Climate Risk Management in the Agricultural Sector: IRI Experience Over the Past Decade

Walter E. Baethgen
Regional Program for Latin America and the Caribbean International Research Institute for Climate and Society (IRI)
Columbia University

CIMR Session: Extension and Application of Climate Information for Agriculture and Natural Resources
Interface of Climate (Seasons to Decades) and Society
CIMR Session: “Extension and Application of Climate Information for Agriculture”

IRI Lessons learned:

Most of them Mentioned Yesterday

One Key Issue:

Demand-driven Research
The IRI was established as a cooperative agreement

*Initial (3 year) IRI grant awarded (June, 1996)*
First Lesson Learned:

In order to achieve Societal Impact / Development:

Work must be  
- Demand-driven  
- Problem Focused

Excellent Scientific Work
Publishable research (peer-reviewed)

Usable?
Used?

Research FOR Development
Research Expertise Growth, by Area

Number of staff

- Climate
- Agriculture
- Health
- Water
- Disasters
- Risk Management
- Anthro/Socio
- Environmental Proxies
- Policy/Institutions
- Economics
- Statistics/Modeling
- Region Expertise

Staff areas, 2000
Research Expertise Growth, by Area

- Climate
- Agriculture
- Health
- Water
- Disasters
- Risk Management
- Anthro/Socio
- Environmental Proxies
- Policy/Institutions
- Economics
- Statistics/Modeling
- Region Expertise

Staff areas, 2000
Additional staff areas, 2005
≈50% Climate, 50% “Other”
Originally IRI focused almost exclusively in Seasonal to Interannual Scale

**Demand Driven: Relevant Temporal Scales change with users**

(Weather 1 – 10 days)

- “Climate Variability”
  - 2-3 months
  - 6 months – 1 year
  - Decade
  - Several decades
  - Centuries

**Most Users:** How does Longer term Affect Climate Variability, Extremes? (Droughts, Floods, vs 2070-2100)

Learn to cope with current climate variability to be better prepared for Climate Change
Demand-driven Research

• Exclusively? May Prevent Advances in Science
• Transition to “Consultant” Organization

Maintain Scientific Identity and Assist Development

1. “Translate” research into usable information

2. Save a “small” percent for pure innovative Science

3. “Create Demand” with Innovations, Capacity Building, New Products
1. “Translate” research into usable information

Start by linking with “Demand” sector

Define Scales (Spatial and Temporal)

**Spatial Scale:**

• Global?
• Regional? (more than one Country)
• National?
• Sub-National?
• Local (community)?
Example Global:

Demand:
IFRCRC Inform/Assist Red Cross Regional / National Agencies to plan, manage risks, anticipate (e.g., FLOODS)

Precipitation forecast for the next 6 days

Corresponding percentiles (how “unusual”?)

Forecast for 29 May 2008 - 3 Jun 2008 Issued 0000 29 May 2008

Forecast for 29 May 2008 - 3 Jun 2008 Issued 0000 29 May 2008
Example **Regional**: Central America

**Demand:**
Inform/Assist **Red Cross Central America** on Flood Risk
(50% of disasters in Central America are flood related)

Global Scale Product: Too Coarse

**Need Regional**
Partner with CATHALAC, National Weather Services
(Higher Resolution)

- **Forecasts**: **Weather** (6 days) / **Climate** (3 months)
- Provide Soil Moisture / Rainfall in last 6 days (**Flood Risk**)
- **Vulnerability** Maps (population in hillsides, floodplains)

**Overlay with GIS**: Decision Support
- **Operations** (Weather)
- **Planning** (Seasonal)
Red Cross Panama acts at **LOCAL** (community) level

Requires Tools, Products, Information at **LOCAL** level

**Role of the IRI?**

- Cannot work at local level in every region

- Identify organizations at local level and build capacity

- Identify organizations at Regional level that can assist the LOCAL level (e.g., CATHALAC, CIIFEN, CRRH)

- Identify organizations at Grass Root level (NGOs)

**“Exit” Strategy for the IRI**
Demand-driven Research: Information, Product “Chains”

NOAA, NASA, CGIAR, Universities, Regional Centers

Results, Information
Global, Regional (National)

IRI: Capacity building, few Demonstrations

Results, Information
Sub-National, Local (Community)

Regional Centers, National Agencies, NGOs
Translating Climate Information and Products into Relevant Agricultural Information and Products

Seasonal Climate Forecasts

(3 months)

Are these numbers Different enough From 33 – 33 – 33?
Integrate Climate Information with Technology, Policies

Soil Map

Climate
(Records, Seasonal forecasts, Scenarios)

Anemometer
(wind speed)
Pyranometer
(solar radiation)
Data logger
Lightning Rod
Wind Vane
(wind direction)
Air Temperature
Humidity sensors
Solar panel

Crop Simulation Models

CERES - Wheat Calibration: Grain Yield

Simulated (kg/ha)

Observed (kg/ha)

What if?

