

Climate and Corn-based Cropping Systems CAP (CSCAP)

Year 2 Accomplishments and Year 3 Continuation

CSCAP is a regional collaboration supported by USDA-NIFA Award No. 2011-68002-30190, "Cropping Systems Coordinated Agricultural Project (CAP): Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems." The 11 institutions comprising the project team include: University of Illinois, Iowa State University; Lincoln University; Michigan State University; University of Minnesota; University of Missouri; The Ohio State University; Purdue University; South Dakota State University; University of Wisconsin; and USDA-ARS Columbus, Ohio.

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CROPS, CLIMATE, CULTURE AND CHANGE

January 2013

TOP 10 YEAR TWO ACCOMPLISHMENTS

The **Climate and Corn-based Cropping Systems CAP (CSCAP)** is a transdisciplinary team creating new science and educational opportunities. The CSCAP team seeks to develop a suite of practices that heighten system capacity to: 1) retain and enhance soil organic matter nutrient and carbon stocks, 2) reduce off-field nitrogen losses that contribute to greenhouse gas emissions and water pollution, 3) better withstand droughts and floods, and 4) ensure productivity under different climatic conditions.

- 1. Two years of carbon, nitrogen, and water data collected across the CSCAP research network.** Researchers completed baseline and Year Two measurements on corn-based cropping systems, including collecting agronomic, soil, and water data across 35 field research sites in 8 Midwestern states.
- 2. Centralized database constructed to functionally increase data sharing and analyses.** Entry and import features of the team's centralized database were created to allow team members to efficiently enter data, share data and access data for analyses.
- 3. Climate and agricultural models calibrated and integrated.** Crop, soil, water, and systems models—including DAYCENT, SALUS, DNDC, SWAT, EPIC, and VIC—were calibrated and integrated to enable research that can capture and address the complexity and geographic scale of corn-based systems' environmental footprint.
- 4. Survey of 5000 farmers from 22 watersheds representing 60 percent of US corn production.** Results show that 66 percent of farmers in the region believe that climate change is occurring, 31 percent are uncertain, and four percent do not believe it is happening. Farmers who believe it is occurring *and* due to human activity (41 percent) expressed higher levels of concern about potential impacts and were more likely to support adaptation and mitigation activities than those who attribute climate change primarily to natural causes, are uncertain about its existence, or do not believe it is occurring. For more details, see: <http://www.sustainablecorn.org/videos.html#Arbuckle>.
- 5. 20 Land Grant University (LGU) Extension Educators enrolled 92 farmer cooperators.** Across ten LGU's, extension educators formed farmer working groups to discuss long-term weather shifts and related management decisions. Educators received climate training and prepared materials for farmers on topics such as the recent drought and past flooding events.
- 6. Teachers and high school students engaged in experiential learning and applications of science.** Twenty-six individuals participated in two interactive summer camps where they learned from CSCAP scientists about climate science, agricultural production, and global challenges related to natural resources and climate.
- 7. Next generation scientists created a roadmap for becoming disciplinary and transdisciplinary scholars.** The project's 35 graduate students created a roadmap defining their disciplinary and transdisciplinary project expectations and opportunities. While learning their disciplinary science, graduate students gave presentations and created posters for the annual meeting, participated in monthly working groups, and served on project committees.
- 8. Leveraged financial resources to accomplish more.** Scientists reached out to key partners and leveraged the USDA investment to acquire an additional \$1.02 million for project activities in year two.
- 9. 370 Presentations, fact sheets, newsletters, videos and refereed journal articles produced.** Team members communicated agronomic, soil, water, and greenhouse gas information to farmers, agribusiness, and scientists. Many of the communication pieces can be found on the CSCAP website: www.sustainablecorn.org.
- 10. Team members learned more about each other's disciplinary science to build collaboration and capacity as a transdisciplinary project.** Working groups, printed materials and a series of speed science presentations were employed to build working knowledge and identify points of connectivity across the CSCAP's six objectives and 140 members.

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January 2013; CSCAP-149-2013

Balancing Carbon, Nitrogen and Water

Agriculture faces unmatched challenges to maximize the efficient use of inputs, reduce its environmental footprint, and increase crop productivity. CSCAP scientists are working to better understand the complex interactions among our changing climate; crop management practices; and carbon, nitrogen and water footprints, to identify adaption and mitigation strategies for farmers and policy makers.

What we know...

- Agriculture covers 40-50% of the Earth's land surface; it affects and is affected by greenhouse gas levels.
- Increases in greenhouse gases (GHG) such as CO₂ (carbon dioxide) and N₂O (nitrous oxide) warm the earth's surface and impact rainfall, snow cover, humidity, winds, and regional temperatures.
- Increased CO₂ is expanding habitable zones for invasive species. Higher temperatures and increased moisture contribute to accelerated growth of plant pathogens and insect populations.
- Nitrogen fertilizer efficiency—the fraction of applied nitrogen that is absorbed and used by the plant—is influenced by moisture and temperature.
- During rains and snow melts, nitrogen that has not been absorbed by plants can be lost off-field in the form of nitrates, which move through subsurface tiles and other subsurface flow paths into nearby streams and eventually into rivers. Nitrates from Midwestern crop fields are a major cause of the hypoxic zone in the Gulf of Mexico—a large region of water that has very low oxygen concentrations and therefore cannot support aquatic life.
- High crop yields coupled with the efficient use of nitrogen fertilizer achieve the lowest GHG emissions per unit of yield.
- Management practices that build soil organic matter can help to maintain long term productivity of soils.



CSCAP cooperator farmers attend a Michigan State University Extension Field Day.



Field with/without a cover crop. Photo by Tom Kaspar

Seeking to know more...

There is still much scientists do not know about the complex interactions among our changing climate and agricultural systems. Some of the questions CSCAP scientists seek to answer as a result of this project are:

- How do changes in drainage water management alter yield variability and nitrogen and water use efficiency? To what extent can drainage water management increase soil water storage and reduce overall nitrate export to streams?
- How do cover crops increase soil carbon, soil aggregation and soil water infiltration and affect year-to-year variability in yield? To what extent can cover crops reduce nitrate leaching by taking up residual soil nitrate? What is the effect of cover crops on yield in different corn production systems under varying weather stresses and diverse terrains?
- How do tillage management systems, winter cover crops, extended rotations, and drainage systems impact the GHG footprint of corn production systems? How does sensor-based nitrogen (N) fertilizer management impact the GHG footprint?
- How do changes in weather patterns and potential changes in agronomic and soil management (such as cover crops, water drainage management, extended crop rotations, reduced tillage) influence pest cycles?
- What are the life-cycle environmental and resource impacts and trade-offs of alternative corn management systems under projected future climate scenarios?
- What is the least-cost placement of cover crops and drainage management to achieve nutrient reduction goals in individual watersheds in the Upper Mississippi River Basin and the entire Basin? How does the optimal placement and cost change when crop prices increase?
- In what ways do farmers perceive climate change as a threat to their livelihoods and how do their perceptions influence their willingness to be supportive of or adopt adaptation strategies?

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United States
Department of
Agriculture

National Institute
of Food and
Agriculture



PROJECT SUMMARY

Instructions:

The summary is limited to 250 words. The names and affiliated organizations of all Project Directors/Principal Investigators (PD/PI) should be listed in addition to the title of the project. The summary should be a self-contained, specific description of the activity to be undertaken and should focus on: overall project goal(s) and supporting objectives; plans to accomplish project goal(s); and relevance of the project to the goals of the program. The importance of a concise, informative Project Summary cannot be overemphasized.

Title: Cropping Systems Coordinated Agricultural Project (CSCAP): Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems

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Institution: University of Illinois

CO-PD: Sawyer, John E.

Institution: Iowa State University

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Institution: South Dakota State University

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Extreme weather events, destructive floods in 2011 and severe drought in 2012, have reinforced the relevance and great need for continuing this USDA research, extension, and education project on adaptation and mitigation strategies that can be employed within corn-based cropping systems in response to changing climate conditions. Primary efforts of the project are to heighten system capacity to: (1) retain carbon (2) reduce off-field nitrogen losses that contribute to GHG emissions and hypoxic conditions, (3) better withstand drought pressures, (4) reduce soil and nutrient losses under saturated soils and flood conditions, and (5) ensure productivity under different climate scenarios. Analysis and recommendations will equip farmers and policy makers in addition to simultaneously training the next generation of scientists and citizens. The Year 3 (Y3) plan of work builds on the accomplishments of Y1 & 2. Data from the field research network (n=35 sites) will continue using standardized protocols, submitted to the central database, compared to baseline site data, readied for integration into climate and other publicly available secondary datasets, and preliminary analyses and modeling continued. The Y2 random sample survey of Midwest farmers was cleaned and preliminary analyses begun; in Y3, these data will be used to test social and economic theories of farmer perceptions and adaptation. The 20 Extension educators will continue to build their climate and cropping systems science knowledge, interact with team scientists, increase farmer collaborations, and gather social and economic data on the farmer fields. Training of 36 CSCAP graduate students will continue along with conducting climate camps and/or intensive courses for high school, undergraduate or graduate students, and science teachers; teachers will also be trained in use of climate and agriculture discovery modules. To-date, CSCAP has leveraged more than \$1.3 million through institutional support, partnerships, and other organizations.

USDA-NIFA Award No. 2011-38002-30190

**Cropping Systems Coordinated Agricultural Project (CSCAP):
Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems**

Program Area Code and Priority: A3101 Regional Approaches to Climate Change
Cropping Systems: cereal production systems (corn)

USDA-NIFA Award No. 2011-68002-30190

USDA Award Date: March 1, 2011

Project Director: Dr. Lois Wright Morton, Iowa State University

Continuation Application Submitted Sept. 25, 2012

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Field 8. Project Narrative

Field 8. A-1. Team POW for next year of funding (Y3)

The climate and corn-based cropping systems coordinated agricultural project (CSCAP) is a transdisciplinary team creating new science and educational opportunities. In summation, the overarching goal and driving motivation behind this project is to identify cropping systems and practices that have a lighter environmental footprint yet remain highly productive under a changing climate. Analysis and recommendations will equip farmers and policy makers in addition to simultaneously training the next generation of scientists and citizens. In the third year of this project we will strengthen team capacity to undertake transdisciplinary science while concurrently making progress on the project objectives and milestones. Specific Y3 activities planned, expected outputs, outcomes and impacts are detailed below.

Strengthening Transdisciplinary Science

The project has both overall and objective specific Y3 planned activities, expected outputs, outcomes and impacts. The overall goal of the project in Y3 is to strengthen the transdisciplinary science approach of the team by more deeply integrating across the six objectives. To do this, we

will (1) continue to learn the language and develop basic understandings of each other's science, (2) develop more comprehensive research questions that reflect the complexity of corn-based cropping systems under changing climate conditions while also integrating the team's multiple disciplinary knowledge to address C, N, water, GHG, pest pressures, farmer perceptions and capacities to adapt and mitigate to changing climate conditions, and (3) create clusters of individuals across the objectives willing to tackle one or more of these difficult, complex questions.

To accomplish transdisciplinary outcomes, the whole team has a number of planned activities including (1) increased and more effective communication within and across objectives, (2) enhanced internal website features and further development of the central database, (3) a more dynamic external website with substantive information that can be applied/utilized by farmers and educators on the intersection of agriculture, climate change, and environmental impacts, and (4) a 2013 annual team meeting and planning for a 2014 national conference.

1. Increased and more effective communication within and across objectives. Year 2 evaluation revealed strong and sufficient communication between project operations and team members. Year 3 will continue the activities team members identified as very helpful: monthly meetings, scheduled email correspondence from project operations, internal monthly newsletter, and one-on-one responsiveness via phone, email, and in person to specific questions. To increase the effectiveness of team meetings, the monthly calls will switch to a web-based platform, Adobe Connect, for increased collaborative opportunities including face-to-face meetings and sharing of documents. Additionally, communications within and across Objectives will occur more frequently due to changes made by the Leadership Team to the meeting schedule which will allow for greater synergy and progress.
2. The internal website used by the team has been very effective with use becoming more frequent. During the period of Oct 2011 to Sept 2012, there have been 4,360 visits and 21,000 pages viewed. This site will continue to be used as a shared platform for the central database interface and location for all primary field data entry and secondary data including climate information. Further, this site serves as source documentation and methodologies for research in the biophysical and social-economic sciences as well as extension processes and programming underway and education curricula development and evaluation. It is a communication mechanism that encourages within and across Objective activities, outputs, working area for analyses underway, publication matrix of articles and papers completed and in process, milestones and yet to be completed activities, as well as operational updates. Operation updates include the archival summaries of team meetings, past and future annual meetings, reports, templates, resources for team use, and media.
3. The external website (www.sustainablecorn.org) will undergo another revision in Y3, to more aptly engage and inform growers, crop consultants, state and county extension agents and other educators, and media with an interest in corn-based cropping systems. Dynamic content will be added to the revised site, including brief videos of project participants discussing project issues, science and research. In addition, the site will be publicized via Facebook and Twitter pages and redesigned and optimized for better recognition by search engines and mobile technologies.

In Y3, social media will be utilized with the operations and extension teams working together to create and maintain a presence on Twitter and Facebook. The target audiences with whom we wish to engage are reporters from the 9-state project region, Midwestern farmers and farm groups known to utilize social media, and communication professionals employed by businesses that communicate regularly with farmers. Both Facebook and Twitter messages will focus on raising awareness about our project, its issues, and driving users to our website to learn more. Strategies, goals and objectives for providing a science blog in Y4, utilizing graduate students in the project, will be explored.

4. 2013 annual team meeting and planning for a 2014 national conference. Face-to-face team meetings are critical to creating new and reaffirming current relationships among team members, building trust, creating new information exchange pathways, providing platforms for creative problem solving associated with the project structure and to address the complexity of Objective-specific and overall project goals. The 2013 team meeting will be held July 30-August 1, 2013 at Purdue University, West Lafayette, Indiana. An activity at the Y2 meeting, held at The Ohio State University campus, in Wooster, Ohio, encouraged team members to interact with others across the disciplines to develop a Science Wall.¹ This Science Wall will provide the themes for the Y3 meeting as we strengthen our transdisciplinary approach: a) integrating experimental treatments (e.g. cover crops x water balance x GHG x pest pressure x soil carbon) via syntheses and modeling to evaluate the net environmental and agronomic effects of the treatments under changing climate conditions and progress toward a suite of corn-based cropping systems with light environmental footprints; b) incorporating farmer skill sets and attitudes that predict success in adopting more biologically complex systems that balance short term productivity while addressing longer term environmental concerns into extension and outreach programming; c) identifying research findings and key messages of interest to agribusiness, local and national policymakers. In Y3, the team will begin planning for the 2014 national conference. In Fall 2012, a committee composed primarily of advisory board members will convene, identify and explore options for co-sponsorship, targeted audiences, and themes; reporting back to the advisory board and leadership team with their findings and recommendations for a national conference. Action items will be developed based on conversations held at the 2013 semi-annual advisory board meeting.

Field 8. A-2. Team POW for next year of funding (Y3) – *OBJECTIVES 1 & 2 SPECIFIC*

The Y3 plan of work for Objectives 1&2 includes increased communication and collaborative work among subgroups, ongoing collection and analysis of field research data across the CSCAP research network sites, transmittal of data into the central database, and integrating further with Objectives 3-6. This POW will be accomplished specifically by:

1. Meeting bi-monthly among Obj. 1&2 members to discuss and conduct data synthesis across research sites and integration of diverse datasets. Subgroups will include the following foci: cover crops, drainage water management, extended crop rotations,

¹ The Science Wall is the result of two rounds of small group brainstorming sessions at the Y2 team meeting which began the process of identifying the layers and connections among the multiple disciplinary expertises' existing across team members with a first structured attempt to develop transdisciplinary questions.

organic cropping systems, greenhouse gas, integrated pest management, nitrogen sensing, and landscape position effects.

