardroom during the period May 21 to 25, 2012.

1. Mr. Rohit Singh, Coastal Crop Extension Coordinator
2. Mr. Laurence Louis, Hinterland Crop Extension Coordinator
3. Mr. Kaimraj Khandhai, District Crop Extension Officer
4. Mr. Lavindra Deonarine, Senior Crop Extension Assistant
5. Mr. Brijesh Singh, District Crop Extension Officer
6. Mr. Teisal Kamaludeen, Crop Extension Assistant
7. Mr. Deonarine Persaud,
8. Mr. Colin Simpson, Crop Extension Assistant
9. Mr. Aaron Ramroop, Regional Crop Extension Officer (ag)
10. Mr. Naimodeen Hussain, Senior Crop Extension Assistant
11. Ms. Abiola Gomes, Crop Extension Assistant
12. Mr. Joel Greene, Crop Extension Assistant
13. Mr. Krishna Sewlall, District Crop Extension Officer
14. Mr. Narinedatt Harridat, District Crop Extension Officer
15. Durjesh Ramkissoon, District Crop Extension Officer
16. Mr. Emanuel Klass, Crop Extension Assistant
17. Mr. Kawal Mangal, Regional Crop Extension Officer
18. Ms. Candy Thomas, District Crop Extension Officer
19. Sherilyn Perry, Regional Crop Extension Officer
20. Mr. Kerry Eleazer, District Crop Extension Officer
21. Mr. Quincy Bentinck, District Crop Extension Officer
22. Mr. Aaron Leitch, District Crop Extension Officer
23. Quinch Scotland, Regional Crop Extension Officer (ag)
24. Mr. Orison Sealey, District Crop Extension Officer
25. Ms. Tracy Alleyne, Regional Crop Extension Officer
26. Ms. Trisha Williams, Crop Extension Assistant
27. Mr. Benjamin Frank, Regional Crop Extension Officer
28. Ms. Dennier Greene, Research Assistant
29. Mr. Drian Mangar, Research Assistant
30. Ms. Samantha Brotherson, Research Assistant

**Table 19: Staffing, 2012**

<b>Categories</b>	<b>No. of Positions</b>	<b>Positions Filled</b>	<b>Position Vacant</b>
Crop Extension Services	99	70	29
General Admin. & Finance *	80	44	36
General Services	157	113	44
National Plant Protection Office	52	25	27
Research and Development	91	46	45
<b>Total</b>	<b>479</b>	<b>298</b>	<b>181</b>

\* Thirteen (13) Security Personnel not yet on Contract employment, but positions are reflected on NAREI's List of Authorized Positions.

**NON CONTRACTED EMPLOYEES**

<b>Extension Agents</b>	17
<b>Petty Contract Workers</b>	4
<b>*Security Guard</b>	13

**Table 20: Staffing in the Crop Development and Support Services Department, 2012**

<b>Category</b>	<b>Authorized Positions</b>	<b>Positions Filled</b>	<b>Vacant Post</b>
Deputy Chief Executive Officer	1	1	0
National Crop Extension & Training Coordinator	1	0	1
Training Manager	1	0	1
Regional Crop Extension Officer	12	4	8
District Crop Extension Officer	30	23	7
Training Officer	1	0	1
Senior Crop Extension Assistant	13	4	9
Crop Extension Assistant	40	38	2
<b>Total</b>	<b>99</b>	<b>70</b>	<b>29</b>

**Staff 21: Staffing in the General Administration and Finance Department, 2012**

<b>Category</b>	<b>Authorized Positions</b>	<b>Positions Filled</b>	<b>Vacant Post</b>
Senior Finance Manager	1	1	0
Human Resources & Admin. Manage	1	1	0
Finance Manager	1	1	0
Corporate Secretary	1	0	1
Internal Auditor	1	1	0
Senior Human Resources Officer	1	0	1
Librarian	1	0	1
Accountant	2	1	1
Human Resources Officer	2	2	0
Farm Manager	3	2	1
Administrative Assistant	2	2	0
Security Supervisor	1	1	0
Assistant Librarian	2	1	1
Storekeeper	4	2	2
Senior Human Resources Clerk	2	2	0
Confidential Secretary	2	2	0
Information Technology Technician	2	1	1
Senior Secretarial Assistant	1	0	1
Cashier	3	0	3
Accounts Clerk	6	6	0
Secretarial Assistant	6	3	3
Human Resources Clerk	2	0	2
Data Entry Clerk	1	1	0
Library Assistant	2	1	1
*Security Guard	30	13	17
<b>Total</b>	<b>80</b>	<b>44</b>	<b>36</b>

