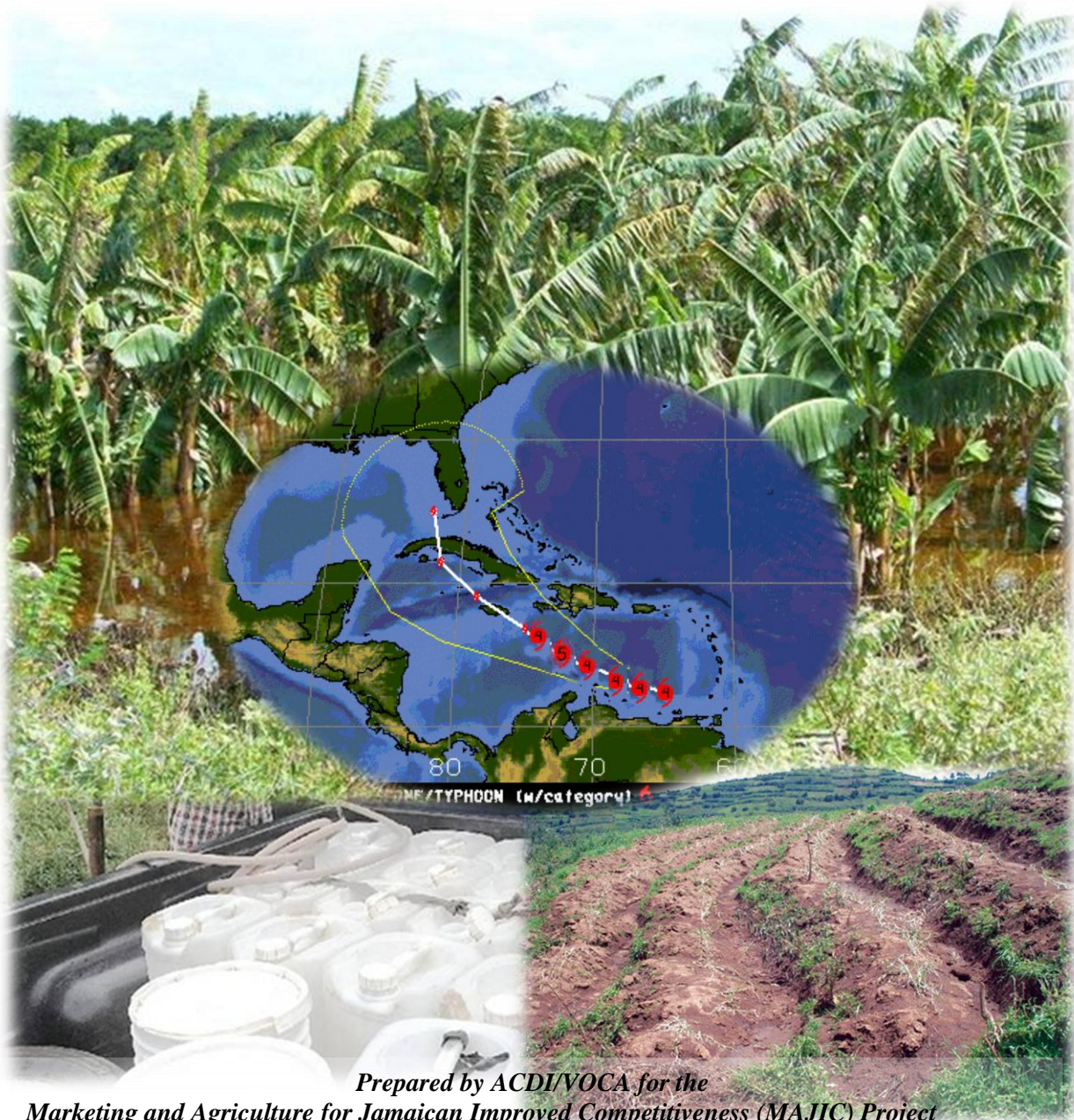


# ADAPTING TO CLIMATE CHANGE: A Training Manual for Farmers



*Prepared by ACIDI/VOCA for the  
Marketing and Agriculture for Jamaican Improved Competitiveness (MAJIC) Project*



Ministry of Agriculture & Fisheries



**RADA**  
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**OBJECTIVE:**

Participants will become climate-smart farmers by creating plans for addressing the greatest risks to their fields.