2. Continuing to gather and conduct field measurements, laboratory analysis, and quality control of data for entry into the central database.
3. Examining Y1&2 data across sites to begin identifying management practices, weather conditions, and soil properties that are especially influential on greenhouse gas emissions, agronomic productivity, soil quality and health, pest pressures, and overall carbon, nitrogen, and water footprints of these cropping systems.
4. Begin to determine the ecosystem service incremental gains or losses in soil quality and nutrient use efficiency.
5. Extending findings and knowledge outward from the field and laboratory to farmers associated with the project in an interactive fashion.
6. Writing a proposal to continue funding from the United Soybean Board, which funds additional integrated pest management research in Y3 (Sept 2013-Sept 2014).
7. Evaluate impacts of land management on soil moisture including specifically the impacts of a drought year.
8. Write publications on initial results from the first two years of field measurements and present results at field days.

Field 8. A-3. Team POW for next year of funding (Y3) – *OBJECTIVE 3 SPECIFIC*

The Y3 plan of work for Objective 3 includes increased communication and collaborative work among subgroups, improvement of the central database, development of life cycle analysis, and integrating economic and climate data into the cropping systems dataset for modeling and analysis. This POW will be accomplished specifically by:

1. Meeting monthly among Obj. 3 members to discuss and collaborate on modeling and synthesis across set of models utilized among PIs. Objective 3 subgroups are organized around model domains and scales, such as: life cycle analysis, field-scale modeling of agronomic and soil variables, and economic and environmental analysis at the watershed and regional scale.
2. Improving the functioning of the team central database to ensure user needs across all Objectives are met.
3. Completing the field mapping for each site within the CSCAP research network.
4. Continuing to parameterize models and build off of Y2 calibrations and assessments.
5. Tying models together to build bridges across the disciplines using the central database and address complex questions concerning carbon, nitrogen, and water. Incorporating Y2 detailed soil data for each site; and performing detailed site hydrologic modeling and the SALUS model to accurately predict grain yield under future climate for each treatment.
6. Utilizing the cover crop meta-analysis to provide an understanding of the interactions among the C, N and water cycles and the trade-offs associated with use of a cover crop in different locations.
7. Developing life cycle assessment (LCA) models across the different management practices will identify the trade-offs among the management practices across the range of life cycle impact categories. Developing LCA models that include industrial uses of corn

will allow examination of the importance of production practices for corn-based products like ethanol.

8. Economic modeling to examine cost implications, economic incentives across the upper Mississippi with a focus on N, sediment (C loss) and water quality.
9. Integrating climate model projections into the team's modeling will enable the evaluation of management practices in future climate projections, such as that expected by mid-century (2050). Since climate models differ in their projections for the U.S. Corn Belt, most notably for precipitation changes, projections from several representative state of the art climate models will be used to sample the range of variability amongst the climate models.

Field 8. A-4. Team POW for next year of funding (Y3) – *OBJECTIVE 4 SPECIFIC*

The Y3 plan of work for Objective 4 includes data collection and analysis focused on development of a comprehensive understanding of farmer perspectives on climate change and adaptive and mitigative action; dissemination of that information to inform the work of scientists, natural resource and agricultural professionals, and policy makers; strengthening the transdisciplinary linkages with other project objectives; and initiation of learning partnerships with extension educators and farmers in nine Corn Belt states. This POW will be accomplished specifically by:

1. Implementation and analysis of in-depth interviews with up to 200 farmers.
2. Creation of survey and in-depth interview databases.
3. Analysis of data from the Y2 survey of 4,778 Corn Belt farmers.
4. Sharing and joint analysis and reporting of Objective 4 data and information with other project objectives.
5. Development of innovative outreach strategies and materials through partnerships with extension educators and farmers.
6. Distribution of research-based information to farmers, the general public, agency staff, and policy makers through publications, extension materials, presentations, and web pages.

Field 8. A-5. Team POW for next year of funding (Y3) – *OBJECTIVE 5 SPECIFIC*

The Y3 plan of work for Objective 5 includes further development of farmer groups to gather research data for Objective 4, one-on-one analysis of farmers' production systems to assist in establishing practices that will adapt to and mitigate climate change, and facilitated discussions on weather variability and agriculture, This POW will be accomplished specifically by:

1. 200 farmers to build knowledge and consider implementation of practices or establish on-farm trials that mimic project experiments from interactions with CSCAP extension educators.
2. Farmer groups use performance-based environmental management and risk assessment tools to collect data from individual fields that can be compared to Objective 2 research.

The tools will give farmers a means to measure their current cropping system impacts on carbon, nitrogen, and soil to make informed decisions on adapting to changing weather patterns.

3. 20 extension educators will increase climate knowledge through monthly webinars and participation in the annual conference and discuss climate and agriculture with farmers individually and in groups through project activities and through state extension program events.
4. Partnering with the Plant Management Network² to host publications, video, and pieces specifically targeting the agribusiness community and industry.
5. Integrate research and outputs from Objectives 1-4 by creating extension fact sheets and publications for farmers and the general public to communicate research results and recommendations as a result of Objective 1-4 research.
6. Hold cover crop field days in Iowa and Indiana for extension educators and farmers in spring 2013 that will emphasize cover crop establishment, emerging species, cover crop selection, and spring cover crop management.
7. Deliverables for year 3 include statewide and within state climate extension publications, a climate and agriculture PowerPoint for extension educators to present during winter meetings, three webinars will feature cover crops, challenges following extreme drought, and greenhouse gas emissions from agriculture.
8. Integration across research, extension, and education efforts through objective leadership meetings and communication among research objective leaders. Research results and recommendations are discussed and proper means of communication are decided upon between the research and extension objective team members. Transdisciplinary discussions at the Year 2 annual meeting focused on integrating research, extension, and education and many ideas were generated for communicating research topics to students, farmers, and the public.

Field 8. A-6. Team POW for next year of funding (Y3) – *OBJECTIVE 6 SPECIFIC*

The Y3 plan of work for Objective 6 includes increased communication and collaborative work between Objective 6 members as well as integrating with other Objective members, graduate students, the NSF GK-12 project at Ohio State University, and teachers in the north central region. This POW will be accomplished specifically by:

1. Regular monthly meetings among Objective 6 members.
2. Interaction between the teachers of the summer camps and short courses along with cross-observation.

² The Objective will utilize Plant Management Network (PMN) (www.plantmanagementnetwork.com) for specifically reaching the agribusiness community. The PMN is an electronic-only resource that provides credible, hands-on information to agricultural practitioners, researchers, educators. In essence, PMN has become a "community of practice" for field crops and is quickly becoming an online resource for farmers, agronomists and academia. Land-grant universities in all twelve states in the North Central region and several agribusinesses have entered a partnership with PMN, giving their employees free access to all material on the PMN website. People in the private-sector can subscribe to PMN for a one-time fee of \$45. Subscribers can then access the information related to CSCAP as well as all other PMN material such as webinars, journals, images, and fungicide and insecticide reports.

3. Working with the graduate students and their representative to augment their new “roadmap” and create a seminar with their input.
4. Continuing to construct climate and agricultural teaching modules aimed at high school students.
5. Outreach by mail, website, workshops, and visitation to annual state, regional, and/or national meetings of high school science and agricultural education teachers.
6. Posting of modules and other educational outputs to the team CSCAP website.

Field 8. A-7. Team POW for next year of funding (Y3) – *ACROSS ALL OBJECTIVES*

The overarching intent of Y3 activities and outcomes is to build on the continuing accomplishments of each objective towards our “strengthening transdisciplinary science” theme. Purposeful, explicit plans for cross cutting activities and outputs among objectives in Y3 are:

1. The Objective 2 field research team will begin to integrate experimental treatments via syntheses to begin assessing their impact on the complex carbon, nitrogen, and water footprints. Evaluation of the treatment net effects under changing climatic conditions will occur so that progress can be made on evaluating whether the suite of management practices and data collected are resulting in the identification of mitigative and adaptive practices. Work will begin with the Objective 3 team to cross-evaluate management impacts with both modeling and experimental approaches.
2. The data syntheses and modeling team (Objective 3) will ensure that the central database is structured to facilitate interaction between modelers and those engaged in field measurements or analysis. A specific example of such interaction planned for Y3 is to use measured GHG and water quality data to calibrate soil carbon models for each treatment. The soil carbon model will be used to make a preliminary estimation of the GHG emissions for each treatment under the future climate.
3. The social-economic research of Objective 4 has established cross-objective analysis and writing partnerships that will develop academic and lay publications linking the farmer survey data to biophysical team scientists’ data and expertise in several areas: pest management (Obj. 2 IPM scientists), variations in precipitation (climate scientists), and conservation practices (Obj. 2 scientists). Analysis and writing partnerships also extend to the USDA U2U farmer decision support tools project which co-developed and co-funded the 2012 farmer survey. A second cross cutting effort of Objective 4 is the application of the survey and interview findings to extension educators’ work with farmers individually and at winter meetings and field days via presentations, webinars, print and electronic media. The extension team, Objective 5, will utilize the climate science bulletins developed for each state and climate regions in winter programming and field days, such as for state crop advisor and summer field demonstrations. They will also incorporate the speed science print and video clips of the team research developed for the Y2 annual meeting. The team will also begin to develop crop production and climate resources to address specific agronomic challenges that result from changing weather conditions.

4. The education team, Objective 6, will revise the speed science print and video clips developed for the Y2 annual meeting to be high school science teacher and student appropriate for use in 2013 summer camps, climate modules, and workshops.

Field 8. B-1. Team Outcomes/Impacts for Y1 & Y2

Overview of Progress To-Date

Overall, during Years 1 & 2, the team focused on starting up the project and initiating activities and outputs to accomplish the work of each objective with good progress made toward all milestones, which are purposeful in their construction so to keep members on track to reaching and accomplishing the overall project goals.

The CSCAP team has increased capacity to connect multi-disciplinary knowledge and to begin understanding the value and explore applications of linking multi-disciplinary science to the practice of science in order to become a transdisciplinary team. This outcome was the result of a deliberate commitment and the construction of a comprehensive virtual and real-time communication and organizational framework that enabled the team to accomplish team-wide and objective-specific goals, milestones and timelines. The collective development of guidelines (see Appendix D) for how research data and findings are published and shared provided an important platform for building team trust and confidence in depositing PI site specific data into the central database for all to access. Feedback from an online survey of the team by the CSCAP evaluator provided baseline knowledge to team leadership, project director, and project manager for use in guiding the team towards their transdisciplinary goals. Reconstruction of the project's milestones (see Appendix A) added structure, detail and clearly defined benchmarks and provided a project roadmap and mechanism for all team members to better evaluate individual objectives and whole team progress toward these goals. Lastly, the comprehensive research directive, including research questions and hypotheses, begun by the team in Year 2 provided foundational disciplinary and multidisciplinary research questions and hypotheses upon which the team is developing additional transdisciplinary questions and hypotheses for Y3.

Field 8. B-2. Team Outcomes/Impacts – *OBJECTIVE 1 & 2 SPECIFIC*

In developing the standardized protocols, PIs worked collectively to communicate and evaluate different potential methodologies, debate each methodology's advantages and disadvantages, make adaptations, and reach a consensus. Following the growing season, these protocols were re-evaluated and codified as a team to assure consistent, uniform data were being collected.

Greenhouse gas emissions have traditionally been measured utilizing gas chromatograph (GC) technology which required field sampling and laboratory analysis. This method of collection requires substantial logistical and technical resources that can limit its use across a project of this scope. This technology enables researchers without chromatography expertise to collect GHG data quickly and easily while in the field but necessitated training of graduate students, staff, and faculty for proper use.

Researchers are now more aware of the data needs of the modeling community, and are better prepared and enabled to make measurements they would not typically collect in their studies to improve overall utility of data to this project and to future work.

A shift in focus for some of the PIs, to apply their skills to climate adaptation and mitigation, has opened new questions, new potential partners, and also provides a way to attract young people into agricultural sciences.

Field 8. B-3. Team Outcomes/Impacts – *OBJECTIVE 3 SPECIFIC*

Creating a transdisciplinary team begins within and among similar disciplines and then extends outward. The Objective 3 team began this process by first determining the goals of individual research units and the strengths of their respective models in addressing the impacts of corn production in multiple dimensions, but with particular emphasis on economics and the C, N and water footprints. Then using iterative cross-training the Objective 3 team built a set of shared goals and collaborative approaches to the research questions. The process of shared inquiry and education has resulted in a new research and education network populated by researchers and students with broad interdisciplinary understanding of the interactions of natural systems, management and climate in corn production. This project has fundamentally altered both the knowledge and practice of these researchers and scholars.

The research network developed in this project also includes a wide range of members who are not directly funded, but who have nonetheless been impacted by this effort. The Objective 3 team includes unfunded collaborators, such as a parameter estimation expert from the USGS (Dr. Michael Fienen), a nitrous oxide expert from the ARS (Dr. Tim Parkin), and members of the soil carbon modeling community (Dr. Keith Paustian), whose knowledge and practice have been impacted through their collaboration with the Objective 3 team. Objective 3 members are collaborating with and developing publications with these members of our extended research network (see Appendix C for publications and external working groups).

In a similar manner, the Objective 3 efforts have had impacts on members of industry and nongovernmental organizations who have participated in the project as unfunded collaborators by participating on the advisory board or by seeking out the growing knowledge base of the team. For example, the Objective 3 team has had a series of in-depth discussions and exchanges of knowledge with Mr. John Kadyszewski, Director of the American Carbon Registry (ACR). The ACR has particular need to understand the uncertainty associated with estimates of the GHG emissions of corn production. The project has also provided data and interpretation to industrial analysts who are seeking to better understand the life cycle impacts of corn production in the U.S. For example, Susan Sanchez of Solazyme, Inc. was recently provided with data and an overview of the impacts of different corn management strategies on the environmental impacts resulting from nitrogen use that her firm will use internally to map out their future feedstock procurement strategy.

Field 8. B-4. Team Outcomes/Impacts – *OBJECTIVE 4 SPECIFIC*

Outcomes have included (1) the establishment of strong survey research partnerships with the USDA Purdue University-led grant, “Useful to Usable” (U2U) and the National Agricultural Statistics Service (NASS), (2) leveraging of project funds through buy-in from key agricultural stakeholders, (3) development of transdisciplinary research and extension partnerships across the CSCAP objectives, (4) improved extension educator capacity to engage farmers about adaptive and mitigative management options through training on how to conduct in-depth interviews, (5) analysis of preliminary data leading to improved knowledge of farmer beliefs and concerns about climate change, and (6) initiation of a relationship with the USDA “Regional Approaches to Climate Change in Pacific Northwest Agriculture” CAP project.

Field 8. B-5. Team Outcomes/Impacts – *OBJECTIVE 5 SPECIFIC*

As result of a new partnership, Jamie Benning, the CSCAP Objective 5 extension leader, serves as an advisory board member to the U2U project. This provides a direct link between the U2U-developed farmer decision tools with opportunities for CSCAP extension educators and farmers to pilot test these tools and strengthen the regional Extension system plans of work associated with row crops and climate science. Garnering widespread support in the team’s efforts to programmatically strengthen the Land Grant University’s focus on climate education within agriculture represents a significant shift to increase attention on this issue relative to past efforts. This programming emphasis is expected to grow in the future with the CSCAP uniquely able to lead and serve as an example. As the extension team has worked to develop climate training materials and messages that appeal to farmer and stakeholder audiences, the impact of climate on the water cycle has resonated well with extension educators. They feel farmers can best incorporate climate science into their decision making process as it relates to increases and decreases in rainfall, soil moisture, relative humidity, etc.; all factors that influence cropping systems on a daily basis. The team focuses their messages on informing farmers of the potential risks associated with weather fluctuation and crop production risk management strategies rather than “big picture” climate issues. Identification of these topic-based approaches during the annual meeting and on monthly conference calls signals progress by communicating information outward in a way that can be positively received and implemented. The educators also requested a climate and agriculture power point presentation that they could modify and present during state specific crop production events during the winter of 2012-2013 indicating they are becoming more comfortable with presenting climate information as a result of their training during webinars and the annual meeting, and interactions with each other as a climate extension team.

