

ANNUAL REPORT 2013

1.0 ABSTRACTS OF COMPLETED RESEARCH PROJECTS

(i) Intensification of Vegetable Production and Diversification in Guyana

O. Homenauth, CEO, NAREI

Diversification of the agricultural sector in Guyana has been proceeding in a structured manner, with vegetable production being an important component of the process. Vegetables represent a two-pronged contribution to development through enhancing the health and nutrition of consumers and thereby contributing to food and nutritional security as well as providing income to farmers and exporters (improving economic security). Continuous emphasis is being placed on the intensification of vegetable production in Guyana both for local and export markets. Both commodity/ species and production systems diversification are being encouraged. Production systems are being developed as adaptation measures to combat the effects of climate change. Such systems include protected seedling production, shaded cultivation (inclusive of hydroponics) and the use of drip irrigation systems (combined with fertigation). The latter are currently being evaluated under the current project 'Improving the Nutrition and Health of CARICOM Populations under the Canadian International Food Security Research Fund (CIFSRF)'. The focus of these activities is to provide vegetable farmers with scientific information on irrigation water application rates as well as timing of application for year round sustainable food production. Experiments are being conducted on farmers' fields in two major vegetable growing regions (Black Bush Polder and Parika) in Guyana. Three treatments (farmers' practice, 50% and 75% FC) with three replications are being employed. Initial results show that potential yields of the crops are being attained with the use of drip irrigation.

Key Words: commodity/species, diversification, shaded cultivation, drip irrigation, climate change

(ii) ***Response of the West Indian Red Hot Pepper to various levels of fertilization under open field conditions***

R. Ragnauth, Research Assistant

The West Indian Red Hot Pepper was a recent introduction in Guyana and is currently in demand by exporters and agroprocessors. There are no reports available on local production data for this commodity as well as appropriate fertilizer recommendations. Consequently, a study was initiated at NAREI's commercial farm on a clay soil to determine the appropriate fertilizer recommendation for this variety of pepper to obtain maximum yields. The experiment was laid out in a Randomized Complete Block Design with four treatment (0kg/ha, 318kg/ha, 418 kg/ha and 518 kg/ha) and three replications. The fertilizer used was 12:12:17:2 and the dosages applied were in tandem with those reported elsewhere. Fertilizer was applied in split applications at two, four and six week intervals. There were significant differences among treatment means, except for treatments two and three. There was a direct correlation between an increase in yields and fertilizer applied. Treatment four recorded the highest yield of 7080kg/ha. This study will be further elaborated to determine fertilizer requirements for obtaining maximum economic yield.

Key Words: WI Red Hot Pepper, fertilizer recommendation, agroprocessors

(iii) Response of the West Indian Red Hot Pepper to various levels of fertilizer under shaded cultivation

R. Ragnauth, Research Assistant

The West Indian red hot pepper was a recent introduction to Guyana and is currently in demand by Exporters and Agro-processors. There are no reports available on the production data for this commodity, including fertilizer recommendations under shaded conditions. Over the past few years climate change has adversely affected crop production and as such, it can be mitigated by adopting shade house cultivation. This ensures higher yields and year round pepper production. Consequently, a study was initiated at NAREI's commercial farm on a clay soil to determine the appropriate fertilizer recommendation for this variety of pepper to obtain maximum yields. The experiment was laid out in a Randomized Complete Block Design with four treatments (0kg/ha, 318kg/ha, 418kg/ha and 518kg/ha) and three replications. The fertilizer used was 12:12:17:2 and the dosages applied were in tandem with those reported elsewhere. Fertilizer was applied in split applications at two, four and six week intervals. There were significant differences among treatment means, except for treatment two and three. There was a direct correlation between an increase in yields and fertilizer applied. The highest yield of 12,106kg/ha was obtained for fertilizer used at 518 kg/ha.

Key Words: WI Red Hot Pepper, fertilizer recommendation, shaded cultivation

(iv) Corn Varietal Evaluation Trial, 2012-13

D. P. Singh, R. N. Cumberbatch & O. Homenauth

Corn is presently imported in Guyana (30,000 tons) mainly to cater for the needs of poultry feed industries. The existing local varieties are low yielding. A systematic corn improvement project was undertaken through collaborative efforts of MOA, NAREI, Government of India (ITEC) and CIMMYT during the 2012-13 crop season at Ebini, and at NAREI, Mon Repos area. Twenty two high yielding and resistant hybrid varieties of corn to biotic and abiotic factors suitable for conditions of Guyana were imported from International Maize and Wheat Improvement Center (CIMMYT), Colombia and were evaluated at NAREI and Ebini (Savannah) along with two local varieties for comparison. The yield and the performance of the improved varieties were significantly higher (yielded > 13 times) than local varieties. The preliminary cost of production estimates of corn indicated that corn produced locally using improved varieties is cheaper (\$37/lb) than imported corn (\$46/lb). The cost of production may be further reduced once commercial cultivation is done adopting proper mechanization. The trial was repeated at NAREI, Mon Repos Commercial Farm with two new trials of corn (46 new varieties) including composite types. The seed production of hybrids and synthetic varieties will need scientific expertise and resources in the near future to reap the full advantage of new corn production technology. Guyana can reduce import of corn by adopting new varieties and production technology simply by planting the crop in about eight thousand hectares of land under rain fed conditions and may attain a status of net exporter in years to come.

Key Words: hybrid varieties, biotic and abiotic factors, cost of products

(v) Alternative Measures to Control Diamondback Moth (*Plutella Xylostella L.*) in Cabbage Ecosystem

S. Brotherson, L. Persaud & S. P. De Souza

An experiment was carried out to assess the effectiveness of organic, botanical and chemical methods for controlling Diamondback Moth (*Plutella Xylostella L.*) in cabbage under open field conditions. The trial was designed according to a RCBD with five treatments; neem extract, pepper + garlic + clove fruit extract, Panchagavya mixture, emamectin benzoate and control with three replicates. Results indicated that there were significant differences in the number of eggs and adult DBM increased for the control and terminator treatments as time progressed. Neem extract was most effective at reducing DBM population when compared to the control. The organic (19%) and botanical (20%) treatments were effective at reducing DBM populations than the chemical (1%) treatment when compared to the control. Since DBM is difficult to control using pesticides, control measures must entail monitoring of pest populations and environmental factors and at the same time utilizing alternative means of control.

Key Words: DBM, organic methods, neem extract

(vi) Comparative effect of black plastic mulch and dried grass mulch on yield and fruit quality of Boulanger

L. Persaud, S. Brotherson & S. De Souza

This study was conducted to examine the effectiveness of using plastic and grass mulches on the growth, yield and post harvest quality of Boulanger on clay soil. A Randomized Complete Block Design (RCBD) was used with three treatments (plastic mulch, grass mulch and no mulch control) and replicated thrice. Results indicated plants grown on plastic mulch had significantly higher yields (60%) and increased plant height (28%) compared to grass and no mulch treatments. There were no significant differences in yield between the grass mulch and the control. Fruit quality was graded and 1-5 (none severe) on a rating scale. Plastic mulched fruits had none to slight damages and moderate defects. Fruits harvested from no mulched treatments had moderate to severe damages and defects. Plastic mulch resulted in increased crop yields and improved fruit quality.

Key Words: mulch, fruit quality

(vii) Identification of Diamondback Moth (DBM) natural enemies in cabbage production

Samantha Brotherson, Leelawattie Persaud & S. De Souza,

Cabbages and other cruciferous crops are important in the diet of Guyanese. Diamond Back Moth (*Plutella xylostella* L.) is one insect that hinders crop production. DBM over the year has developed resistance to a wide range of insecticides. This has led to the search for more effective alternatives for controlling DBM. Natural enemies are widely used to control DBM populations and this trial was focused on identifying the natural enemies of DBM in Parika (Region 3) and Garden of Eden (Region 4) locations, as an initial step to devise control measures. At Parika, the most common predators found in cabbage fields were *Colemeqill amaculata* and *Hypselonotus supterpuntatus* that are known DBM predators. *Paryphus flavcintus*, *Anasa bellator* and *Hypselonotus fulvus* were found in DBM fields but their role as predators of DBM is yet to be determined.

Key Words: cruciferous crops, DBM, natural enemies

(ix) Characterization of the fresh produce distribution network and postharvest handling practices in Guyana and establishing practices and appropriate technologies that would minimize loss of quality, nutritional value and spoilage of produce.

O. Homenauth & P. Beecham

A study was initiated on the "characterization of the fresh produce distribution network and postharvest handling practices in Guyana and establishing practices and appropriate technologies that would minimize loss of quality, nutritional value and spoilage of produce" on tomato, boulangier, ochro and cucumber which were evaluated for postharvest losses in a market chain. During that period two market retailers (large and small) were recruited to participate in the study. These commodities were purchased from the retailers and were retained for three days at the retailer's stall. Samples were collected every day from both retailers outlet and analysed. The parameters measured were colour, length, diameter, % Brix, fresh weight, firmness and quality ratings. Results have shown that quality changes as time elapses on the retailer's market for fruits and vegetables. Firmness increases for Ochros and Boulangier while quality reduced significantly as the day's elapsed. The noteworthy preliminary interpretations are that firmness and quality were significantly reduced for tomatoes and boulangier, an indication that as the produce is kept after harvesting without consuming, its quality is reduced with time. An advance data analysis is currently in progress.

Key Words: Post Harvest handling, market chain, firmness & quality

2.0 STATUS REPORTS OF WORK IN PROGRESS

Eight of the research activities initiated in 2013 remained incomplete at the end of the year. The following are the status reports on these initiatives. Additionally, two observational trials were conducted in 2013.

2.1 Research

(i) Control of Red Palm Mite (*Raoiella indica Hirst*) on Coconut Palms in Guyana

Red Palm Mite (RPM) is one of the most recent pest introductions into Guyana. This pest is known for its negative impact on the coconut industry throughout the Caribbean. Its presence on the island of Wakenaam has prompted the need for implementation of control measures. A field trial was initiated to compare the control methods available to determine their effectiveness in controlling RPM population on established coconut palms.

A Randomized Complete Block Design (RCBD) was used in this study with five treatments: Monocrotophus (10ml/plant), Imidacloprid (10ml/plant), Abamectin (80ml/plant), Cow manure (20ml/plant) and control, with four replicates. There were five plants per treatment and all treatments were applied through a hole (7.5 cm deep) drilled into the trunk at 45° angle. Data were collected on the number of live eggs, nymphs, adult males and adult females for three 25mm diameter colonies per leaflet before and after treatment applications.

Preliminary results obtained from this study have found that there were significant differences in treatment, time and treatment x time interactions. All chemical treatments significantly reduced the number of RPM compared to control and cow manure treatments. However, insecticides Monocrotophus and Abamectin had significantly lower numbers of eggs (20-21%), nymphs (16-18%) and adult females (11%) and adult males (15%) RPM when compared to the control. Imidacloprid and

Cow manure significantly reduced eggs (4-7%), nymphs (2-4%), adult females (2%) and males (3-6%) population compared to the control. Monocrotophus and Abamectin can be implemented as suitable control measures for RPM in established palms.

