Climate Smart Agriculture
in the Eastern Caribbean States

Meeting the Challenges of Climate Change in Grenada through Organic Agriculture

Grenada Organic Agriculture Movement (GOAM)

Caribbean
Climate Smart Agriculture
FORUM

Contributions to Climate Smart Agriculture

Adaptation and Resilience

By implementing practices that are suitable to adapt to the increase in temperatures and climate variability and the change in precipitation, the farmers have made both their farming systems and their livelihoods more resilient. Improving water management and soil quality, incorporating multi-storied intercropping, and protective structures are some of the adaptation measures implemented.

Food Security and Productivity

Diversification, improved soil health, and better water and landscape management to address the climate changes have resulted in an increase in yields, a reduction in losses, and an overall increase in production, leading to enhanced incomes and food security for the farmers.

Mitigation

Reduced tillage, incorporation of perennial crops, and the use of biochar help reduce greenhouse emissions by maintaining soil carbon and enhancing carbon sequestration.

Climate change signals:

- Changes in precipitation patterns
- Increased climate variability
- Increased temperatures
- Sea level rise

Climate smart practices and technologies:

- Soil Management
- Diversification
- Agroforestry
- Water management
- Alternative farming methods
- Capacity development

The challenges posed by climate change

This story focuses on two farms owned and managed by members of GOAM, one in Belvidere, St. John and the other at DeBlandeau in St. Andrew. The DeBlandeau farm is on 15 acres in the middle agricultural belt and receives less rainfall (~100 mm/year). The 25 acre Belvidere farm is located in the center of Grenada, the upper agricultural belt which experiences the highest rainfall (180mm/year) on the island. In the 1990's, during a governmental drive to increase banana production, farmers there were encouraged to cut nutmeg trees to establish pure stand bananas. When the moko disease and black sigatoka emerged, banana production was no longer viable. Farmers in Belvidere have since been testing alternative production systems – tree crops, vegetables, root crops, and livestock – with encouraging results.

Hurricanes Ivan (2004) and Emily (2005) destroyed the production base of most farmers in Grenada. Recognizing that extreme events might increase in intensity and frequency with climate change, in 2008 Belvidere made the decision to adopt a sustainable approach to farming by introducing a multi cropping system based on permaculture principles and organic farming. In 2011, the Grenada Organic Agriculture Movement (GOAM) formed, and its members began farming organically to respond to climate change and to produce safe and healthy foods.

The areas of Belvidere and DeBlandeau have historically had a very predictable climate with a wet season extending from late May through January followed by a marked dry season. Today, the rains and dry season come at any time with great intensity resulting significant soil and crop loss. The historical rainfall pattern ensured that soils did not dry out. Plants were able to reach water even in the dry season which allowed the vegetation remain green throughout the year without irrigation. Today with the long dry spells, the soils dry out and irrigation is a necessity for maintaining production levels. Heavier downpours not only break down the soil structure, but also cause nutrient leaching and flower loss. Strong winds are more common, especially in Belvidere, resulting in tree toppling, especially bananas.

Higher night temperatures have been reducing production of certain vegetable and tree crops, such as cauliflower, broccoli, cabbages and nutmeg. Belvidere previously enjoyed low night temperatures, giving the region an advantage for growing cole crops that has since disappeared because of elevated night temperatures, which have impacts like reducing the size of nutmeg pods. This has, however, opened new opportunities as higher night temperatures permit enhanced fruiting and reduction of disease in certain crops such as mangoes (fruiting) and avocadoes (reduced fungal disease).

The solution

Given the climatic changes experienced and anticipated, the farm managers began to adopt practices to address soil and nutrient loss, better manage their landscape and water, and adjust to the higher temperatures and increasing climate variability. The practices and technologies implemented include:

Mulching and composting: Where annual crops are planted, both plastic and dry mulch are used to protect the soil from direct impact of rain, reducing runoff, soil loss and evapotranspiration. In the areas where plastic much was used, the land was first plowed and composted manure from chickens, rabbits and cattle was integrated. The four-foot wide beds were then covered with plastic mulch with four to six inch holes to accommodate the crops planted. Dry mulching is now used in the dry season. Lands are ploughed and manure is incorporated before the land is covered by four inches of dry shredded mulch made from trimmings from farms and public road works along rural roads.

Intercropping, wind breaks and diversification: To help manage the more intense and frequent winds that were damaging crops, old windbreaks were restored and new ones planted. A permaculture design was utilized, dividing the farm into zones delimited by blue mahoe *(Talipariti elatum)*, which is used for farm building and sold to furniture makers. Any gaps in the windbreaks were filled with other tree crops, especially cloves and cinnamon. Crops were selected to form different layers/levels so that at maturity the plants would be stacked. For instance, bananas provided shade for nutmeg when the latter is first planted, then as the nutmeg matures it shades the bananas. The wind break formed the highest layer, followed by nutmeg, then citrus, then bananas and finally dasheen (taro) or sorrel.

Biochar: Biochar is being incorporated with pen manure in the vegetable beds. The process of mixing the two, called charging, allows for the soil organisms from the manure to inhabit the pores in the char thus providing a home for the organisms that will provide the nutrients that are needed for plant growth. It is produced using a kiln that allows for the gasification of biomass at 700 degrees Fahrenheit. Charging biochar allows for greater moisture retention in the soil, thus making the plant more resilient to dry spells, while also providing nutrients to enhance plant growth and development. Initial results with peppers show that plants grown with charged biochar have higher yields.