Field 8. B-6. Team Outcomes/Impacts – *OBJECTIVE 6 SPECIFIC*

Graduate student involvement relative to the research, extension and education efforts of the team are critical in raising up the next generation of climate and agricultural scientists. Thirty-six graduate students (see Appendix C) have been recruited by individual PIs and hired across the participating institutions for inclusion in all project efforts. These students were significantly

involved in the team's annual meetings. Prior to these meetings, many students did not grasp the size and complexity of the CSCAP team. Over the course of the Y1 and Y2 annual meetings, a change in connectivity and team unity occurred, especially among the graduate student subcomponent. Nearly every graduate student presented a poster describing his or her research methodologies in a 2-hour poster session that allowed other project and advisory board members to discuss and ask questions. Beyond the CSCAP annual meeting, some students also attended professional society meetings or institutionally-based meetings to learn and/or present initial findings from their CSCAP research project (see Presentations in Appendix B).

The web-based seminar titled "The Science of Climate Change" included 21 CSCAP graduate students who enrolled for the half-semester online course in 2011 led from Iowa State University and streamed out to other participating institutions through Blackboard or corresponding technology. The appointment of a graduate student to the Leadership Team provided two-way communication between the graduate students and the leadership team to ensure an environment conducive to growth.

This student leader created a "roadmap" to provide a framework of experiences that would increase graduate student capacity for transdisciplinary work. Activities in the roadmap begin with student's assessment of individual skillsets and disciplines; it then progresses to integrated work such as participation in graduate student seminars and collaboration in field days and extension/education experiences. The roadmap will continually be updated based on current graduate student feedback and shared with new students as they begin in the project.

Field 8. C-1. Team Outputs for Y1 & Y2

Three in-person CSCAP meetings have occurred to-date with two in Y1 and one in Y2. In early spring 2011, nearly all PIs attended the first meeting to begin the work of the project. As a result of this meeting standardized protocols for gathering field data were formulated, the groundwork for developing the farmer survey instrument for the social and economic research was begun, and efforts to obtain support from Extension Directors in participating states to build the network of extension educators was undertaken. The first, full-team meeting occurred in November 2011 in which 10 CSCAP advisory board members and eight invited guests increased their knowledge of the project, team members evaluated progress toward Y1 milestones, adjustments and progress made for Y2, and relationships were strengthened among the project team. The second, full-team meeting occurred in August 2012, with highlights including a speed science session of each overarching theme and discipline, field demonstrations showcasing protocol based measurements, farmer panel to discuss real-life implications of extreme weather, and breakout group discussions to develop the Science Wall and discuss transdisciplinary work.

The signature look and identity of the project along with the team website, www.sustainablecorn.org, promotional and resource materials developed for field days, farmer meetings, and teacher education has resulted in increased awareness and use of information by partner institutions, organizations, and stakeholders; see Appendix B for information on activities such as extension presentations and presentations. The external website offers team

personnel a way to recruit new students and staff while also serving as a way for clientele to have access to project descriptions, goals and progress, videos, and initial research findings as presented at the team annual meetings. Site usage statistics from Oct. 2011 to Sept. 2012 show 2,000 unique visitors viewing 13,000 pages over 4,520 visits to the external Web site.

Field 8. C-2. Team Outputs - *OBJECTIVE 1 & 2 SPECIFIC*

The creation of standardized protocols for measuring C, N, water and other variables established sound, reputable scientific methods and generated a highly functional and usable data set. Standardized protocols carried out among CSCAP research sites allows for near seamless data entry into the CSCAP central database and provides a consistent set of data for systems analysis and predictive modeling. Data collection, entry, analysis and modeling are time-intensive activities necessitating the methods used to collect the data are uniform across field and lab personnel. In analysis and modeling, a certain number of assumptions need to be made concerning agricultural cropping systems due to the massive number of variables possible. A set of standard protocols allows for real-time, tested data to drive the models with fewer necessary assumptions.

CSCAP researchers established and implemented standardized methodologies for measuring soil organic carbon (SOC), total nitrogen, soil physical properties, water quality and volume, greenhouse gas (nitrous oxide [N₂O], carbon dioxide [CO₂], and methane [CH₄]), crop biomass, C and N in biomass and grain, insect and disease pressure, and grain yield. These protocols provide the structure in collecting baseline site data and seasonal measurements for every research site over the next five years.

Existing and new sites were established to provide a comprehensive set of treatments and data. This combination of previously established and newly developed research sites is configured with unified equipment and methodologies and in some cases allows data prior to 2011 to be incorporated into the project. An expansive field research network was established in all project states, except South Dakota. Nearly all research sites were established in Y1, although additional plots were added and equipment added in Y2 at MN and OH; a total of 35 research sites now comprise the CSCAP research network. Specific sites vary on exact treatments employed due to varying site capacities. Every site includes a corn-soybean rotation or continuous corn plot acting as a comparative baseline. Treatments employed across the research network include extended crop rotations, cover crops integrated into corn-soybean systems, tillage management, drainage water management, nitrogen management, and landscape position. Within the network, a minimum of two research sites exist with the same treatment combinations. Following data collection of all outlined variables needed per site, scientists organize their data into a consistent structure and submit to the team's central database.

To aid the assessment of C and N footprints associated with corn-based cropping systems, researchers are measuring greenhouse gas (GHG) emissions in 18 of 35 research sites. Measuring GHG emissions in agricultural systems can be complex due to a range of variables, including cropping systems, soil variables (type and drainage), landscape characteristics and local climate. Equipment necessary for collecting the required data was purchased, installed and

used including photoacoustic spectrometers (PAS), soil moisture meters, weather stations and various tools. Formal equipment training has occurred through project-wide events held in-person at the November annual meeting and through live, Web-based video. Discussions via phone and e-mail between colleagues have also addressed questions on protocol methodologies and procedures. Graduate students at each institution received individual training by PIs or research specialists from their institution.

Working with researchers from the USDA GraceNet greenhouse gas monitoring network, CSCAP researchers tested the suitability of PAS for measurement of N₂O and CO₂ fluxes from the soil surface by comparing measurements of N₂O and CO₂ flux and concentration between GC and PAS. The paper is now published in *Global Change Biology*; ranked third for most-cited journals in climate change research and behind only Nature and Science (see Appendix B for reference under lab group “Castellano”).

To supplement the team’s pest management effort, a proposal for \$263,000 was submitted to and awarded by the United Soybean Board. This award allowed the addition of 13 principal investigators, three graduate students and one research staff to the team. This funding widens the scope of CSCAP’s original proposal and offers more data for project analyses. Scientists included have expertise in plant pathology, entomology, and weed science and represent eight of the ten CSCAP Land Grant Universities.

To ensure the continuance of plots located at the previous USDA-ARS facility in Coshocton, OH, a partnership was developed between PIs in OH and MN that added a set of well-established organic experimental plots in MN to the CSCAP network and would replicate many of the same treatments already occurring in OH. These plots utilized organic cropping practices and with the addition of some equipment, research data can now be collected, analyzed, and combined to produce unique results not published before. A proposal and promotional pieces were developed highlighting this partnership and the opportunity for the organic industry to support research efforts. Financial support has been received with more sought after.

Field 8. C-3. Team Outputs - *OBJECTIVE 3 SPECIFIC*

Objective 3 PIs are charged with the task of combining data gathered from the CSCAP field research network with public climate data and applying physical, climate, social and economic models to evaluate the impacts of corn production under current and predicted changes in climate. Objective 3 involves the development of an analysis infrastructure and the use of that infrastructure to provide insight into and evaluate the impacts and outcomes that will likely affect the sustainability and economic vitality of corn-based cropping systems. The analysis infrastructure includes a database system to manage experimental data and a variety of physical and economic models capable of analyzing impacts at multiple scales.

During Y1 and Y2, one of the primary efforts has been taking the central database from an initial design plan to actual construction, implementation, management, and continued developmental efforts. A committee of CSCAP researchers across Objectives 1, 2 and 3 worked to develop a

framework, build a central database to store, manage, and provide data that already have an existing construct of metadata, climatic, carbon, nitrogen, water and other variables needed for model input. Three relational spreadsheets serve as the foundational framework for the central database design and development. The spreadsheets include site metadata, 55 treatments within five main categories, and 80 types of collected data within six main categories.

Researchers began collecting, enhancing and combining process models, historical data and climate projections with data from field trials to calibrate biophysical models at ever-larger scales: field, farm, and landscape. For example, researchers have integrated a parameter estimation algorithm with the DAYCENT soil carbon model to allow for automated calibration of the DAYCENT model with historical climate and field data. DAYCENT and other process models will be used to perform “what if” experiments about observed climate variability and projected climate change.

In addition to process models, a life cycle assessment (LCA) modeling framework is being developed. Researchers have collected and harmonized all published life cycle inventories of U.S. corn which provides a baseline for comparison and a basis for selecting data representing all of the “upstream” impacts associated with the manufacture of materials such as fuel, pesticides and fertilizers. The LCA model structure has been populated with preliminary field data representing tillage and cover crop treatments. Sensitivity studies have been performed using this model to identify the most influential independent variables which can now be used to index the abstraction of life cycle impacts to locations beyond the field sites.

Field 8. C-4. Team Outputs - *OBJECTIVE 4 SPECIFIC*

Activities and outputs included weekly conference calls and several in-person meetings of the 10-investigator CSCAP-U2U survey team and extensive consultation with NASS that led to the development of an innovative survey research design, sampling approach, a questionnaire, and a database on 4,778 farmers. Support from key stakeholders was manifested through \$51,400 in additional survey funding. Farmer interview-related outputs include 20 trained extension educators and materials that will facilitate interviews with farmers. A survey conducted jointly with CSCAP IPM researchers led to a technical report (see Arbuckle/Mueller in Appendix B). Analysis of preliminary survey data on farmers and agricultural educators resulted in one peer-reviewed journal article, two reports, a major regional meeting presentation, a Web-based video, and substantial media coverage.

Field 8. C-5. Team Outputs - *OBJECTIVE 5 SPECIFIC*

In Y1, the CSCAP extension team worked closely with Extension Agriculture and Natural Resource (ANR) Directors across the 10 Land Grant University (LGU) institutions involved with this project to identify extension educators with an interest and ability to dedicate time to the CSCAP. Initially, the project budgeted approximately \$22,000 per institution to hire and support extension educators committed to building strong connections among the work of the project and

their LGU institutions. The CSCAP goal is to build upon the current capacity of the upper Midwest Extension system to communicate and promote programming efforts in climate and agricultural science. Currently, CSCAP has 20 extension educators who are actively working with farmer audiences in their state.

In Y1, a project orientation and training session on agriculture and climate was held for newly recruited CSCAP extension educators, sponsored co-jointly with the USDA Heartland Regional Water Coordination Initiative “Water and Climate Conference.” In Y2, extension educators attended the CSCAP project-wide meeting in Wooster, Ohio and began to connect with project scientists and the research of the project; it was extremely beneficial to have them in attendance.

Throughout Y1 & 2, there has been considerable extension educator skepticism of climate science and climate change’s effects to agriculture. The Objective 5 extension team has encouraged questions, seeking to convey that scientists and educators are learning together with a goal of encouraging open-minded dialogues regarding what is known, what is not known, certainty and uncertainty, and perceptions of risk. The team has built trust and support among extension educators by sharing project resources, concerns about and strategies for the transfer of climate science and agricultural practices to farmers. Extension educators have over 80 key farmer leaders and group members for their state-based farmer groups. The goal is 200 participating farmers across the region. As farmers are enrolled to participate in the project, they take a baseline assessment survey of their attitudes, beliefs and practices related to climate and conservation practices. A second assessment will occur early in year five of the project and will be compared to this baseline to document change or lack of change in perceptions and behaviors. Each farmer will provide production and agronomic data for two fields within their operation that will be analyzed using a suite of risk assessment and decision support tools. Several of the extension educators have started to collect farmer data for this effort. CSCAP participating farmers, with support from their extension educator, will begin to discuss selection of their own field trial experiments based on Objective 1 protocols and the results of the risk assessment and decision support tool analyses. Field trials may include cover crops, tillage management, and nitrogen management demonstration plots for on-farm assessment of new technologies.

The extension team meets via conference call and webinars monthly. These meetings are used to identify partners and resources for extension educators to create learning opportunities for their farmer groups. They are also used as professional development opportunities for the extension educators to learn more about climate and other sciences the project is engaged in. A series of statewide and within-state regional publications, 81 in total, featuring climate data are being developed for extension educators to use with farmers. These 81 draft publications of region-specific climate information are also engaging State Climatologists with extension educators as they finalize these education tools for farmers within their states. These publications support the work of CSCAP and U2U and will interact with a NOAA multi-agency effort on the National Climate Assessment. These are currently online and available for extension educators to use.

Field 8. C-6. Team Outputs - *OBJECTIVE 6 SPECIFIC*

The Objective has spent time in Y1 and 2 in preparatory work due to the overall team's need to meet certain objective goals before being able to fully address others. Principal investigators recruited, hired and trained individuals for an educational specialist and graduate student openings in support of CSCAP educational activities.

Graduate students participated in a student-centered learning session at the Y1 annual meetings and discussed convergence and transdisciplinary science. The students also had a separate dinner to meet others and build connections across institutions. The breakout session and separate dinner were continued at the Y2 annual meeting and allowed for discussion of the graduate roadmap, graduate seminar, and allowed for students to know one another better. The goal of this and other sessions is designed to increase the student's sense of their individual science learning experiences and build a cohort community of scholars cross-trained in both climate and agriculture, to expand the student's professional network, and to further strengthen interactions among project participants.

The curriculum goals for the Y1-Y2 web-based graduate seminar "Science of Climate Change" were to develop an overall awareness of climate change, its possible causes and how people may develop strategies to cope with these changes. Students participated in weekly web-based discussions related to climate change and agriculture. The seminar was offered to CSCAP graduate students free of charge with a nominal book cost, with the option to take it with or without graduate credit (1 semester credit).

Project personnel are working with three educators in Ohio to develop climate education modules which are currently being reviewed and evaluated. The first module includes a course outline for use in high school or entry level college classes on environment, biology, or agricultural education classes focusing on phenology; the second module focuses on food production, safety and economics.

At Iowa State University, Science with Practice (SWP) is a College of Agriculture and Life Sciences experiential learning and internship program for undergraduate students in agriculture. Students work closely with faculty and staff mentors on specific projects. At The Ohio State University, 21 summer interns were hosted through the OARDC research internship program (ORIP). CSCAP personnel worked with the SWP and ORIP staff to identify students to work with CSCAP and non-CSCAP based scientists within their research programs (see Appendix C for undergraduate internships). The project topics related to CSCAP in terms of greenhouse gases, sustainable agriculture, and farmer surveys. The students worked with their mentors to conduct experiments as a part of their internship.

OSU personnel also developed a class, "Climate, Agriculture, and Sustainability in the Corn Belt: Focus on the Lake Erie Watershed," for undergraduate and graduate students and teachers. The class for teachers, undergraduate students, and graduate students, July 29-August 4, 2012, focused on corn production in Ohio and the effect on Lake Erie and other Ohio waters.

Field 8. D. Team Milestones and Deliverables

The team milestones for Year 2 and Year 3 are attached in Appendix A and sorted by Objective. All Year 1 milestones were met during the team's first year of funding and the team is well positioned to meet Year 2 and 3 milestones based on current progress. Slight modifications were made to the milestones from those included in the original proposal but this is primarily due to clarification of steps necessary to reach milestones, expansion of efforts, and refining of best approaches given discussions within and across Objectives. Year 1 milestones are not included here but can be found in the team's annual report submitted to USDA-NIFA in February 2011.

The team deliverables for Years 1 and 2 are attached in Appendix B and sorted by Objective. The team has been highly proficient with a total of 27 refereed journals, 129 conference presentations, 40 extension presentations, 21 press releases or news items, 23 white papers, 27 videos, 6 extension publications, 17 educational camp presentations, 10 proposals, 1 survey, 2 books or book chapter, 2 websites, 2 radio spots, 7 partnerships with external groups, and 9 project promotional pieces. Team members have also identified planned publications and various types of deliverables in future years; these are not shown in the Appendix due to space.

