



**Workshop on the
*Science of Climate Change and Climate Change
Vulnerability and Adaptation.***

20– 29, August 2012, Kingston, Jamaica

**Sectoral Adaptation for the
Agricultural Industry**

by

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Presentation Outline

- CARDI's Regional Mandate
- Climate Change impacts on the Agricultural sector
- Adaptation Strategies to deal with climate hazards:
 - Adapting to extreme climate events
 - scarce water resources and extended seasons e.g. the dry season
 - Adapting to drought, floods, heat and salt intrusion
 - Training of farmers
- The use of Crop Models for predicting yield under varying climate scenarios

CARDI's Regional Mandate

Mission

- To contribute to the sustainable economic well being of Caribbean people by the generation and transfer of appropriate technology through agricultural research and development.

Goal

- Increase agricultural and food production and productivity through the use of science, technology, innovation, information resources and sustainable natural resources management, thereby increasing the competitiveness of the agri-food sector and enhancing food and nutrition security.

Slogan

- *Improving Lives through Agricultural Research*

CARDI's Programme in Climate Change

- **Strategic Axis 1: Development of Sustainable Industries**
- **Focal Area: Natural Resource Management**
- **Priority Area: Risk Management**
- **Programme 1: Invasive species management**
- **Programme 2: Climate change for agriculture development**

Climate Change Challenges to the Agricultural Sector

- The chief climate hazards that affect agricultural production in the Caribbean are:
- Severe weather events, such as, tropical storms and hurricanes
- Rainfall variability, droughts, floods,
- Temperature increases, and
- Saline intrusion as a result of sea level rise.

Severe Weather Events

- The region, located in the Caribbean Sea, experiences a long hurricane season (June – November, annually).
- There are perennial variations between above and below normal seasons in which tropical cyclone activity peaks and decreases.
- The unpredictability of this cycle and limited lead time pose significant challenges to sustainable production and in many cases, farmers incur major losses due to their inability to adequately prepare, and in some cases, insufficient knowledge of mitigation strategies.

Impacts on Agriculture from Hurricane Tomas

- As recent as 2010, Hurricane Tomas devastated islands of the Caribbean particularly St Lucia and St Vincent causing damage to the agricultural sector. |
- In St Lucia, the banana industry was severely affected through toppling, flooding and sedimentation.
- Damage was estimated to range between 80% and 90% with a potential weekly income loss up to EC\$2.0 million before recovery. Also, damages to the fishing industry was estimated at EC\$1.5 million.
- In St Vincent, There has been widespread destruction in the agricultural sector, with bananas and plantains suffering an almost 98% loss in the affected areas. The preliminary damage to the agriculture sector is an estimated EC \$67.2 million.

Drought Impact

- As a consequence of the drought in the Caribbean in the latter part of 2009 into the first three months of 2010:
 - Banana exports in Dominica were approximately 43% lower in the first 11 weeks of 2010.
 - In St. Vincent and the Grenadines, agricultural production was reduced to 20%.
 - In Antigua and Barbuda, where the 2010 onion crop was expected to be about 500,000 kg, 25 percent of it was lost, whilst about 30 percent of the Tomato crop which was estimated to total 250,000kg was lost.

Impacts on Agriculture of Hot Weather accompanying Droughts

- Dry hot weather condition also increase the risk of bush fires which can resulted in added crop losses. In Dominica 160 fires (mainly bush fires) were attended to for the 1st quarter of 2010, which was more than the 103 for the entire year 2009.
- St. Vincent and the Grenadines reported 150% increase in the amount of bush fires and seven different farms reported the destruction of at least two acres of crops.



Impacts on Agriculture from Floods

- Floods are estimated to account for 70 % of all weather-related losses in the region's agriculture sector.
- For example, in Guyana floods from January to February 2005 resulted in US\$ 55 million in damage to the agriculture sector accounted for (35.4 % of Guyana's GDP in 2004).
- A similar flood event in 2006 resulted in total losses to the sector of US\$ 22.5 million also in Guyana.

Response to the Climate Challenges

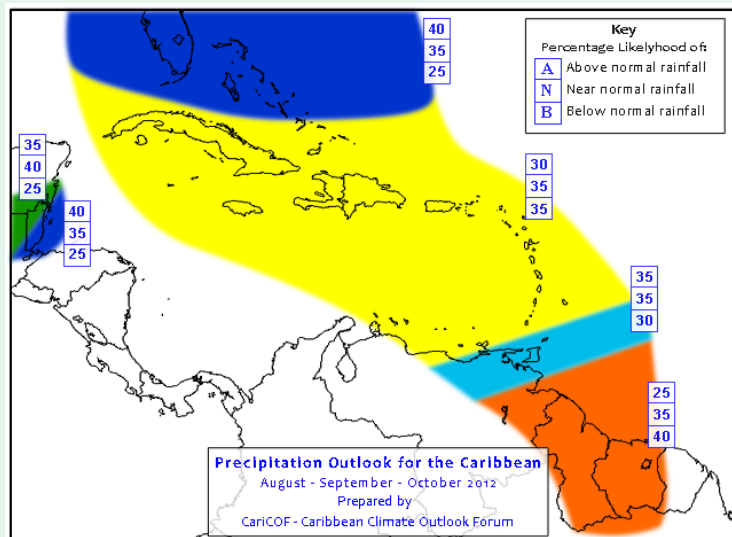
- CARDI has been working with regional and international organization as well as stakeholders in the sector:
 - to develop a suitable policy environment,
 - To improve technical expertise and research capabilities and
 - to provide appropriate information to stakeholders in the adaptation and mitigation of climate change in the agricultural sector.