(ii) Integrated Pest Management (IPM) of Black Sigatoka Disease (BSD)

Black Sigatoka disease caused by *Mycosphaerella fijiensis* Leach is an important foliar disease of plantains in Guyana. It was first reported in 2008, and since then it has caused significant reduction in bunch weight and subsequent yield losses. In Guyana, BSD is currently managed mainly by the use of fungicides.

This study focused on adapting an IPM approach using fungicides, sanitation practices and plant nutrition to assess their impact on controlling BSD and improving crop yields. Two field trials were established at Parika (1 acre) and Timehri (1/2 acre). All trials were conducted using a Randomized Complete Block Design (RCBD) with control and fungicide rotations (Volley, Stratego, Bellis) as treatments with three replicates. Fungicides were applied only when disease infection index was greater than 25%.

Preliminary results obtained from the period June to December, 2013 indicated that the number of leaves per plant were higher at the Timehri location (11-13 leaves) compared to Parika (9-10 leaves). Timehri location had lower disease infection (<20%) from June to October. However, in November and December the infection index increased to $\geq 25\%$ indicating the need to protect the new leaves. At Parika the disease infection was <21% from June to September. In October and November it had increased to $\geq 25\%$. In December, disease infection decreased to <11% mainly due to sanitation practices that were implemented. Four applications of fungicides were done in both locations from planting to within seven months. Monitoring of trial plots are ongoing.

(iii) Comparative Evaluation for Yield and Yield Components Inter-relationships among Two Putatively Field Persistent Local Cassava Accessions alongside Two Local Check Varieties

This preliminary Kairuni on-Station Trial was planted on February 21, 2013 and harvested during one-month duration between October 23, 2013 and November 26, 2013. The two test entries, White Stem and Brown Stem were previously evaluated in field under an extended drought period of more than three years at Kairuni Out-Station and found to be persistent. They were consequently promoted to this preliminary on-station trial to evaluate their yield potential in a white sand ecology. The checks varieties were Kairuni Cassava and Smokey Prolific. Further evaluation pressure was exerted by two manuring levels: Poultry Manure-only (Rupee Analysis) was applied at 11.4 MT/ha, and the other level was Poultry Manure (Rupee Analysis) at 11.4 MT/ha supplemented with 94.4 kg/ha of 15-15-15. A single application was added to each plot (soil incorporation) 10 days after planting. The entry factor (4 varieties) and manuring factor (2 levels) were laid out in a strip-plot field design comprising four replicates.

Data were recorded for eight plot progress monitoring variables, seven yield component variables, eight descriptors of morphological characters and scores for reaction to a transient fungal infection. Varietal maturation period, yields of marketable tubers and harvested plants per hectare are reported for this documentation.

Varietal yield differentials were a pronounced function of reaction to a transient fungal infection and maturation period that was evidently restricted by duration of the trial. This infection was most severe on the entry Smokey Prolific and least on entry Brown Stem. The duration of the trial was shortened to sync with the seasonal planting cycle. Table 1 below illustrated some results.

Table 1: Composite table for performance of number of plants harvested per hectare

Plants per hectare for Manuring			Plants per hectare for Entries			Plants per hectare for Manure*Entry Interaction			
Manure	Mean	Sig Diff	Entry	Mean	Sig Diff	Manure	Entry	Mean	Sig Diff
Man+F	23991	A	KC	25059	A	Man+F	SP	25913	A
Man	22923	B	SP	25059	A	Man	KC	25059	A
			BS	22069	A	Man+F	KC	25059	A
			WS	21642	A	Man	SP	24205	A
						Man+F	WS	23066	A
						Man	BS	22211	A
						Man+F	BS	21926	A
						Man	WS	20218	A

The main preliminary inferences are that yields were empirically improved with very low levels of inorganic supplemental fertilization (Table 2); an indication that the putative drought tolerant entries are likely to have even greater yield on inherently fertile soils. Secondly (data accumulated but not reported) the three entries, Kairuni Cassava, White Stem and Brown Stick are of a longer field maturation period; evidenced by a comparatively low percentage of the number of marketable tubers. Because growth was retarded by its response to the fungal infection the maturation period of Smokey Prolific could not be decisive. Indicative results of more advanced data analysis have promoted all four varieties to an advanced on-station trial that is currently in progress.

Table 2: Composite table for performance of yield of marketable tubers per hectare

Weight of Marketable Tubers per hectare for Manuring			Weight of Marketable Tubers per hectare for Entries			Weight of Marketable Tubers per hectare for Manure*Entry Interaction			
Manure	Mean	Sig Diff	Entry	Mean	Sig Diff	Manure	Entry	Mean	Sig Diff
Man+F	15704	A	KC	14915	A	Man+F	WS	22009	A
Man	10361	A	WS	14466	A	Man+F	KC	15701	A
			BS	13505	A	Man	KC	14129	A
			SP	9246	A	Man+F	BS	13549	A
						Man	BS	13461	A
						Man+F	SP	11559	A
						Man	SP	6933	A
						Man	WS	6922	A

(iv) The Use of Acacia Cuttings in Crop Cultivation on Re-habilitated Mine-spoils

The process of land reclamation at this site began in 2003 with efforts at re-vegetation of a rugged, razor grassed and swampy 6 ha site with support from the community. At present, ground cover is more than 80% through the maintenance of pasture grass *B. humidicola*, legumes *Glycerida spp.*, and acacia; and cashew nuts and fat pork. Over the years, erosion management using silt fences and vetiver grasses has improved infiltration. Also, the practice of allowing grass to mat and become incorporated into the profile has improved organic matter and fertility sufficiently to support crop production.

Conservation plots using acacia as mulch for sorrel, sweet potato, cassava, passion fruit, West-Indian cherry, sweet-pepper, pigeon pea and tomato are being established through a community effort with technical support from NAREI.

(v) The Effects of Micro-nutrients on Cherry Production

In response to farmers' complaint of poor quality and short falls in all year round cherry production, studies was initiated to correct nutrient deficiencies on Mr. Joseph's Farm at Coverden, EBD and NAREI's cherry plots at Mon Repos, ECD.

Phosphorus and pH deficiencies were improved above the critical levels (4ppm and 5 respectively). Ca and OM levels remain below adequate levels (5 meq/100g and 5% respectively). No deficiency of micronutrients Cu, Fe, Mn and Zn was established; and Mo and B status was not determined.

Analysis of chemical soil tests result established that chemical imbalances exists in the soils. Consequently, a re-sampling would be done in 2014 to further determine the nutrient status before a formal fertilizer programme could be implemented.

(vi) Investigating the Effectiveness of Locally Available Liming Material

The timing of application for liming materials to optimize their effectiveness poses a challenge owing the wide range of soils available for cropping. Table 3 shows three soil units and three locally available liming materials were selected to determine their optimal timing of application using recommendations from soil analyses.

1. The rates of application based on soil analyses was determined; and
2. The properties of a locally available by-product of GWI's water clarification process determined.

Table 3: Three soil units and three locally liming materials

Soil Unit	Unit 36 (Brickery Clay)	Unit 41 (Onverwagt Clay)	Unit 72 (Ithaca Loamy Sand)
MATERIAL	lb/acre	lb/acre	lb/acre
CaCO ₃	4732	1594	4305
LGRP	9464	3188	8610
GWI (dry)	9464	3188	8610

In Table 4, shows the Chemical properties of Effluent from Water Clarification Process determined.

Table 4: Chemical Properties of Effluent from Water Clarification Process

GWI	pH	Elect. Conductivity	OC	Exch. acidity
Wet material	5.3	0.15	4.8	0.2
Dry material	6.4	0.15	-	0.2

The next steps involve the application of the various materials to the soil in order to determine the quantities needed to reach the desired pH.

(vii) Response of established coconut palms (varieties: dwarf and tall) to fertilizer regimes.

Improving the agronomy of coconuts including fertilization has been touted as an option to improving coconut yields. However, coconuts are rarely fertilized in Guyana. In order to promote this technology in the coconut growing areas, fertilizer studies were conducted at farmers' field in the Pomeroon and at Mon Repos.

The study was conducted on mature coconut palms (three and five years). Two different fertilizers; 12:12:17:2 and 15:15:15, were applied at a rate of 3.75kg/palm and 3 kg/palm + 0.3125kg of Muriate of Potash (MOP) respectively. The experiment was arranged according to randomized complete block design

(RCDB), with the three treatments: control, 12:12:17:2 and 15:15:15, with three replicates.

The Parameters measured were number of fruits per bunch, number of bunches per palm, number of branches per palm, water content per fruit and thickness of the endosperm. These parameters were taken before and after each fertilization, every six months over a period of 2 years.

Soil analysis was taken at depths of 15cm, 30cm and 45cm at the initial stage of the trial and at the end of the trial.

After one fertilizer application results are summarized in the Table 5 below.

Table 5: Fertilizer Application Results

Parameters		Locations					
		Pomeroon				Mon Repos	
		3 year nuts		5 year nuts		3 year nuts	
		a	b	a	b	a	B
Average water content/nut	1	427ml	570ml			250.7ml	285ml
	2	520ml	575ml			315.5ml	320.2ml
Average no. of bunches/palm	1	7	6	7	6	9	8
	2	9	8	8	9	9	9
Average no of branches/palm	1	18	18	25	24	30	38
	2	24	26	27	26	31	37
Average no. of nuts/bunch	1	22	23	12	9	10	8
	2	26	27	15	13	16	15
Endosperm thickness	1			1.3cm	1.4cm		
	2			1.4cm	1.5cm		
Diameter of nuts	1			8.5cm	8.8cm		
	2			9.7cm	10cm		

1: measurements before fertilization

2: measurements after fertilization

a: 15:15:15 applied at a rate of 3 kg/palm + 0.3125kg of Muriate of Potash (MOP)

b:12:12:17:2 applied at a rate of 3.75kg/palm.

The highest increase recorded was 87.5% in the average number of nuts per bunch using 12:12:17:2 on three year palms (water nuts) at Mon Repos and a 44.4 % increase when applied on 5 year nuts in the Pomeroon.

The 15:15:15 fertilizer showed a 14.1 % increase in the thickness of the endosperm on the 5 year nuts in the Pomeroon as compared to a 12.9% increase using 12:12:17:2 at this same location.

The water content per nut increased by 25.5% using 15:15:15 at Mon Repos, with Pomeroon sharing a similar increase of 21.7% using the same fertilizer.

The average number of bunches per palm increased by 50% using 12:12:17:2 on 5 year nuts at Pomeroon as compared to 14.2% using the 15:15:15.

2.2 OBSERVATIONAL

2.2.1 Observation of Kabuli and Desi varieties of chickpea in Field 17 Mon Repos and Kairuni.

This activity was conducted in support of the Ministry of Agriculture's Crop Diversification Programme. Fungal infection in seedlings and bacterial infestation at flowering were the major limitations to crop growth. The crop adapted well to clay and loamy sand soils during the dry season. However, in rainy season, production was best on sandy soils in open field conditions.