Improved water management: The farm's contour drainage was remodeled using an A frame to design a system of swales and weirs for enhanced water control. The gradient of the drains was improved to water flow and allow for greater water infiltration. Controlled run-off was achieved by the creating of weirs by blocking one end of the swale with stones and organic matter. Gravity fed irrigation, using water collected in a nearby dam, was added to help address the fluctuations in precipitation and water availability.

Protected agriculture: The farm has been experimenting with mini covered protective structures of approximately four feet in height. Bamboo and plastic are used to cover the beds, protecting the crops from the direct impact of the heavy rains as well as permitting water to enter the beds through the nearby drains.

Reduced tillage: On both farms, land preparation for short term crops historically involved annual land plowing. A decision was made to reduce plowing and to adopt the practice of digging holes only to accommodate the crops, leaving the rest of the bed undisturbed. This has helped reduce the impact of both drought and heavy downpours.

Capacity building: GOAM has an outreach programme that uses farmer field schools to train and build capacity of our stakeholders. For instance, of the six compost units we have established we organized a rotational training programme to have training on each site – beginning on the first and completing on the last site. GOAM has also developed plans to work with two schools through the 4H group.

Results and contributions to the 3 pillars of climate smart agriculture

- On both farms, there has been a great improvement in soil health. A decrease in soil loss has been evidenced by the colour of the runoff and reduction in sediment load. The protective structures and mulch help prevent nutrient leaching and the breakdown of the soil structure caused by heavy rains. The mulching and compost also add nutrients and organic matter into the soil; while the incorporation of biochar enhances the water holding capacity and nutrient supply.

- Enhanced management and efficient use of water was achieved on both farms. The swales and weirs prevent runoff and allow water to infiltrate into the soil. Increased infiltration helps restore groundwater supplies and allows higher soil moisture levels increase resilience to drought. Plants located in beds with mulch and or biochar incorporated withstand drought conditions better than those without.

- Increased resilience to more intense droughts and winds has been observed on both farms. Plants that were grown on mulched beds withstood the drought better than those that were not mulched. The plastic mulch without irrigation in the wet season helped plants to grow well and eliminated the need for weeding, thus reducing on the cost of labor which is significant on the principal farm. On the principal farm, the farmers have observed a noticeable reduction in the toppling of bananas due to the wind breaks installed.

- Intercropping and stacking have permitted the farm to incorporate additional crops and increase production, as more food can be grown in the same space. The impacts of the combination of practices described above that have helped to reduce the impacts of higher temperatures, provided additional nutrients to plants (mulching, biochar); allow for continuous water supply without excessive leaching (swales and weirs); protected crops from rotting and flower loss (mini covered protective structures), reduced waste, helped maintain produce quality, and minimized losses from drought. Farmers have noted that this has helped increase yields and maintain production, as well as reduced the risk of relying on one crop.

- Crop diversification has allowed for the harvesting of different crops at different times of the month, providing stability and diversity in food availability. The production and sale of different commodities has increased the amount of disposable income for the families so they can supplement what they grow, thus enhancing the food security of the farming families.

- Healthier soils have helped to increase yields and therefore income. Intercropping using the stacking principle allows for marketable crops throughout the year, enabling a regular cash flow. Lower losses from droughts and heavy rains have also helped to maintain incomes. Adoption of these practices has made the farms more viable, and as such, is increasing job opportunities for others. Nine people are employed full time, and in the summers, additional youth are employed. It is also helping youth to see that farming can in fact be profitable and make a suitable career.

- Reduced tillage, perennial crops, and the use of biochar help reduce greenhouse emissions by helping to maintain or sequester carbon in the soil.

The principal beneficiaries of these efforts have been the farm families and workers. The environment, improving both human and agro-ecosystem health. Other consumers of the farm's produce also benefit from the safe, nutritious and healthy goods grown without the use of synthetic fertilizers or toxic pesticides. The broader community benefits because the organic practices reduce contamination and help maintain water quality. Finally, Grenada benefits as the island moves towards more sustainable production practices that creates positive synergies between land and marine based systems to support food security.

Lessons Learned

Longer time frames are required to observe the true impact of climate smart agricultural practices. Observation and both quantitative and qualitative data collection are important to be able to demonstrate costs and benefits. In addition, farmers should be prepared to adjust the practice as what works in one situation may not always work in another. Technologies and practices need to be adapted for the local context. Some of the interventions have hidden or unanticipated costs over time. For instance, the costs of operating the biochar unit were not contemplated, only the cost of the unit itself was considered.

Working together and learning from the experiences, achievements, and errors of others will facilitate success. Exchange between farmers and outreach from extension officers are critical. Finally, it is very important to involve all those with implementation responsibilities (paid workers, volunteers, etc.) in the trainings so that they not only understand what to do, but also why it is being done. ■

Climate Smart Agriculture (CSA) is an approach to developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change. The goal of CSA is to enable the sector to transition towards more climate-resilient production systems and more sustainable livelihoods in the presence of climate change stressors and climate variability. The three pillars of CSA interventions and practices are intended to:

1. Sustainably increase agricultural productivity and incomes (i.e. strengthen livelihoods and food security, especially of smallholders);
2. Adapt and build resilience to climate change;
3. Reduce and/or remove greenhouse gases emissions, where possible and appropriate.

Caribbean countries are particularly vulnerable to climate change related risks, and in response, are actively seeking to develop agricultural production systems that are resilient to climate related risks and stressors and make efficient use of the limited natural resources available. In that regard, efforts are made to develop, identify, promote and disseminate innovative farming systems, farm technologies, strategies and measures that will help to build resilience and increase the productivity and viability of the agriculture sector in the region.

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