**OVERVIEW:**

After learning about the climate change phenomena, participants will discuss their observations on climate change impacts, weather patterns, why climate smart agriculture is important and develop an understanding of the financial impact of climate change. By the end each farmer will identify steps to reduce the impacts of climate change.

**Integration:** This content can be delivered over multiple sessions after the discussion on the climate change phenomena and observations on climate change impacts. The threat of climate change and the detrimental effects on agriculture must be introduced early in FFS during the planning stages. The adaptation strategies farmers work with will again be revisited in later technical units, so this module should be linked to other sessions such as irrigation and water efficiency, land husbandry, nutrient application for productivity and pest and disease identification and control.

**SUPPLIES NEEDED:**

1. Pencil and notebook for each participant
2. One sheet of flipchart-paper for each group of participants and facilitator
3. One set of colored felt tip pens or colored crayons for each small group
4. Record of rainfall in your area for the entire period of the FFS (historical rainfall records and production levels from an available agricultural area would help demonstrate correlation between both)

**SESSION CONTENT:**

- **Part 1. What is climate change? (30 minutes)**
- **Part 2. Climate change in Jamaica (60 minutes)**
- **Part 3. How can I be a climate-smart farmer? (90 minutes)**
- **Part 4. Conclusion: Agreement on what is Climate-Smart Agriculture (30 minutes)**



## **PART 1. WHAT IS CLIMATE CHANGE? (30 MINUTES)**

In this first part, the activities focus on building a level of understanding on the core concepts of climate change. The science behind climate change is briefly covered, as are some core terminology used by the international community. Much of the scientific information offered in this section is informative for the extension agent or lead farmers, but it is not important, for example, that farmers learn the types of greenhouse gases. It is more critical that they agree or express some perception of the major climatic trends that are covered in Part 2.

### **What is the difference between Weather and Climate?**

Begin by asking the participants a question to differentiate between climate and weather:

1. *Thinking back since childhood, how would you describe the weather in Jamaica?* (hot, humid, rains quite a bit)
2. *How would you describe the weather in Canada?* (cold, snowy, freezing temperatures)
3. *What are climates are you familiar with?* (desert, temperate, Rainforest, polar/ice, dry/arid)
4. *What is the weather like today?*

### **Explain:**

The difference between weather and climate is a measure of time. **Climate** is the pattern or cycle of weather conditions such as temperature, wind, rain, snowfall, humidity, clouds, including extreme or occasional ones, over a large area, averaged over many years. The term weather the state of the atmosphere at a particular place and time as regards heat, cloudiness, dryness, sunshine, wind, rain, etc

### **What is Climate Change?**

When we talk about **climate change**, we refer to changes in long-term averages of daily weather.

### **Activity I - Global Warming**

Unless there is a greenhouse nearby which you can visit, guide the trainees in reconstructing a mini greenhouse using plastic sheets, plastic containers, sticks and any other locally available materials. Have a small group set up the green house in advance so that the sun can heat it up and condensation forms on the inside of the plastic. Depending on the number of trainees in the farmer group, you may want to construct multiple examples.



Ask the trainees:

1. *How would you describe the conditions?* (hot)

2. *What happens to the sun's heat that enters the green house? (it is trapped under the plastic).*