2.2.2 Observation of Potato (*Solanum tuberosum*) on sandy soils under shaded conditions

This activity was conducted in support of the Ministry of Agriculture's Crop Diversification programme. Cut and whole potatoes were sprouted and planted on Kasarama Loamy Sand (Unit 810). Production of seed potatoes with fertilizer applied in the planting hole was compared with fertilizer application 21 and 42 days after emergence.

It was established that:

1. Whole potato used as seed gave superior yields (46g) compared to cut potatoes (34g/seed).
2. Potato planted with fertilizer in planting hole gave superior yields (60g) compared to 20g for plants with split application.
3. The incidence of fungal infection was minimized below 21 % soil moisture content.
4. Cutting worm is the major pest limiting potato production.

3.0 EXTENSION, TRAINING AND PROVISION OF SERVICES

3.1 Acoushi Ant Management

The Acoushi Ant has been the main problem facing farmers in the hinterland regions, defoliating cassava, citrus, and vegetable crops thus discouraging farmers to expand their farming areas, many of which have been abandoned.

As a consequence, the Government of Guyana, Ministry of Agriculture/ NAREI has established a more focused Acoushi Ant Control Programme (AACP) to control the pest in Amerindians communities across the hinterland region. The intention of this initiative is to promote/enhance food security in these communities.

At the end of 2013, 1366 Acoushi nests were fogged in three Sub Districts in Regions 1, 7 and 8, targeting fifteen Amerindian communities with a population of 10726 persons (1996 households).

Seventeen additional Amerindians communities in Regions 1, 7 and 9 were trained, sensitized about the AACP. Farmers and residents of the 15 Amerindians' communities who participated in the exercise complemented the Government of Guyana for the new approach in controlling the pest. This approach entailed the provision of chemicals and fogging machines and the actual conduct of the exercise which was participatory. In the past, only chemicals were provided to the communities without any supervision being done. Follow up visits are also continuously being done to monitor the success of the exercise. Simultaneously, training was also provided to residents on improved agronomic practices to better their farming practices. Vegetable seeds were also provided to residents.

3.2 Community Development Plans (CDP)

Field missions to various Amerindian communities were made following the Inception Workshop conducted on March 22 and 23, 2013, which resulted in the community projects being classified for implementation in two waves.

Missions were fielded from 17th April – 31st December 2013, through the collaborative effort of multi-agency team (UNDP, Ministry of Agriculture, NAREI)

- The technical aspect of implementing each CDP, outlining each community's technical and training needs;
- The management and implementation arrangements for each CDP;
- Adjusting the budgets within the allowable allocation (\$5m) while taking into consideration the required inputs; and
- All the agricultural constraints that might impede development in the community.

Site Visits

- Examined and assessed the technical feasibility and suitability of each site proposed; and
- Examined the business and economic feasibility of each CDP

Technical Training

- Training documents were provided for each community on various aspects of agricultural development.
- Capacity building and infrastructural strengthening was conducted by NAREI for these projects.
- NAREI provided training in different facets of cassava production and processing such as: (i) how to enhance production systems through the demonstration of GAPs, (ii) increase the knowledge and skill of stakeholders through the relevant training, (iii) Improve value addition of cassava with the use of improved processing techniques.

The technical expertise provided by NAREI was critical to the design and ultimate success of the CDPs implementation and minimization of risk. These projects are being periodically monitored to ensure that all the CDPs implemented are well managed by the various communities and agricultural extension officers within the

region. The current status of the implementation of projects for which NAREI is a collaborator is shown in Table 6 below.

Table 6: Current Status of the Projects

Region	Village/Community	Project	Status
#1	Manawarin	Cassava Production & Processing	15 Acres of cassava was planted. A building is presently being constructed for the use as processing facility for cassava.
#3	Bethany	Cassava Production & Processing. Cash crop production.	20 acres of cassava was proposed to be planted (bitter and sweet). To date only 5 acres of land has been cleared, prepared and planted with cassava.
#7	Karrau	Cassava and cash crop production	5 acres of cassava and 2 acres of cash crop have been proposed for cultivation. Land clearing and preparation have been completed. Planting is in progress.
#8	Itabac	Cassava Production & Processing.	20 acres of land were cleared, prepared and planted with cassava for the production of farine, tapioca and cassava cassareep. Construction of processing facility is currently in progress.
#9	Rupertee	Cassava Production & Processing.	5 acres of cassava was planted. Construction of processing facility has been completed.
#9	Massara	Cassava Production &	5 acres of cassava was planted.

		Processing.	Construction of processing facility in progress.
#9	Parikwaranau	Cassava production and shade house cultivation of cash crop.	20 acres of land were cleared, prepared and planted with cassava for processing into farine and other products. Processing facility was also constructed. Sourcing of equipment is in progress. Shade-house is operational.
#10	Sandhills	Production of cash crop	50 acres were identified for the production of red beans, peanuts and other crops. About 5 acres have already planted with red beans. Further developmental works are in progress for expansion of cultivation.

3.3 Training

3.3.1 Training Programme

As shown in Table 7 for the period under review, NAREI in collaboration with Other Agencies and Departments trained 5,367 farmers in 188 training sessions. The sessions were conducted in the following areas:

- a) Management of plantain and its associated pest and diseases with special emphasis on Black Sigatoka Management (BSM) using a convenient nutrition programme along with IPM;
- b) Management of diamond back moth in cabbages;
- c) Management strategies associated with the cultivation of sweet peppers on acidic soils;
- d) Climate smart agriculture;
- e) Pesticides identification and proper use;
- f) Management of soil borne diseases; and
- g) Management of pests and diseases in tomatoes.

Table 7: Numbers of Training Sessions & Persons Trained per Region

Region	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	Total
# Sessions	8	12	34	23	31	44	6	4	15	11	188
Persons Trained	336	312	986	736	961	968	234	128	420	286	5367

3.3.2 Acoushi Ant Control Programme (AACP)

This training and awareness of acoushi ant was conducted in twenty seven Amerindian communities in the hinterland regions attended by 540 farmers. The following topics were also addressed under this programme:

- (i) Safe use of Agro-pesticides - This was a collaborated training held while conducting the AACP awareness, and was conducted in twenty seven Amerindian communities.
- (ii) Simple Agouti Traps - This simple training was conducted in three Amerindian communities in Region 8, which 64 persons participated.
- (iii) Fixing and operating the Swing fog machine - A total of twenty nine personnel were trained to operate and fix the swing fog machine during the reporting period.
- (iv) Cocoa and Ginger Production - This training was conducted in collaboration with CUSO in Region 1.
- (v) Use of Poultry litter as organic fertilizer for plants - This was conducted with small farming groups in Region 1.

3.3.3 Black Sigatoka Management Programme

As shown in Table 8, a total of 22 demonstration plots were established for the year and was used to train 1750 farmers. All of the plots are in their first cycle of production are currently on the ground.

Table 8: Number of Demonstration Plots, Farmers Field Schools & Farmers Trained in 2013

Region	R2	R3	R4	R5	R6	Total
# of Demo Plots	4	5	3	2	8	22
# FFS	8	15	8	2	21	54
# Farmers Trained	284	473	279	65	649	1750

In all farmers' field school sessions, farmers were trained in various aspects of plantain management with a bias to BSM, using established nutrition regime and proven fungicide application protocol. The highest adoption of the strategy is in the Crabwood Creek, Mara and Essequibo Islands. However, it must be noted that the handful of large farmers across the country is most adaptive to strategies developed and are the more successful.

In the Hinterland this disease is present in all three of the sub regions in Region 1 and some sign have been identified in the Lower Mazaruni in Region 7.

3.4 Services

Entomology, Plant Pathology & Weed Science Department

Plant diagnostics processed 173 samples for pest and disease problems and provided recommendations. Table 9 shows the major pests and diseases identified and the recommendations that were provided.

Table 9: Pest identified in 2013 and Recommendations

Pests	Causal Organisms	Crop Affected	Regions	Recommendations
Fusarium Wilt of Banana	<i>Fusarium oxysporum f.sp. cubense</i>	Banana	4	<ul style="list-style-type: none"> • Use resistant cultivars
Bacterial Blotch of Watermelon	<i>Pseudomonas sp.</i>	Watermelon	6	<ul style="list-style-type: none"> • Use clean seed material • Do not plant in contaminated soil • Clean and sanitize all equipment and tools • Apply copper base fungicide (2-3 application) at the early stages of flowering and continue until fruits are mature
Pepper Mild Mottle Virus (PMMoV)	Tobamovirus	Tomato, pepper	4,6	<ul style="list-style-type: none"> • Use clean planting materials • Practice good field sanitation
Post-harvest Deterioration of Cassava	Physiological disorder	Cassava	4	<ul style="list-style-type: none"> • Prune cassava stem leaving a 20-30 cm stub prior to harvest • Harvest at the correct time
Locust of coconut	<i>Tropidacris latreillei</i>	Coconut	6	<ul style="list-style-type: none"> • Use systemic insecticides to inject into

				palms
Red Palm Mite of Coconut	<i>Raoiella indica</i>	Coconut, Banana, Heliconia	2,3,4,5	<ul style="list-style-type: none"> • Use of natural enemies Amblyseius sp. and lace wing bug • Apply abamectin as spray or inject
Plague Thrips of Tomato	<i>Thrips imaginis</i>	Tomato	4	<ul style="list-style-type: none"> • Use systemic insecticides that are available • Practice crop sanitation
Plant Parasitic nematode	<i>Criconemoides sp.</i>	Soil		<ul style="list-style-type: none"> • Use resistant cultivars in crop rotation. • Disinfect tools and implements. • Soil fumigation with approved nematicide.

3.5 Production

The Institute was involved in the production of Acoushi Ant Bait, inocula, vegetable seedlings and fruit plants for the farming community. Table 10 below shows the quantities of each of the commodities provided produced in 2013.

Table 10: Production for 2013

Item	Quantity Production
Acoushi Ant Bait	10,000 packets
* Inocula	133kg
Vegetable Seed	
Ochro (Clemson Sprinkler)	26.0 kg
Ochro (Emerald Green)	7.0 kg
Boulanger (Long Purple)	4.9 kg
Bora	3.8 kg
Minica IV	1500kg
Pigeon Peas	4 kg
Black Eye	18 kg
Vegetable Seedlings	11,200
Fruit Plants	112,040
* Produced for GUYSUCO	

The production targets for 2013 were realised. It should be noted that NAREI produces seed material only for open pollinated vegetable crops.

4.0 NATIONAL PLANT PROTECTION ORGANIZATION (NPPO)

4.1 Quarantine Services

- To ensure that agricultural and other related commodities imported conforms to Guyana's import regulations and are free from pests of economic importance.
- To ensure that agricultural and other related commodities exported conform to the importing country's Phytosanitary requirements.
- Supervise the treatment administered on commodities for export and import.

4.2 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 non-conforming items of plant origin.

4.3 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 three hundred and ninety four (3,394) Phytosanitary Certificates were issued for export consignments (Table 11 & Figure 1).