**Table 22: Staffing in the General Services Department, 2012**

<b>Category</b>	<b>Authorized Positions</b>	<b>Positions Filled</b>	<b>Vacant Post</b>
Heavy Duty Operator	10	6	4
Drivers/Office Assistants	20	5	15
Well Operator	1	1	0
Welder	1	1	0
General Workers	125	100	25
<b>Total</b>	<b>157</b>	<b>113</b>	<b>44</b>

**Table 23: Staffing in the National Plant Protection Office, 2012**

<b>Category</b>	<b>Authorized Positions</b>	<b>Positions Filled</b>	<b>Vacant Post</b>
Assistant Chief Executive Officer/Chief Plant protection Officer	1	1	0
Senior Plant Protection Officer	1	0	1
Senior Quarantine and Pest Risk Officer	1	0	1
Plant Protection Officer	5	3	2
Plant Quarantine Officer	5	4	1
Senior Plant Quarantine inspector	5	0	5
Senior Plant Protection Assistant	4	0	4
Plant Protection Assistant	10	0	10
Plant Quarantine Inspector	20	17	3
<b>Total</b>	<b>52</b>	<b>25</b>	<b>27</b>

**Table 24: Staffing in the Research and Development, 2012**

<b>Category</b>	<b>Authorized Positions</b>	<b>Positions Filled</b>	<b>Vacant Post</b>
Chief Executive Officer	1	1	0
Assistant Chief Executive Officer/Chief Research Scientist	1	0	1
Head, Fruits, Vegetables and Other Crops (Senior Research Scientist)	1	0	1
Head, Entomology, Pathology and Weed Science (Senior Research Scientist)	1	0	1
Head, Biotechnology and Seed Technology (Senior Research Scientist)	1	0	1
Head, Soils and Farm Mechanization (Senior Research Scientist)	1	0	1
Head, Bio Energy (Senior Research Scientist)	1	0	1
Horticulturist	1	0	1
Research Scientist	15	6	9
Nurseries Manager	1	1	0
Research Assistant	30	18	12
Nursery Supervisor	5	0	5
Senior Research Technician	6	2	4
Research Technician	16	11	5
Laboratory Attendant	10	7	3
<b>Total</b>	<b>91</b>	<b>46</b>	<b>45</b>



## VIII. FINANCIAL REPORT 2012

### STATEMENT OF FINANCIAL POSITION AS AT 31 DECEMBER, 2012

	Note	As At 31.12.2012	As At 31.12.2011
	\$	\$	
<b><u>Assets</u></b>			
<b><u>Non Current Assets</u></b>			
Buildings	8	155,012,816	153,382,508
Machinery & Equipment & Motor Vehicles	8	11,935,500	42,986,513
Household Furniture & Fittings	8	5,805,389	1,776,420
Laboratory Equipment	8		4,762,619
Library Books	8		-
Animals	8		7,744,991
Work In Progress	8	-	-
<b>Total Non Current Assets</b>		<b>172,753,705</b>	<b>210,653,050</b>
<b><u>Current Assets</u></b>			
Inventory		13,714,124	16,043,797
Debtors		21,149,189	15,622,850
Short Term Investment			5,329,989
Cash and Bank	6		172,926,300
<b>Total Current Assets</b>		<b>34,863,313</b>	<b>209,922,936</b>