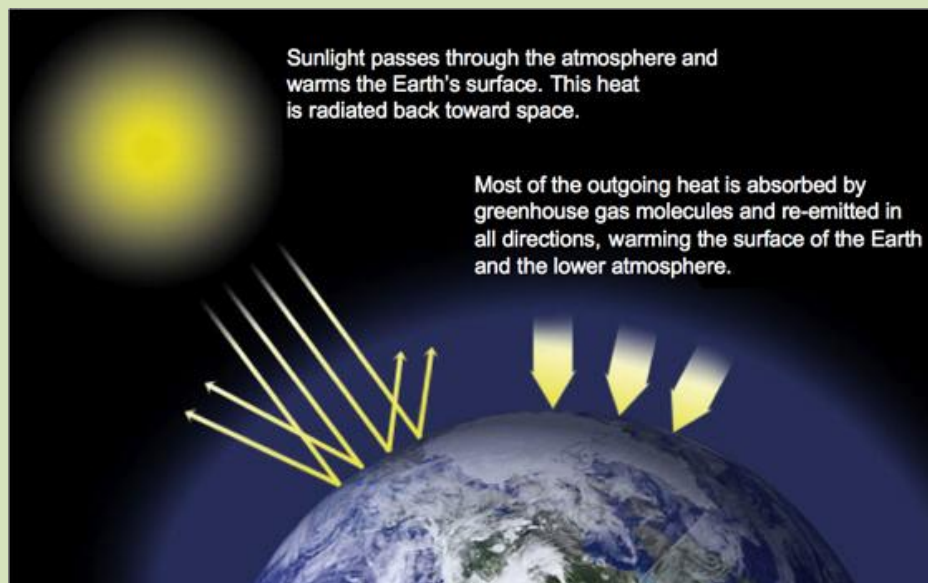
As an alternative to, you can also use **Blankets**. Ask for a volunteer and cover him/her with a blanket. Then cover him/her with a second blanket, and eventually add a third. Ask the volunteer to reflect on how heat was built up beneath the blanket. Draw connection between insulating heat under a blanket and trapping heat from the sun in the atmosphere.

## Explain

### What is the Green House Effect?

The Greenhouse effect is "a general warming effect" felt on Earth's surface, produced by greenhouse gases. These gases allow incoming sun light to pass through the Earth's atmosphere, but trap heat by preventing some of the infrared radiation from the Earth's surface from escaping to outer space.

**This process occurs naturally** and has kept the Earth's temperature about 60 degrees Fahrenheit warmer than it would otherwise be. Current life on Earth could not be sustained without the natural greenhouse effect. However, the greenhouse effect is becoming stronger as a result of human activities, which is causing the warming we have observed over the past century."



### What Contributes to, or Cause, Climate Change?

Climate change effects are due to an increase in **GREENHOUSE GASES** (Green House Effect) in the atmosphere. Originally referred to as **Global Warming** because of the warming effect that gases have on the earth, the name was later changed to climate change because the combination of the greenhouse effect and devastation of the world's natural resources has led to a wide variety of climatic extremes, not just warming.

The main gases responsible for the greenhouse effect are:

- |                          |                        |
|--------------------------|------------------------|
| ❖ <b>carbon dioxide,</b> | ❖ <b>fluorocarbons</b> |
| ❖ <b>methane,</b>        | ❖ <b>water vapour</b>  |
| ❖ <b>nitrous oxide</b>   |                        |

The burning of fossil fuels, plants/remains, forest destruction and agriculture (rice field cultivation and the keeping of livestock) all play a role. This will be revisited when we cover field preparation and burning.

## Activity II - Key Climate Change Terms to Know

There are four general reactions to how we can deal with the major trends we just spoke about. These are vocab words used by climate change specialists and project planners. It is not critical for farmers to learn them, but in case the group is interested, include this vocabulary activity.

Explain that we will now explore some terms more in-depth. These terms relate to how we can react to climate change trends we see in Jamaica. We can **adapt** to the changes, we can **mitigate** carbon levels, we can become more **resilient** and we can decrease our **vulnerability**.

Provide the participants with shuffled cards and instruct them to match the vocabulary word with the definition. They will need to work together as a team to match them. The facilitator may also decide to assign each card to a separate person or group of people, and instruct the groups to find their match.

<b>Adaptation</b>	<b>Adjustments and changes made to reduce the negative impacts or damages associated with climate change. i.e. actions to reduce vulnerability or enhance resilience</b>
<b>Mitigation</b>	<b>&lt; _____ &gt; of climate change is a human intervention aimed at reducing the sources or enhancing the sinks of greenhouse gases.</b>
<b>Resilience</b>	<b>The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to maintain an acceptable level of functioning and structure.</b>
<b>Vulnerability</b>	<b>The degree to which a system (e.g. farm) is susceptible to, or unable to cope with, adverse effects of climate change.</b>

During the debrief of this matching activity, ask the farmers why they should care about these words. As they answer the question, try to emphasize that they need to have ways to assess their own vulnerability, and they need to adapt and change their habits so that they are more resilient.