Field 8. E. Broad Impacts

The team leveraged additional funding to address gaps or presented opportunities for expansion of work. To-date, a total \$1,308,600 has been leveraged with nearly a million dollars of institutional support (\$950,000), \$263,600 by the United Soybean Board to help address integrated pest management needs, and \$95,000 by the Biological Agricultural Partners to support organic-focused research at the University of Minnesota and USDA-ARS, Coshocton, Ohio.

Field 8. F. Training

The CSCAP team includes a diverse set of expertise and specialties across the faculty, postdoctoral researchers, topic-based specialists/technical staff, graduate students, and undergraduate students. Included in Appendix C is the team personnel listing with individuals sorted by their primary Objective and then by PI. A total of 29 undergraduate students, 36 graduate students, 8 postdoctoral researchers, and 17 research staff are members of this team. Many of these individuals have produced various items listed within the Deliverables section as denoted by the author list.

Andrea Basche, graduate student representative and member of the Leadership Team, recognized a need among the graduate students for greater understanding of expectations and opportunities to be active members of the team and contribute to their development of becoming transdisciplinary scientists. The graduate student roadmap, as discussed previously on page 17, identifies steps for each program year. Graduate students discussed this roadmap in detail at the 2012 annual meeting with it soon to-be finalized. This document will serve as the platform for existing and current students within the CSCAP.

Field 8. F. Concluding Statement

Drought. Flooding. Extreme spring precipitation and humidity. Prolonged high temperatures. Shifting frost dates. Increased disease and pest pressures. US agriculture is increasingly impacted by the effects of a changing climate. Recent and projected changes in the volatility and timing of weather events and conditions underscore the urgent need for the continued funding of this project so as to systematically address agricultural vulnerability, risks, and adaptation strategies that can be employed by farmers, recommended by agribusiness, and supported through policy for corn-based cropping systems.

In Years 1&2 the CSCAP team has comprised over 140 scientists, technical specialists and staff, extension educators, graduate students and postdoctoral researchers; this team has made considerable progress toward addressing the societal challenge to mitigate and adapt the dominant Midwest corn-based cropping system to climate change. We have in place Y 3 plans to continue efforts that are integral, substantial, and critical steps towards reaching our goal. Standardized protocols and a network of 35 carefully-selected sites are already in place and scientists are measuring greenhouse gases, carbon, nitrogen, water, pest pressure, and agronomic productivity. In Y3, the team will begin to analyze the suite of crop management practices undertaken by our field trials: no-tillage, cover crops integrated into corn-soybean systems, extended crop rotations, drainage water management, nitrogen sensing, and landscape position. Data from these sites in Y3 will continue to be archived in a central database and used in conjunction with baseline data from Y1 and Y2. Further, project scientists in Y3 continue to develop, adjust, and/or employ physical, climate, life cycle, sociological and economic models to establish strengths and weaknesses of these cropping practices and to better understand farmer willingness and capacities to adopt these varying management practices. Social and economic data gathered in Y2 will be analyzed in Y3, combined with agriculture census data and climate data for peer review publications, the development of public policy recommendations and as products to engage producers and stakeholders in managing for climate uncertainty and environmental sustainability. Leveraged dollars and personnel resources totaling nearly \$1.3 million enable the project to measure pest pressure and incorporate that unique dataset into our central database, test water balance hypotheses at two organic sites with extended rotations, and survey a larger proportion of farmers in the region regarding climate beliefs and farm management practices (see Broad Impacts on the previous page for sources and sum of leveraged dollars). Transdisciplinary goals are expected to continue to be realized in Y3 with project graduate students (the next generation of scientists) leading the way in asking difficult questions, enthusiastically applying their disciplinary knowledge and seeking out others within and outside their disciplines as well as practitioners and farmers to refine the questions that exist at the intersection of agriculture and climate and how they can be addressed and ultimately answered.

Logic Model: Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems

Situation: Climate change threatens sustainability of corn systems unless mitigation and adaptive strategies are implemented. Blue arrows indicate integration of activities.








Assumptions	Inputs/Activities	Outputs	Short-term Outcomes	Long-term Outcomes	Impact
Obj 1. Establish standardized methodologies for C, N, water footprints.	Establish standardized methodologies; GHGs; soil organic pool & dynamics, agronomic indicators, & water fluxes.	Standard protocols codified. Researchers & students trained in methodologies for gathering data.	Baseline soil C pool, soil quality, GHG, water fluxes across project sites are collected, archived & aggregated.	Aggregated data across 8-state region on GHG emissions, C sequestration & water retention.	Standard protocols: reliable, accurate & comparable data.
Obj 2. Coordinated network of corn based system monitoring sites established for GHGs, C, N water on baseline systems & crop management practices to mitigate/adapt	21 field sites of corn based rotations: baseline & treatments established across 8 NC states. Crop mgmt practices: tillage, cover crops, rotations, drainage water management, & N-sensors.	Regional collaboration among project team results in peer-reviewed publications and information for stakeholders.	Aggregated data across the region provide real time field data for comparing & evaluating current corn-soybean rotations with experimental treatments.	Results for Extension educators to use with farmers in evaluating & selecting appropriate crop management practices to mitigate/adapt to climate change	Identify crop mgmt practices causing significant climate mitigation & adaptations to sustain corn systems.
3. Climate & physical models used for synthesizing results & providing up scaling evaluations & scenarios under changing climate conditions.	Public Central Database created: integrate field & climate with conservation practices. Data used in DAYCENT, farm-scale and watershed scale models.	GHG emissions findings in corn based systems are quantified. Publications in peer reviewed journals and publications for stakeholders.	Landscape-scale modeling simulates land mgmt practices under future climate scenarios. GHG emissions are evaluated under a range of climate regimes.	Models under different climate & land use practice Scenarios provide alternative futures for public policy decisions.	Database maintained. Models support science base decision making for farmers & policy.


Assumptions	Inputs/Activities	Outputs	Short-term Outcomes	Long-term Outcomes	Impact
4. Social, economic & life cycle analyses involving farmers evaluating cropping systems; providing feedback for changes in farmer management.	Farmer surveys, life cycle analyses, participatory farm-level scenario analysis & economic assessment of cropping systems	Local farmer knowledge & experience integrated with research knowledge provides guidance for future research.	Social & economic knowledge used to build capacity of extension & educators in transferring knowledge.	Stakeholders change corn management practices in response to new knowledge & experiences associated with N, C, & water impacts.	Farmers adapt cropping practices that result in climate mitigation & sustainability.
5. Link research, extension & education: place-based learning; graduate student training build exten./educ. capacities: increase student & stakeholder understanding of climate change impacts on agricultural systems.	Network of Extension facilitated & farmer exchanges; I-FARM & watershed group development across NC region. Education: climate discovery modules, college short courses, undergraduate internships & graduate student training, mentoring, & career development	20 graduate students, 50 undergraduates, 10-15 H.S. teachers, 8 extension educators trained.. Peer-to-peer farmer watershed groups. Extension bulletins created & delivered by eXtension. Refereed publications.	Project students have experiences in working across disciplinary boundaries, presenting to interdisciplinary audiences, learning about climate change & agriculture.	Graduate students learn disciplinary skills, team building, & trans-disciplinary interactions; learn how to develop a feedback loop between research knowledge & local stakeholders.	A cadre of well-trained students at all levels, with skills to take on the challenges of climate change.
Management	Leadership, communications, team-building, advisory board.	A cohesive team to carry out Obj 1-5. Attention on deliverables.	White papers targeted to Farm Bill policy makers, national conference.		Influence on national socioeconomic policy.






APPENDIX A. CSCAP Team Milestones by Objective.






Year 2 & 3 Milestones listed for each Objective (1-6).


Note: Formatting (font size) is restricted by the software program.










Task Name	Objective Team	Lead
Objective 1. Develop standardized methodologies and perform baseline monitoring of carbon, nitrogen, and water footprints at agricultural test sites across the Midwest.		
YEAR 2 MILESTONES		
 Evaluate written standard protocols for agronomic indicators	1, 2	Lauer, Kladviko, Scharf
Evaluate protocols developed for in-season measurements: plant population, biomass (dry matter) for all crops; adjust as appropriate.		
Evaluate protocols developed for harvest measurements: grain moisture, grain yield, and grain total C & N for all crops; adjust as appropriate.		
 Evaluate standard protocols for greenhouse gas data (CO₂, N₂O, and CH₄)	1, 2	Castellano
Evaluate protocol developed for GHG collection and adjust as appropriate.		
Sampling for data quality control.		
Check each PAS every 3 months for accuracy; recalibrate as necessary.		
 Evaluate written standard protocols for soil data	1, 2	Lal, Kladviko, Helmers
Evaluate protocols developed for baseline carbon, nitrogen, pH, CEC, and texture measurements; adjust as appropriate.		
Evaluate protocol developed for baseline soil bulk density measurements; adjust as appropriate.		
Evaluate protocol developed for baseline soil water retention measurements; adjust as appropriate.		
Evaluate protocols developed for optional soil quality measurements of aggregation, penetration resistance, earthworms, and infiltration; adjust as appropriate.		
Evaluate protocols developed for soil moisture monitoring on selected plots; adjust as appropriate.		
Evaluate protocols developed for soil nitrate sampling on selected plots; adjust as appropriate.		
 Evaluate written standard protocols for IPM measurements	1, 2	Gassmann, Mueller, ONeal
Evaluate protocols developed for crop diseases; adjust as appropriate.		
Evaluate protocols developed for insects; adjust as appropriate.		
Evaluate protocols developed for weeds; adjust as appropriate.		
Train IPM USB colleagues in protocol collection since were not present in Y1.		
 Evaluate written standard protocols for water and drainage measurements	1, 2	Helmers
Evaluate protocols developed for measuring drainage flow and collection of nitrate concentrations in drainflow.		
 Evaluate method of collecting weather data; related to use of protocols, formatting and metadata.	1, 2, 3	Herzmann, Arritt
Evaluate protocols for processing, quality control, and formatting of raw data into the central database; adjust as appropriate.		
Complete the collection process for long term climate information from each of the field sites or from available data from nearby, long-term stations.		
Maintain and improve (as needed) raw weather data transmittal to the central database.		
Monitor data for quality control of data collection.		
Integrate with other outside weather data sources as needed.		
YEAR 3 MILESTONES		
 Evaluate standard protocol for greenhouse gas data (CO₂, N₂O, and CH₄)	1, 2	Castellano
Sampling for data quality control.		
Check each PAS every 3 months for accuracy; recalibrate as necessary.		



Task Name	Objective Team	Lead
 Evaluate method of collecting weather data; related to use of protocols, formatting and metadata.	1, 2, 3	Herzmann, Arritt
Maintain and improve (as needed) raw weather data transmittal to the central database.		
Monitor data for quality control of data collection.		
Integrate with other outside weather data sources as needed.		






Task Name	Objective Team	Lead
Objective 2. Develop & implement a functional network of monitoring sites. Evaluate how crop management practices impact carbon, nitrogen and water footprints at test sites.		
YEAR 2 MILESTONES		
 Collect and compare greenhouse data (CO₂, N₂O, and CH₄)	1, 2	Castellano
Collect real-time data on gaseous fluxes weekly/fortnightly.		
All sites electronically transfer raw data to GHG manager for preparation into database.		
GHG manager prepare and process data for the database.		
Compare and analyze treatments with control plots.		
 Collect and compare agronomic data using consistent protocols	1, 2	Lauer, Kladvko, Scharf
Collect agronomic indicator data (plant population, plant biomass, grain moisture & yield, grain total C & N).		
Transmit agronomic data to central database		
Compare and analyze treatments with control plots.		
 Collect and compare soil data using consistent protocols	2	Lal, Kladvko, Helmers
Collect baseline measurements on few experimental plots that were not in Y1.		
Transmit all baseline data to central database		
Compare and analyze treatments with control plots.		
 Collect and compare integrated pest management (IPM) data using consistent protocols	1, 2	Mueller, Gassmann, O'Neal
Collect data during the season on pest abundance and use of pest management tactics		
Collect pest data from cover crops		
Collect pest data from extended rotations		
Transmit IPM data to central database		
Compare and analyze treatments with control plots		
Work closely with United Soybean Board Cooperators to expand IPM activities.		
 Collect water and drainage data using consistent protocols	1, 2	Helmers
Measure tile drainage and water quality at drainage water management sites.		
Measure complete hydrologic budget at Coshocton, OH.		
Transmit water data to central database.		
Compare and analyze treatments with control plots.		
 Collect weather & climate data using consistent protocols, formatting & metadata	1, 2, 3	Herzmann, Arritt
Transmit on-site weather data collected by PI instrumentation to central database. This includes all available variables (precipitation, air temperature, soil temperature, solar radiation, etc.).		
Ongoing collection of weather data by Herzmann across all network sites.		
 Develop and assess Soil Quality Index (SQI)	1, 2	Lal
Use data collected to develop a soil quality index to aggregate results		
Assess SQI based on available data (5 sites under different management e.g., NV, NT, CT, cover crops, manure, etc.)		
Collect required yield data.		
Develop relation between SQI and yield.		
Review article on SQI.		
YEAR 3 MILESTONES		
 Collect and compare greenhouse data (CO₂, N₂O, and CH₄)	1, 2	Castellano
Collect real-time data on gaseous fluxes weekly/fortnightly.		
All sites electronically transfer raw data to GHG manager for preparation into database.		
GHG manager prepare and process data for the database.		
Compare and analyze treatments with control plots.		
 Collect and compare agronomic data using consistent protocols	1, 2	Lauer, Kladvko, Scharf









Task Name	Objective Team	Lead
Collect agronomic indicator data (plant population, plant biomass, grain moisture & yield, grain total C & N).		
Transmit agronomic data to central database		
Compare and analyze treatments with control plots.		
 Collect and compare soil data using consistent protocols	2	Lal, Kladvko, Helmers
Collect soil data as applicable in Y3.		
Transmit soil data to central database		
Compare and analyze treatments with control plots.		
 Collect and compare integrated pest management (IPM) data using consistent protocols	1, 2	Mueller, Gassmann, ONeal
Collect data during the season on pest abundance and use of pest management tactics		
Collect pest data from cover crops		
Collect pest data from extended rotations		
Transmit IPM data to central database		
Compare and analyze treatments with control plots		
Work closely with United Soybean Board Cooperators (if funding continues) to expand IPM activities.		
 Collect water and drainage data using consistent protocols	1, 2	Helmers
Measure tile drainage and water quality at drainage water management sites.		
Transmit water data to central database.		
Compare and analyze treatments with control plots.		
 Collect weather & climate data using consistent protocols, formatting & metadata	1, 2, 3	Herzmann, Arritt
Transmit on-site weather data collected by PI instrumentation to central database. This includes all available variables (precipitation, air temperature, soil temperature, solar radiation, etc.).		
Ongoing collection of weather data by Herzmann across all network sites.		
 Validate Soil Quality Index (SQI)	1, 2	Lal
Validation of the SQI model (e.g., collect additional field data from 3 sites; 2 same sites from previous year i.e., year 2, and 1 additional new site).		
Prepare manuscripts		



