A Framework for Developing Agricultural Applications of Seasonal Forecasts

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Overview

- Introduce the problem and how the Training Institute addresses it

- Discuss the conditions that must be in place for decision makers to benefit from seasonal forecast information

- Introduce the training modules in the context of those preconditions

- Suggest some questions that the modules will equip trainees to address
Introduction

The Problem:
Vulnerability to Climate Variability

Humanity vulnerable to direct hazards and impacts on health, primary production, transportation, etc.

Agriculture, in particular, "the most weather-dependent of all human activities" (P. Oram)
Introduction

Direct Impacts of Climate Variability

- Episodic regional food shortages
- Sustenance and livelihood of rural populations
- Food price and availability for consumers
- Damage to infrastructure
- Ripple effects on economies
Uncertainty leads to conservative risk management strategies that reduce negative impacts at the expense of reduced average productivity, inefficient resource use, accelerated resource degradation:

- Low intensity of production
- Under-adoption of technological innovations
- Under-investment in soil fertility

By contributing to persistent poverty, climatic uncertainty contributes to household-scale food insecurity by reducing access to purchased food.
Introduction

Potential Benefit from Climate Prediction

Year-to-year climate variations influenced by interactions between atmosphere and slowly-varying ocean and land surfaces, e.g., ENSO

Improvements in understanding of ocean-atmosphere interactions, advances in modeling global climate system, investment in monitoring the tropical oceans provide a degree of predictability of climate fluctuations at a seasonal (3 month) lead time in many parts of the world.
Introduction

Potential Benefit from Climate Prediction

Our emerging ability to provide timely, skillful forecasts offers potential to reduce vulnerability through improved decisions that reduce negative impacts or take advantage of favorable conditions.
Equip young developing country agriculture and food security professionals to apply advances in climate prediction to their home institutions' ongoing efforts to address problems of food insecurity and rural poverty.
Introduction

What is the Training Institute About?

PEmphasis on supply side (i.e., agricultural production) of food security, but also concerned with rural poverty and food insecurity early warning

PFocus on year-to-year climate variability and seasonal ($3 month) prediction

PAs an advanced institute, emphasizes methods

PUltimate goal is to institutionalize the learning
Prerequisites to Beneficial Use

What conditions must be in place in order for decision makers to benefit from seasonal climate prediction?

Benefit arises when prediction of climate fluctuations leads to decisions that reduce vulnerability to impacts of climate variability.
Prerequisites to Beneficial Use

- Climate predictability
- Human vulnerability
- Benefit potential
- Decision capacity
Vulnerability and motivation

Forecast information is useful only when it addresses need that is real and perceived. Decision makers must be aware of climate risk and its impacts, and motivated to use forecasts to manage that risk.
Prerequisites to Beneficial Use

PVulnerability and motivation
PDecision options

Benefits are conditioned on existence and understanding of decision options that are sensitive to incremental information in forecasts, and compatible with goals and constraints.
Prerequisites to Beneficial Use

- Vulnerability and motivation
- Decision options
- Predictability of climate

Relevant components of climate variability must be predictable in relevant periods, at an appropriate scale, with sufficient skill and lead time for decisions.
Prerequisites to Beneficial Use

PVulnerability and motivation
PDecision options
PPredictability of climate
PCommunication

Use of climate forecasts requires that the right audience receives, understands, and correctly interprets the right information at the right time, in a form that can be applied to the decision problem(s).
Prerequisites to Beneficial Use

Vulnerability and motivation
Decision options
Predictability of climate
Communication
Institutions and policy

Sustained operational use of forecasts requires relevant institutions committed to providing forecast information and other support, and policies that favor provision and use of climate forecasts.
Prerequisites to Beneficial Use

Training Institute Modules

P Vulnerability & motivation

P Decision options

P Predictability of climate

P Communication

P Institutions & policy

Module 4: Understanding Decision Makers
## Prerequisites to Beneficial Use

### Training Institute Modules

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Prerequisites to Beneficial Use