Expand on this concept of adaptation and provide the additional explanation and examples. End this section by explaining that when we next revisit climate change in the next session, we will take a look more specifically how we are vulnerable in Jamaica and what farmers can do.

## **PART 2. CLIMATE CHANGE IN JAMAICA (60 MINUTES)**

This part includes three major sections, all of which help farmers better understand changes in climate and weather patterns in Jamaica. This section serves as a bridge between the theoretical and scientific information (last section), and the very specific, farmer-centered activities (earlier sections).

### **1a. Identifying environmental changes in Jamaica**





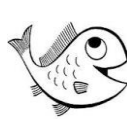

Now let's explore a little more the environmental changes in Jamaica over the years. Since production among farmers has been affected by the changes in the climate, we can ask farmers to identify the level of change over a period of 20 yrs.

#### **Activity III: Identifying recent trends**

Possible questions to initiate discussion:

1. What would you say the temperature, rainfall, wind, hurricanes, etc. was like 20yrs ago?
2. What is the temperature, rainfall, wind, hurricanes, etc. like now?

**NB. This activity could create a platform to identify the climate change impacts that would be needed for worksheet 1.**

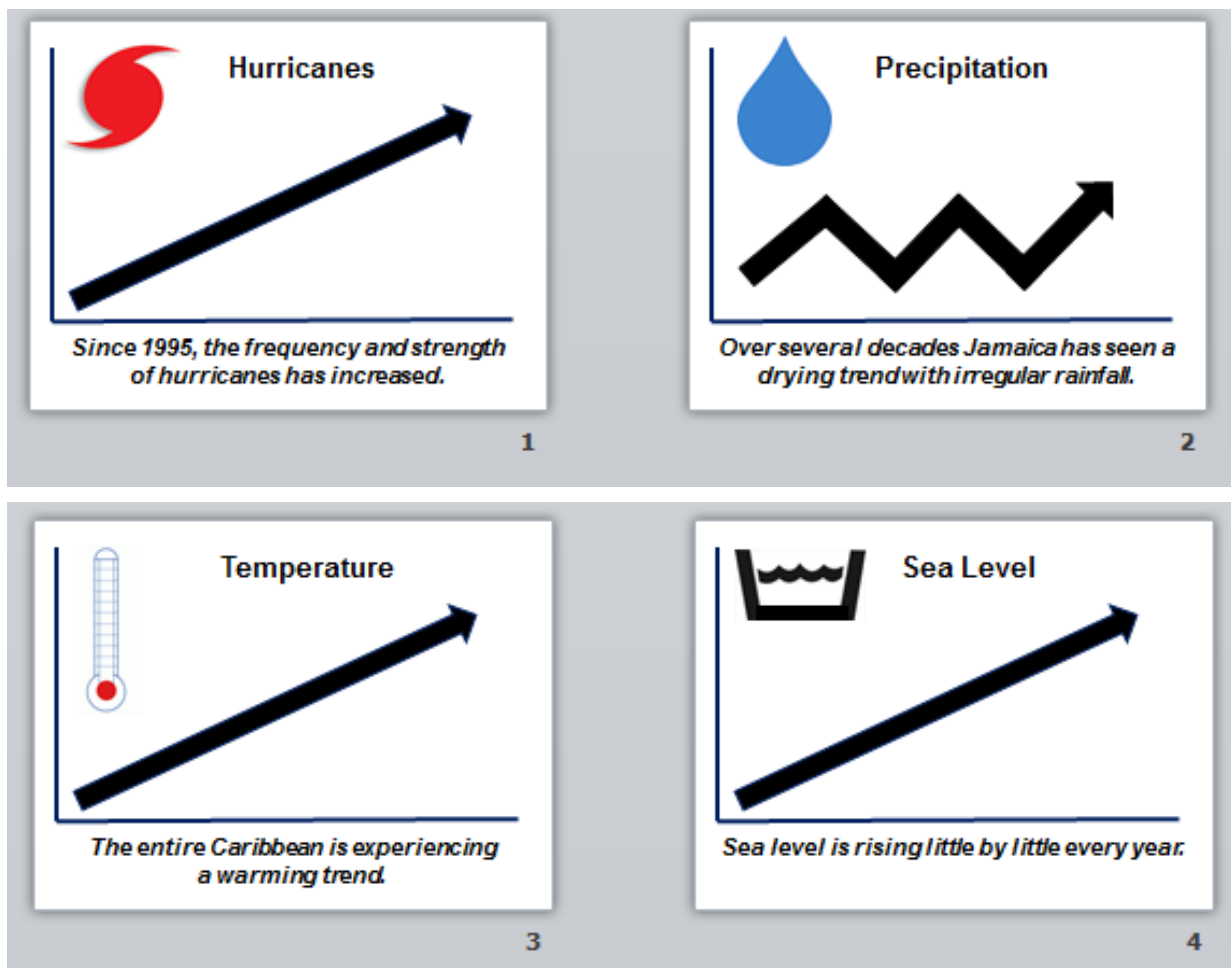
<b>Identifying Recent Trends in Climate and Environmental Changes</b>							
<b>Year</b>	<b>Historical Events</b> (hurricanes and drought)	<b>Temperature</b> 	<b>Rain</b> 	<b>Wind</b> 	<b>Forest</b> 	<b>River</b> 	<b>Soil</b> 
<b>20 years ago</b>							
<b>Now</b>							