Adaptation Strategies to deal with Climate Hazards

- Adapting to extreme climate events
 - Climate risk management
 - Protected agricultural systems
 - Alternative livelihoods
- Managing Scarce water resources
 - Improved on-farm water management systems
 - Enhanced soil water management systems
- Developing Plant germplasm Adapted to drought, floods, heat and salt intrusion
 - Improved germplasm of food and forage crops
 - Improved housing for farm animals

Enhanced Climate Risk Management

- Activities of the Caribbean Agrometeorology Initiative (CAMI) Project
 - Early warning systems
 - Seasonal climate forecast
 - Climate /Pest and disease modelling and forecasting
 - Farmers' Forums



Protected Agricultural Systems

Modification of the natural environment to achieve controlled or improved plant growth

Benefits

- High yields (quality & quantity)
- Increased profit margin



Protected Agricultural Systems



Some structures can be collapsed and rapidly restored in the event of a tropical storm

Development of Alternative Livelihoods in Agriculture

- Aquaponics: A closed growing system combining aquaculture with hydroponics, supplied with harvested rainwater
- CARDI/INMED/USAID collaborative project in Jamaica



Improved On-farm Water Management Systems

1. Use of heavy duty pond liners



Initiation of excavation Works



Excavated area



Putting lining in place



Pond filled with rain water

Improved On-farm Water Management Systems

2. Use of solar pumps and black plastic tanks

Solar pump



Black plastic tank



Soil Water Conservation Systems

- This includes live mulches as well as straw mulches and plastic mulches



Mulch Farming in South St Elizabeth, Jamaica

- Rainfall in South St Elizabeth is low - 1450 mm [57 inches] per annum.
- Land clearing provides the mulch for the planting area
- Crops are introduced directly into plant holes dug through the mulch.
- Increases water use efficiency and decreases risk to drought



Increased use of Trickle irrigation

- Uniform water distribution
- Efficient water use
- Easy installation, operation and maintenance
- Possibility of fertigation
- Decreases risk to drought



Enhanced Soil Water Infiltration and Storage

- Increasing soil water infiltration and retention by more use of organic manures in integrated plant nutrient systems (IPNS)
- Experimentation has also begun in the use of Biochar as a means of retaining soil moisture and helping plants through periods of drought.



Agricultural Biodiversity Management

- This CARDI programme addresses the need to conserve, share and sustainably utilise plant genetic resources.
- The objective is to ensure that farmers have access to climate-ready planting material that will be sufficiently resilient and productive under future climate threats.
- Present status will be highlighted at a Workshop on Climate change and Plant Biodiversity during the CWA 2012 in Antigua



Cassava Germplasm Collection and Assessment in Guyana

- The National Agricultural Research and Extension Institute (NAREI) has collected cassava germplasm in Guyana, from which three important climate-resilient cultivars were identified.



Dasheen Germplasm Assessment

- CARDI successfully imported 50 Dasheen (*Colocasia esculenta*) accessions from the Secretariat of the Pacific Community (SPC) -Centre for Pacific Crops and Trees (CePaCT).
- These are now being evaluated for local climate tolerance in three CARICOM countries.



Dasheen: A moisture loving tuber-bearing crop.

Storage and Security of Plant Germplasm

- Working with The Global Crop Diversity Trust (GCDDT), CARDI and regional partners have collaborated in:
 - upgrading germplasm collections of prioritized staple food crops,
 - mass produced and distributed planting materials to farmers and
 - prepared germplasm of unique accessions for security conservation in the safest international genebanks. .



Improved Housing for Farm Animals



Housing which combines good ventilation with sturdiness against hurricanes

Training of Small Farmers

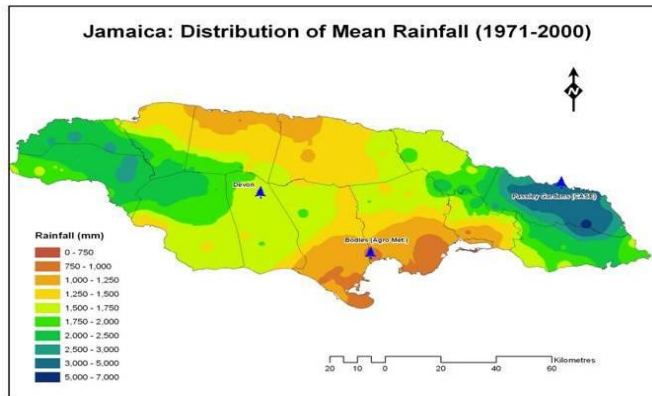
- A training course on the World Bank Risk training portal
- Risk Mitigation for Smallholder Agricultural Production in the Caribbean
- See: <http://www.agrisktraining.org/>



The use of Crop Models for predicting Yield under varying Climate Scenarios

- Crop modelling in the Anglo -Caribbean is in its infancy.
- The CARDI Climate Change programme articulates crop modelling in important economic crops including: Cereals (Corn, Rice) Roots and tubers (Cassava, Yams, Irish Potato, Sweet Potato), Legumes (Cowpeas, Soybean, Peanut), Vegetables, Bananas, Citrus and Sugarcane.
- The programme is planned in two phases:
 - Phase 1 will be dedicated to Cereals, Roots and Tubers and increasing the human capacity and facilities for carrying out these studies.
 - Phase 2 will be focussed on the remaining crop species and added forage species.

Assessing Sweetpotato Varieties in Jamaica - CSGM/CARDI and other Stakeholders



To assess drought tolerance in root and tuber crops using crop models using Sweet Potatoes, (*Ipomoea batatas*) as the test crop

The three project sites; Devon, Manchester, Bodles Research Station, St Catherine and Passley Gardens, Portland provide very contrasting agro-ecological zones for the study.



Thank you