Task Name	Objective Team	Lead
Objective 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. Develop and calibrate the central database while ensuring usability for all CSCAP members.		
YEAR 2 MILESTONES		
 Construction & functioning of central database for sharing available data for this project.	3	Herzmann, Abendroth
Complete inventory of data to be collected.		
Complete the establishment of metadata and practices.		
Complete the build of collaborative infrastructure around the collection of field data. Transition afterwards to support and improvement of infrastructure.		
Complete metadata for each site including cropping history, historical data, climate, and landscape data.		
Ensure the collection and archival routines are working, adjust any methods as necessary.		
Verify Obj 3 has all data variables needed for models.		
Maintain the servers that store data.		
Support community members wishing to access the data.		
Collect auxiliary datasets as deemed necessary by the team.		
 Work with Objective 1, 2, and 3 members to test data processes to database.	1, 2, 3	Herzmann, Abendroth
Ensure that systematic and consistent process and methods exist for all types of data transmission.		
Establish a "dashboard" in which members can see what is needed and on what time schedule.		
Check data quality continuously.		
Evaluate data processes continuously for efficiency and accuracy.		
 Develop methods to create digital soil map products for describing field research sites.	3	Owens
Exploration and development of knowledge based approaches.		
Exploration and development of geostatistical based approaches.		
 Create a digital soil map product for the SEPAC field site in Indiana.	3	Owens
Initial field sampling, site characterization and validation sampling.		
Knowledge based model building and implementation.		
Uncertainty analysis and validation/accuracy assessment.		
 Provide gridded SSURGO products for CSCAP members.	3	Owens
Acquire and analyze data from USDA-NRCS.		
Generation of CSCAP specific gridded SSURGO product and distribution to team website.		
 Provide gridded SSURGO products for CSCAP members.	3	Owens
Acquire and analyze data from USDA-NRCS.		
Generation of CSCAP specific gridded SSURGO product and distribution to team website.		
 Coordinate the calibration of biophysical models at field, farm, and landscape scales.	3	Anex, Arritt
Complete the assembly of data needed to conduct "what if" experiments on observed climate variability, projected climate change, and economic land use models.		
Develop "what if" experiments based on observed climate variability and projected climate changes.		
 Develop and evaluate corn life cycle assessment model(s)	3	Anex
Complete development of LCA models.		
Review LCA scope and revise as required.		
Review allocation methods and revise as required.		
Continue to develop technology, management, and climate change analysis scenarios.		
Conduct preliminary LCA impact assessment and interpretation.		
Relay initial LCA results back to team members to help guide.		
 Develop life cycle inventory model of corn production system.	3	Anex
Begin development of spatially-explicit corn life cycle inventory data structure.		
Complete development of inventory data for all common background processes.		
Populate inventory database with baseline model data from Obj 1, 2, and 3.		
 Quantify impact of climate variability and change on corn yield	3	Basso

Task Name	Objective Team	Lead
Gather data input on soil, weather, management to run SALUS crop model		
 Coordinate upscaling of experimental findings to larger scales through modeling	2, 3, 4, 5	Anex, Kling
Integrate data from field and farm scale experiments of Obj 2 to models.		
Calibrate DAYCENT modeling to evaluate GHG emissions under variety of climate regimes.		
Perform initial testing of SWAT baseline and begin exploring scenario simulations for the UMRB and Ohio-Tennessee River Basin (OTRB) using new SWAT modeling approach being developed for NSF-funded project.	3	Gassman, Kling
Begin testing of EPIC and DAYCENT models with field data collected at CSCAP field research sites and/or with data collected at other existing research sites. Focus especially on testing of long-term soil sequestration and model's ability to replicate GHG emissions.	3	Gassman, Kling
Construct UMRB-level EPIC and DAYCENT modeling systems based on spatial units and input data used in the SWAT modeling system, and perform UMRB-level testing with both models.	3	Gassman, Kling
Develop economic cost estimates for different pertinent cropping systems and management practices.	3	Gassman, Kling
YEAR 3 MILESTONES		
 Construction & functioning of central database for sharing available data for this project.	3	Herzmann, Abendroth
Support and improve the collaborative infrastructure used for the collection of field data.		
Ensure the collection and archival routines are working, adjust any methods as necessary.		
Verify Obj 3 has all data variables needed for models.		
Maintain the servers that store data.		
Support community members wishing to access the data.		
Collect auxiliary datasets as deemed necessary by the team.		
 Work with Objective 1, 2, and 3 members to test data processes to database.	1, 2, 3	Herzmann, Abendroth
Check data quality continuously.		
Evaluate data processes continuously for efficiency and accuracy.		
 Develop digital soil map products for all research site locations.	3	Owens
Complete field level mapping		
Uncertainty and accuracy assessment.		
 Continue to develop methodology to scale soil data to state and regional scales.	3	Owens
Comparative analysis of field level modeling for all modeled CSCAP sites.		
Create soil data that is more descriptive and useful for the Soil Modeling CSCAP group.	3	Owens
 Coordinate the calibration of biophysical models at field, farm, and landscape scales.	3	Anex, Arritt
Refine "what if" experiments based on observed climate variability and projected climate changes.		
Present findings at YEAR 3 annual CAP team convening for discussion.		
Write up "what if" experiments for producer and scientific community feedback evaluation.		
Develop lay and scientific publication of findings.		
 Develop and evaluate corn life cycle assessment model(s)	3	Anex
Test and document sensitivity to allocation method choice.		
Perform sensitivity analysis to identify key assumptions and data.		
Present findings at YEAR 3 annual CAP team convening for discussion.		
Continue to refine impact assessment methods and data.		
 Develop life cycle inventory model of corn production system.	3	Anex
Incorporate field and modeling scenarios into LCA model.		
Present findings at YEAR 3 annual CAP team convening for discussion.		
Continue to refine the LCA model.		
 Quantify impact of climate variability and change on corn yield	3	Basso
Report testing of crop model results with local field site measurements on corn yield.		
Test model results of management impact strategies (described in Obj. 1 treatments)		
Produce results from SALUS crop model runs with future climate scenarios.		

Task Name	Objective Team	Lead
 Coordinate upscaling of experimental findings to larger scales through modeling	2, 3, 4, 5	Anex, Kling
Integrate data from field and farm scale experiments of Obj 2 to models.		
Meet with producers regarding the adoptability of model findings and test.		
Present findings at YEAR 3 annual CAP team convening for discussion.		
Prepare white paper and publications.		
Complete testing of SWAT baseline for the UMRB and OTRB regions; perform expanded set of corn-system scenarios for the two regions.	3	Gassman, Kling
Continue testing of EPIC and DAYCENT models with field data collected at CSCAP field research sites and/or with data collected at other existing research sites.	3	Gassman, Kling
Expand EPIC and DAYCENT simulations to the OTRB region and perform baseline testing of both models for the OTRB region. Continue investigating impacts of alternative cropping system/management practices with both models for the UMRB.	3	Gassman, Kling
Complete supply curves for GHG offsets from a range of cropping systems.	3	Gassman, Kling
Present results at annual CSCAP meeting and at other conferences. Submit SWAT and EPIC/DAYCENT papers for planned JSWC special issue.	3	Gassman, Kling
 Supply downscaled data for current and future climates to Objective 3 modelers.	3	Arriitt, Herzmann
Coordinate with Objective 3 modelers to assess data needs.		
Assess climate projections suitable for CSCAP goals, with respect to available variables and format.		

Task Name	Objective Team	Lead
Objective 4. Develop a comprehensive understanding 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, programming, and policies that promote long-term sustainability of crop production.		
YEAR 2 MILESTONES		
 Conduct a stratified random sample survey of farmers from across the Corn Belt	4	Arbuckle, Tyndall
Work with NASS to implement mail survey		
Construct a survey database with CSCAP and NASS data		
 Prepare for in-depth interviews with 200 farmers in nine Corn Belt states	4	Arbuckle, Tyndall
Get IRB clearance for in-depth interviews		
Recruit and train extension educators in interview skills		
Develop interview protocols		
 Develop and disseminate information from socioeconomic research to inform other project objectives, extension and outreach programming, and policy development	4	Arbuckle, Tyndall
Analyze farmer survey data		
Develop manuscripts for dissemination through peer-reviewed journals and project reports		
Develop and give presentations to stakeholder groups		
YEAR 3 MILESTONES		
 Conduct and analyze in-depth interviews with farmers in nine Corn Belt states	4	Arbuckle, Tyndall
Begin in-depth interviews with 200 farmers		
Transcribe interviews		
Begin analysis of in-depth interviews		
Begin preparation for year 4 follow-up focus groups with interviewed farmers		
 Develop and disseminate information from survey and in-depth interviews to inform other project objectives, extension and outreach programming, and policy development	4	Arbuckle, Tyndall
Continue analysis of farmer survey data		
Discuss survey and interview findings with extension educators to inform ongoing development of outreach strategies and materials		
Continue to share survey and interview data with other project objectives		
Continue to develop manuscripts for dissemination through peer-reviewed journals and project reports		
Continue to develop and give presentations to stakeholder groups		

Task Name	Objective Team	Lead
Objective 5. Promote extension, outreach and stakeholder learning and participation across all aspects of the program.		
YEAR 2 MILESTONES		
 Extension-facilitated participatory exchanges	Entire Team	Arbuckle, Tyndall, Benning, Ingels, Wright Morton
Engage in specific interactive exchanges regarding team findings and producer acceptability.		
Engage advisory board in research, extension and education applications.		
Develop mechanism at Y2 annual convening to link research, education, and extension.		
 Farmer-led watershed groups	5	Benning, Ingels
Complete the identification of farmer leaders in watersheds across states.		
Extension educators continue to develop farmer-led watershed leadership and watershed groups.		
Active watershed groups begin to use performance-based environmental management tools to collect data on water, carbon and nitrogen in their watershed and apply experiments similar to Obj 2 field trials.		
Selected farmer leaders attend Y2 annual convening to increase farmer-scientist exchanges.		
 Incorporate web-based tools into extension component	4, 5	Tyndall
Extension educators work with producers in their respective state with various web tools.		
Preliminary findings presented at Y2 annual team convening.		
 Interact with USDA-funded Climate Change Mitigation & Adaptation in Agriculture (A3141) project U2U (Useful & Usable Decision Support Tools)	Entire Team	Arbuckle, Todey
Ongoing communication, exchanges and collaboration between teams.		
YEAR 3 MILESTONES		
 Extension-facilitated participatory exchanges	Entire Team	Arbuckle, Tyndall, Benning, Ingels, Wright Morton
Engage in specific interactive exchanges regarding team findings and producer acceptability.		
Engage advisory board in research, extension and education applications.		
Develop mechanism at Y3 annual convening to link research, education, and extension.		
 Farmer-led watershed groups	5	Benning, Ingels
Extension educators continue to develop farmer-led watershed leadership and watershed groups.		
Active watershed groups use performance-based environmental management tools to collect data on water, carbon and nitrogen in their watershed and apply experiments similar to Obj 2 field trials.		
Selected farmer leaders attend Y3 annual convening to increase farmer-scientist exchanges.		
 Incorporate web-based tools into extension component	4, 5	Tyndall
Extension educators work with producers in their respective state with various web tools.		
Data gathered from tools are aggregated and shared with individuals and farmer groups.		
Preliminary findings presented at Year 3 annual team convening.		
Prepare lay and scientific publications.		
 Interact with USDA-funded Climate Change Mitigation & Adaptation in Agriculture (A3141) project U2U (Useful & Usable Decision Support Tools)	Entire Team	Arbuckle, Todey
Ongoing communication, exchanges and collaboration between teams.		

Task Name	Objective Team	Lead
Objective 6. Train the next generation of scientists, develop science education curricula and promote learning opportunities for high school teachers and students.		
YEAR 2 MILESTONES		
 Next generation of scientists are engaged in team research	Entire Team	Wright Morton
Undergraduates and graduate students present findings with team mentors at Y2 team convening.		
 9-12 focused educational approaches	6	Moore
Develop Climate & Agriculture Discovery (CAD) modules for in-place NSF curriculum project		
Begin to develop the evaluation tools for these modules		
Begin to identify teacher education programs in 9 states that can incorporate Climate & Agriculture Discovery modules into their curriculum.		
Train grades 9-12 teachers in using CAD modules.		
 Climate camp and/or University short courses (non-credit and credit based)	6	Miller, Nkongolo, Todey
Identify and work with other LGU insitution to transfer Y2 short course curriculum.		
Conduct short courses for 15-20 students in Iowa and Ohio, evaluate and revise.		
 Undergraduate Internships	6	Moore, Miller, Nkongolo
Undergraduate interns from ISU and OSU develop a poster for the Y2 team convening.		
Invite other north central LGU students to participate in OSU internships.		
 Distance Education Graduate Course	6	Miller
On-line graduate course "The Science of Climate Change" is launched. Revise based on ISU pilot test evaluations.		
YEAR 3 MILESTONES		
 Next generation of scientists are engaged in team research	Entire Team	Wright Morton
Undergraduates and graduate students present findings with team mentors at Year 3 team convening.		
Undergraduate and graduate students work with mentors to develop scientific papers on findings.		
 9-12 focused educational approaches	6	Moore
Teacher educators apply and evaluate modules.		
Modules are revised based on evaluation feedback.		
 Climate camp and/or University short courses (non-credit and credit based)	6	Miller, Nkongolo, Todey
Conduct short courses for 15-20 students in Iowa and Ohio, evaluate and revise.		
Evaluate these courses.		
 Undergraduate Internships	6	Moore, Miller, Nkongolo
Undergraduate interns from ISU and OSU develop a poster for the Y3 team convening.		
 Distance Education Graduate Course	6	Miller
On-line course conducted and expanded connections made to other educational sites with on-going evaluation.		

APPENDIX B. CSCAP Team Deliverables by Objective.

Note 1: Formatting (font size) is restricted by the software program.

Note 2: Web links become "broken" in the PDF. To access, simply copy all of the web address in the cell into a web browser.

PI	Obj.	Type of Output/Product	Status	Final Author List	Year	Final Title	Journal or Source	Online Source	Attendance
Bonta	2	Presentation (Conference)	Complete	Bonta, James* and Dave Barker	2011	Effects of climate change on grass/legume growing season.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-	100
Bowling	2	White Paper/ Fact Sheet	Complete	Laura Bowling	2012	The Water Balance	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/doc/publications/LBowling	N/A
Bowling	2	Video	Complete	Laura Bowling	2012	The Water Balance	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Castellano	2	Refereed Journal	Complete	Iqbal J, Castellano MJ, Parkin TB	2012	Evaluation of photoacoustic spectroscopy for simultaneous measurement of N ₂ O and CO ₂ gas concentrations and fluxes at the soil surface	Global Change Biology.	DOI: 10.1111/gcb.12021	N/A
Castellano	2	Presentation (Conference)	Complete	Iqbal, Javed* and Michael Castellano	2011	Nitrous oxide and carbon dioxide measurement with photoacoustic spectroscopy	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Castellano	2	Presentation (Conference)	Complete	David C. Mitchell, Michael J. Castellano, John E. Sawyer, Fernando Miguez and Jose L. Pantoja	2011	Nitrous Oxide Emissions From a No-till Corn-Soybean Rotation Comparing N Fertilization and Cover Cropping Treatments.	ASA-CSSA-SSSA 2011 Annual Meetings. San Antonio, TX.	http://scisoc.confex.com/scisoc/2011am/webprogr/am/Paper64956.html	Unknown
Castellano	2	Presentation (Conference)	Complete	Mitchell, David C., Michael J. Castellano, John E. Sawyer, Fernando Miguez and José L. Pantoja	2011	Nitrous Oxide Emissions From a No-till Corn-Soybean Rotation Comparing N Fertilization and Cover Cropping Treatments.	ASA-CSSA-SSSA 2011 Annual Meetings. San Antonio, TX.	http://scisoc.confex.com/scisoc/2011am/webprogr/am/Paper64956.html	Unknown
Castellano	2	White Paper/ Fact Sheet	Complete	Michael Castellano	2012	Nitrous Oxide and Greenhouse Gas	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/doc/publications/Castell	N/A
Castellano	2	Presentation (Extension/ Outreach)	Complete	Mitchell, David C., Michael J. Castellano, John E. Sawyer, Fernando Miguez and José L. Pantoja	2012	Cover Crop and Nitrogen Fertilizer Effects on Nitrous Oxide Emissions from No-till Maize and Soybean.	ISU Ecology and Evolutionary Biology Annual Spring Symposium. Jan. 28, 2012.	Not available	Unknown
Castellano	2	Presentation (Extension/ Outreach)	Complete	Mitchell, D.	2012	Carbon, Nitrogen, and Water Controls on Nitrous Oxide from Fertilized Maize Systems	Agronomy 600B, Soil Science Seminar, March 28, 2012	Not available	Unknown
Castellano	2	Video	Complete	Michael Castellano	2012	Nitrous Oxide and Greenhouse Gas	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Castellano	2	Video	Complete	Castellano, M. and J. Iqbal	2012	Photoacoustic spectroscopy training session	Iowa State University Extension.	https://connect.extension.iastate.edu/p8v0uwyk6877?launcher=false&fcsContent=true&pbMode=normal	N/A
Castellano	2	External Groups	Complete	Michael Castellano	2012	Invitation to speak on US strategy to mitigate cropland GHG with Taiwanese government.			N/A
Cruse	2	Presentation (Conference)	Complete	Rick Cruse and Scott Staggenborg	2011	Climate change impact of crop performance and soil and water.	Agricultural Decision Making with a Water and Climate Change Perspective Conference, Nebraska City, NE, November 1, 2011.	http://www.heartlandwq.iastate.edu/NR/rdonlyres/F6E4ABDB-6A8E-4775-97BE-99E20FB3CAC0/159539/	114
Cruse	2	Presentation (Conference)	Complete	Cruse, Richard and Scott Lee	2011	Evaluation of crop management practices on soil infiltrability.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-	100