The first section will cover the trends identified in a more detailed manner. The goal here is to obtain a level of agreement that climate is changing. With agreement on the trends, you can then move to the next section where you take each trend and discuss how the trends affect farmers' crops.

### **1b. Perceived effects of current trends.**

Hold up the sheets one-by-one and explain the four recent weather trends **in the Caribbean and Jamaica** that affect agriculture production. After explaining the trend, ask the farmers the following discussion questions to solicit reactions.

- *Have you noticed these trends?*
- *Have you noticed something different in your area?*



## FOR REFERENCE (as farmers state their observations confirm the data trends):

### Temperature – Recent Trends, Projections, and Future Scenarios

Climate data records over the past 30-50 years document a general warming trend in the Caribbean, with Jamaica experiencing some of the most extreme climate variability in the region.

### Precipitation – Recent Trends, Projections, and Future Scenarios

Precipitation patterns in Jamaica over the past several decades have shown an overall drying trend through the summer months, with rainfall becoming more irregular in its distribution. Rains are being punctuated by periods of greater intensity and flash flooding, followed by longer dry spells, all concentrated within a shorter time span. Thus, greater extremes of moisture and dryness are contributing to more severe soil erosion and exposure to pest infestation and plant disease<sup>1</sup>. While a general drying trend will occur, rains will continue to fall with greater intensity when they do occur, and overall, relative humidity will rise. Due to the increasing intensity of storms, extreme hazard events such as landslides are expected to occur.

### Hurricanes – Recent Trends, Projections, and Future Scenarios

The occurrence of tropical storms and cyclones in the Caribbean and North Atlantic Basin has risen sharply since 1995, with a doubling of category 4 and 5 hurricanes. There has been a marked increase in hurricanes affecting Jamaica since 2004, and six storms events between 2002 and 2010 resulting in \$74 billion in losses to the Jamaican economy (USAID/USDA 2011). Major hurricanes have included Ivan and Charley in 2004, Dean in 2007 and Nicole in 2010.

<sup>1</sup> This was particularly the case observed during a visit to one of the largest coffee producers in Jamaica, discussed further below in examining various cropping systems.



### Activity IV: How do the trends affect me?

The goal of this exercise is to link climate change trends with effects on the farm.

Instruct FFS participants to brainstorm on the four climate trends that we reviewed in the previous section and identify ways that these trends have affected their crops and farms over the last 20 years. Unless individual copies are made for each participant, facilitators should recreate the chart below on flip chart paper and capture the farmers' ideas in Column 2 in the corresponding rows.

