

Corn belt farmers and climate change:

Evaluating the socioeconomic acceptability of adaptive and mitigative cropping systems

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INTRODUCTION

The objectives of the Climate Change, Mitigation, and Adaptation in Corn-Based Cropping Systems (CSCAP) socioeconomic research component are to 1) conduct research on the socioeconomic acceptability of adaptive and mitigative practices and strategies, 2) contribute to the development of feedback loops between biophysical field research, monitoring, modeling of agricultural production systems, social science research, and education, extension and outreach activities, and 3) inform the development of policy and programming to encourage the adoption of appropriate systems across the region. It will accomplish these objectives through survey research and participatory farm-level scenario analysis and economic assessment of cropping systems.

While much literature has focused on varied ways that agriculture could or should respond to climate change risk through adoption of adaptive or mitigative behaviors (e.g., Burton and Lim 2005; Lal 2011; McCarl 2010; SWCS 2011), farmer views on the potential implications of climate change have been left largely unexamined.

The guiding research questions for this activity are:

- 1) To what degree do farmers view climate change as a threat to their livelihoods, and how do those attitudes impact their willingness and ability to adopt appropriate adaptation and mitigation strategies?
- 2) What other institutional, economic, cultural, and geographic factors may act as barriers to or facilitators of more resilient corn-based systems?

The Survey: CSCAP-U2U Collaboration

USDA-NIFA instructed all Coordinated Agricultural Project (CAP) climate grants to explore avenues for collaboration that could enhance overall climate CAP initiative results. Shortly after the award, CSCAP PIs contacted PIs from the Useful to Usable (U2U): Transforming Climate Variability and Change Information for Cereal Crop Producers standard CAP grant awarded to a consortium led by Purdue University. We found that: 1) the projects' research and extension objectives overlapped significantly; and 2) by combining resources in a partnership the geographic scope of survey research could be broadened and sampling strategy improved to obtain results superior to those that would otherwise be attained.

