

Caribbean week of agriculture: Coming soon: a healthier and food secure Caribbean*

October 2013, Guyana

**The abstracts presented at this workshop have not been subjected to peer review*

Abstract No 1

Title: Innovations in the approach to food and nutrition security in CARICOM: Linking agriculture and nutrition to improve the health of the region's populations

By: Leroy. E. Phillip

Obesity is a major risk factor in the rising prevalence of chronic non-communicable diseases in CARICOM, and limited consumption of vegetables and fruits and consumption of energy-dense foods underlie consumer food choices that now threaten population health. For the first time in the region, an integrated, multidisciplinary, multi-partnership project in four CARICOM countries (Guyana, St. Lucia, St. Kitts and Nevis, and Trinidad and Tobago) is being undertaken; the aim is to link agricultural production to nutrition and health outcomes to address food and nutrition insecurity in the region. Nutrition interventions in school feeding programs and research with small holder farmers into technologies to enhance agricultural productivity, diet quality and diversity serve as key "impact pathways" for changing nutrition outcomes of children, while offering local farmers new opportunities to market their produce and improve their livelihoods. Baseline results show that primary school children are growing well by international standards but up to 22% of those sampled are overweight or obese; 43% to 51% live in food insecure households and the level of obesity and overweight among caregivers range from 69 % to 75 %. On a given day, 84% of all children sampled received one or less serving of vegetables, and 73% received one or less serving of fruits. Drip irrigation technology introduced on small farms increased productivity and diversity of vegetables and fruits but inappropriate handling and storage of fresh produce lead to post harvest losses as high as 46%. Additional constraints to the contribution of small holder farmers to local availability of nutritious produce include praedial larceny, lack of financing, and challenges with institutional support for farming. Project findings on farmer resilience identified social capital and social leaning as untapped opportunities for policy changes to improve food and nutrition security in CARICOM.

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researchers, students, research assistants and field staff for their support and contributions to the research.

Abstract No 2

Title: Water resources management to ensure food security in the context of climate change

By: Chandra A. Madramootoo

It is estimated that food production will have to at least double by the Year 2050, in order to meet the dietary demands of the world population, which could exceed 9 billion by that time. There are several challenges to meeting this global food demand, including dwindling availability of freshwater resources, declines in soil productivity, loss of productive agricultural lands, and a changing climate. Per capita water availability has been steadily declining over the past decades and we are witnessing a depletion of groundwater aquifers, slower replenishment of water resources, and an over-exploitation of surface and ground water. In addition, freshwater availability is being limited by water quality degradation due to pollution from anthropogenic sources, including agricultural pollutants. Good agricultural land is being lost due to increasing urbanization, and housing and industrial developments.

Of equal concern is that a changing climate is predicted to lead to an increased frequency of floods and droughts, and warmer ambient temperatures. These climatic perturbations will have negative impacts on crop yields, and agricultural production in general. The consequence is that food production goals will be difficult to attain in the medium and long term. The Caribbean is not immune from the soil, water and climate effects described above. This presentation will explore advanced water management technologies that can help to cope with the environmental stresses, herein described, while at the same time yielding to sustainable crop production systems.

Abstract No 3

Title: Protected Agriculture and Open Field Crop Diversification to enhance food crop productivity and diversification in CARICOM

By: W P Isaac, G Eudoxie, M Mohammed, N Mark, L. Solomon

Protected agriculture (i.e., *green house* or *shade house*) addresses the limitations of open field cultivation of vegetables; it also has potential to generate additional income to farmers and contribute to improved food security in CARICOM. To evaluate the impact of crop variety and plant growth media on crop performance under protected agriculture, we undertook studies with tomato and sweet pepper under greenhouse conditions at two locations, in Trinidad (UWI Field Station) and in St. Kitts (CARDI). We evaluated crop cultivars (tomato and sweet pepper) in locally available growth media. Analysis of the results from both countries revealed no interaction between crop variety and media for tomato and sweet pepper. Media containing compost showed greater yield for sweet pepper, while media containing compost together with imported vermiculite showed greater yields for tomatoes. Open crop field trials were conducted with pumpkin (Trinidad), papaya, carrot and sweet potato (St. Kitts). The results

revealed that improvements could be made in the sensory quality and marketability of pumpkin by paying attention to differences in crop variety at planting and proper handling during curing. Studies showed that curing resulted in firmer skin and flesh for all 3 pumpkin cultivars tested. Also, flesh firmness was consistently firmer as curing time progressed for these cultivars. The data obtained therefore supports that the curing of pumpkin can indeed improve the quality of the various pumpkin cultivars. However, on-going sensory evaluation would have to confirm these findings.