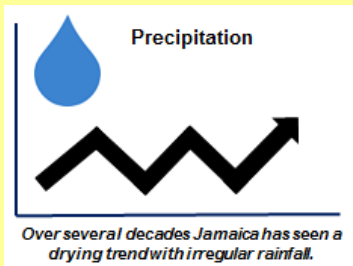
Use the examples in the worksheet example to prompt discussion and brainstorming. When completed, ask the farmers to identify the two effects that they suffer from the most or which are most costly to their bottom line.

#### Worksheet 1: The effects of climate change on farming in Jamaica.

Column 1. Climate Trends that have affected farmers

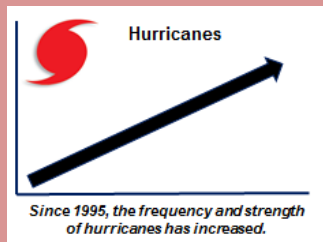
Column 2. What was the **EFFECT** on farmers' crops?

Changes in the timing and intensity of rainfall



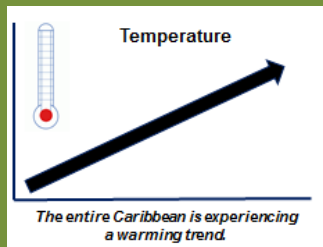
1. Drought
2. Flooding
3. Topsoil loss/Landslides
4. Unpredictable rainfall
5. Increased Pest/disease incidence

Hurricanes/ Tropical Storm: more frequent and intense



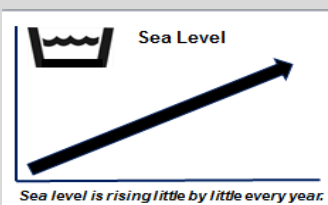
1. Flooding
2. Wind damage to crops and farm infrastructure
3. Topsoil loss /Landslides
4. Pest/disease incidence

Changes in Temperature



1. Increased water loss
2. New and increased pest and diseases
3. More stress on plants

Sea Level Rise



1. Loss of coastal agricultural lands
2. Salination of coastal agricultural lands with saline intrusion



### **PART 3. HOW CAN I BE A CLIMATE-SMART FARMER? (60-90 MINUTES)**

This final part takes the theory and background information covered in the previous parts and guides the farmers through identifying the most critical adaptations that they should consider for their own farms.

We start with scenarios to help farmers begin thinking about what individuals can do. Then we'll have farmers think through the many stages in production – beginning with first deciding what to plant and going all the way through production and eventually sale – to systematically identify climate change vulnerabilities at each stage. This enables us to consider threats and opportunities in planning, post-harvest handling and marketing, as well as risks in the field.

#### **ACTIVITY V: Problem Solving Scenarios – Identifying popular adaptations to effects of climate change**

To prepare for this assignment, the facilitator needs to add names, crops and places into the scenarios below.

Divide the farmers into five groups. Instruct them to read the scenario and brainstorm on how they would adapt to the situation. What would they change? What would they invest in? What do they think are the most important things to do to protect their livelihoods? The facilitator may need to go around and read the scenario to each group depending on literacy level. If appropriate, provide each group with a marker and flipchart to gather their responses to the scenario.

After coming up with their own adaptation strategy for each effect of climate change, each group should report out so that everyone sees the various effects and the various ways in which farmers can adapt to climate change. Encourage the other groups to respond and build on the answers provided by the other small groups.

**Scenario 1:** Farmer A lives in [Insert name of location]. His [insert type of crop] has suffered greatly from the strange rainy season. It flooded just after he seeded/planted his [insert type of crop], and then it hasn't rained at all for the last week. The [insert type of crop] is wilting because of a lack of rain. What can farmer A do?

**Scenario 2:** Farmer B has grown tomatoes in [Insert name of location] for several years. He is frustrated that the tomatoes suffer from fungal diseases when it rains too much and the fields flood. He is also very concerned that every September and October the storms devastate the plants. What can Farmer B do?