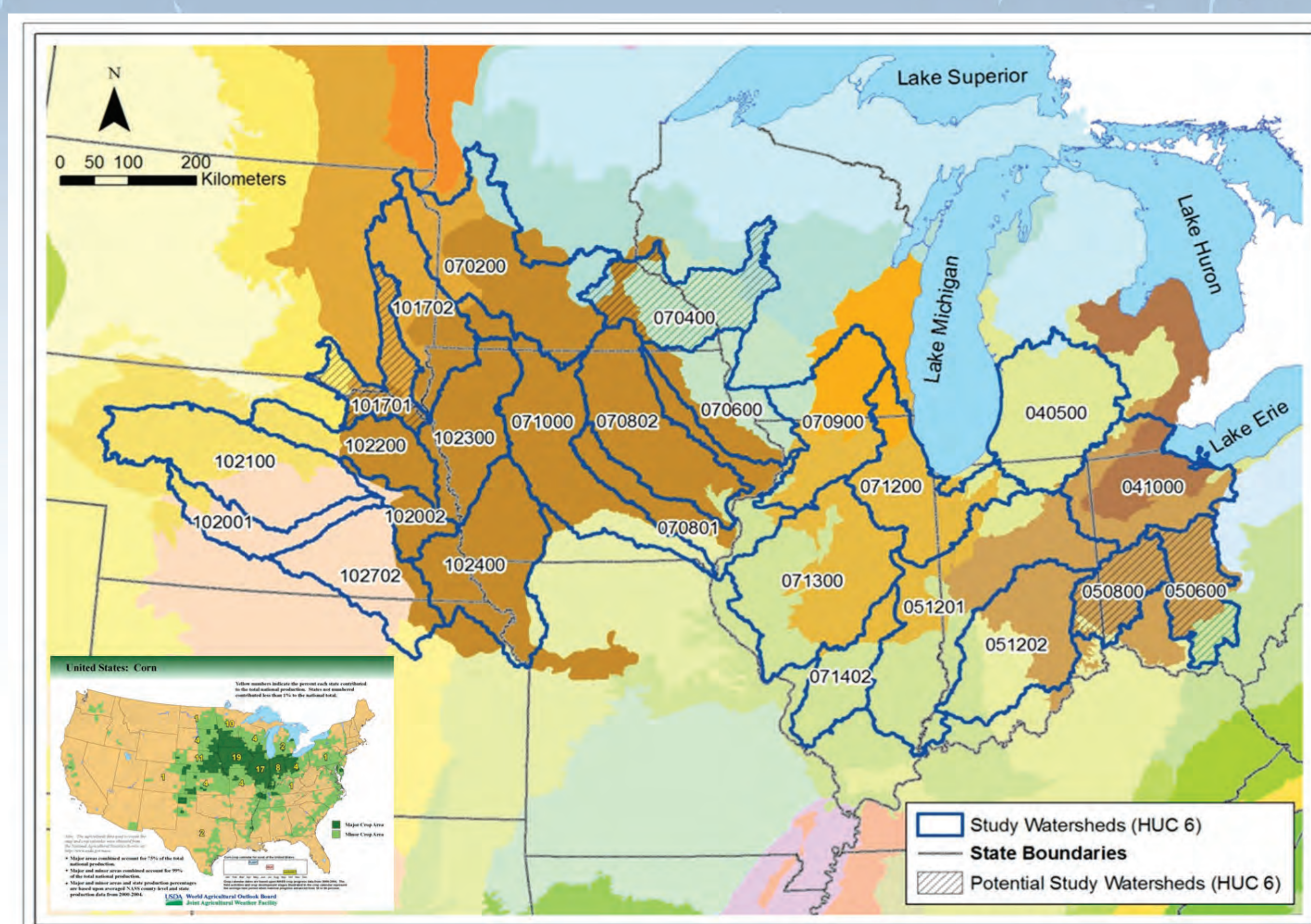


Figure 1. Twenty-one selected watersheds (6 digit hydrologic unit code) within the Corn Belt Region of the United States; four additional watersheds depicted, indicating future inclusion with potential available funding. The selected watersheds encompass diverse biotic and abiotic patterns, as represented by the different ecoregions (Level III Ecoregions of the Continental United States, US EPA, 2011).

Sampling Approach

The survey research design is a stratified random sampling of corn farmers in "major crop areas" for corn and soybeans as defined by USDA (USDA 1994). The sample will be stratified by watershed because: 1) ecological conditions that vary largely by hydrological unit shape agricultural systems; and 2) the impacts of climate change are predicted to be in large part hydrological. Major crop area counties span approximately 25 watersheds (6 digit hydrologic unit) that represent nearly 65% of all corn acres and 55% of soybean acres in the U.S. CSCAP-U2U pooled survey resources will enable us to survey 21 watersheds (Fig.1).

Because our project focuses on long-term sustainability of corn (and soybean) production, we must be able to generalize to a substantial proportion of Corn Belt grain acreage. Larger-scale farms operate a disproportionate amount of acreage: whereas only 16% of farms generate \$100,000 or more in gross sales, they operate 60% of farmland acreage (USDA NASS 2009, 94). Thus, our sample frame will contain only farmers with greater than \$100,000 in sales and 80 acres planted to corn. We will draw a random sample of approximately 875 farmers from each watershed to allow generalization at a 95% confidence level and 5% confidence interval and assuming a 40% response rate.

I-Farm Scenario Assessment & In-Depth Interviews

This participatory research activity will: 1) provide detailed information about how farmers assess alternative cropping systems; and 2) engage extension educators and key stakeholders in the research process. Extension educators in nine states will conduct one-on-one interviews using the I-FARM model (<http://ifarmtools.iastate.edu/>). I-FARM is a web-based model that allows farmers to analyze the biophysical and financial characteristics of their current operations (accounting for crops/rotations, tillage, fertilization, planting, weed control, harvesting, and residue removal) and compare them to land-use scenarios that simulate incorporation of various GHG mitigating practices.

This scenario modeling will provide real-farm platforms for structured discussions between extension educators and farmers regarding key decision variables such as: opportunity costs, capital budgeting, risk management, transaction costs, and key non-economic factors and farmer willingness and capacity to adopt more resilient systems. Two hundred corn farmers across the region will be selected via purposive sampling, with preference given to participants from active farmer-led watershed groups.

Informing Extension and Education

Information from the survey and I-FARM interviews will form an integral part of outreach activities. Extension educators, researchers, and interview participants will share information generated with other watershed group participants. Findings from the survey and I-Farm interviews will contribute to the development of outreach materials and decision-support tools for farmers, resulting in changes in awareness and implementation of mitigation and adaptive management practices.

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