Drought Risk Assessment in the Agricultural Sector

Overview

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Sustainable Agriculture

• Goals: environmental health; economic profitability; and socio-economic equity.

• Principle: meet the needs of the present without compromising the ability of future generations to meet their own needs.

• 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.
1. Sustainable Agriculture

• What is it? Many, many definitions.
• We can discuss the properties of Agro-ecosystems.
• Conway’s three properties are:
  – Productivity
  – Stability
  – Resilience

1. Productivity

Net increment of valued product per unit of resource (kg/ha for example)
1. Stability

Degree to which productivity remains constant over time when not faced with a shock (1/CV productivity)
1. Resilience

The ability of a system to maintain or recover productivity when subject to stress or shock.
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!
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!
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.

VS. 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
Adaptation Strategies

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3. Adaptation occurs at all levels, ranging from local to national and international levels.
Adaptation Strategies

1. Adaptation measures are assessed in a developmental context.
2. Adaptation to short-term climate variability and extreme events are explicitly included as a step toward reducing vulnerability to longer-term climate change.
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: water conservation and demand management; develop resource management plans at community level; facilitate access to credit; Limit deforestation.

• 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 drought and other climate impacts and adaptation measures.
U.S. National Drought Policy

Management Strategies for Sustainable Agriculture
National Drought Policy Commission

• Recommending a paradigm shift in policy from “Relief” to “Readiness”.

National Drought Policy Commission
Facts

• Planning and Mitigation: Overall
  – Thirty states have individual drought plans
  – Few river basin and watershed plans include a drought component.
  – Small percentage of towns and counties have drought preparedness plans
  – Small percentage of individual agriculture producers have drought contingency plans
National Drought Policy Commission (NDPC)

Case Studies of Successful Drought Plans:

- *Advanced planning*
- *Proactive mitigation*
- *Innovative technology*
- *Cooperative and collaborative efforts among federal and non-federal entities*
NEW PARADIGM:

• Change the STATUS QUO of spending billions of dollars in response to drought without reducing the risk situation of the recipients to:

• Reducing long term costs;
• Reducing risks; and,
• Maintaining a safety net.
POLICY STATEMENT

Priorities:

• Preparedness over insurance;
• Insurance over relief; and,
• Incentives over regulation.
Federal/non-federal partnership to ensure that:

• Drought programs are better coordinated;
• Programs are better integrated; and,
• Their services are more efficient, effective, and driven by customer needs.
GOAL 1:
The key elements of an effective national drought policy include:
• planning and the implementation of plans;
• proactive mitigation measures;
• risk management;
• resource stewardship and environmental considerations; and,
• public education.
GOAL 2:
Collaboration among scientists and managers needs to be improved in order to:

• increase the capability of observation networks;
• enhance the effectiveness of monitoring, prediction, information delivery, and applied research systems; and,
• to foster public understanding of and preparedness for drought.
Dealing with the effects of a 3-year drought

Drought persists in southern TX and has begun to expand.

Upper Midwest: a stubborn pocket of dryness

The Southeast: an area to watch for developing drought.

CA: Dealing with the effects of a 3-year drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

http://drought.unl.edu/dm

Released Thursday, July 2, 2009
Author: Rich Tinker, CPC/NCEP/NWS/NOAA
The National Integrated Drought Information System (NIDIS)

- An information system for drought early warning and adaptation
- Public Law 109-430 authorizing NIDIS signed by President in December 2006
- Led by NOAA, a multi-agency partnership of Federal, State, and Local cooperators
- A clearinghouse for drought mitigation and response innovations
- Coordination of drought plans among states, communities of a common river basin
- Strengthening monitoring networks
GOAL 3:

- Drought preparedness plans need to develop and incorporate comprehensive insurance and financial strategies into their overall long-term plans.
USDA Risk Management Options
Crop Insurance

• Crop insurance policy is one risk management option.
• **Actual Production History (APH)** policies insure producers against yield losses due to natural causes such as drought, excessive moisture, hail, wind, frost, insects, and disease.
• Risk Management Agency provides policies for more than 100 crops.
• There are a wide variety of policy options available to farmers.
GOAL 4:

• A safety net of emergency relief must be maintained that emphasizes sound stewardship of natural resources and self help.
Emergency Response

• Natural disaster is a constant threat to America's farmers and ranchers and rural residents. USDA provides assistance for losses that result from drought, flood, fire, freeze, tornadoes, pest infestation, and other calamities:
  --Food Assistance
  --Loan Assistance
  --Crop Disaster Programs
  --Rural Development Assistance Programs
  --Forestry and Livestock Assistance Programs
NDM Counties Approved, April 3, 2003

