

Developing an Adaptation Strategy for Sustainable Agriculture

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The Challenge: Sustainable Agriculture in a Changing Climate



Food production needs to double to meet the needs of an additional 3 billion people in the next 30 years



Climate change is projected to decrease agricultural productivity in the tropics and sub-tropics for almost any amount of warming

IPCC

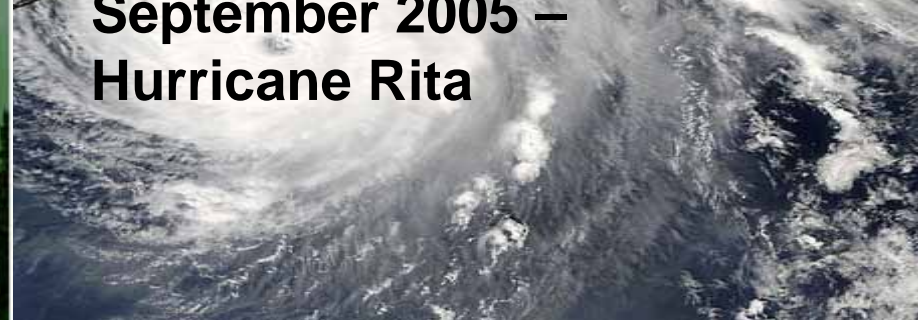
Vulnerable Agricultural Systems



Major Natural Disasters



**September 2005 –
Hurricane Rita**



Environmental Degradation and Natural Disasters

- Environmental degradation is one of the major factors contributing to the vulnerability of agriculture, forestry and rangelands to natural disasters
- Poverty and environmental degradation are closely linked, often in a self-perpetuating negative spiral in which poverty accelerates environmental degradation and degradation results in or exacerbates poverty.

Background – Agriculture

Sustainable Agriculture

- To help address these issues, a growing movement has emerged during the past 25 years to offer innovative and economically viable opportunities.
- **Concept of Sustainable Agriculture**

Sustainable Agriculture

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- Stewardship of both natural and human resources is of prime importance. Land and natural resource base needs to be maintained or enhanced for the long term.
- A systems perspective is essential to understanding sustainability – from the individual farm to the local ecosystem *and* to communities affected by the farm.

Agriculture in the 21st Century

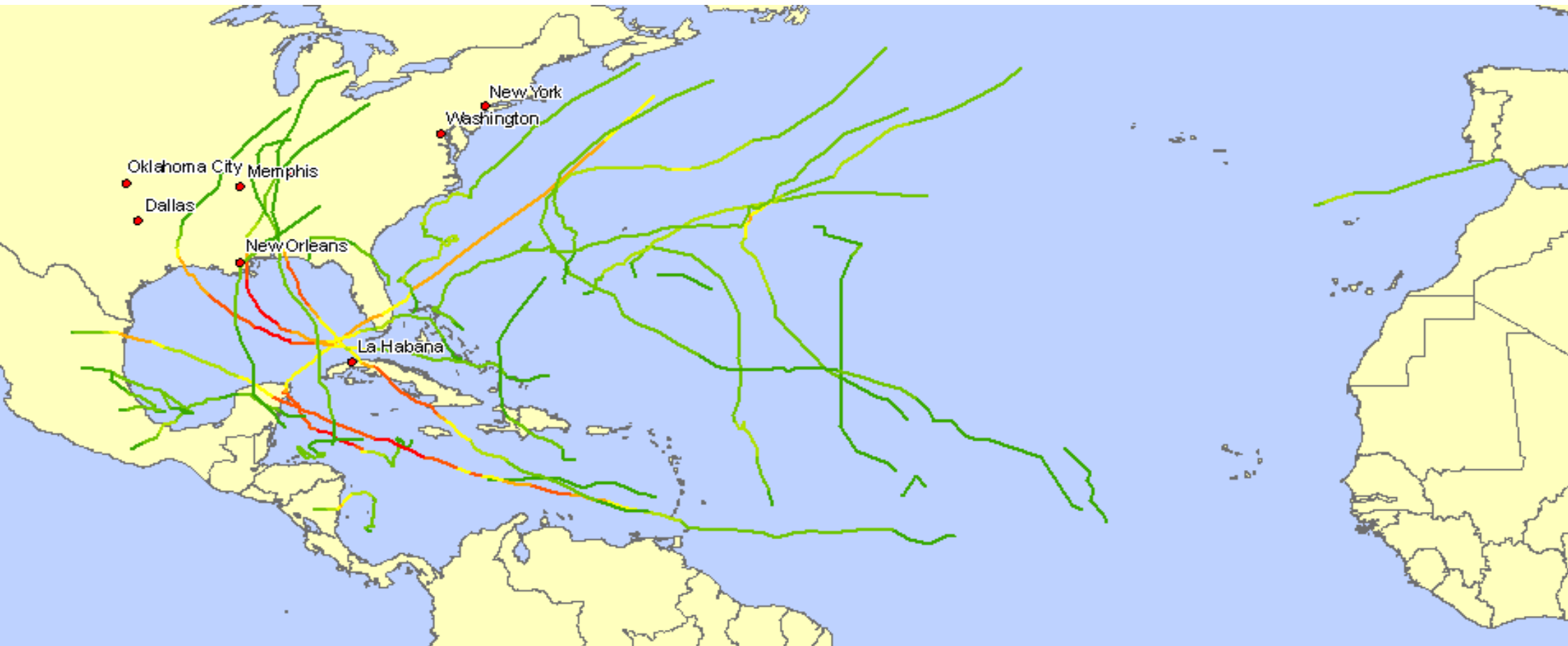
- A globalization of markets and culture
- Advances in information and biological (and other) technologies
- Fundamental changes in our family structure and workforce
- These changes extend throughout the network of food marketing, distribution, trade, and consumption.
- New global economic factors!