Table 11: Major Commodities Exported and Phytosanitary Certificates Issued

Commodity	Number of PCs issued (January to December)	
	2012	2013
Rice	1538	1699
Sugar	206	100
Lumber	970	675
Fruits and Vegetables	765	553
Sand	56	30
Charcoal	-	10
Rice Bran	-	10
Wheat Flour	55	36
Wheat Middling	23	11
Soil Sample	3	2
Others	5	18

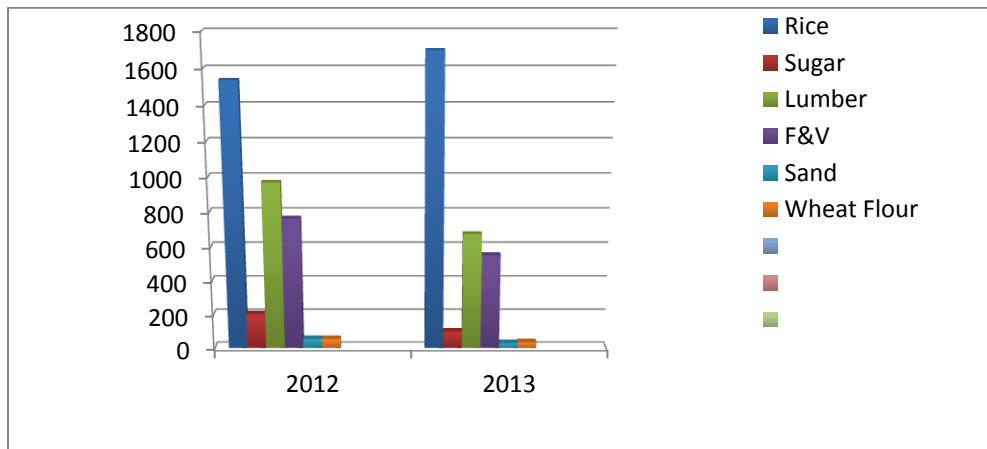


Figure 1: Showing Major Commodities Exported for years 2012 and 2013

As shown in Table 12 & Figure 2, a total of two hundred and fifty two (252) non-commercial exports were recorded for the period under review, while a total of three thousand one hundred and forty-two (3142) were recorded for commercial exports for the same period.

Table 12: Total Commercial and Non-commercial exports for years 2012 and 2013

Export Type	2012	2013
Commercial	3631	3142
Non-Commercial	293	252

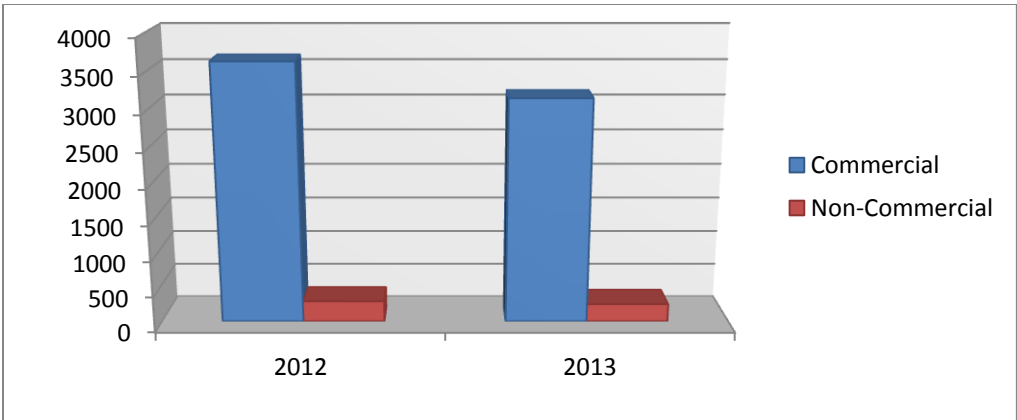


Figure 2: Showing Total Commercial and Non-commercial exports for years 2012 and 2013.

A total of two hundred and twenty nine (229) containers of Dried Coconut, Fruits and Vegetables were shipped to countries within the Caribbean region:

- Antigua – 4
- Barbados – 13
- Dominican Republic – 207
- Grenada – 1
- Trinidad & Tobago – 4

Air shipments consisting of Fruits and Vegetables amounted to a total of sixty (60):

Barbados – 27

USA - 32

St. Maarten- 1

5.0 THE INTERMEDIATE SAVANNAHS – EBINI 2013

1. Floyd Benjamin - Senior Research Technician
2. Kevin Gonsalves - Technician
3. N. Cumberbatch - Coordinator

(1) Programme: Special Project under the direct supervision of the Chief Executive Officer

The year 2013 was a watershed year for the Ebini Station, because, a major rehabilitation of some of the infrastructure of the station was planned and executed. The rehabilitation effort has caused considerable disruption to the station's activities particularly during the last quarter of the year, however, these works should auger well for the future of the station, particularly as it relates to the planned research and development programmes of NAREI, the food security programmes of Guyana, seed production of selected crops, germplasm evaluation and observation studies of introduced crops and managing plant genetic resources of coconut, mango and other important orchard crops.

The financing for the rehabilitation activities were made possible by the Agricultural Export Diversification Programme Loan No. 1929/BL-GY, with funds provided by the Inter-American Development Bank (IDB)

The infrastructural and capital work being undertaken at the Ebini Station, termed the Rehabilitation of the Ebini Research and Breeding Station include repairs to the office/laboratory complex, the renovation of the Ebini Guest House, the rehabilitation of the building earmarked to serve as a staff house for the Guyana Livestock Development Authority (GLDA), the installation of a new power generator plant, coupled with the erection of a new power generation house and the complete refurbishing of the power lines as well as the planting of new poles. Additional capital work being undertaken at Ebini, include the building of a calf pen as well as the erection of a corral for use by the GLDA.

The rehabilitation programme was not restricted to the repairs of buildings, the station was supposed to be the recipient in 2013 of a new Massey Ferguson 280 tractor with front bucket, a 7 ton dump trailer, and assorted implements.

In 2013, the Ebini station conducted a corn study centered on the development and selection of suitable lines, the production and supply of seeds and the development of production technological packages for the selected productive lines. The objective of the study was to identify the best performing entries under local conditions. The entries were obtained from International Maize and Wheat Improvement Center (CIMMYT), Regional Centre, Colombia.

In the area of the Special Projects, the Memorandum of Understanding which was developed between NAREI and BLUEWAVE Agricultural Company for the development of an agricultural complex in the Savannahs was signed during the reporting year. The BLUEWAVE Agricultural Company has a MOU with the Government of Guyana for the development of the lands in the Ebini Savannahs for large scale agricultural purposes. In keeping with the terms of the MOU signed with NAREI, the BLUEWAVE Agricultural Company has bought and handed over to the Ebini Station a refurbished Massey Ferguson 298 tractor.

The rainfall at the Ebini Station in 2013 was 2522.6 mm as compared to that of 2012 when the rainfall was 2094.mm. The rainfall in 2013 was the second highest rainfall total for the past five years. (Table 13)

Table 13: Rainfall Data for the Ebini Station, 2009, 2010, 2011, 2012 and 2013

Months	J	F	M	A	M	J	J	A	S	O	N	D	Total
2009	178	103	79.1	140	64.3	251	213	184	59.5	160	45	126	1602.9
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	2570.4
												1-16	

												Dec	
Rainfall (mm)	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
2011													
Rainfall (mm)	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
2012													
Rainfall 2013	39.8	332.4	63.9	187.8	441.5	411.5	315.7	252.1	17.8	108.3	95.7	256.1	2522.6

Figure 3 graphically shows the rainfall pattern for the past five years at Ebini 2009-2013. Traditionally the month with the most predictable rainfall was during the period May to July, however over the past five years only June and July seem to fit that pattern with the exception of May 2013, when the highest amount of rain was recorded. The graph also shows that with the rainfall pattern between the months of September –March, crop production in the Intermediate Savannahs for those crops that require 120 days for maturity and indeed the orchard crops would be difficult without irrigation. The only dependable period for crop production appears to be the period of May-August. There were 232 rainfall days for the year 2013 as compared with 200 for 2012.

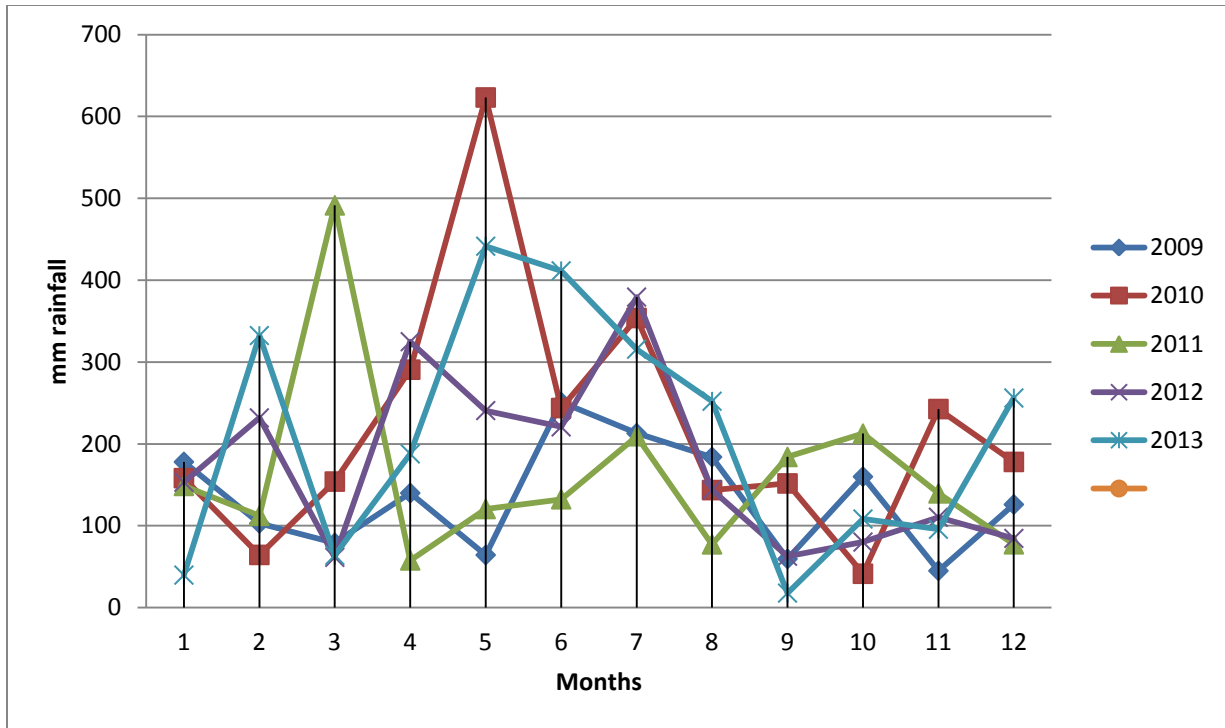


Figure 3: Chart showing rainfall for the years 2009-2013 at Ebini

(a) 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.

(b) 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.

