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CROPS, CLIMATE, CULTURE AND CHANGE

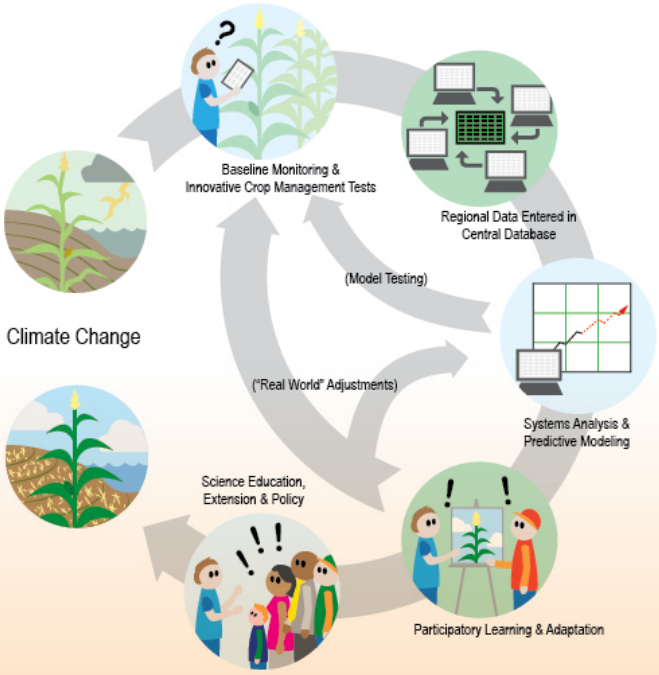
The **Climate and Corn-based Cropping Systems CAP (CSCAP)** is a transdisciplinary partnership among 11 institutions creating new science and educational opportunities. The CSCAP seeks to increase resilience and adaptability of Midwest agriculture to more volatile weather patterns by identifying farmer practices and policies that increase sustainability while meeting crop demand.

THE CSCAP TEAM

Climate scientists widely agree the global climate is changing as evidenced by temperature, precipitation, and seasonality shifts; these changes will continue. Yet, there is uncertainty and little research regarding how these global climate changes will impact local and regional cropping systems. The US agricultural base is susceptible and as such, the USDA is seeking to strengthen the resilience of managed ecosystems by targeting funding towards identifying adaptative and mitigative strategies with the potential for implementation by farmers, industry and supported through policy. USDA began funding climate and agricultural research in 2010 with $165 million invested across 32 projects addressing crops, livestock, and natural resource systems. The CSCAP is the largest corn-based research project funded by the USDA-NIFA to-date. The team seeks to investigate complex carbon, nitrogen, and water cycles to increase the efficiency and productivity of corn-based cropping systems while simultaneously decreasing the environmental footprint under extreme and variable long-term weather conditions.

The CSCAP is a partnership among Iowa State University, Lincoln University, Michigan State University, The Ohio State University, Purdue University, South Dakota State University, University of Illinois, University of Minnesota, University of Missouri, University of Wisconsin, and USDA ARS – Columbus, Ohio. These 11 institutions house a team of 140 scientists, graduate students and topic-based specialists across 19 disciplines.

Scientists are taking a comprehensive approach to assess crop and environmental responses by researching a suite of management practices and measuring carbon, nitrogen, greenhouse gas, water quality and flow, pest populations, and agronomic indicators. Management practices investigated include: corn-soybean rotation, cover crops within a corn-soybean rotation, extended crop rotations, organic cropping system, drainage water management, nitrogen fertilizer management, tillage management, and landscape position. A suite of local, regional, and national scale models utilize the field research data to examine current and predicted implications of the various practices on C, N, and water under different climate conditions. Farmer social and economic behavior and responses are additionally researched related to changing climate and their perceptions of impacts to their production systems. This unique research and analysis drives the education and extension components as information is distributed outward to empower and equip students and citizens with greater knowledge and ways to actively engage.



OBJECTIVES

1. Develop standardized methodologies and perform baseline monitoring of carbon, nitrogen and water footprints at agricultural test sites across the Midwest.
2. Evaluate how crop management practices impact carbon, nitrogen and water footprints at test sites.
3. Apply models to research data and climate scenarios to identify impacts and outcomes that could affect the sustainability and economic vitality of corn-based cropping systems.
4. Gain knowledge of farmer beliefs and concerns about climate change, attitudes toward adaptive and mitigative strategies and practices, and decision support needs to inform the development of tools and practices that support long-term sustainability of crop production.
5. Promote extension, outreach and stakeholder learning and participation across all aspects of the program.
6. Train the next generation of scientists, develop science education curricula and promote learning opportunities for high school teachers and students.

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USDA United States Department of Agriculture National Institute of Food and Agriculture

This research is part of a regional collaborative project supported by the USDA-NIFA, Award No. 2011-68002-30190 "Cropping Systems Coordinated Agricultural Project: Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems."
CSCAP-0106-2012

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INVESTMENT

NEW DISCOVERIES IN

- Crop water use including evapotranspiration
- Carbon and nitrogen balance within the soil
- Impact of weed pressure on system water use
- Capacity of organic systems to remain viable in a changing climate
- Predictive modeling of organic cropping systems

NEW DIRECTION

Organic cropping system research and efforts have primarily focused on certification standards, market development, and building production capacity. There are new opportunities to expand foundational research for organic systems related to carbon, nitrogen, and water in the Midwest.