Studies with papaya showed that this crop is susceptible to “yellow leaf curl virus” disease but none of the varieties studied were resistant to the disease. Studies with 8 different varieties of sweet potato indicate that controlling the timing of planting, in combination with appropriate selection of crop variety, could reduce the problem of non-tuberization of sweet potato and improve the productivity of this crop. By paying attention to crop variety, improvement could also be made with productivity of carrots grown in St. Kitts. Overall, these findings indicate that improvement in crop management practices by farmers, including selection of varieties, time of planting, appropriate selection of growth media could enhance crop productivity and diversity under both green house and open field conditions in CARICOM countries.

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Abstract No 4

Title: Harnessing the Potential of Smallholder Farmers to Innovate in the Caribbean Community (CARICOM)

By: A S Saint Ville, G M Hickey, and L E Phillip

Using a case study approach, we undertook Social Network Analysis (SNA) to investigate whether social capital could be measured to assess knowledge transfer and innovation among smallholder farmers in two communities (Black Bay and Marquis) of St. Lucia. We collected and analyzed data from 112 surveys of farmer households. Responses from the surveys were used to develop farmer-centered networks (ego-centric networks). Matrices were built to facilitate social network and statistical analyses (UCINET software; SPSS VI).

Although farmers received new knowledge from diverse sources, 60% received new knowledge from other farmers. We found differences in knowledge flow among farmers in the rural communities. The farmer knowledge network in Black Bay appears to be based on “weak ties” that facilitate the exchange of new information and diffusion of innovation. In Marquis, the knowledge network appears to be based on “strong ties”, which fosters group identity and cohesiveness but is less responsive to innovation and change.

This study provides strong evidence that social learning is the primary means of knowledge exchange among farmers in these two communities. Policy can apply these cutting edge research tools to understand and measure how farmers currently innovate and adapt to improve food security outcomes in CARICOM. This tool identified existing knowledge networks that can be used to classify communities, identify innovation champions, and assess community

social roles. Better understanding of social capital in rural communities can harness smallholder farmer potential to enhance the design of science-based policies, improve community targeting and knowledge transfer among smallholders.

Abstract No 5

Title: Improving CARICOM Food Security: Novel approaches for Mapping Post-Harvest Losses Of Fresh Produce

By: *Patrick E. Cortbaoui, Michael O. Ngadi, Leroy E. Phillip*

A relevant problem that underlies food security in CARICOM countries is “Inefficient post-harvest management practices of fresh fruits and vegetables” resulting in a high level of post-harvest losses and major issues of food quality and quantity. These losses are a major constraint to crop productivity and food availability for local households. Mapping post-harvest losses is therefore an essential operational strategy to enhance post-harvest management and to curtail quality loss of fresh horticultural commodity throughout the different segments in the supply chain. Here, mapping post-harvest losses is the process of tracking, identifying, quantifying and preventing losses.

For the purpose of this study project, three complementary experimental techniques for mapping post-harvest losses were recommended. The first method allowed us to assess and quantify post-harvest losses of locally grown produce (tomato, string bean, eggplant, okra and cucumber) in St. Kitts and Guyana. It consists of field-based activities using producer household surveys and direct measurement protocols. The results from this intervention revealed that post-harvest losses were mainly due to inappropriate quality management and environmental factors abuse among farmers, wholesalers and retailers. There is a serious problem with regard to market access for small farmers, which compounds the problem of postharvest losses arising from limitations in postharvest technology. The second approach will be associated with activities on investigating the effect of fluctuation of environmental factors on quality changes over time such as color, texture and phytochemical content. It entails laboratory-based work to simulate the environmental conditions during food supply process in both Guyana and St.Kitts. In the third technique, Taguchi experimental design will be used to quantify quality loss during handling. This novel approach will consist of reducing the variability of a process around a customer-defined target instead of just meeting customer specifications.