PI	Obj.	Type of Output/Product	Status	Final Author List	Year	Final Title	Journal or Source	Online Source	Attendance
Cruise	2	Presentation (Conference)	Complete	Scott R. Lee* and Richard M. Cruse	2012	Evaluation of Crop Management Practices on Soil Infiltrability.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Cruise	2	Presentation (Conference)	Complete	Rick Cruse	2012	Soil Surface Cover/Residue Measurements: Methods of Making Measurements, Potential Errors, and Implication of Errors	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	Not available	60
Cruise	2	Presentation (Conference)	Complete	Scott Lee	2012	Water Infiltration	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	Not available	
Cruise	2	Presentation (Extension/Outreach)	Complete	Scott Lee and Richard Cruse	2012	Evaluation of Crop Management Practices on Soil Infiltrability.	New Technology Expo: Gulf of Mexico Hypoxia Task Force and National Association of State Departments of Agriculture, Sept 12, 2012. ISU Biocentury Farm.	Not available	120
Cruise	2	Video	Complete	Rick Cruse	2012	Soil Surface Cover/Residue Measurements: Methods of Making Measurements, Potential Errors, and Implication of Errors	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	http://sustainablecorn.org/resources.html	N/A
Cruise	2	Video	Complete	Scott Lee	2012	Water Infiltration	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	http://sustainablecorn.org/resources.html	N/A
Dick	2	Presentation (Conference)	Complete	Warren Dick	2012	Keynote Presentation: Fifty Years of No-Tillage and Rotation in Ohio, USA: Soil and Crop Responses.	3rd International Conference on Carbon Sequestration and Climate Change Mitigation in Agriculture, July 21-27, 2012 in Beijing, China.	Not available	Unknown
Dick	2	Presentation (Conference)	Complete	Warren Dick	2012	How to Manage and Analyze Data from Long-Term Experiments?	3rd International Conference on Carbon Sequestration and Climate Change Mitigation in Agriculture, July 21-27, 2012 in Beijing, China.	Not available	Unknown
Dick	2	Presentation (Conference)	Complete	Campbell, B. and W. Dick.	2012	Tillage and rotation effects on CO ₂ , CH ₄ and N ₂ O Emissions from Two Long-Term Sites in Ohio.	The Ohio Agricultural Research and Development Center Annual Conference, April 26, 2012. Wooster, OH.	Not available	Unknown
Dick	2	Presentation (Conference)	Complete	Brittany D. Campbell* and Dr. Warren A. Dick	2012	Tillage and Rotation Effects on CO ₂ , CH ₄ , and N ₂ O Emissions from Two Long-Term Sites in Ohio.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Dick	2	Presentation (Conference)	Complete	Liming Chen*, David Kost, Clayton Dygert and Warren Dick	2012	Tillage, Crop Rotation, Nitrogen Fertilizer and Cover Crop Impacts on Greenhouse Gas Fluxes in Ohio.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Dick	2	Presentation (Conference)	Complete	Warren Dick	2012	Productivity Measurements (Stand Count, Crop Yield, and Biomass Estimates)	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	Not available	60
Dick	2	Presentation (Conference)	Complete	Clayton Dygert	2012	Crop Canopy Nitrogen Measurements	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	Not available	60
Dick	2	White Paper/ Fact Sheet	Complete	Warren Dick	2012	No-Tillage Impacts on Soil Carbon, Nitrogen and Water	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/doc/publications/Speed-	N/A
Dick	2	White Paper/ Fact Sheet	Complete	Warren Dick, Clayton Dygert, Chelsea Smith, Rick Cruse, Sandeep Kumar, Scott Lee, Brittany Campbell, Toru Nakajima, and Sarah Pinkham	2012	Field Research Network: Strengths, Challenges, Methods, and Data Aspects	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	Not available	N/A

PI	Obj.	Type of Output/Product	Status	Final Author List	Year	Final Title	Journal or Source	Online Source	Attendance
Dick	2	Video	Complete	Warren Dick	2012	Productivity Measurements (Stand Count, Crop Yield, and Biomass Estimates)	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	http://sustainablecorn.org/resources.html	N/A
Dick	2	Video	Complete	Clayton Dygert	2012	Crop Canopy Nitrogen Measurements	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	http://sustainablecorn.org/resources.html	N/A
Dick	2	Video	Complete	Warren Dick	2012	No-Tillage Impacts on Soil Carbon, Nitrogen and Water	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Dick/Lal	2	Presentation (Conference)	Complete	Brittany Campbell and Toru Nakajima	2012	Soil Water, Temperature, and Greenhouse Gas Measurements	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	Not available	60
Dick/Lal	2	Video	Complete	Brittany Campbell and Toru Nakajima	2012	Soil Water, Temperature, and Greenhouse Gas Measurements	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	http://sustainablecorn.org/resources.html	N/A
Frankenberger	2	Presentation (Conference)	Complete	Frankenberger, J.R.	2011	Limitations of drainage water management.	Managing Water. Harvesting Results. America's Ag Water Management Summit. October 2011. Minneapolis, MN	http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/water/management/7&cid=stetprdb1045701	Unknown
Frankenberger	2	White Paper/ Fact Sheet	Complete	Jane Frankenberger	2012	Drainage Water Management	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/doc/publications/Frankeberger-0111-2012.pdf	N/A
Frankenberger	2	Video	Complete	Jane Frankenberger	2012	Drainage Water Management	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Frankenberger/Bowling	2	Presentation (Conference)	Complete	Brooks, Kyle*, Laura Bowling, Jane Frankenberger, and Eileen Kladvko	2011	Improved flow measurement for drainage water management in Indiana.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Frankenberger/Bowling	2	Presentation (Conference)	Complete	Brooks, K., J. Frankenberger, L. Bowling and E. Kladvko.	2012	Monitoring tile drains with electromagnetic sensors.	Presented at the Agricultural Drainage Management Systems Task Force meeting, Dundee Michigan, April 17-19, 2012.	Not available	Unknown
Frankenberger/Bowling	2	Presentation (Conference)	Complete	Kyle Brooks*, Jane R. Frankenberger, Laura C. Bowling and Eileen J. Kladvko	2012	Drainage Water Management: Flow, Water Table Depth and Soil Moisture in Eastern Indiana.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Helmers	2	Presentation (Conference)	Complete	Ryan J. Goeken*, Xiaobo Zhou and Matthew J. Helmers	2012	Comparison of subsurface drainage under perennial pasture and row crops in a tile-drained field in Iowa.	ASABE Annual Meeting, Dallas, TX, July 29-August 1, 2012.	Not available	Unknown
Helmers	2	Presentation (Conference)	Complete	Ryan J. Goeken*, Xiaobo Zhou and Matthew J. Helmers	2012	Comparison of subsurface drainage under perennial forage and row crops in a tile-drained field in Iowa	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Helmers	2	Presentation (Conference)	Complete	Helmers, Matthew, Xiaobo Zhou, Carl Pederson, and Ryan Goeken	2011	Iowa State University's Agricultural Drainage Water Research Site: Site characterization and past and present research.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Helmers	2	Presentation (Conference)	Complete	Helmers, Matthew*, Xiaobo Zhou, Reid Christianson, Carl Pederson, and Greg Brenneman	2011	Drainage water management in Iowa – Crawfordsville site.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100

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Helmers	2	Presentation (Extension/ Outreach)	Complete	Ryan Goeken, Xiaobo Zhou, and Matthew Helmers.	2012	Comparison of subsurface drainage under perennial forage and row crops in a tile-drained field in Iowa.	New Technology Expo: Gulf of Mexico Hypoxia Task Force and National Association of State Departments of Agriculture. Sept 12, 2012. ISU BioCentury Farm.	Not available	120
Helmers	2	Radio	Complete	Matthew Helmers	2011	Climate Change Effects on Agriculture	Talk of Iowa, Iowa Public Radio. May 17, 2011.		N/A
Helmers	2	Press/News Releases	Complete	Edith Munro, Matthew Helmers	2012	5 Ways to Cut Nitrate Loss	Corn & Soybean Digest	http://cornandsoybeandigest.com/fertilizer/5-ways-	N/A
Kladvko	2	Presentation (Conference)	Complete	Cavadini, Jason*, Kaylissa Horton*, and Eileen Kladvko	2011	Standardized soil sampling protocols and their use on two Indiana CSCAP research sites.	CSCAP Annual Conference, Chicago, IL. Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Kladvko	2	Presentation (Conference)	Complete	Jason Cavadini*, Kaylissa Horton and Eileen Kladvko	2012	The Influence of Oilseed Radish Cover Crop Bicultures on Overall Soil Quality and Nutrient Cycling.	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Kladvko	2	Presentation (Conference)	Complete	Kaylissa A. Horton*, Jason S. Cavadini and Eileen J. Kladvko	2012	Soil Physical Properties of Two Indiana CSCAP Field Sites.	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Kladvko	2	White Paper/ Fact Sheet	Complete	Eileen Kladvko	2012	Cover Crops	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/doc/publications/Kladvk	N/A
Kladvko	2	White Paper/ Fact Sheet	Complete	Eileen Kladvko	2012	Cover Crops Following the Summer 2012 Drought	Purdue University Extension	https://ag.purdue.edu/agry/extension/Documents/	N/A
Kladvko	2	Extension Publication	Complete	Eileen Kladvko	2011	Cover crops for modern cropping systems	Purdue University Extension.	http://www3.ag.purdue.edu/agry/extension/Docu	N/A
Kladvko	2	Extension Publication	Complete	Eileen Kladvko	2011	Cover crops for nitrogen management	Purdue University Extension.	http://www3.ag.purdue.edu/agry/extension/Docu	N/A
Kladvko	2	Extension Publication	Complete	Eileen Kladvko, Barry Fisher	2011	Cover crops for prevented planting acres	Purdue University Extension.	http://www3.ag.purdue.edu/agry/extension/Docu	N/A
Kladvko	2	Presentation (Extension/ Outreach)	Complete	Eileen Kladvko	2011	Cover crop benefits and selection	Advanced Cover Crop Training program for NRCS and Extension Educators held at Throckmorton Purdue Agricultural Center. Sept 8, 2011.	Not available	Unknown
Kladvko	2	Presentation (Extension/ Outreach)	Complete	Eileen Kladvko	2012	Tile drainage and cover crops for soil and water quality	Southern Region Cover Crop Workshop, Salem, IN. January 31, 2012.	Not available	Unknown
Kladvko	2	Presentation (Extension/ Outreach)	Complete	Eileen Kladvko	2012	Cover crop management	White County Agricultural Winter School, Chalmers, IN. February 6, 2012.	Not available	Unknown
Kladvko	2	Presentation (Extension/ Outreach)	Complete	Eileen Kladvko	2012	Tile drainage and cover crops for soil productivity and water quality	Wabash County Adult Farmer Class, Wabash, IN. February 13, 2012.	Not available	Unknown
Kladvko	2	Presentation (Extension/ Outreach)	Complete	Eileen Kladvko	2012	Cover Crops Workshop	Shelby County Workshop, Shelbyville, IN. February 21, 2012.	Not available	Unknown
Kladvko	2	Presentation (Extension/ Outreach)	Complete	Eileen Kladvko	2012	Cover Crops within Conservation Cropping Systems.	Conservation Cropping Systems Training, West Lafayette, IN. Training for NRCS and Extension Educators. March 23, 2012.	Not available	Unknown

PI	Obj.	Type of Output/Product	Status	Final Author List	Year	Final Title	Journal or Source	Online Source	Attendance
Kladviko	2	Presentation (Extension/ Outreach)	Complete	Eileen Kladviko	2012	Cover Crops Workshop and Field Day.	Porter County, IN. March 28, 2012.	Not available	Unknown
Kladviko	2	Presentation (Extension/ Outreach)	Complete	Eileen Kladviko	2012	Cover Crops	Field Day presentation at Davis Purdue Agricultural Center, August 21, 2012.	Not available	Unknown
Kladviko	2	Presentation (Extension/ Outreach)	Complete	Eileen Kladviko	2012	Cover Crops	Field Day presentation at Southeast Purdue Agricultural Center, August 23, 2012.	Not available	Unknown
Kladviko	2	Presentation (Extension/ Outreach)	Complete	Eileen Kladviko	2012	Cover crop benefits and selection	Advanced Cover Crop Training program for NRCS and Extension Educators held at Throckmorton Purdue Agricultural Center. Sept 13, 2012.	Not available	Unknown
Kladviko	2	Video	Complete	Eileen Kladviko	2012	Cover Crops	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Kravchenko	2	Presentation (Conference)	Complete	Ladoni Moslem, Juan Munoz-Robayo, Alexandra Kravchenko, and Sieglinde Snapp	2011	Effects of Agricultural Management with and without Cover Crops On Soil Nitrate In Different Topographical Positions.	ASA-CCSA-SSSA Annual Meeting, San Antonio, TX	http://iscsoc.confex.com/iscsoc/2011am/webprogram/Paper66699.html	Unknown
Kravchenko	2	Presentation (Conference)	Complete	Wakene Negassa* and Alexandra Kravchenko	2012	Time and topography affect cover crop contribution to soil particulate organic matter.	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Kravchenko	2	Presentation (Conference)	Complete	Negassa, W. and A.N. Kravchenko	2012	Soil aggregates and organic matter dynamics in short, medium and long-term cover crop based land use systems.	Long Term Ecological Research ASM Meeting, Estes Park, CO. September 10-13, 2012.	Not available	Unknown
Kravchenko	2	White Paper/ Fact Sheet	Complete	Melissa Erickson and Sasha Kravchenko	2012	Landscape Scale Variability in Plant Performance: Preliminary Findings from Two New Michigan CAP Sites	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/publications/Enckso n-0119-2012.pdf	N/A
Kravchenko	2	White Paper/ Fact Sheet	Complete	Sasha Kravchenko	2012	Soil Organic Carbon Cycle	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/publications/Kravch	N/A
Kravchenko	2	Video	Complete	Melissa Erickson	2012	Landscape Scale Variability in Plant Performance: Preliminary Findings from Two New Michigan CAP Sites	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Kravchenko	2	Video	Complete	Sasha Kravchenko	2012	Soil Organic Carbon Cycle	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Lal	2	Presentation (Conference)	Complete	Heitkamp, Felix*, Hermann Jungkunst, and Rattan Lal.	2011	Strategies to reduce variation of greenhouse gas flux measurements on the field scale.	CSCAP Annual Conference, Chicago, IL. Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Lal	2	Presentation (Conference)	Complete	Kadono, Atsunobo and Rattan Lal	2011	Modeling of GHG flux from corn field under different land management in Central Ohio.	CSCAP Annual Conference, Chicago, IL. Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Lal	2	Presentation (Conference)	Complete	Kumar, Sandeep*, Atsunobu Kadono, Rattan Lal, and Warren Dick.	2011	Longterm tillage and cropping systems influences on soil hydraulic properties.	CSCAP Annual Conference, Chicago, IL. Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Lal	2	Presentation (Conference)	Complete	Toru Nakajima*, Sandeep Kumar, Atsunobu Kadono and Rattan Lal	2012	Influences of Long-term Tillage and Drainage Systems on Green House Gas Emissions from a Poorly-Drained Soil of Central Ohio	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Lal	2	Presentation (Conference)	Complete	Obade Vincent de Paul*, Rattan Lal, Toru Nakajima and Atanu Mukherjee	2012	Assessing soil quality under different land management	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110

