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Climate and Corn based Cropping Systems CAP

I'm Lois Wright Morton, Professor of Sociology at Iowa State University and project director for the climate and corn-based cropping systems CAP project.

Forty-nine of the 50 US states have corn-based agricultural systems. The last census of agriculture reports corn production at 12.7 billion bushels of grain and 104 million tons of corn silage. The nine north central US states represented by this project produce more than 64% of the annual US harvest. The corn-based cropping system is an important economic engine and the social foundation of a highly successful production of food, feed, fuel, and fiber. However, this system, like all production and manufacturing, has some unintended environmental consequences, including water quality and production of greenhouse gases (GHGs). Increased climate uncertainty and change add risk to agricultural production and our environment.

In this project we will be estimating the carbon, nitrogen and water footprints of corn-based production systems in the mid-west. Of particular interest is creating linkages among our research, producer decision making, and training the next generation of scientists. We are asking, Under long term shifting weather patterns—increasing climate variability—what are the environmental, economic and social impacts? How can we best help producers be more resilient, adapt or transform their management systems and corn based cropping decisions under long term changing weather conditions? What are the policies that need to be in place to support productive and environmentally responsive management systems?

Many producers are already factoring weather variability into their risk management decisions. Climate data for the region have revealed the following trends: warmer winters, longer growing seasons, warmer nights, higher dew-point temperatures, increased humidity, greater annual stream flows, and more frequent severe precipitation events than were prevalent during the past 50 years. (ISU Climate Science Program Dr. Gene Takle “Talk-lee”)

A more variable climate is expected to impact future production through a variety of mechanisms. Increased precipitation can

- Delay planting and associated yield loss, especially critical in poorly drained soils.
- Increase the replanting of damaged croplands.
- Increase soil erosion and water runoff.

Increased tile drainage, while solving the problem of excess soil moisture, can lead to more water quality degradation. Combined increases in precipitation, humidity, and temperature can foster additional crop stress including insects and diseases; and more potential weed problems.

In this project, we have assembled a most awesome team from 10 Land Grant Universities and two USDA Agricultural Research Service laboratories across nine states in the Heartland (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, South Dakota, and Wisconsin). The team is comprised of biophysical and social scientists including soil scientists and agronomists, sociologists, economists, agricultural engineers, modelers, and climatologists as well as educators and extension field specialists. This project directly involves producers and producer watershed groups across the region who will be actively engaged in co-learning with the scientific team.

To accomplish this project our transdisciplinary team will focus on both mitigation and adaptation to variable climate. We will develop standardized protocols and a network of 21 sites across the region that will provide baseline measurements on greenhouse gases, carbon, nitrogen and water usage. Along with an evaluation of the dominant corn-soybean rotation, the team will test a suite of crop management practices, including tillage, cover crops, extended crop rotations, drainage water management and nitrogen management techniques. Data from these sites will be archived in a central database and used in conjunction with climate data and models

Physical, climatic, and socio-economic models will be applied in iterative ways to quantify strengths and weaknesses of the corn based cropping systems. Life cycle analyses, social, and economic findings will be used to develop public policy recommendations and engage producers and stakeholders in managing for climate uncertainty and environmental sustainability. This project integrates research, extension and education, builds capacity for extension to address climate change needs of stakeholders, and prepares the next generation of scientists for interdisciplinary research on the intersection of agriculture and climate.

This exciting project is a true partnership among USDA-National Institute of Food and Agriculture, the Agriculture Research Service and the North Central land grant universities to sustain the productivity and environmental responsiveness of corn based cropping systems.