Training Institute Modules

PVulnerability & motivation
PDecision options
Predictability of climate
PCommunication
PInstitutions & policy

Module 1: Understanding and Predicting Climate Fluctuations
Prerequisites to Beneficial Use

Training Institute Modules

P Vulnerability & motivation
P Decision options
P Predictability of climate
P Communication
P Institutions & policy

Module 6: Communicating Forecast Information
## Prerequisites to Beneficial Use

### Training Institute Modules

- **Vulnerability & motivation**
- **Decision options**
- **Predictability of climate**
- **Communication**
- **Institutions & policy**

**Module 5: Institutionalizing Support for Forecast Applications**
Objectives:

- Understand the basis for seasonal prediction and methods to capture that predictability
- Analyze relationships of both observed predictors and dynamic climate model output to climate fluctuations
- Characterize forecast skill associated with those relationships
- Appreciate the requirements for operational seasonal climate forecasting
What’s the difference between *weather* and *climate*?

If we can predict weather only a few days in advance, how can we predict climate fluctuations months in advance?

How can I obtain useful seasonal forecasts for my location and application?

How do I determine how good the forecasts are?
Objectives:

- Analyze and predict impacts of climate variability, including its predictable components, on agricultural production via historic data analysis and process-level agricultural models

- Appreciation of the capabilities and limitations of both approaches
What approaches are available to anticipate agricultural impacts of climate fluctuations?

- How can I make use of historic crop data?
- How can I use agricultural simulation models?

How can I deal with the spatial and temporal scale mismatch between climate forecasts and agricultural models?

How can I use agricultural simulation models to predict regional production?
Objective: Equip to perform realistic *ex-ante* evaluation of management responses to climate forecasts at several system levels.
Module 3: Analyzing Management Responses to Forecasts

How can I evaluate management responses to forecast information?

What is the best management response to a particular forecast?

How do we factor the inherent uncertainty of seasonal forecasts into recommendations?

How do we attribute value to a forecast system, or compare different forecast systems?
Objectives:

<Understand enough about the needs, perspectives, constraints and socioeconomic context of target decision makers to effectively evaluate, foster and guide appropriate use of forecast information

<Engage decision makers in identifying and evaluating viable responses to forecast information
How does climatic risk impact the target decision makers?

Are they poised to benefit from climate information?

What do I need to know about the decision makers before I can work effectively with them?

What methods are most appropriate if I want to:
- Assess their interest and ability to use forecasts?
- Test particular hypotheses?
- Work with them to evaluate particular management responses?
Objectives:

Understanding, and tools for analyzing, existing institutional networks, including where their home institutions fit into those networks.

Appreciation of the elements of institutional and policy support required for sustained application of climate forecasts by a large segment of the population.
Institutions and Policy

Module 5: Institutionalizing Support for Forecast Applications

What institutional support is needed to:

• Facilitate effective use of climate information?
• Scale up benefits to a significant portion of the population?
• Sustain benefits beyond the life of a project?

What are the relevant institutions in my country?

Where does my home institution fit?

What does my home institution need to do to work effectively with other relevant institutions?
Objectives:

- Appreciation for the challenges of communicating information about skillful but uncertain forecasts in a manner that can be incorporated into decision making.

- Promising approaches for communicating forecast information in a manner that can be incorporated into decision making.
Communication

Module 6: Communicating Forecast Information

- What do decision makers need to know in order to be able to use skillful but imperfect forecasts?
- Can farmers understand probabilistic forecasts?
- What interventions can help decision makers understand and apply probabilistic forecasts?
- What role can decision support systems play?
An Evolutionary Strategy

**Exploratory phase** – Understand the system and assess the potential to benefit from climate prediction.

**Pilot phase** – Through intensive interaction, develop understanding and evidence of benefit foundational to operational support.

**Operational phase** – Mobilize institutional and policy support for sustained use of seasonal climate prediction.