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Lal	2	Presentation (Conference)	Complete	Sandeep Kumar	2012	Measuring bulk density and water retention at field capacity and permanent wilting point	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	Not available	60
Lal	2	Video	Complete	Sandeep Kumar	2012	Measuring bulk density and water retention at field capacity and permanent wilting point	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	http://sustainablecorn.org/resources.html	N/A
Lauer	2	Presentation (Conference)	Complete	Maciej Kazula*, Joe Lauer and Thierno Diallo	2012	Corn rotation effect on greenhouse gases emission from Wisconsin soils.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Lauer	2	White Paper/ Fact Sheet	Complete	Lauer, Joe	2011	2011 Agronomic Data for Arlington and Marshfield research sites.	University of Wisconsin.	http://corn.agronomy.wisc.edu/Research/09Rotati	N/A
Nkongolo	2	Presentation (Conference)	Complete	Haruna S.I. and N.V.	2012	Baseline assessment of soil texture in a farmer field.	Annual Meetings of the Missouri Academy of Science, 13-14 April 2012.	http://www.moacadsci.org/gmasmeeting/2012annual_program.pdf	Unknown
Nkongolo	2	Presentation (Conference)	Complete	Haruna S.I. and N.V.	2012	Spatial variability of soil physical properties in a corn and soybean field.	Annual Meetings of the Missouri Academy of Science, 13-14 April 2012.	http://www.moacadsci.org/gmasmeeting/2012annual_program.pdf	Unknown
Nkongolo	2	Presentation (Conference)	Complete	Haruna, Samuel	2011	Effects of tillage and cropping system on soil properties.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-	100
Nkongolo	2	Presentation (Conference)	Complete	Samuel I. Haruna* and Nsalambi V. Nkongolo	2012	Effects of Depth on the Distribution of Soil Properties in a Corn and Soybean Field.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Nkongolo	2	Presentation (Conference)	Complete	Mebruer, B.D. and N.V.	2012	The response of CO ₂ , CH ₄ AND N ₂ O fluxes to tillage treatments in Missouri Corn and Soybean fields.	Annual Meetings of the Missouri Academy of Science, 13-14 April 2012.	http://www.moacadsci.org/gmasmeeting/2012annual_program.pdf	Unknown
Nkongolo	2	Presentation (Conference)	Complete	Mebruer, B.D., N.V. Nkongolo and K. Schmidt.	2012	Monthly fluctuations of greenhouse gases in Missouri corn and soybean fields.	Annual Meetings of the Missouri Academy of Science, 13-14 April 2012.	http://www.moacadsci.org/gmasmeeting/2012annual_program.pdf	Unknown
Nkongolo	2	Presentation (Conference)	Complete	Mebruer, Brandon	2011	Greenhouse gases emissions as affected by tillage and cropping system.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Nkongolo	2	Presentation (Conference)	Complete	Brandon D. Mebruer* and Nsalambi V. Nkongolo	2012	Mapping the Distribution of Greenhouse Gas Fluxes in a Missouri Corn and Soybean Field.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Nkongolo	2	Presentation (Conference)	Complete	Myers, A.N. and N.V. Nkongolo.	2012	Distribution of micronutrients in surface soil of a Waldron silty clay.	Annual Meetings of the Missouri Academy of Science, 13-14 April 2012.	http://www.moacadsci.org/gmasmeeting/2012annual_program.pdf	Unknown
Nkongolo	2	Presentation (Conference)	Complete	Griffith, C.H. and N.V. Nkongolo.	2012	Distribution of macronutrients in surface soil of a Waldron silty clay	Annual Meetings of the Missouri Academy of Science, 13-14 April 2012.	http://www.moacadsci.org/gmasmeeting/2012annual_program.pdf	Unknown
Nkongolo	2	Presentation (Conference)	Complete	Sale, S. and N.V. Nkongolo.	2012	Variability of greenhouse gases emissions in a corn field.	Annual Meetings of the Missouri Academy of Science, 13-14 April 2012.	http://www.moacadsci.org/gmasmeeting/2012annual_program.pdf	Unknown
Nkongolo	2	Presentation (Conference)	Complete	Sale, S. and N.V. Nkongolo.	2012	Greenhouse gases emissions from soil in a soybean.	Annual Meetings of the Missouri Academy of Science, 13-14 April 2012.	http://www.moacadsci.org/gmasmeeting/2012annual_program.pdf	Unknown
Nkongolo	2	Presentation (Conference)	Complete	Sale, Stephanie* and Nsalambi Nkongolo	2011	Monitoring greenhouse gases emission and soil thermal properties in corn and soybean fields from 2004 to 2006.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Nkongolo	2	Presentation (Conference)	Complete	Stephanie D. Sale*	2012	Greenhouse Gases Emissions from Corn and Soybean Fields in Relation to Soil Thermal Properties (June-November 2007).	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110

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Nkongolo	2	Presentation (Conference)	Complete	Williams, J. and N.V. Nkongolo.	2012	The impact of tillage on the growth and yield of soybean.	Annual Meetings of the Missouri Academy of Science, 13-14 April 2012.	http://www.moacadsci.org/masmeeting/2012annual_program.pdf	Unknown
Nkongolo	2	Presentation (Conference)	Complete	Williams, J. and N.V. Nkongolo.	2012	The effect of tillage on the growth of corn.	Annual Meetings of the Missouri Academy of Science, 13-14 April 2012.	http://www.moacadsci.org/masmeeting/2012annual_program.pdf	Unknown
Nkongolo	2	Presentation (Conference)	Complete	Williams, Jason	2011	Effect of tillage on corn and soybean growth and yield.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-	100
Nkongolo	2	Presentation (Conference)	Complete	Jason Williams* and Nsalambi Nkongolo;	2012	Tillage Effect on Growth and Yield of Corn and Soybean: First Season Results.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Nkongolo	2	Proposal	Complete	Nsalambi Nkongolo	2012	Quantifying the Impact of Soil Health Management Practices on Soil Properties, Nutrient Cycling and Plant Growth.	2012-2013: USDA-NRCS-MO-12-03. Approved, pending final award.	Not available	N/A
Pagliari/ Strock	2	Presentation (Conference)	Complete	Pagliari, Paulo* and Jeff Strock	2011	Alternative statistical analysis options for unreplicated paired design experiments.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Pagliari/ Strock	2	Presentation (Conference)	Complete	Pagliari, Paulo and Jeffrey Strock	2011	Analysis of Paired Design Approach Experiments Using a MIXED Model Approach.	ASA-CSSA-SSSA 2011 Annual Meetings. San Antonio, TX, USA	http://a-cs.confex.com/crops/2011am/webprogram/Paper6	Unknown
Project	2	Presentation (Extension/ Outreach)	Complete	Lori Abendroth	2011	Crops and Climate - 4H Session	Field Extension Education Laboratory, Iowa State University, Ames, IA.	Not available	40
Sawyer	2	Presentation (Conference)	Complete	Pantoja, J.L., J.E. Sawyer, and D.W. Barker	2011	Corn nitrogen fertilization in a rye cover cropping system.	ASA-CSSA-SSSA 2011 Annual Meetings. San Antonio, TX, USA.	http://a-cs.confex.com/crops/2011am/webprogram/Paper6	70
Sawyer	2	Presentation (Conference)	Complete	Jose L. Pantoja*, John E. Sawyer and Daniel W. Barker	2012	Winter Rye Cover Crop Biomass Production, Degradation, and N Recycling.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Sawyer	2	Presentation (Conference)	Complete	Sawyer, John, Jose Pantoja*, and Dan Barker	2011	Nitrogen fertilization requirement and corn-soybean productivity in a rye cover cropping system.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Sawyer	2	Presentation (Conference)	Complete	Sawyer, J.E., J.L. Pantoja, and D.W. Barker	2011	Effect of a rye cover crop and crop residue removal on corn nitrogen fertilization.	B.A. Pringnitz (ed.). 23rd Integrated Crop Management Conference Proceedings, Iowa State University, Ames, IA.	http://www.aep.iastate.edu/ircm/proceedings/ICM11a.pdf	350
Sawyer	2	White Paper/ Fact Sheet	Complete	John Sawyer	2012	Soil Nitrogen Cycle	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/publications/Sawyer	N/A
Sawyer	2	White Paper/ Fact Sheet	Complete	Sawyer, J., J. Pantoja, and D. Barker.	2012	Nitrogen fertilization of corn grown with a cover crop	Iowa State University Research and Demonstration Farms annual reports, Iowa State University, Ames, IA.	http://www.ag.iastate.edu/farms/11Treports/AEA%20Cent%20IA%20BioCent/NitrogenFertilization.pdf	N/A
Sawyer	2	Presentation (Extension/ Outreach)	Complete	Dan Barker	2012	Quantifying Corn N Deficiency and Application Rate with Active Canopy Sensors	New Technology Expo: Gulf of Mexico Hypoxia Task Force and National Association of State Departments of Agriculture, Sept 12, 2012. ISU BioCentury Farm.	Not available	120
Sawyer	2	Presentation (Extension/ Outreach)	Complete	Sawyer, J.E.	2011	Nitrogen management with a rye cover croppingsystem.	Iowa Learning Farm, Practical Farmers of Iowa, Clay county Extension, and Clay county NRCS, Spencer, IA.	Not available	65

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Sawyer	2	Presentation (Extension/ Outreach)	Complete	Sawyer, J.E.	2011	Nitrogen rate management with a rye cover cropping system.	Iowa Learning Farm, Practical Farmers of Iowa, Cover Crop Working Group field day, Rob Stout, Iowa Learning Farm cooperators cover crop demonstration site, West Chester, IA.	Not available	40
Sawyer	2	Presentation (Extension/ Outreach)	Complete	Sawyer, J.E.	2011	Nitrogen management with cover crops.	Iowa Learning Farm, Practical Farmers of Iowa, Cover Crop Working Group field day, Jeff Joyce, Iowa Learning Farm cooperators cover crop demonstration site, Ruthven, IA.	Not available	60
Sawyer	2	Presentation (Extension/ Outreach)	Complete	Sawyer, J.E.	2011	Nitrogen management with cover crops.	Iowa Learning Farm and Cover Crop Working Group field day, Ann Smeltzer Trust Farm, Gary and Dave Nelson site hosts, Otho, IA.	Not available	52
Sawyer	2	Presentation (Extension/ Outreach)	Complete	Sawyer, J.E.	2011	Nitrogen rate management with rye cover crop, nitrogen rate recommendations, and using active canopy sensors in corn production.	Iowa Learning Farm Water Quality Field Day, Gilmore City, IA.	Not available	45
Sawyer	2	Presentation (Extension/ Outreach)	Complete	Sawyer, J.E.	2011	Nitrogen management with cover crops.	Iowa Learning Farm, Practical Farmers of Iowa, Cover Crop Working Group field day, Competine Creek Watershed and Pekin High School FFA Field Day, Ruthven, IA.	Not available	35
Sawyer	2	Presentation (Extension/ Outreach)	Complete	Sawyer, J.E.	2011	Nitrogen fertilization in a rye cover cropping system.	Iowa State University Crops Team Professional Development program, Ames, IA.	Not available	15
Sawyer	2	Presentation (Extension/ Outreach)	Complete	Sawyer, J.E.	2011	Nitrogen management with cover crops.	Iowa Learning Farm, Practical Farmers of Iowa, Cover Crop Working Group field day, Gustafson Farms, Boone, IA.	Not available	60
Sawyer	2	Presentation (Extension/ Outreach)	Complete	Sawyer, J.E.	2012	Nitrogen use in corn production	Iowa State Univ. Extension Crop Advantage Series, Moravia.	Not available	75
Sawyer	2	Presentation (Extension/ Outreach)	Complete	Sawyer, J.E.	2012	Nitrogen use in corn production	Iowa State Univ. Extension Crop Advantage Series, Burlington.	Not available	120
Sawyer	2	Presentation (Extension/ Outreach)	Complete	Sawyer, J.E.	2012	Nitrogen use in corn production	Iowa State Univ. Extension Crop Advantage Series, Iowa City.	Not available	105
Sawyer	2	Presentation (Extension/ Outreach)	Complete	Jose L. Pantoja*, John E. Sawyer and Daniel W. Barker	2012	Winter Rye Cover Crop Biomass Production, Degradation, and N Re-Cycling.	New Technology Expo: Gulf of Mexico Hypoxia Task Force and National Association of State Departments of Agriculture, Sept 12, 2012. ISU Biocentury Farm.	Not available	120
Sawyer	2	Video	Complete	John Sawyer	2012	Soil Nitrogen Cycle	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A

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Sawyer	2	External Groups	Complete	John Sawyer	2012	Research Site used for Cover Crop Working Group	The Iowa Learning Farm/Practical Farmers of Iowa Cover Crop Working Group utilized cover crop study sites to show the early spring growth of winter rye following corn and soybean and explain management of a rye cover crop as a component of their Cover Crop Management Workshops.	Not available	N/A
Sawyer	2	External Groups	Complete	John Sawyer	2012	Yield data of corn with rye cover crop was used for the Iowa Nutrient Reduction Strategy. Data provided through 2010 from previously established CSCAP research site.	Iowa Nutrient Reduction Strategy Paper	Not available	N/A
Scharf	2	Refereed Journal	Complete	Scharf, P.C., D.K. Shannon, H.L. Palm, K.A. Sudduth, S.T. Drummond, N.R. Kitchen, L.J. Mueller, V.C. Hubbard, and L.F. Oliveira	2011	Sensor-based nitrogen applications out-performed producer-chosen rates for corn in on-farm demonstrations.	Agron. J.	doi: 10.2134/agronj2011.0164	N/A
Scharf	2	White Paper/ Fact Sheet	Complete	Peter Scharf	2012	Nitrogen Sensing and Impact on C, N, and H2O	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/zoo/publications/Scharf-	N/A
Scharf	2	Video	Complete	Peter Scharf	2012	Canopy Sensors and Nitrogen: Contributions to Adaptation and Mitigation	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Scharf	2	Press/News Releases	Complete	Peter Scharf	2012	Experts gather at MU to talk climate change	Columbia Daily Tribune, Columbia, Missouri.	http://www.columbiatribune.com/news/2012/jun/0	N/A
Strock	2	Presentation (Conference)	Complete	Strock, J.	2011	Experimental field site presentation to soil scientists and engineers from the University of Saskatchewan and Agriculture and Agri-Food Canada.		Not available	Unknown
Strock/ Pagliari	2	Proposal	Complete	Strock, Abendroth, Pagliari, Wright Morton, Oh	2012	Crop rotation, diversification, water balance, and soil organic carbon in organic production systems (2012)		Not available	N/A
Lauer/ Nafziger	2	Presentation (Conference)	Complete	Lauer, Joe* and Emerson Nafziger	2011	Extended rotations for Midwest U.S. cropping systems.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-	100
Gassmann/ Gardner	IPM	Presentation (Conference)	Complete	Mike Dunbar and Chelsea Smith	2012	Integrated Pest Management	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	Not available	60
Gassmann/ Gardner	IPM	Video	Complete	Mike Dunbar and Chelsea Smith	2012	Integrated Pest Management	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012. Field Demonstration.	http://sustainablecorn.org/resources.html	N/A
Gassmann	IPM	Video	Complete	Mike Dunbar	2012	Effects of Rye Cover Crop on Arthropod Communities	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Mueller	IPM	White Paper/ Fact Sheet	Complete	Daren Mueller and Nate Bestor	2012	Integrated Pest Management, Filling in the Cracks	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/zoo/publications/Mueller	N/A
Mueller	IPM	Presentation (Extension/ Outreach)	Complete	Daren Mueller	2011	ISU Integrated Pest Management Program: Where Research and Education Meet.	Iowa State University Plant Pathology Departmental Seminar, Ames, IA, Jan. 10, 2011.	Not available	Unknown
Mueller	IPM	Video	Complete	Daren Mueller	2012	Integrated Pest Management, Filling in the Cracks	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A