Research data from two organic experimental sites (MN and OH) will be analyzed and presented relative to individual site performance and each other. Organic and conventional cropping systems will be presented from a holistic and fair stance with emphasis placed on each system's strengths. This approach allows for a comprehensive understanding to sustainability and stewardship.

INCENTIVES

- Support first-of-its-kind research on organic cropping systems
- Support organic farmers through scientifically-driven and tested recommendations that can be implemented on their own farms
- Support training efforts of the next generation of scientists as 35 graduate students are part of the CSCAP
- Support systems analysis and predictive modeling of organic systems
- Be recognized as an industry partner and leader in supporting breakthrough organic corn research

PARTNER BENEFITS

- Access to the CSCAP annual report to USDA
- Receive quarterly newsletters highlighting research progress and discoveries
- Invitation to the Organic Field Day at University of Minnesota Southwest Research & Outreach Center
- Interact with research scientists conducting organic systems research
- Access to research data when project is complete and data is hosted within the National Agricultural Library
- Access to promotional and educational videos showcasing field and laboratory research
- Highlighted as an industry contributor on the CSCAP external website and public reports
- Ability to utilize CSCAP logo and key text on individual website to show partnership

The Climate and Corn-based Cropping Systems Coordinated Agricultural Project (CSCAP) is a transdisciplinary partnership seeking to increase resilience and adaptability of Midwest agriculture to more volatile weather patterns by identifying farmer practices and policies that increase sustainability while meeting crop demand. Scientists are gathering field research data and utilizing a central database for data synthesis and modeling of the carbon, nitrogen, and water footprints associated with various cropping systems and management practices. A gap in the CSCAP research network is the assessment of organic cropping systems and whether their response to changing climatic conditions is similar to conventional cropping systems. Crop rotation diversification is a centerpiece within the team's research network as it is the most powerful tool farmers have to reduce economic risk, disrupt pest cycles, increase soil resilience and improve water quality.

Industry partnership offers an important opportunity to address this gap by supporting the implementation of necessary instruments at pre-existing organic corn-based rotations at two participating research sites: Lamberton, Minnesota and Coshocton, Ohio. The University of Minnesota experimental plots have been in place for 25 years. The instrumentation will provide the basis for farm decision making related to the use of long-term rotations and implications for water use and balance. Research findings and discoveries will increase our understanding of and capacity for farmers to manage organic cropping systems under wet and dry conditions; helping to maximize crop yields while also protecting our water and soil.

BECOMING A PARTNER

To financially support organic research conducted from 2012-2016, contact:

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CSCAP-0107-2012

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BREAKTHROUGH RESEARCH

CLIMATE CHANGE

Corn-based cropping systems are vulnerable to the stresses of a changing climate:

- Longer growing season (shifted frost dates)
- Warmer winters
- Warmer nights
- More frequent severe precipitation events
- Greater annual stream flows
- Increased humidity within canopy

CORN

Corn is the major cereal crop produced in the US with over 70% coming from the CSCAP 9-state region. Also, two-thirds of organic corn grain is grown within this region. Currently, the US organic market is driven by a consumer base seeking food produced differently than perceived notions of conventional food production. Organic agricultural production is expected to continue to increase in the US; currently there is over $20 billion in sales annually.

SUSTAINABILITY

Crop rotation diversification is the most powerful tool farmers have to reduce economic risk, disrupt pest cycles, increase soil resilience, and improve water quality.

Sustainability of cropping systems can be evaluated by several factors:

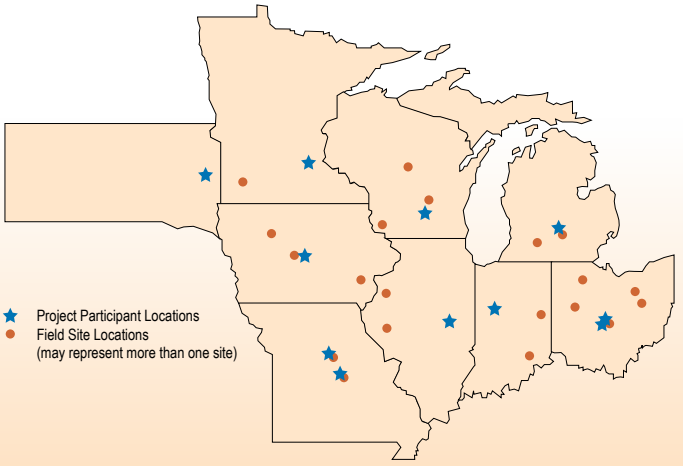
- Soil quality (organic matter, infiltration)
- Crop productivity (yield)
- Water quantity and quality (drainage, streams)
- Efficient and limited use of inputs (pesticides, fertilizers, manure)
- Conservation for future generations
- Identification of good farmers across systems

Funding and direction by the USDA for the CSCAP team is focused primarily on identifying mitigative and adaptative strategies for the Midwest corn base which is predominately managed conventionally. Funding for organic research is possible through industry partnerships that build into the existing CSCAP research network, thereby leveraging scientific expertise, research protocols, central database portal, systems analysis and predictive modeling, and outreach.

TWO ORGANIC SITES

Equipping two sites with additional funding will create the first-of-its-kind research on organic cropping systems and can start immediately. The research will appropriately measure the extent of variation from west to east of the Corn Belt as an established 40-acre organic cropping experiment at Lamberton, MN is utilized along with watershed scale research at Coshocton, OH.

Data collected from these sites include total water usage with allocations to the crop, weed, and whole system; additional measurements include all standardized measurements collected from other CSCAP research sites including soil organic carbon, soil nitrogen, and agronomic indicators.



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