One of the studies undertaken by the Ebini unit in 2013, was the Guyana Corn Varietal Evaluation Trial (Ebini)

Twenty two entries of corn seed were received from International Maize and Wheat Improvement Center (CIMMYT), Regional Centre, Colombia; (courtesy of Dr. D. P. Singh ITEC Consultant) these entries were to be compared with two local checks for performance under Guyana conditions. The objective of the study was to identify the best performing entries under local conditions.

The experimental design was a randomized complete block design study. There were three replications per block and there were three blocks. There were 24 plots per replication including the two local checks, totaling 72 plots per block. The individual plot size was 2.75X1.8 m, with a 1 m wide passage way between each replication. Corn seeds were planted in three rows per plot and 39 seeds were planted per plot. Three planting lines of length 2.75 m was used per plot. The plant to plant distance within rows was 30 cm and between rows the distance was 60 cm. The sowing was done at a depth of 5-7 cm and seeds were covered with soil at sowing.

The fertilizer used for the study was NPK (130:60:50 kg/ha) Half the dose of N and full P and K were applied at sowing. The remainder of the N was divided in two and applied at 25-30 days after planting and at 60 days after planting. The N was sourced from urea, the P from Triple Super Phosphate and the K from Muriate of Potash. Round-up was used as a pre-emergence herbicide, and the plots were hand weeded to control the weeds post emergence.

The following parameters were to be observed.

Table 14: Parameters to be Observed

Parameters	Results
Date of sowing	25-05-2013
Days for germination	12 days (06-06-13)
Plants germinated per plot	Poor between 11-40 %
Date of application of weedicide	26-05-2013
Top dressing of fertilizer	25-05-2013
Second fertilizer application	20 -06-2013
Days of 50% flowering	53-59 days
Days to maturity	120 days

The data obtained from the trial is appended and the analyzed results could be obtained from the Progress report of the study by D.P. Singh ITEC consultant.

(c)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 of NAREI. The unit planted for commercial seed production purposes in 2013, cowpea, corn, pigeon pea and sorghum. 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 Ebini unit were transferred to the Mon Repos Unit for storage, sale and distribution, a total of 1500kg of red pea seed was transferred to the Mon Repos Unit. Additionally, 18 kg of black eye pea seed was also transferred.

Table 15: Commercial Crops Planted at Ebini for 2013

Crop Type	Area planted	Date planted	Seed available (kg)
Cowpea Minica IV	2.5 ha	2013	1500
Pigeon pea	50 m ²	2013-07-04	4 kg
Sorghum	500 m ²	2013-06-20	1.4 kg
Black eye pea	825 m ²	2013-11-21	18 kg
Corn (M-92-A2)	2000 m ²	2013-07-04	Stored in cob
Corn (Pioneer)	744 m ²	2013-12-09	
Sorghum (Beharry)	300 m ²	2013-12-09	
Sorghum (3 D)	18 m ²	2013-12-09	
Cowpea Minica 4	0.25 m ⁴	2013-12-12	

(c) Orchard Crop Programme

The Department of Plant Genetic Resources and Biotechnology

The orchard crop programme is responsible for 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:

1. To establish basal collections of local mango varieties to serve as the national basal gene pool.
2. To establish basal collections of local coconut varieties representing the diversity of riverain and coastal ecologies.
3. To establish basal collections of local cassava and sweet potato varieties, and
4. To evaluate the growth and production of dwarf cashew varieties.

As part of the Orchard Crop programme, the PGR activities in the Intermediate Savannas 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.

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 16, the number in the mango row represents the number of plants in each row. During the reporting year the plots suffered severe damage as a result of a fire in October 2013, an assessment would be made of the plot after the May/June 2014 rainy period.

Table 16: Field Plan for the Ebini Mango Germplasm Plot, 2013

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
B 1	5	1	4	5	4	4	5	5	5	5	5	3	1	1	2	1	1	1	1	0	0	0	3	1
B 2	4	2	3	3	5	4	4	5	4	4	5	4	4	3	5	4	3	5	3	4	4	3	3	

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 Savannas. 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 17, 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 2013 all plants were fertilized with 12-12-17-2 fertilizer twice and some of the first plantings have begun to set fruit.

Table 17: Field plan for the Ebini coconut germplasm plot, 2013

Rows	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6
Plants /plot						
1	5	5	1	4	5	5
2	3	Nil	4	Nil	5	5
3	5	1	Nil	5	5	5
4	5	4	5	4	5	5
5	4	5	5	3	5	5
6	5	5	Nil	Nil	5	5
7	2	4	4	5	5	5
8	3	1	4	4	5	5
9	5	4	Nil	1	5	5
10	Nil	5	5	5	5	5
11	5	5	5	5	5	5

12	4	5	5	Nil	5	5
13	5	5	4	5	5	5
14	2	5	4	4	5	5
15	1	5	Nil	Nil	5	5
16	4	5	2	2	5	5
17	2	5	1	5	5	5
18	Nil	5	Nil	4	5	5
19	2	5	5	5	5	5
20	5	5	4	Nil	5	5
21	5	5	5	5	5	5
22	5	5	5	5	5	5

(d) The Horticulture Department

The orchard crops, such as the citrus, mango, guava, pineapple, cherry, golden apple and rambuttan 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 the following plants have been planted in the new orchard crop area as shown in table 18.

Table 18: New Orchard Crop

Crop type	Number of Plants	Date Planted
Citrus (Rough Lemon)	36	2013-07 and 2013- 12
Guava (White lady)	20	2013-12
Avocado Pear (Seedling)	24	2013-12
Sour sop	24	2013-12

(e) The Intermediate Savannahs Agricultural Project (INSAP)

The INSAP project was very active during the reporting year. The programme hosted a number of visits from potential investors who were desirous of investing in the Intermediate Savannahs.

Additionally, a Memorandum of Understanding was signed with the Blue Wave Company of India. The Blue Wave Company has an MOU with the Government of Guyana for the development of large scale agricultural projects for the Intermediate Savannahs. The MOU with NAREI is to conduct research on specific crops for the development of technological packages.

(f) 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.

**(g) The Agricultural Export Diversification Programme
Loan No. 1929/BL-GY**

Rehabilitation of the Ebini Research Station.

The rehabilitation of the Ebini Research Station was one of the programmes undertaken by the ADP programme in 2013. The rehabilitation include, repairs to the office/laboratory complex, the renovation of the NAREI Ebini Guest House, the rehabilitation of the building earmarked to serve as a staff house for the Guyana Livestock Development Authority (GLDA), the installation of a new power generator plant, coupled with the erection of a new power generation house and the complete refurbishing of the power lines as well as the erection and planting of new poles. Additional capital work being undertaken at Ebini, include the building of a calf pen as well as the erection of a corral for use by the GLDA.

The rehabilitation programme was not restricted to the repairs of buildings, equipment required for the work programmes were also supplied, the following equipment supplied are listed below.

Major equipment supplied to Ebini for the rehabilitation of the Ebini Research Station

1. One Massey Ferguson 280, four wheel drive tractor, with front end loader with extended frame.
2. One low profile dump trailer

3. One rotary (brush) cutter single deck
4. Post hole digger and accessories
5. Two FS160 brush cutters
6. One disc harrow
7. One SR 420 mist blower
8. One MS310 chain saw
9. One ACBCJD 190-60-213 KVA3 phase Broad Crown enclosed diesel generator. Serial number 58154
10. One X-Power 5000 watts power inverter
11. Six 140 watts solar panels
12. Two Pro Star 30 Amp charge regulators
13. One 3000 litre reserve fuel tank

6.0 MANGROVE MANAGEMENT PROJECT

This report covers the period of 12 months from January 1, 2013 through to December 31, 2013 and provides an overview of the activities which were implemented under the framework of the Guyana Mangrove Restoration Project (GMRP) financed by the Government of Guyana (GoG) and the European Union.

During the period under review, the Project Unit continued the implementation of the National Mangrove Management Action Plan (NMMAP) with guidance from the Mangrove Action Committee.

During the period the Project benefitted from technical expertise in several key areas which was provided through a Technical Assistance contract with Landell Mills Limited which was financed by the European Union. Twelve short term consultancies were fielded in areas of coastal engineering, GIS, Ecological Mangrove Restoration, mangrove research and mud bank identification and mapping. These consultancies provided critical information to aid decision making on site selection and restoration activities. The short term consultancies complimented the support provided by TA Team Leader and mangrove specialist, James Machin who provided Project Management, site selection, data collection and analysis support to the project team.

Mangrove restoration through planting and other supporting interventions resulted in the restoration of 1.48Km of coastline with *Avicennia germinas* seedlings (black mangroves) in Region #6 and Region #2 during the year. Seventeen community nurseries were established in Region 6 for the production of 50,000 seedlings. Thirty six thousand seedlings were planted to protect 1.03km at Kilmarnock, Region #6 and 11,984 seedlings to protect .45 km at Lima, Region 2. Three hundred and twenty meters of coastline was planted with spartina grass to aid in accretion of the shoreline and support natural mangrove regeneration to compliment to the seedling planting program.

During the period under review, the Project executed several coastal engineer interventions to support mangrove restoration. Three thousand seven hundred meters of coastline was protected through coastal engineering interventions. These included:

- Construction of 321m rubble mound groyne field along the coastline at Cane Garden, Leguan. This structure will support the accretion of sediments along 1,943m of coastline and reduce further erosion of the coastline. In the long term the accreted area will be restored with mangroves.
- Construction of a 65m rubble mound groyne to protect 442m of existing mangroves and aid in accretion of 450m of shoreline to protect the residents of Mon Repos, East Coast Demerara.
- Construction of 463m Bamboo Brushwood dam at Buxton, East Coast Demerara. The bamboo brushwood dam assembly is intended to act as a breakwater to dissipate wave energy and promote sediment deposition in the lee of the structure.
- Construction of 135m Bamboo Brushwood dam at Anna Regina, Essequibo Coast.
- Construction of 868m iron bamboo fence to protect young mangrove seedlings from being destroyed at Village #8 WCB.

Mangrove protection and monitoring was enhanced with the completion of the GIS based monitoring system and continued engagement of nine community mangrove rangers and six active Village Mangrove Action Committees. The GIS system was developed to allow web-based access and allow GMRP users more efficient and focused ways to interact with GIS to generate results and products that suit their needs. Similarly, the system will allow stakeholders and sister agencies to access information and share data on mangrove cover along the coastline.

Mangrove Research and Development during the period was enhanced with the successful hosting of the 1st Guyana Mangrove Forum which saw the participation of seven regional countries and 27 technical presentations on mangrove restoration

and management. Ten research projects were completed through the Project's Grant scheme in collaboration with the University of Guyana. These research projects were complimented by the completion of a research database and research strategy. The database consisted of a total of seventy four documents including completed and solicited research projects, relevant academic papers and project reports related to mangroves and coastal zone research in Guyana. The research strategy attempted to find answers to some of the critical questions underlying the issues of mangrove losses and restoration in Guyana and identified priority research areas. The database will be linked to the Project's website and continuously updated to ensure researchers have access to data available on Guyana's mangroves.