**NATIONAL AGRICULTURAL RESEARCH & EXTENSION INSTITUTE**  
**STATEMENT OF FINANCIAL POSITION**

AS AT 31 DECEMBER, 2012

<u>Equity &amp; Liabilities</u>	<u>Note</u>	<u>As at</u> <u>31.12.2012</u>	<u>As At</u> <u>31.12.2011</u>
<b><u>Equity</u></b>		\$	\$
Grant from Foreign Sources		51,897,479	51,897,479
Government of Guyana Contribution	7	554,504,647	554,504,647
Revaluation of Stock		341,781	341,781
Accumulative Surplus/(Deficit)		(264,046,855)	(264,046,855)
<b>Total Equity</b>		<b>606,743,907</b>	<b>307,697,052</b>
<b><u>Liabilities</u></b>			
<b><u>Non Current Liabilities</u></b>			
Ministry of Public Works		5,606,815	5,606,815
ASDU/Project Funds		105,397,786	105,397,786
<b>Total Non Current Liability</b>		<b>5,606,815</b>	<b>111,004,601</b>
<b><u>Current Liabilities</u></b>			
Creditors		-	1,874,333
<b>Total Current Liabilities</b>		<b>-</b>	<b>1,874,333</b>
<b>Total Equity &amp; Liabilities</b>		<b>612,350,722</b>	<b>420,575,986</b>
<i>Note: Financial Statement incomplete, awaiting completion of December, 2012 bank reconciliation statement</i>			

**NATIONAL AGRICULTURAL RESEARCH & EXTENSION INSTITUTE**

**STATEMENT OF COMPREHENSIVE INCOME  
FOR THE PERIOD ENDED 31 DECEMBER, 2012**

	<b>Note</b>	<b>Period Ended 31/12/2012</b>	<b>Period Ended 31/12/2011</b>
		\$	
<b><u>Revenue</u></b>			
Government of Guyana Subvention	2	538,009,000	394,668,718
Income from Operation	3	23,706,947	39,225,418
Other Income	4	19,916,798	7,506,852
Interest Earned	5	-	35,685
<b>Total Revenue for the year</b>		<b>581,632,745</b>	<b>441,436,673</b>
<b><u>Expenditure</u></b>			
Wages & Salaries		372,288,538	184,731,230
Overhead Expenditure		50,507,735	82,627,501
Material, Equipment & Supplies		30,373,954	35,671,432
Fuel & Lubricant		21,134,698	19,740,559
Rental & Maintenance of Buildings		9,997,670	4,485,287
Maintenance of Infrastructure		4,106,871	1,544,231
Transport, Travel & Postage		34,943,813	29,639,452
Utility Charges		26,882,937	19,716,354
Other Goods & Services		37,301,608	33,759,803
Other Operating Expenses		9,598,895	7,944,875
Education Subvention & Training		749,700	2,955,932

Old Age Pension	983,525	807,046
Depreciation	62,267,323	54,976,643
Total Expenditure for the year	<b>661,137,267</b>	<b>478,600,345</b>
Surplus/(Deficit) for the year	<b>(79,504,522)</b>	<b>(37,163,672)</b>
Accumulated Surplus/(Deficit) as at 1. January. 2011	(264,046,855)	(226,883,183)
Accumulated Surplus/(Deficit) as at 31. December. 2012	<b>(343,551,377)</b>	<b>(264,046,855)</b>

**NATIONAL AGRICULTURAL RESEARCH & EXTENSION INSTITUTE**

**STATEMENT OF CASHFLOW**

**FOR THE PERIOD ENDED 31 DECEMBER, 2012**

	<b>Note</b>	<b>Period Ending 31/12/2012</b>
<b><u>Operating Activities</u></b>		
Net Surplus / (Deficit) for the year		(79,504,522)
<b><u>Adjusted for:</u></b>		
Depreciation		62,267,323
Operating Surplus/(Deficit) Before changes in Working Capital		<b>(17,237,199)</b>
(Increase)/Decrease in Stock	2,329,673	
(Increase)/Decrease in Debtors	(5,526,339)	
Increase/(Decrease) in Creditors	(1,874,333)	
		<b>(5,070,999)</b>
Net Cash Inflow/(Outflow) from Operating Activities		<b>(22,308,198)</b>
<b><u>Investing Activities</u></b>		
Purchase of Fixed Assets	8	
Net Cash Inflow/(Outflow) from Investing Activities		-
<b><u>Financing Activities</u></b>		
Government Contribution ASDU/Project Funds	7	35,000,000
Net Cash Inflow/(Outflow) from Financing Activities		<b>35,000,000</b>

Cash & Cash Equivalent for period	12,691,802
Cash & Cash Equivalent as at 1.January.12	178,256,289
Cash & Cash Equivalent as at 31. Dec. 11	<b>190,948,091</b>