Scientific evidence linking global warming and extreme events

- Intense European heat wave in the summer of 2003; U.S. 1988 summer drought. (Stott et al., Nature 2004).
- Evidence linking climate change to the intensification of hurricanes by 18% until 2050 (Knutson et al., J of Climate 2004).
- Major tropical storms in the Atlantic and the Pacific regions have increased since the 1970s in duration and intensity by about 50 percent, induced by global warming (Emanuel, Nature 2005; Webster, Science 2005).
- Sea surface temperatures have increased by 0.5°C due to climate change, accounting for the rising strength of storms in six ocean basins around the world (Barnett, Pierce, 2005, Science, 2006)

2005, a Year of Weather Extremes

Never before since the beginning of records (1850) have so many named tropical storms occurred in the North Atlantic basin in one season: 27, of which 14 with hurricane strength (old absolute record 21 in 1933, resp. 12 in 1969).



Major reasons for increasing losses due to natural disasters (globally)

- Increasing population
- Better standard of living
- Concentration of people and property in large urban areas
- Settlement in and industrialization of extremely exposed regions
- Susceptibility of modern societies and technologies to natural hazards
- Change in environmental conditions - Climate Change/Variability!

Frequent Droughts in Brazil



Agriculture & Climate

- Historically, agriculture develops over time in a given region based on “normal” or average climate conditions.
- The frequency of occurrence of extreme climate conditions dictates the response of agriculture to climate variability/change.

Management Changes

- Producers can adapt to climate changes by altering crop management practices, e.g., planting date, crop selection, nutrient management
- Producers can adapt to climate changes in livestock through changes in management practices that reduce exposure to thermal stress

Long-Term Strategy

- ***Preparedness*** to improve the effectiveness of response and recovery, such as establishing early-warning systems.
- ***Mitigation measures*** to reduce the impact of extreme events or natural disasters prior to their occurrence.
- ***Adaptation strategies*** to prepare for and cope with the potential impacts of climate variability and climate change.

Long-Term Strategy – Key Objectives

- Incorporates weather and climate knowledge into planning and management decisions for agricultural production.
- Achieve a sustainable, optimized production level through the use of weather and climate information, while maintaining environmental integrity and minimizing the degradation of soil, nutrient and water resource bases.
- Technology (fertilizers, new seed varieties, farming practices) should aid production but not harm the resource base in the long term.