Technical assistance was also provided for critical preliminary research on the importance of mud banks to the restoration of Guyana's coastal mangrove forest.

During the period the Project engaged in an ongoing public awareness and education campaign on the importance of mangroves, building on initiatives started during the previous years. The Mangrove Visitor Center and complimenting Mangrove Heritage Trail Tour facilitated over 1500 visitors inclusive of students and tourists. Twenty schools participated in mangrove education tours.

As part of the Project's ongoing collaboration with the Ministry of Education through NCERD, Guyana's celebration of World Plant Day was hosted at the Mangrove Visitors Center. This collaboration also saw the successful hosting the 1st Mangrove Schools Essay and Poster competition which saw the participation of 246 students from across Guyana.

7.0 BIOENERGY

The Bioethanol Plant has been commissioned at Albion Estate and will commence full operation in the upcoming sugar crop slated to begin 28th February 2014. This facility has the capacity to produce 1000 liters/day of anhydrous ethanol. This fuel will primarily be blended with gasoline to create a E10 blend and used to fuel vehicles. This would be done on a limited number of vehicles for an evaluation period of six (6) months before expanding its use. All the components necessary including the blending has already been installed.

This facility will serve an important teaching and research resource as we seek to advance the biofuel knowledge base in Guyana. In fact, several University of Guyana students and researchers are currently engaged in studies at the facility.

8.0 PUBLICATIONS

There were four publications done in 2013.

1. Homenauth, O & Cumberbatch, R. N & Austin, R. : ***"Farmer's Manual: Livestock Production"***, NAREI, November 2013
2. Homenauth, O & Cumberbatch, R. N. ***"Understanding Pastures: A Guide for Guyana"***, November 2013
3. Homenauth, O (2013): ***"Fertilizer Manual (Concepts, Application, Storage and Handling)"***, November 2013
4. Homenauth , O. ***"Training Manual "Protected Agriculture System"***, 2013

9.0 HUMAN RESOURCES DEPARTMENT REPORT, 2013

1. RECRUITMENT – Fifty-one (51) persons were recruited in 2013 as follows:

A. CROP DEVELOPMENT AND SUPPORT SERVICES

Name	Designation	Date of Employment
1. Reynard Ward	District Crop Ext. officer (Reg. # 5)	2013-02-01
2. Nehal Patterson	District Crop Ext. Officer (Reg. # 3)	2013-02-01
3. Patel Jairam	Crop Extension Assistant (Reg. # 4)	2013-05-01
4. Vitus Spencer	District Crop Ext. Officer (Reg. # 9)	2013-08-05
5. *Edmund Inniss	District Crop Ext. Officer (Reg. # 9)	2013-09-03
6. *Kwesi Smartt	District Crop Ext. Officer (Reg. # 3)	2013-09-03
7. *Gavin Glen	District Crop Ext. Officer (Reg. # 4)	2013-09-03
8. *Talica Bristol	Crop Extension Assistant (Reg. # 3)	2013-09-03
9. *Yashma Subhai	District Crop Ext. Officer (Reg. # 6)	2013-09-03
10. *Oдания Chisholm	District Crop Ext. Officer (Reg. # 4)	2013-09-03
11. *Ryan Marco	Crop Extension Assistant (Reg. # 9)	2013-09-03

*Represent Bonded Scholars – Paid by Ministry of Agriculture

B. GENERAL ADMINISTRATION AND FINANCE

Name	Designation	Date of Employment
1. Victoria Simpson	Security Supervisor (Mon Repos)	2013-05-01
2. Gangaram Raghbir	Security Guard (Mon Repos)	2013-05-01
3. Poonsammy Dasanmangarazon	Security Guard (CEO Residence)	2013-05-01
4. Bhagouti Mahabir	Security Guard (Mon Repos)	2013-05-01
5. Roland Doorga	Security Guard (Reg. # 2)	2013-05-01
6. Lloyd Doorga	Security Guard (Reg. # 2)	2013-05-01
7. Donnette Harry	Security Guard (Mon Repos)	2013-05-01
8. Peter Jones	Security Guard (Mon Repos)	2013-05-01
9. Denise John	Security Guard (Mon Repos)	2013-05-01
10. Kim Jackson	Security Guard (Mon Repos)	2013-05-01

11. Joyline Jonas	Snr. Security Guard (Mon Repos)	2013-05-01
12. Dravindra Ramkissoon	Security Guard (Reg. # 6)	2013-05-01
13. Bhagwatnarine Ramsarran	Security Guard (CEO Residence)	2013-05-01
14. Karen Phillips	Security Guard (Mon Repos)	2013-05-01
15. Harripaul Arjoon	Security Guard (Mon Repos)	2013-05-01
16. Moses Jackson	Snr. Security Guard (Mon Repos)	2013-06-02
17. Dawn Newark	Security Guard (Mon Repos)	2013-08-02
18. Chandradat Arjoon	Office Assistant/Driver (Mon Repos)	2013-09-05
19. Erika Haag Tularam	Projects/Public Relations Officer	2013-10-01
20. Rajaindra Singh	Deputy Chief Executive Officer	2013-12-09

C. GENERAL SERVICES

Name	Designation	Date of Employment
1. Abiola Gordon	General Worker (Mon Repos)	2013-06-03
2. Ralph Pollard	General Worker (Mon Repos)	2013-06-03
3. Udysteir Ram	General Worker (Mon Repos)	2013-06-03
4. Arnold Naraine	Heavy Duty Operator (Mon Repos)	2013-08-05
5. Roland Jones	Driver (Mon Repos)	2013-09-02
6. Avinash Hereman	General Worker (Ebini)	2013-11-01
7. Rohit Sanichar	General Worker (Lesbeholden)	2013-11-01
8. Glendon Rodrigues	General Worker (Kairuni)	2013-11-25

D. NATIONAL PLANT PROTECTION OFFICE

Name	Designation	Date of Employment
1. Seema Singh	Plant Quarantine Officer	2013-08-05
2. Lionel Ramdin	Plant Quarantine Officer (Mon Repos)	2013-08-20
3. *Kendra Belgrave	Plant Quarantine Officer (Timehri)	2013-09-03
4. * Anawatie Gobind	Plant Quarantine Officer (Timehri)	2013-09-03
5. * Kesta Smartt	Plant Quarantine Officer (Mon Repos)	2013-09-03
6. * Leon Folkard	Plant Quarantine Officer (Mon Repos)	2013-10-24

E. RESEARCH AND DEVELOPMENT

Name	Designation	Date of Employment
1. Vickram Persaud	Research Assistant (Mon Repos)	2013-02-01
2. *Analesa Skeete	Research Assistant (Mon Repos)	2013-09-03
3. *Cliffton Joseph	Research Assistant (Mon Repos)	2013-09-03
4. *Lancelyn Sucre	Research Assistant (Mon Repos)	2013-09-03
5. *Rachel Carew	Research Assistant (Mon Repos)	2013-09-03
6. Amrita Churaman	Research Assistant (Mon Repos)	2013-09-23
7. Arifea Hassan	Research Technician (Mon Repos)	2013-11-18

2. **RESIGNATION – Ten (10) persons tendered their resignations as follows:**

A. **CROP DEVELOPMENT AND SUPPORT SERVICES**

Name	Designation	Date of Resignation
1. Raul Khan	Training Officer	2013-01-01
2. Latchman Bhola	Crop Extension Assistant	2013-03-01
3. Verrick Jaundoo	District Crop Ext. Officer	2013-12-18

B. **GENERAL SERVICES**

Name	Designation	Date of Resignation
1. Punadai Roopnarine	General Worker	2013-03-01
2. Terrence Edwards	General Worker	2013-10-31

C. **MANGROVE**

Name	Designation	Date of Resignation
1. Winston Walcott	Driver	2013-08-14

D. **RESEARCH AND DEVELOPMENT**

Name	Designation	Date of Resignation
1. Sharon Nicholson	Research Technician	2013-04-30
2. Rebecca Brehaspat	Research Technician	2013-08-26
3. Chitradai Deonarine	Research Assistant	2013-09-13
4. Shelika Vyphuis	Research Technician	2013-09-16

3. **DISMISSAL – Two (2) persons were dismissed as follows:**

A. **GENERAL ADMINISTRATION AND FINANCE**

Name	Designation	Date of Dismissal
1. Harripaul Arjoon	Security Guard	2013-02-21

B. GENERAL SERVICES

Name	Designation	Date of Dismissal
1. Evorn Edwards	General Worker	2013-04-24

4. **VOLUNTARY WITHDRAWAL OF SERVICE – Two (2) persons have withdrawn their service as follows:**

A. GENERAL SERVICES

Name	Designation	Date of Withdrawal
1. Bivendra Budhu	General Worker	2013-10-22
2. Sasenauth Ramsarran	General Worker	2013-10-29

5. **NON RENEWAL OF CONTRACTS – Three (3) persons contracts were not renewed**

A. CROP DEVELOPMENT AND SUPPORT SERVICES

Name	Designation	Date of Non-Renewal
1. Joshua Sagar	Crop Extension Assistant	2013-04-30

B. GENERAL SERVICES

Name	Designation	Date of Non Renewal
1. Raghubeer Singh	Driver	2013-04-30

C. RESEARCH AND DEVELOPMENT

Name	Designation	Date of Non Renewal
1. Jean Paul Santos Mendez	Research Assistant	2013-04-30

6. **MEDICALLY UNFIT FOR SERVICE – One (1) person came off Medically unfit as follows:**

A. **GENERAL ADMINISTRATION AND FINANCE**

	Name	Designation	Date Severed
1.	Sooknarine Shadrock	Security Guard	2013-02-28

7. **PROMOTION – Three (3) persons were promoted as follows:**

A. **CROP DEVELOPMENT AND SUPPORT SERVICES**

	Name	Designation	Date
of Promotion			
1.	Brijesh Singh	Regional Crop Ext. Officer	2013-05-01

B. **NATIONAL PLANT PROTECTION OFFICE**

	Name	Designation	Date of Promotion
1.	Shamane Richmond	Plant Quarantine Officer	2013-05-01

C. **RESEARCH AND DEVELOPMENT**

	Name	Designation	Date of Promotion
1.	Kumar Bishundial	Nursery Supervisor	2013-05-01

8. **TRANSFER – Three (3) persons were transferred as follows:**

A. **CROP DEVELOPMENT AND SUPPORT SERVICES**

	Name	Designation	Date of Transfer
1.	Benjamin Frank	Training Manager	2013-08-02
2.	Chevy Bissessar	District Crop Ext. Officer	2013-08-02

B. RESEARCH AND DEVELOPMENT

Name	Designation	Date of Transfer
1. Dork Bess	Research Technician	2013-10-21

9. REDESIGNATION – Two (2) persons were re-designated as follows:

A. CROP DEVELOPMENT AND SUPPORT SERVICES

Name	Designation	Date
Re-designated		
1. Benjamin Frank	Training Manager	2013-08-02
2. Chevy Bissessar	District Crop Ext. Officer	2013-08-02

Table 19: Staffing at NAREI

Categories	No. of Positions	Positions Filled	Position Vacant
Crop Extension Services	99	79	20
General Admin. & Finance	82	51	31
General Services	157	114	43
National Plant Protection Office	52	*31	27
Research and Development	91	47	44
Total	481	322	165

* Represents overlapping of six (6) Plant Quarantine Officers which is reflected under staffing at NPPO

NON CONTRACTED EMPLOYEES

Extension Agents 18
 Petty Contract Workers 1

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

Category	Authorized Positions	Positions Filled	Vacant Post
Deputy Chief Executive Officer	1	1	0
National Crop Extension & Training Coordinator	1	0	1
Training Manager	1	1	0
Regional Crop Extension Officer	12	6	6
District Crop Extension Officer	30	30	0
Training Officer	1	0	1
Senior Crop Extension Assistant	13	4	9
Crop Extension Assistant	40	37	3
Total	99	79	20

The Hinterland and the Coastal Coordinators are reflected as Regional Crop Extension Officers, hence their current positions are not stated.