NON-FAT DRY MILK PROGRAM
Counties APPROVED
As of April 3, 2003

Non-fat Dry Milk Counties

No
Yes
## NDM Initial Allocations by State

### 2003 Non-Fat Dry Milk Feed Program

**Initial Allocation by State**

**U.S. Drought Monitors - September 3, 2002 - March 11, 2003**

**NDM Allocation Data - NASS/Other Available Data**

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<th>STATE</th>
<th>Number of Counties</th>
<th>Beef Cattle</th>
<th>Sheep/Goats</th>
<th>Bison</th>
<th>30-Day Allocation in Pounds</th>
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Last revised on April 30, 2003
The USDA Non-Fat Dry Milk (NDM) Program

February/March 2003: USDA officials had several meetings with their meteorologists to discuss the Drought Monitor, including definitions of drought intensities and DM weaknesses. USDA’s Chief Economist describes the previous disaster declaration: four entire states were granted disaster relief based on subjective USDA/NASS pasture conditions (>70% very poor to poor).

March 2003: It was recommended by the US analyst that instantaneous D3/D4 areas define the disaster areas (with the concern that dozens of maps would have to be digitized). USDA officials decided to restrict the disaster areas to counties that were in D4 at some point between September 3, 2002, and March 11, 2003, and remain in D3 or D4 on March 11.

April 8, 2003: Secretary Ann Veneman announces that USDA will provide surplus stocks of non-fat dry milk (NDM) to eligible livestock producers in areas hardest hit by continuing drought.
On April 8, 2003, then-Agriculture Secretary Ann M. Veneman announced that the U.S. Department of Agriculture will provide surplus USDA stocks of non-fat dry milk (NDM) to livestock producers in areas hardest hit by continuing drought.

USDA will enter into agreements with state and tribal governments to coordinate the movement of the NDM to eligible producers. Approximately 100 counties in nine states (Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, South Dakota, Utah and Wyoming) currently meet the initial eligibility criteria.

The U.S. Drought Monitor will be used to determine which counties are eligible, and eligibility will be re-evaluated every 30 days to ensure the program is targeted to producers in greatest need. To be eligible, counties must meet one of the following two criteria:

* Be a county or part of a county located in a D4-Exceptional category on the Drought Monitor at any time on or between Sept. 3, 2002, and March 11, 2003, and on the March 11, 2003, Monitor be located in at least D3-Extreme or D4-Exceptional area.

* Be a county or part of a county located in a D4-Exceptional area on the Drought Monitor on March 11, 2003.

Eligible livestock are foundation herds (breeding and replacement stock) of beef cattle, buffalo, sheep, and goats. The allocation of NDM for a county will be based on a renewable, if applicable, 30-day supply, based upon two pounds of NDM per day for beef cattle and buffalo, and one-half pound of NDM per day for sheep and goats.
U.S. Drought Monitor Usage by FSA

- State FSA Committees are authorized to approve emergency haying and/or grazing of certain land enrolled in the Conservation Reserve Program (CRP) for an area or county within their State when the U.S. Drought monitor attains D3 or D4.

- Informs FSA at the National Office of conditions in areas seeking approval of emergency haying and/or grazing of CRP which has not attained D3 or D4.

- Informs FSA at the National Office of drought conditions to support requests for funding under the Emergency Conservation Program.

- Lack of moisture verification for prolonged precipitation deficiencies that exceed the D2 level for review of prevented planted claims for nonirrigated crops.
U.S. Drought Monitor Usage by FSA

- Food, Conservation, and Energy Act of 2008 authorizes the Livestock Forage Disaster Program
  - Grazing loss because of drought on owned or leased grazing land or pastureland that is physically located in a county experiencing:
    - D2 intensity for at least 8 consecutive weeks during normal grazing period will be eligible to receive payment equal to 1 monthly payment
    - D3 intensity during the normal grazing period will be eligible to receive a payment equal to 2 monthly payments
    - D3 intensity for at least 4 weeks or a D4 intensity during the grazing period will be eligible to receive a payment equal to 3 monthly payments
Goal 5:

• The combination of drought programs and emergency response measures need to be coordinated in an effective, efficient, and a customer-oriented manner.
Preparedness is the key to a proactive drought policy.
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 extreme events or natural disasters.
Thank you