GIS

Product:
Expected Income and Risks

Technologies

<table>
<thead>
<tr>
<th>Country</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>TURKEY</td>
<td>MOROCCO</td>
</tr>
<tr>
<td>SYRIA-1</td>
<td>BRAZIL</td>
</tr>
<tr>
<td>SYRIA-2</td>
<td>ROMANIA</td>
</tr>
<tr>
<td>BRAZIL</td>
<td>INDIA</td>
</tr>
<tr>
<td>INDIA</td>
<td>URUGUAY</td>
</tr>
<tr>
<td>CHINA</td>
<td>ARGENTINA</td>
</tr>
</tbody>
</table>
Integrate Climate Information with Technology, Policies at RELEVANT SCALE

Soil Map

Climate
(Records, Seasonal forecasts, Scenarios)

Anemometer (wind speed)
Pyranometer (solar radiation)
Data logger
Lightning rod
Wind vane (wind direction)
Air temperature and humidity sensors
Solar panel

Crop Simulation Models
CERES - Wheat Calibration: Grain Yield

GIS

What if?

Product:
Expected Income and Risks

What if?

Integrate Climate Information with Technology, Policies at RELEVANT SCALE
Climate Risk Management in Agriculture:

Information and Decision Support Systems
SIMULATION MODELS
REMOTE SENSING
EXISTING DATABASES
CLIMATE SCENARIOS
GIS

Different Spatial Resolutions: Input (data) → Output (Product)
Country → Provinces, counties → Users

Different Temporal Resolutions: Input (data) → Output (Product)
Seasons → Decades → Climate Change

Inform Decisions, Planning, Development
Analyze possible impacts and responses: (What if...)

Interventions
- Technologies
- Management
- Policies

Simulation Model
(Crop, Water, Health)

Possible Outcomes
1
2
3
4
5

Analyze a wide range of alternatives and
Possible impacts in different climatic conditions:

Inform Planning and Decision Making

Uncertainties?
Analyze possible impacts and responses: (What if…)

Interventions
• Technologies
• Management
• Policies

Climate Information
(Seasonal Forecasts, Climate Change Scenarios)

Possible Outcomes

Analyse a wide range of alternatives and possible impacts in different climatic conditions:

Inform Planning and Decision Making Including UNCERTAINTIES!
Also critical for development:
- Risk aversion reduces adoption of technology
- Affects natural resources
- Poverty traps

Climate Risk Management: the Full Range of Variability

Climatic outcome (e.g., rainfall, production)

Probability density

- e.g., Drought
- e.g., Mitch

FOREFITED OPPORTUNITY

CRISIS

HARDSHIP
IRI Approach to Climate Risk Management
(from months, through Decades, to Climate Change)

Identify Vulnerabilities to Climate Variability and Change in collaboration with Users (which systems, components within systems)

Reduce Uncertainties (learn from the past, monitor the present, provide relevant info on the future)

Identify technologies that reduce vulnerability (e.g., water holding capacity, diversification, drought resistance)

Identify Policies and Institutional Arrangements that reduce Vulnerability and/or transfer risks (e.g. Insurance)
Managing Climate Risks

Reduce Uncertainties:

Provide Relevant Climate Information
(e.g., Probability of “good” season, “bad” season)

i.e., “Tailor” Information (Temporal, Spatial Scales)
Cover for unfavorable Situations: Role of Market Instruments

Take advantage of good seasons being covered for bad seasons
Farmers AND Input Providers, Loan providers

Technology Adoption

Probability density

Climatic outcome (e.g., rainfall, production)

Disaster Insurance (Governments, Aid Agencies)

Private + Public Insurance

FOREFITED OPPORTUNITY

CRISIS

HARDSHIP
Lessons learned: Some Common Features

Start with Problem Definition, Demand Definition with Users

Identify relevant Scale (including Exit Strategy for local level)

Establish the right partnerships (research, technology, operations)

Establish collaborative research for products, tools, information

Tailor/Translate/Integrate Climate Information and Products

Research for understanding Decisions, Institutions, Policies

Build Capacity (for existing tools, for new tools):
Create New Demand
Thank you