Table 21: Staffing in the General Administration and Finance Department

Category	Authorized Positions	Positions Filled	Vacant Post
Deputy CEO (Admin. & Finance)	1	1	0
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
Projects/PRO	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	18	12
Total	82	51	31

Table 22: Staffing in the General Services Department

Category	Authorized Positions	Positions Filled	Vacant Post
Heavy Duty Operator	10	7	3
Drivers/Office Assistants	20	6	14
Well Operator	1	1	0
Welder	1	1	0
General Workers	125	99	26
Total	157	114	43

Table 23: Staffing in the National Plant Protection Office

Category	Authorized Positions	Positions Filled	Vacant Post
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	*11	0
Senior Plant Quarantine inspector	5	0	5
Senior Plant Protection Assistant	4	0	4

Plant Protection Assistant	10	0	10
Plant Quarantine Inspector	20	16	4
Total	52	31	27

*Six (6) additional Plant Quarantine Officer were employed in 2013

Table 24: Staffing in the Research & Development Department

Category	Authorized Positions	Positions Filled	Vacant Post
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	21	9
Nursery Supervisor	5	1	4
Senior Research Technician	6	2	4
Research Technician	16	8	8
Laboratory Attendant	10	7	3
Total	91	47	44

TRAINING

OVERSEAS

Workshops/Forums/Training Courses/Seminars/Meetings

1. Mr. Cleveland Paul, Research Scientist, participated in the ASTI workshop on "Tracking Agricultural R & D Investments and Capacities in Central America and the Caribbean", held in San Jose, Costa Rica, during the period March 19 to 20, 2013.
2. Ms. Zareefa Bacchus, Plant Quarantine Officer, participated in the "WTO/CARICOM Regional Workshop on Agriculture and Sanitary and Phytosanitary Measures for the Caribbean," held in Christ Church,, Barbados during the period July 9 to 11, 2013.
3. Dr. Oudho Homenauth, Chief Executive Officer, participated in a Forum for Leaders in Agriculture, held in Costa Rica during the period May 19 to 25, 2013.
4. Mr. Basudeo Dwarka, Deputy Chief Executive, participated in the Caribbean Regional Climate Service forum, held in Trinidad and Tobago, during the period May 22 to 31, 2013.
5. Mr, Rohit Singh, Coastal Crop Extension Coordinator and Ms. Somwattie Pooran-DeSouza, Research Scientist, participated in a Regional Training course on "Biological Methods for monitoring fungicide Resistance on *Mycosphaovella Fijiensis* populations", held in Dominica, during the period June 17 to 22, 2013.
6. Ms. Sherilyn Perry, Regional Crop Extension Officer and Mr. Paul McWatt, Plant Protection Officer, participated in a Training Course on Carambola Fruit Fly Control and Eradication supporting project, held in Brazil during the period June 17 to 24, 2013.

7. Mr. David Fredericks, Research Scientist, participated in a Training Course on Public Policies, Focused on Family Agriculture and Food Nutrition Security, held in Brazil during the period June 21 to 29, 2013.
8. Mr. Cleveland Paul, Research Scientist, participated in a Regional Seminar on “New Plant Variety Protection, Under the UPOV Convention, hosted by the Intellectual Property Office, Ministry of Legal Affairs”, held in Trinidad and Tobago during the period July 01 to 02, 2013.
9. Dr. Oudho Homenauth, Chief Executive Officer, participated in the 6th Meeting of the Caribbean Plant Health Directors, held in Sonasta, St. Maarten, during the period July 17 to 19, 2013.
10. Dr. Oudho Homenauth, Chief Executive Officer, participated in the Launch of the FAO Global Soil Partnership: Towards and prevention, conservation and restoration of degraded soils in Central America and the Caribbeans, held in Cuba, during the period September 30 to October 03, 2013.

LOCAL

Workshop

1. Several staff members of NAREI participated in a Training Workshop on Domestic Violence and Gender Base Violence, held at NAREI’s Conference facility on 2013 November 22.

10.0 FINANCIAL REPORT



NATIONAL AGRICULTURAL RESEARCH & EXTENSION INSTITUTE



STATEMENT OF FINANCIAL POSITION

AS AT 31st DECEMBER, 2013

	Note	As At 31.12.2013	As At 31.12.2012
	\$	\$	
<u>Assets</u>			
<u>Non Current Assets</u>			
Property, Plant & Equipment	8	235,940,622	236,985,626
Total Non Current Assets		235,940,622	236,985,626
<u>Current Assets</u>			
Inventory	10	125,586,903	13,414,673
Debtors	11	41,809,483	20,957,178
Short Term Investment	12	5,399,684	5,384,202
Cash and Bank	6	257,473,070	84,161,810
Total Current Assets		430,269,139	123,917,863
Total Assets		666,209,762	360,903,489



NATIONAL AGRICULTURAL RESEARCH & EXTENSION INSTITUTE




STATEMENT OF FINANCIAL POSITION

AS AT 31st DECEMBER, 2013

	Note	As At 31.12.2013 \$	As At 31.12.2012 \$
<u>Equity & Liabilities</u>			
<u>Equity</u>			
Grant from Foreign Sources	13	51,897,479	51,897,479
Government of Guyana Contribution	7	775,739,804	554,504,647
Revaluation of Stock		341,781	341,781
Accumulative Surplus/(Deficit)		(174,092,102)	(283,481,555)
Total Equity		653,886,962	323,262,351
<u>Liabilities</u>			
<u>Non Current Liabilities</u>			
Ministry of Public Works	14	5,606,815	5,606,815
ASDU/Project Funds	15	-	21,912,396
Total Non Current Liability		5,606,815	27,519,211
<u>Current Liabilities</u>			
Creditors	16	6,715,985	10,121,927
Total Current Liabilities		6,715,985	10,121,927
Total Equity & Liabilities		666,209,762	360,903,489

The accompanying notes form an integral part of these financials statements. These financial statements were signed on the 30th April 2014 by:



Senior Finance Manager



Chief Executive Officer



NATIONAL AGRICULTURAL RESEARCH & EXTENSION INSTITUTE



STATEMENT OF COMPREHENSIVE INCOME

FOR THE PERIOD ENDED 31st DECEMBER, 2013

	Note	Period Ended 31/12/2013	Period Ended 31/12/2012
<i>Revenue</i>			
Government of Guyana Subvention	2	619,386,480	538,009,000
Income from Operation	3	23,374,042	31,494,947
Other Income	4	227,264,704	18,342,618
Interest Earned	5	132,657	280,191
Total Revenue for the year		870,157,883	588,126,756
<i>Expenditure</i>			
Wages & Salaries		403,782,812	366,854,046
Overhead Expenditure		57,622,028	56,576,788
Material, Equipment & Supplies		32,864,902	32,232,868
Fuel & Lubricant		19,220,761	21,420,757
Rental & Maintenance of Buildings		7,413,351	10,918,000
Maintenance of Infrastructure		1,791,821	3,896,401
Transport, Travel & Postage		42,946,659	35,123,878
Utility Charges		32,661,330	26,882,937
Other Goods & Services		23,066,240	28,536,672
Other Operating Expenses		93,160,493	14,701,404
Education Subvention & Training		1,763,723	749,700
Old Age Pension		1,035,156	1,053,572
Disposal	8	60,000	7,744,991
Depreciation		43,971,327	40,499,185
Total Expenditure for the year		761,360,603	647,191,199
Surplus/Deficit for the year		108,797,281	(59,064,443)



NATIONAL AGRICULTURAL RESEARCH & EXTENSION INSTITUTE



STATEMENT OF CHANGES IN EQUITY

FOR THE PERIOD ENDED 31 DECEMBER, 2012

	Grants from Foreign Sources	Government of Guyana Contribution	Revaluation of Stock	Accumulated Surplus/Deficit
Balance as at 01.01.2012	51,897,479	554,504,647	341,781	(283,481,555)
Adjustment to Surplus/Deficit as at 01.01.2012				592,173
Surplus/Deficit as at 31.12.2012				108,797,281
Capital Contribution		407,509,232		-
Capital Contribution adjustment		(186,274,075)		
Balance as at 31.12.2012	<u>51,897,479</u>	<u>775,739,804</u>	<u>341,781</u>	<u>(174,092,102)</u>

NATIONAL AGRICULTURAL RESEARCH & EXTENSION INSTITUTE
NOTES TO THE FINANCIAL STATEMENT
FOR THE PERIOD 1st JANUARY 2013 TO 31st DECEMBER 2013

Note: 1

i. NAREI

The National Agricultural Research and Extension Institute (NAREI) became operational on the 1st May 2011. The establishment of NAREI required the removal of the Extension Service from the jurisdiction of the Crops and Livestock Department and the creation of a separate unit called the Crop Development Support Services (CDSS) under NAREI to foster the link between research and extension.

The operations of NAREI are now governed by a Board of Directors and the associated Advisory Committees to cover Research, Extension (CDSS) and Crop Protection (National Plant Protection Organisation).

ii. ACCOUNTING POLICIES

The Financial Statements of NAREI were prepared in accordance with the International Accounting Standards (IAS). All assets and liabilities of NARI were transferred to the new entity at historical cost, based on NARI's Statement of Financial Position as at 30th April, 2011. The Institute is awaiting from the Ministry of Agriculture, a list of all assets transferred before a revaluation can be done to reflect a true value of NAREI.

iii. NON CURRENT ASSETS

Depreciation is charged on non-current assets in accordance with IAS 16 (Property, Plant & Equipment), on a straight line basis. However, depreciation is not charged on freehold land, capital work in progress and livestock. The Institute does not charge any depreciation in year of acquisition. The following depreciation rates are used:

Building	5%
Motor Vehicle	20%
Machinery & Equipment	20%
Laboratory Equipment	20%
Household Furniture & Fittings	20%
Library Books	15%

iv. INVENTORY

Inventory is valued at the lower of cost or net realizable value in accordance with IAS 2 (Inventory), and is issued on a first in first out basis.

