Transforming Climate Variability and Change Information for Cereal Crop Producers in the North Central Region

PROJECT LEAD:
Linda Stalker Prokopy, PhD
Purdue University

http://www.AgClimate4U.org
The Problem

- Highly dependent on favorable temperatures and appropriate precipitation patterns
- Climate variability limits season-to-season predictability and lessens ability to maintain viable farm operations
- Producers need enhanced information for decision making
Cotton Acreage and Gross Farm Profit Under Reduced Water Supply

Projected sea-level rise calculated from...

Improve the resilience and profitability of farms amid variable climate change through:

- Developing a knowledge base of past and future biophysical and economic impacts
- Understanding stakeholder needs
- Designing decision support tools
- Preparing training materials and delivery approaches
- Pilot testing tools, methods and outreach
- Disseminating across 12 state region
U2U Team

State climatologists
Crop modelers
Agronomists
Economists
Social scientists
RCC staff
NOAA staff
Overarching Characteristics

- Ongoing dissemination and feedback
- Process, output, outcome, and impact evaluation
- HUBzero™ technology
Current predictive tools and models do not meet producer needs:

- No systematic climate outlook and prediction data for corn/soybean systems in Midwest
- Existing tools and models do not incorporate economic outcomes

Objective 1 -- Better understand contributions of anomalous weather to crop productivity, and implications for farm management
Key Issues

Impact/interaction of weather and climate on:

- Timing of nitrogen application and crop yields
- Soil moisture and resulting fieldwork opportunities
- Planting date and crop yields
- Crop cultivar maturity requirements
- End of season crop dry-down rates
- Economic feasibility of longer-term investments (i.e. irrigation, tiling)
Specific Modeling Tasks

Outcomes:

• Develop 4-km gridded crop models across 12-state region
• Identify impact of climate and management decisions on crop yields and farm profitability

• Crop simulations using 3 models
  – Validate using site-specific climate, soil, and agronomic data
  – Use newly developed NLDAS-derived gridded datasets
  – Model output cross-comparisons (DSSAT, Hybrid Maize, ISAM)

• Four farm case studies under various climate scenarios
  – Use Purdue Crop/Livestock Linear Program (PCLP)
  – Evaluate how crop mix, rotation, and other practices affect profitability and capital investment decisions
Need to Understand Stakeholders

“Study the people and their problems and when you are able to know them they will know you. If you do not have their support and cooperation there is something wrong. Find the reason and if you are at fault, endeavor to correct the error.”

-- T.J. Talbert, The Extension Worker’s Code, 1922

- Little is known about what type of information stakeholders would like and how they would like to receive it.
- Preliminary data suggests that producers are unclear if climate change will affect how their farms are operated.

Objective 2 -- Understand the use and value of climate information in agricultural decision making, determine effective dissemination methods
Specific Survey Tasks

Outcomes:
- Understand the use and value of climate information for farmers
- Determine effective methods for disseminating usable climate knowledge

Tasks:
- Cereal crop producer survey
  - Collaborative effort with CS-CAP (Iowa State)
  - Deploy in Jan. 2012 with assistance from NASS
  - Survey 19,000 farmers in 21 watersheds
Outcomes:

• Understand the use and value of climate information for farmers
• Determine effective methods for disseminating usable climate knowledge

Tasks:

• Cereal crop producer survey
• “Advisor” survey in four states
• Stakeholder network analysis
• Follow-up focus groups
• Native American farmer survey

Concurrently
• What type of climate information do you currently use?

• What type of information would you like? And in what format?

• Who do you talk to about farm planning?

• Who do you trust for information?

• Climate change / climate variability awareness/beliefs
• Using data from ag-climate models and information about stakeholder needs, appropriate DSTs will be identified and developed.

• We will work closely with stakeholder groups and the U2UU Advisory Committee to do this.

Not clear yet what tools will be needed!
DST Example: Fertilizer Management

• Inputs:
  – Data provided by user such as farm location and type of fertilizer
  – Data from the HUB automatically generated from farm location:
    • climate projections
    • expected field days
    • crop yield patterns
    • economic and market information

• Outputs:
  – Tool presents possible results in physical and economic units with uncertainty measures.
The tool is not enough! People need to know it’s there and how to use it!

We plan to develop an interactive delivery system including:
- Training materials
- Recorded and real-time webinars
- Fact sheets
- Job aids
- Printed materials
How effective are decision support tools and outreach materials?

- Work with Extension educators to deliver tools and information
- Evaluation:
  - Knowledge and skills of Extension staff
  - Survey participants at training sessions
  - Survey producers across pilot states
• Disseminate validated training materials, tools and Extension programs across 12 state region

• Regional workshop to train Extension educators and subsequent funds to disseminate in their state
Useful to Usable (U2U): Transforming Climate Variability and Change Information for Cereal Crop Producers

Introduction

Agricultural crops contribute about $150 billion annually to the U.S. economy, most of which comes from the intensely cultivated corn-belt region of the Midwest (USDA-ERA, 2010). Successful crop production in this area is highly dependent on favorable temperatures and appropriate precipitation patterns, making the viability of this industry subject to increasingly variable climate patterns.

Useful to Usable (U2U): Transforming Climate Variability and Change Information for Cereal Crop Producers, is an integrated research and extension project that seeks to improve the resilience and profitability of farms in the North Central Region amid variable climate change through the development and dissemination of improved decision support tools, resource materials, and training. The goal is to help producers make better long-term plans on what, when and where to plant, and also how to manage crops for maximum yields and minimum environmental damage.

Objectives

During the span of this 5-year project, the U2U team will complete tasks associated with 5 objectives that together will improve the usability of climate information for the agricultural community and lead to more sustainable farming operations.

First the team will produce research on the biophysical and economic risks and impacts of different climate scenarios on corn/soybean yields and farm profitability in the North Central Region (objective 1). Simultaneously, research will be conducted to understand how producers use climate information, evaluate producers' and advisors' climate information needs, and assess effective methods for disseminating usable knowledge to the agricultural community (objective 2).

Based on these findings, decision support tools (DSTs) and training materials will be developed to effectively deliver climate information to stakeholders (objective 3). DSTs, training materials, and implementation approaches for corn/soybean producers will then be piloted in Indiana, Iowa, Nebraska, and Michigan (objective 4). After several iterations with stakeholders to ensure the usability and utility of the tools, the program will be extended to all twelve states in the region (objective 5).
**Purdue University**: Linda Prokopy (Lead), Otto Doering, Ben Gramig, Dev Niyogi, Carol Song

**Iowa State University**: Roger Elmore, Chad Hart, Lois Morton, Gene Takle

**Michigan State University**: Jeff Andresen

**South Dakota State University**: Dennis Todey

**University of Illinois**: Jim Angel, Steve Hilberg, Atul Jain

**University of Michigan**: Maria Lemos

**University of Minnesota**: Tom Bartholomay

**University of Missouri**: Pat Guinan, Ray Massey

**University of Nebraska**: Cody Knutson, Martha Shulski

**University of Wisconsin**: Tom Blewett
FOR MORE INFORMATION CONTACT:

Linda Prokopy, PhD
Project Director, U2U
Purdue University
lprokopy@purdue.edu

Melissa Widhalm
Project Manager, U2U
Purdue University
mwidhalm@purdue.edu

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http://www.AgClimate4U.org

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