**Scenario 3:** Family C has several hectares in [Insert name of location] where they grow [insert type of crop]. It is one of the driest zones in Jamaica, and they struggle with water availability each year. Depending on the rain is stressful for the family and the plants! They cannot afford to install drip irrigation, nor do they have a water source to connect to. What options does family C have?

**Scenario 4:** Farmer D cleared his land several years ago so he could farm it. While the soil was one very fertile, he has seen it decline in productivity over the years. Storms, prolonged rains and hurricanes have eroded much of this good topsoil. He is finding it more difficult to grow most crops. The plants themselves grow rather slowly without a full fertilizer regime. What should farmer D do?

**Scenario 5:** Community Leaders E in [Insert name of location] is concerned about how all the members of the community suffer from hurricanes. They are on the edge of Jamaica where hurricanes usually hit first! Property gets damaged, electricity gets cut, and people do not know what to do. What should Community Leaders E do?

## 2. Seed-to-Sale

This next exercise is a critical activity for each farmer. Not only will the farmers identify the effects of climate change which they are susceptible to, but they will also attempt to prioritize vulnerabilities and possibly even calculate a financial implication of an effect.

Ideally, this would be an individual or small group activity, but depending on literacy level, the facilitator may want to do this exercise as a large group so that he/she can pose questions to draw out information from the farmers.

### ACTIVITY VI: Climate Change Considerations from Seed to Sale

Stage	Market research	Land prep	Irrigation, water, drainage	Nursery, seeding & planting	Husbandry, weeding, management	Field harvest	PHH & marketing
What is the impact of CC on this stage?	Deciding what to plant...	Exposing soils...	Prepare fields for flooding...	Be careful not to seed or plant if storms or droughts are imminent.	Might run out of what.	High temperatures make vegetables spoil in field	How long can we hold or store?
Priority?							

## 3. Activity: What can I do?

The result of the previous activity was that farmers identified the effects which are often most costly or most common. Now they will use the worksheet provided (worksheet X) – or flipcharts – to determine what the best courses of action are to combat the effects. The steps they take to address the effects of climate change are ‘adaptations.’

Divide the farmers into small groups. Instruct each group to take the top two EFFECTS they identified in Worksheet 2 and create a list of:

1. The things that they, as farmers, have done to mitigate or reduce the impacts and basis for same (to understand the farmer thought process)
2. What else can be done by farmers or by other groups working in the community:
  - a. What else can farmers do?
  - b. What can RADA and other extension partners do to help farmers address the risks?
  - c. What can government and other national level players do?
3. Finally, in the final column, list reasons why they think the selected solutions have not yet been done. What is holding them back?

Worksheet 2: What can farmers and other stakeholders do to reduce or mitigate climate change impacts

Climate Change Impact	What have we done to mitigate or reduce impacts?	What else can we do?	What are the barriers? (what is preventing success)
1.			
2.			

**What can be done to reduce the impacts & expected challenges?**

Adaptation is the process through which societies make themselves better able to cope with an uncertain future. Adapting to climate change entails taking the right measures to reduce the negative effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes. Strategies could include:

- ❖ Water harvesting and storage
- ❖ Better water management/ reduced and more efficient water use
- ❖ Mulching/organic matter incorporation (to reduce water loss)
- ❖ Changes to crop production cycles to align with seasonal changes
- ❖ Investigate drought tolerant crops/cultivars
- ❖ Investigate insurance options and ways to minimize risks
- ❖ Application of integrated pest management practices
- ❖ Growing different types of crops to diversify their risks
- ❖ Use of protected agriculture systems

**PART 4. CONCLUSION: AGREEMENT ON WHAT IS CLIMATE-SMART AGRICULTURE**

In this session the facilitator and farmers will summarize the conclusion made from the previous sessions with a view to agreement on how to make agriculture “climate-smart” through sustainable production practices that:

- a. Increase productivity
- b. Make producers more resilient
- c. Promote adaptation
- d. Reduce or mitigate against the agriculture’s contribution to global warming through green house gas emissions.
- e. Reduce/mitigate against the sector’s contribution to resource (soil, water, bio-diversity) degradation (an important impact of CC)

Note: Brochure and other information resources will be made available to share with the farmers or to be included in the farmers’ handbook.