NATIONAL AGRICULTURAL RESEARCH & EXTENSION INSTITUTE

NOTES TO THE FINANCIAL STATEMENT

FOR THE PERIOD 1st JANUARY TO 31st DECEMBER 2013

Note		31/12/2013	31/12/2012
		\$	\$
2	Subvention	619,386,480	538,009,000
3	<u>Income from Operation</u>		
	Sale of Plant	12,945,737	12,087,710
	Sale of Ducklings		6,829,010
	Sale of Livestock		703,210
	Acoushi Ants Bait	148,820	148,700
	Other Agri Produce	189,910	166,704
	Rental of Houses	2,233,200	2,072,363
	Sale of Seeds	853,950	428,250
	Technical Services	6,568,925	7,765,000
	Tender Documents	231,000	74,000
	Sanitation & Maintenance Fee	202,500	1,220,000
	Total Income from Operation	23,374,042	31,494,947



NATIONAL AGRICULTURAL RESEARCH & EXTENSION INSTITUTE



NOTES TO THE FINANCIAL STATEMENT

FOR THE PERIOD 1st JANUARY TO 31st DECEMBER 2013

Note: 8

	Buildings	Mach. & Equip. & Motor Vehicle	Furniture & Fittings & Office Equipment	Laboratory Equipment	Library Books	Animals	Construction Work In Progress	Grand Total
<u>Percentage</u>	5%	20%	20%	20%	15%	0%	0%	
<u>Costs</u>								
As At 01-01-2013	327,646,942	212,831,336	73,645,366	79,098,025	2,262,388			695,484,057
Acquisition as at 31.12.2013	19,985,439	19,704,796	2,572,888	723,200				42,986,323
Disposal/Transfer		1,875,000						1,875,000
As At 31-12-2013	347,632,381	230,661,132	76,218,254	79,821,225	2,262,388	-	-	740,345,380
<u>Depreciation</u>								
As At 01-01-2013	174,079,388	151,353,885	60,962,811	69,855,100	2,247,247	-	-	458,498,431
Charge as at 31.12.2013	15,857,729	18,922,340	4,190,762	4,989,287	11,208	-	-	43,971,327
Accumulated Depreciation on Disposal *		1,815,000						1,815,000
As At 31-12-2013	189,937,117	168,461,225	65,153,573	74,844,387	2,258,455	-	-	504,284,758
Net Book Value	157,695,264	62,199,907	11,064,681	4,976,838	3,933	-	-	235,940,622

National Agricultural Research and Extension Institute
Activities under taken and achievements during Jan.-Dec. 2013 based on Strategic Objectives

National Agricultural Research and Extension Institute
Activities under taken and achievements during Jan.-Dec. 2013 based on Strategic Objectives

No.	Activity	Achievements	Possible Impact
1	Finalization of 'Strategic Research and Development Agenda (SRDA)' of NAREI for 2013-20 (short and medium term)	The SRDA of NAREI for the period of 2013-2020 was finalized. Following presentation to the Board, appropriate adjustments were made.	Will help to provide a road map for tuning up and revamping of research, extension, training and developmental activities at NAREI. The technologies developed will be more relevant to the stakeholders. It will help to generate resources and use these effectively.
2	Genetic Resource Enhancement	The improved germplasm with new genetic background and suitable for conditions of Guyana (corn, wheat, cassava, chickpea, beans, lentil, grass pea, hot pepper, Guava, fenugreek) were imported free of cost from CGIAR Institutes like CIMMYT, ICARDA and CIAT.	It will broaden the genetic base of crops leading to release of high yielding and tolerant varieties to biotic and abiotic stresses. A guava orchard of improved variety was planted at NAREI.
3	All Guyana coordinated varietal evaluation trials	The new project on crop improvement was submitted. The yield trials of corn, hot pepper and wheat were conducted at NAREI and Ebini. During the second half of 2013, three corn trials having 48 numbers of new varieties were being conducted at the Commercial farm of NAREI.	The varietal evaluation trial of improved corn was planted during the first half of 2013 at NAREI and Ebini. The report was prepared and economic of cultivation was calculated. The new varieties were found extremely high yielding (>13 times) than local corn varieties.

4	Crop Protection	The extension programme conducted 31 on farm demonstrations in Regions 2, 3, 4, 5 and 6 on IPM of the Black Sigatoka Disease of plantain. A total of 1,870 farmers were trained on management of the disease using IPM techniques. Likewise, extension staff was trained on the identification of the Red Palm Mite in coastal areas. A total of 800 nests of Acoushi Ant were treated in Regions 1, 4, 7, 8, 10 and 15.	The proper management of the diseases will help to get cleaner produce and better yields.
5	Facilitation of export of plant produce from Guyana through health certification	The inspection of produce (rice, sugar, lumber, fruits and vegetables) for export was done at ports, containers and packaging facilities. Farm certifications were done in Regions 2, 3, 4 and 5 to promote export to different countries.	It facilitated timely and smooth export of plant products.
6	Monitoring of strategic pests	The surveys and surveillances were undertaken to monitor the presence and intensity of important insect pests like 'Carambola Fruit Fly' (<i>Bactrocera carambolae</i>), 'Pink Mealy Bug' (<i>Maconellicoccus hirsutus</i>), 'Papaya Mealy Bug' (<i>Paracoccus marginatus</i>), 'Mediterranean Fruit Fly' (<i>Ceratitis capitata</i>), 'Pink Mealy Bug', 'Mango Seed weevils', 'Giant African Snail' and 'Red Palm Mites'. The 'Red Palm Mite' was found in Islands of Wakenaam and Leguan whereas Hogg Island, three villages and seventeen Grants along the Pomeroon River as well as New Amsterdam town covering 49 villages were found free from pest. No presence of Giant African Snail was detected in Guyana. The incidence of Pink and Papaya Mealy Bugs was not alarming. A total 25,000 lbs of illegally imported bananas from Suriname was seized.	The survey will help in managing the pests effectively in future and promotion of export.

7	Supply of planting material	The seedlings of promising fruit trees and improved seeds of crops and vegetables were produced and supplied to farmers. . A culinary herbs garden was established at NAREI headquarters.	The impact will be visible in years to come in terms of crop diversification, increased productivity, quality and profitability as well as export.
8	Bio ethanol Production project	The installation and operation of the bio ethanol plant at was done at Albion Estate, Berbice. Thirty-nine trainees from fifteen agencies/ institutions across Guyana were trained at the bio ethanol plant. The training was targeted to provide basic knowledge and functioning of the main components of plant, operations, quality control, plant maintenance and safety guidelines. The Agro-Energy Policy was drafted and submitted to Hon. Dr. Leslie Ramsammy, Minister of Agriculture.	The bio ethanol research will add to energy security of Guyana. The policy will serve as a guide for the development, growth and support of this sector
9	Extension and training	Five thousand, three hundred and sixty seven farmers were trained in Guyana on best crop practices related to use of fertilizers and integrated pest management. About nine thousand farmers were registered during 2013.	The training will be helpful in increasing the crop production and help in keeping the environment clean.
10	Human Resource Development	Trained technical staff and students in conduct of research trials and evaluation of germplasm. In-House Training sessions/ workshops were conducted for Quarantine Inspectors/ Officers on identification, surveys and control of pests like Red Palm Mite, Carambola Fruit Flies (CFF), pests of fruits and vegetables, and on New Plant Protection Act 2011.	Trained technical staff and UG student associated with me in conduct of field trials, crop production and evaluation of varieties, germplasm and seed production. The transfer of knowledge will help to carry out the research work once ITEC expert leave NAREI. The plant quarantine staff will be more effective in performing duties.
11	Events organized	The world food day, NAREI day etc. were organized at NAREI.	It promoted the research and development in the country and region.

12	Collaborations	NAREI collaborated with CARICOM, FAO, ITEC, IICA, GLDA, GMC, GNBS, CIAT, CIMMYT, ICARDA, CARDI etc.	It gave edges to NAREI for research and development.
13	Infrastructure developed	The laboratory buildings are being renovated at NAREI. Likewise new civil work was done at Kairuni and Timheri centre	The infrastructure will help to managing the day to day operations effectively in research and development.

**COST OF PRODUCTION FOR TOMATOES UNDER SHADE HOUSE
CULTIVATION FIELD 17**

Area cultivated: 60m²

Category	Details	Total cost G/\$
Materials		
Seedlings	300	3000
Fertilizer (Pen manure)	180kg@ \$4 per kg	720
Trellising material	300 sticks @ \$100 each	3000
Agrochemicals	For pest control	4000
Labour		
Land preparation	1 man day@ 2000	2000
Transplanting	2 hrs @ \$250	500
Spraying	2 man days @2000	4000
Weeding	6 man days @ 2000	8000
Trellising	1 man day @ 2000	2000
Fertilizer application	1hr @ 250	250
Harvesting	3 man days @2000	6000
Total operational cost		33,470

Total Yield = 298 kg

RETURNS = TOTAL YIELD X SALE PRICE PER KG

=298 X \$300 = \$89400

PROFIT = RETURNS – TOTAL OPERATIONAL COST

= \$ 89400 – 33470 = \$ 55930

Profit/acre = G\$3,728,666

COST OF PRODUCTION FOR SWEET PEPPER (SWEET BULLNOSE) UNDER SHADE HOUSE CULTIVATION FIELD 17

Area cultivated: 45M²

Category	Details	Total cost G/\$
Materials		
Seedlings	240	2400
Fertilizer (Pen manure)	135kg@ \$4 per kg	540
Foliar fertilizer	0.2 liters	625
Agrochemicals	For pest control	3500
Labour		
Land preparation	1 man day@ 2000	2000
Transplanting	2 hrs @ \$250	500
Spraying	2 man days @2000	4000
Weeding	6 man days @ 2000	8000
Fertilizer application	3hrs @ 250	750
Harvesting	2 man days @2000	4000
Total operational cost		26315

Total Yield = 64 kg

RETURNS = TOTAL YIELD X SALE PRICE PER KG

=64 X \$900 = \$57600

PROFIT = RETURNS – TOTAL OPERATIONAL COST

= \$ 57600- 26315 = \$ 31285

Profit/acre = G\$2,780,888

**COST OF PRODUCTION FOR POI UNDER SHADE HOUSE CULTIVATION
FIELD 17**

Area cultivated: 33.5m²

Category	Details	Total cost G/\$
Materials		
Seedlings	400	4000
Fertilizer (Pen manure)	180kg@ \$4 per kg	720
Agrochemicals	For pest control	1000
Labour		
Land preparation	1hr @ 250	250
Transplanting	2 hrs @ \$250	500
Spraying	2 man days @2000	4000
Weeding	2 man days @ 2000	4000
Fertilizer application	1hr @ 250	250
Harvesting	1 man days @2000	2000
Total operational cost		16780

Total Yield = 312 kg

RETURNS = TOTAL YIELD X SALE PRICE PER KG

=312 X \$200= \$62400

PROFIT = RETURNS – TOTAL OPERATIONAL COST

= \$ 62400-\$16780= \$45620

Profit/acre = G\$5,447,164