Agroclimatic Risk Management Plan

- Vulnerability Analyses
- Vulnerability---extent to which climate change may damage or harm a system.
- This depends not only on a system's sensitivity but also on its ability to adapt to new climatic conditions.

Agroclimatic Risk Management Plan

- Vulnerability Analyses
- Impact Assessments
- Climate change affects underlying risk factors and the ability to cope with and recover from extreme events.
- For example, production shifts into more marginal areas will be more seriously impacted by droughts/floods etc.
- Impact of longer growing season/potential heat waves on crop phenology & crop varieties has significant consequences on food security

Agroclimatic Risk Management Plan

- Vulnerability Analyses
- Impact Assessments

- Mitigation Planning

Mitigation measures to prevent or reduce the impact of a catastrophic event prior to its occurrence.

Mitigation of global warming involves taking actions to reduce [greenhouse gas emissions](#) and to enhance [sinks](#) aimed at reducing the extent of [global warming](#). This is to distinguish from [adaptation to global warming](#) which involves taking action to minimize the [effects of global warming](#) (IPCC)

Agroclimatic Risk Management Plan

- Vulnerability Analyses
- Impact Assessments
- Mitigation Planning
- **Adaptation Strategies**

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3. Adaptation occurs at all levels, ranging from local to national and international levels.
4. Equal importance is placed on both the adaptation strategy and the process needed for its implementation .

Adaptation Strategies For Vulnerable Groups

- Need to identify adaptation strategies that favor the most vulnerable groups.
- For e.g., strategies such as large-scale agriculture and irrigation may benefit national interests and large operations, but may actually harm local, poor indigenous populations.
- The ability to adapt is based on a “bottom-up” approach, identifying local and future risks.

Adaptation Strategies

- No one adaptation strategy fits all needs
- Need to work with stakeholders to identify the most effective adaptation strategies to enable them to better cope with local risks.
- Emphasis should be on finding measures that increase resilience to changing climate, but still make sense under existing conditions.

Agricultural Adaptation Strategies

Some adaptation strategies include:

- genetic improvements to drought-tolerant crops;
- translocation of crops and changes in cropping patterns;
- afforestation to condition the soil;
- improved water infiltration (if available);
- improve shade through shelterbelts;
- increase water use efficiency;
- diversification into non-farm activities to avoid overuse;
- crop insurance; and,
- improve management of or access to markets and finance (e.g., microcredit)

Agricultural Adaptation Strategies

Types of Options

- Infrastructure: development of food storage facilities; build dam; improved design of levees.
- Capacity building: develop early-warning system; build knowledge and capacity to understand agricultural production stressors; drought/risk management; climate network monitoring; strengthen commodity estimates system and find new markets.
- Policy: Limit deforestation; water conservation and demand management; develop resource management plans at community level; facilitate access to credit.
- New practices: Incorporation of crop residue into soil tillage; use of short-rotation and heat-tolerant crops; intercropping and crop rotation (to address pest); shift livestock rearing etc.

Contribution of the research and development communities

- The development of new technologies to cope with climate change and anticipate climate variability, in particular related to early warning systems.
- The development of sophisticated models for regional studies to adapt to possible changes i.e. further research on potential impacts of climate change on agriculture.
- The development of focused farm specific climate change information.
- The collection and dissemination of technology transfer projects, indigenous knowledge and farmer training programs to identify and scale up good management practices.
- Addressing and planning areas for research and development through partnerships between farmers and scientists e.g. research projects addressing energy harnessing techniques on the farm.

What is lacking for farmers?

- Lack of incentives from governments for farmers to keep abreast of climate friendly farming technologies; a lack of guidance on climate change adaptation; and, a lack of capital to put necessary adaptations into place. In particular, there is a lack of pro-poor farming research.
- The lack of risk management tools related to weather damage, in particular in developing countries. Traditional insurance markets and informal insurance arrangements between farmers and community members in developing countries are inadequate in preparing for climate change.
- The establishment of crop insurance funds by national governments to help farmers recover from losses and stabilize their incomes in situations of increasing “climate vulnerability” may need to be promoted.
- Incomplete policy frameworks to address climate change impacts and adaptation measures are inconsistent with climate change adaptation and mitigation goals.

Thank You