This kind of study is an important tool, allowing the fulfillment of major data gaps in the knowledge of measuring postharvest losses of fresh produce and the prediction of the outcome of different storage and distribution conditions, aiming to improve the product’s quality and supply chain settings.

Abstract No 6

Title: Intensification of Vegetable Production and Diversification in Guyana

By: *Oudho Homenauth*

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 the potential yields of the crops are being attained with the use of drip irrigation.

Abstract No 7

Title: Water Management: A Complex Balancing Act

By: *Chandra A. Madramootoo*

Under the auspices of the CARICOM Canadian International Food Security Research Project, drip irrigation and advanced irrigation scheduling technologies have been introduced at pilot sites in Guyana, St Kitts, and St Lucia. The objective is to quantify the benefits of these technologies with respect to year round fruit and vegetable production in the region. In order to make this assessment, we conducted extensive soils investigations at the pilot sites, in order to ascertain the daily irrigation requirements. This was backed up with some extensive mathematical modelling of the water balance at the pilot sites. An innovative aspect is that the model accounted for the seasonality of rainfall, by contrasting water surpluses in the wet seasons with water deficits in the dry seasons.

The results of this study led to new information on the timing and application of irrigation water supplies and the amount of carry-over soil moisture in the soil profile. There is a clear irrigation requirement for the St Kitts pilot sites, where the dry season in the first half of the year is very distinct and different from the rainy period in the latter half of the year. The situation in Guyana is much different, due to the wetter than normal years, and the very heavy

clay soil conditions on the flat, low lying coastal plains, which are lower than the mean sea level. The mathematical modelling results show that there could be higher soil moisture conditions in these soils during the dry season, minimizing the need for irrigation. The simulations show that drainage may be more of a constraint to food crop production, than irrigation, on the Guyana coastal plains. This has also been confirmed by farmer surveys in the pilot areas of Black Bush Polder and Parika.

Abstract No 8

Title: Development of a Forage-Based Feeding System for the Small Ruminant Sector

By: A Hosein, S Borucki, I Watts, J Berry and L E Phillip

Native tropical grasses are generally low in crude protein content leading farmers to rely heavily on costly commercial concentrate feeds in order to enhance productivity of their small ruminant livestock. Alternatively, farmers rely on the natural, unmanaged pastures that consist mainly of scrub vegetation. In addition to the low quality pastures there is a seasonal shortage of forage in many Caribbean countries. This project intervention sought to demonstrate the viability of establishing drought-tolerant, highly yielding and nutritious forages that could also be preserved as silage for year-round feeding of small ruminants.

Two hectares each of Mulato II grass (*Brachiaria* hybrid CIAT 36087) and forage sorghum (*Sorghum bicolor*) were established in St Kitts and Nevis in the dry season of 2012. During the dry season, the dry matter yield of Mulato II, after 84 days of successful establishment, was 4,783 kg of dry matter (DM) per ha; forage sorghum yielded 1,870 kg DM/ ha within 81 days of growth. During the wet season the Mulato II produced 10,465 kg DM/ha after 24 days of re-growth and the forage sorghum produced 3,429 kg DM/ha, with 53 days of growth.

In addition to production of fresh material, the use of the “silage bag” technique revealed that both Mulato grass and forage sorghum could be successfully preserved as silage for feeding small ruminants. Over 9 and 23 tonnes of Mulato grass and forage sorghum silages respectively, was produced, with optimal pH (4.2) obtained during 6 months of storage.

Project results indicate that both forage species are easy to establish, produce good quality forages under wet and dry conditions in St. Kitts and Nevis, and can be successfully ensiled for use by small farmers. We conclude that both Mulato grass and forage sorghum represent viable options for inclusion in a forage based feeding system to increase small ruminant productivity and improve livelihood of small holder farmers in CARICOM countries.

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