IMPROVING LIVES THROUGH AGRICULTURAL RESEARCH

FACTSHEET

AGRICULTURE AND CLIMATE

II. Adaptation and mitigation strategies to climate change

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CLIMATE CHANGE AND AGRICULTURE

Climate change is today widely recognised as one of mankind's greatest challenges in the 21st century. If left unchecked, climate change can seriously harm economies, societies and eco-systems around the world, especially in developing countries.

According to the 2007 Intergovernmental Panel on Climate Change (IPCC) report (IPCC, 2007), the best estimates from climate models indicate that the global average surface temperature will rise between 1.8 °C to 4 °C by the year 2099 depending on how much the concentrations of CO2 and other greenhouse gases increase.

The Caribbean region is already vulnerable to risks arising from climate change. Current climate data suggest that in future the Region will be hotter, drier, prone to extremes of floods and drought, experience more frequent cyclonic storms and be affected by salt water intrusion. This future climate is likely to result in weather conditions which will be particularly hazardous to the agriculture sector in the region.

Agriculture is not just a victim of climate change; it is also a significant cause of climate change. Agricultural activities are directly responsible for 10–12% of human-generated greenhouse gas emissions, excluding emissions resulting from fuel use and fertiliser production (CTA, 2011). However, agriculture is responsible for a much greater share of global emissions if the clearance of forests to make way for crops and livestock is included. For this reason, agriculture also has an important role in mitigating climate change.

IMPACT OF CLIMATE CHANGE ON AGRICULTURE

According to Simpson (2010) climate change is likely to affect all aspects of agriculture and food production i.e. crop production, livestock production and fisheries in the Caribbean region. Crop production is likely to be affected in multiple ways. These include:

- Carbon fertilisation due to increased CO2 levels
- Positive yield response to increased temperature and longer growing seasons by heat-loving crops such as melons, sweet potato and okra
- Negative yield response by some grain crops as increased heat accelerates the plants development cycle and reduces the duration of the grain-filling period
- Increased evapotranspiration and water use due to increased temperature.

ADAPTATION STRATEGIES

The following adaptation strategies could be part of a combined climate variability/change extension programme:

- Changing planting or harvest dates are effective, low cost options. The major risk could be shifting to a different market window with lower prices
- Changing varieties is another low cost option, although some varieties can be more expensive or require investments in new planting equipment

- Selecting varieties with greater drought and heat tolerance
- Increased use of irrigation, fertiliser, herbicide, and pesticide may be necessary to achieve maximum benefits from increased atmospheric CO2. Climate change is also likely to increase weed and pest pressure in many cases
- Changing crop species or livestock produced could bring new profits, but is a risky and more expensive option because the necessary infrastructure or marketing mechanisms may not exist locally
- Investments in new irrigation or drainage systems or other capital items including water harvesting and storage facilities are likely to be essential if climate change increases climate variability
- Changing soil water management strategies to include soil organic matter enhancement and the use of mulch
- Changing tillage practices
- Developing and implementing improved Integrated Pest Management (IPM) programmes included the use of Protected Agricultural systems.

MITIGATION STRATEGIES

Management of forestry and agricultural activities is regarded as an important option for greenhouse gases (GHG) mitigation (Fraisse et al. 2009). Activities in these sectors can reduce and avoid the release into the atmosphere of the three most important GHGs: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O).

Mitigation strategies include:

- Afforestation
- Improved forest management and protection
- Soil carbon sequestration: Soil carbon sequestration has additional appeal because practices that enhance soil carbon also improve soil quality and fertility. Examples of management practices with the potential to increase soil organic carbon include:

    - Adoption of conservation and no-tillage practices
    - Optimise crop rotations by using legumes, rotations crop-pasture, green manures
    - Improved fertilisation to stimulate biomass production and root growth
    - Optimise manure management
    - Promotion of land use shifts that enhance soil organic matter (e.g. forest, wetlands)
    - Mixed cropping systems that combine annual and perennial crops (e.g. agroforestry)

- Agricultural methane and nitrous mitigation
- Biofuels offsets.

Grass mulch farming in St Elizabeth Parish, Jamaica to increase soil moisture retention and soil organic matter enhancement

A water harvesting facility: ferro cement water tank in St. Lucia

Protected agriculture: a group of hoop houses at Mr Bertrand John's farm, Bathway, Grenada

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PSC# JA/009/11

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