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Mueller	IPM	Proposal	Complete	Daren Mueller	2011	Combining Integrated Pest Management with Climate Change, Mitigation, and Adaptation in Soybean (2011)	Proposal submitted to the United Soybean Board.	Not available	N/A
Project	IPM	Promotional/ Project Report	Complete	Daren Mueller, Lois Wright Morton, and Lori Abendroth	2012	Integrated Pest Management Effort of CSCAP	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	Not available	N/A
Gassmann/ Mueller/ O'Neal	IPM	Presentation (Conference)	Complete	Dunbar, M. W., A. J. Gassmann, D. S. Mueller, and M. E. O'Neal	2011	Effect of cover crop and extended rotation on pest communities.	59th Annual Meeting of the Entomological Society of America. Reno, NV. General Session.	Not available	Unknown
Gassmann/ O'Neal	IPM	Presentation (Conference)	Complete	Dunbar, M.W., A.J. Gassmann, and M.E. O'Neal	2012	Effects of cover crop and extended rotation on insect taxa and plant disease pressure.	67th Annual Meeting Entomological Society of America - North Central Branch, Lincoln, NE	Not available	Unknown
Gassmann/ O'Neal	IPM	Presentation (Conference)	Complete	Dunbar, Mike*, Aaron Gassmann and Matt O'Neal.	2011	Effects of cover crop and extended rotation on insect communities.	CSCAP Annual Conference, Chicago, IL. Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-	100
Gassmann/ O'Neal	IPM	White Paper/ Fact Sheet	Complete	Mike Dunbar, Aaron Gassmann, and Matt O'Neal	2012	Effects of Rye Cover Crop on Arthropod Communities	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/200c/publications/Dunbar	N/A
Miller/ Gassmann/ O'Neal	IPM, 6	Education Camp/ Workshop	Complete	Mike Dunbar, Matt O'Neal, Matt Shultz	2012	Entomology Demonstrations	Iowa State University, Ames, IA. June 13, 2012.	Not available	18
Miller/ Mueller	IPM, 6	Education Camp/ Workshop	Complete	Daren Mueller, Nate Bestor, Matt Shultz	2012	Field Diseases and Pests	Iowa State University, Ames, IA. June 12, 2012.	Not available	18
Castellano/ Anex	2, 3	External Groups	Complete	Michael Castellano and Rob Anex	2012	Multiple collaborations with Dr. Timothy Parkin of ARS NLAE, Ames, IA			N/A
Miller/ Castellano	2, 6	Education Camp/Workshop	Complete	David Mitchell, Matt Shultz	2012	Greenhouse Gas Measurements	Iowa State University, Ames, IA. June 13, 2012.	Not available	18
Miller/ Sawyer/ Helmers/ Cruse	2, 6	Education Camp/Workshop	Complete	Jose Pantoja, Scott Lee, Ryan Goeken, Matt Shultz	2012	Agronomy Demonstrations	Iowa State University, Ames, IA. June 11, 2012.	Not available	18
Anex	3	Presentation (Conference)	Complete	Anex, Robert	2011	Systems Evaluation Data and Tools.	NIFA Sustainable Bioenergy Project Directors Meeting. Arlington, Virginia, October 24-26, 2011.	Not available	120
Anex	3	Presentation (Conference)	Complete	Anex, Robert	2011	Team Progress Report.	CSCAP Annual Conference, Chicago, IL. Nov. 8-10, 2011.	Not available	100
Anex	3	Presentation (Conference)	Complete	Lei Gu*, Robert Anex, Rashid Rafique and Shashi Dhungel	2012	Preliminary life cycle comparison of corn grown with and without cover crop.	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Anex	3	Presentation (Conference)	Complete	Ao Li* and Robert Anex	2012	Preliminary life cycle comparison of corn production with and without tillage.	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Anex	3	Presentation (Conference)	Complete	Rashid Rafique*, Robert Anex, Sasha Kravchenko	2011	Power analysis of soil measurements: soil carbon and greenhouse gases.	CSCAP Annual Conference, Chicago, IL. Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Anex	3	Presentation (Conference)	Complete	Rashid Rafique* and Robert Anex	2012	Nitrous Oxide emissions from cropland: A procedure for calibration of the biogeochemical model DayCent using an inverse modeling technique.	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110

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Anex	3	External Groups	Complete	Rashid Rafique and Rob Anex	2012	Collaborations with Dr. Michael Fienen of the USGS in using the PEST Model-Independent Parameter Estimation and Uncertainty Analysis program to calibrate the DayCent soil carbon model.			N/A
Anex	3	External Groups	Complete	Rashid Rafique and Rob Anex	2012	Collaborations with DayCent developers at Colorado State University in an effort to improve model performance for our management systems.			N/A
Anex	3	External Groups	Complete	Rob Anex	2012	Collaborations with and receipt of a partial data set from Dr. Shannon Osborne, USDA/ARS, Brookings, SD			N/A
Arritt	3	White Paper/ Fact Sheet	Complete	Ray Arritt	2012	Integrating Climate Projects One-Pager	CSCAP Semi-Annual Advisory Board Meeting. Ankeny, IA. March 9, 2012.	Not available	N/A
Arritt	3	White Paper/ Fact Sheet	Complete	Ray Arritt	2012	Climate and Climate Change	CSCAP Annual Conference. Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/doc/publications/Arritt-0720-2012.pdf	N/A
Arritt	3	Video	Complete	Ray Arritt	2012	Climate and Climate Change	CSCAP Annual Conference. Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Basso	3	Refereed Journal	Submitted for Review	Colecchia, S. Basso B., Cammarano, D., Gallo, A. Mastrangelo A.A., Pontieri P.b.c, Del Giudice L., Pignone D, De Vita, P.	2012	On the relationship between N management and grain protein content in six durum wheat cultivars in Mediterranean environment.	Journal of Plant Interactions	http://dx.doi.org/10.1080/17429745.2012.710656	N/A
Basso	3	Refereed Journal	Complete	Basso B., L. Sartori, M. Bertocco, D. Cammarano, E.C. Martin and P.R. Grace	2011	Economic and environmental evaluation of site-specific tillage in a maize crop in NE Italy.	European Journal of Agronomy	DOI: 10.1016/j.eja.2011.04.002	N/A
Basso	3	Refereed Journal	Complete	Grace P.R., Robertson G.P., Millar N., Colunga-Garcia M., Basso B., Gage S.	2011	The Contribution of Maize Cropping in the Midwest USA to Global Warming: A Regional Estimate.	Agr. Systems	http://dx.doi.org/10.1016/j.agsy.2010.09.001	N/A
Basso	3	Refereed Journal	Complete	Basso, B., Sartori, L., Cammarano D., Grace P., Sorensen C., Fountas S.	2012	Environmental and economic evaluation of N fertilizer rates in a maize crop in Italy: a spatial and temporal analysis using crop models	Biosystems Engineering	http://dx.doi.org/10.1016/j.biosystemseng.2012.06.012	N/A
Basso	3	Refereed Journal	Complete	Basso B. and J.T. Ritchie	2012	Assessing the impact of management strategies on water use efficiency using soil-plant-atmosphere models	Vadose Zone	doi:10.2136/vzj2011.0173	N/A
Basso	3	Refereed Journal	Complete	Diacono, M., Castrignano, M., Troccoli, A. De Benedetto, D., Basso, B., Rubino, P.	2012	Spatial and temporal variability of wheat grain yield and quality in a Mediterranean environment: A multivariate geostatistical approach.	Field Crops Research	http://dx.doi.org/10.1016/j.fcr.2012.03.004	N/A
Basso	3	Refereed Journal	Complete	Basso, B., Fiorentino, C., Cammarano D., Caferro, G., Dardanelli, J.	2012	Analysis of rainfall distribution on spatial and temporal patterns of wheat yield in Mediterranean environment.	Europ. J. Agronomy	http://dx.doi.org/10.1016/j.eja.2012.03.007	N/A
Basso	3	Refereed Journal	Complete	Basso, B., De Simone, L., Cammarano, D., Martin, E.C., Margiotta, S., Grace, P.R., Yeh, M.L., Chou, T.Y.	2012	Evaluating Responses to Land Degradation Mitigation Measures in Southern Italy.	International Journal of Environmental Research	http://168.144.92.92/journals/ijer/?action=articleinfo&article=504	N/A
Basso	3	Refereed Journal	Complete	Syswerda, S.; Basso, B.; Hamilton, S.K.; Tausig, J.B.; Robertson G.P.	2012	Long-term Nitrate Loss along an Agricultural Intensity Gradient in the Upper Midwest USA.	Agriculture, Ecosystems and Environment	http://dx.doi.org/10.1016/j.agee.2011.12.007	N/A

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Basso	3	Refereed Journal	Complete	Basso, B.; Ritchie, J.T.; Jones, J.W.	2012	On modeling approaches for effective assessment of hydrology of bioenergy crops: comments on Le et al., (2011) Proc Natl Acad Sci USA 108:15085-15090	European Journal of Agronomy	http://dx.doi.org/10.1016/j.eja.2011.11.009	N/A
Basso	3	Refereed Journal	Complete	Giola, P.; Basso, B.; Pruneddu, G.; Giunta F.; Jones, J.W.	2012	Impact of manure and slurry applications on soil nitrate in a maize-triticale rotation: field study and long term simulation analysis.	European Journal of Agronomy	http://dx.doi.org/10.1016/j.eja.2011.12.001	N/A
Basso	3	Refereed Journal	Complete	Grace, P., Antle J., Aggarwal P., Ogle, S., Paustian, K., Basso, B.	2012	Soil carbon sequestration and associated economic costs for farming systems of the Indo-Gangetic Plain: a meta-analysis.	Agriculture Ecosystem and Environment	http://dx.doi.org/10.1016/j.agee.2011.10.019	N/A
Basso	3	Refereed Journal	Complete	Grace P.R., Basso B.	2012	Offsetting greenhouse gas emissions through biological carbon sequestration in North Eastern Australia.	Agricultural Systems	http://dx.doi.org/10.1016/j.agsy.2011.08.006	N/A
Basso	3	Refereed Journal	Complete	Finley, A., Banerjee S., Basso B.	2011	Improving Crop Model Inference Through Bayesian Melding with Spatially-Varying Parameters.	Journal of Agricultural, Biological and Environmental Statistic	DOI: 10.1007/s13253-011-0070-x	N/A
Basso	3	Refereed Journal	Complete	Cammarano D., Fitzgerald, G., Basso, B., O'leary, G., Grace, P.R., Fiorentino C.	2011	Use of the Canopy Chlorophyll Content Index (CCI) For Remote Estimation Of Wheat Nitrogen Content In Rainfed Environments.	Agronomy Journal	doi: 10.2134/agronj2011.0124	N/A
Basso	3	Refereed Journal	Complete	Basso B., Ritchie, J.T., Cammarano, D., Sattori L.	2011	A strategic and tactical management approach to select optimal N fertilizer rates for wheat in a spatially variable field.	Eur. J. Agron.	http://dx.doi.org/10.1016/j.eja.2011.06.004	N/A
Basso	3	Refereed Journal	Complete	Basso, B. Gargiulo, O., Paustian, K., Porter C.H., Robertson, G.P., Grace P.R., Jones J.W.	2011	Procedures for initializing soil organic carbon pools in DSSAT-Century model for agricultural systems.	Soil Sci. Soc. Amer. J.	doi:10.2136/sssaj2010.0115	N/A
Basso	3	Presentation (Conference)	Complete	Basso, B.	2011	Crop management assessment and spatial variability impact on yield and environment.	ASA 2011. Special Symposium Honoring James W. Jones, ASA-SSSA-CSSA meeting in San Antonio, Texas, October, 2011	http://scisoc.confex.com/scisoc/2011am/webprogr/am/Paper67584.html	Unknown
Basso/ Kravchenko	3	Presentation (Conference)	Complete	Munoz, J.D., Basso B., J. Winkler, J. Andresen, A. Kravchenko.	2011	Climate change impact of crop yield in a rotational system in Michigan.	ASA-CCSA-SSSA Annual Meeting, San Antonio, TX	http://scisoc.confex.com/scisoc/2011am/webprogr/am/Paper66088.html	Unknown
Bowling	3	Presentation (Conference)	Complete	Laura Bowling*, Sarah Rutkowski, Keith Cherkauer and Eileen Kladvko	2012	Subsurface drainage: how does it affect simulated soil moisture status?	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Gassman	3	Presentation (Conference)	Complete	Philip W. Gassman*, Adriana M. Valcu, Yiannis Panagopoulos, Catherine L. Kling, Todd Campbell, Mark Siemers, Carlos Tornquist, Raghavan Srinivasan, Mike White, and Jeff Arnold	2012	An Integrated Modeling System for Assessing the Impacts of Climate Change and Alternative Management Systems in Corn-Based Cropping Systems in the U.S. Cornbelt Region.	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Gassman	3	Presentation (Extension/ Outreach)	Complete	Philip W. Gassman*, Adriana M. Valcu, Yiannis Panagopoulos, Catherine L. Kling, Todd Campbell, Mark Siemers, Carlos Tornquist, Raghavan Srinivasan, Mike White, and Jeff Arnold.	2012	An Integrated Modeling System for Assessing the Impacts of Climate Change and Alternative Management Systems in Corn-Based Cropping Systems in the U.S. Cornbelt Region.	New Technology Expo: Gulf of Mexico Hypoxia Task Force and National Association of State Departments of Agriculture. Sept 12, 2012. ISU Biocentury Farm.	Not available	120

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Herzmann	3	Presentation (Conference)	Complete	Herzmann, Daryl	2011	Data Management.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	Not available	100
Herzmann	3	Presentation (Conference)	Complete	Daryl Herzmann and Lori Abendroth	2012	Project Collaboration and Data Management (whole team version)	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	Not available	110
Herzmann	3	Presentation (Conference)	Complete	Daryl Herzmann and Lori Abendroth	2012	Project Collaboration and Data Management (advisory board version)	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	Not available	30
Kling	3	Refereed Journal	Submitted for Review	Jimena Gonzalez-Ramirez, Catherine L. Kling and Adriana Valcu.	2012	An Overview of Carbon Offsets from Agriculture	Annual Review of Resource Economics	DOI: 10.1146/annurev-resource-083110-120016	N/A
Kling	3	White Paper/ Fact Sheet	Complete	Catherine Kling, Philip Gassman, Todd Campbell, Manoj Jha, Keith Schilling and Calvin Wolter.	2011	The Potential for Agricultural Land Use Changes in the Raccoon River Basin to Reduce Flood Risk: A Policy Brief		Not available	N/A
Miguez	3	Refereed Journal	Complete	SUJITHKUMAR SURENDRAN NAI R, SHUJIANG KANG, XUESONG ZHANG, FERNANDO E. MIGUEZ, R. CESAR IZAURRALDE, WILFRED M. POST, MICHAEL C. DIETZE, LEE R. LYND and STAND. WULLSCHLEGER	2012	Bioenergy crop models: descriptions, data requirements, and future challenges.	Global Change Biology Bioenergy	doi: 10.1111/j.1757-1707.2012.01166.x	N/A
Miguez	3	Presentation (Conference)	Complete	Basche, Andrea* and Fernando Miguez	2011	Protocol development for greenhouse gas analysis in corn systems with cover crops using the current literature.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Miguez	3	Presentation (Conference)	Complete	Andrea D. Basche* and Fernando E. Miguez	2012	Do cover crops increase or decrease nitrous oxide emissions? A meta-analysis.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Miguez	3	Proposal	Complete	Andrea Basche and Fernando Miguez	2012	Quantifying long term cover crop impacts on soil quality using a cropping systems model, Leopold Center Grant		Not available	N/A
Owens	3	Presentation (Conference)	Complete	Goodman, Jenette*, Phillip Owens, and Eileen Kladviko	2011	Methods for developing soil functional property maps for scaling to regional estimates	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Owens	3	Presentation (Conference)	Complete	Goodman, J.M., P.R. Owens, and Z. Libohova.	2012	Predicting Soil Organic Carbon using mixed conceptual and geostatistical models in glaciated landscapes.	Digital Soil Assessments and Beyond: Proceedings of the 5th Global Workshop on Digital Soil Mapping, Sydney, Australia.	Not available	Unknown
Owens	3	Presentation (Conference)	Complete	Goodman, J.M., and P.R. Owens.	2012	Soil Mapping: Historic and Digital Perspectives.	Presented at the 128th Annual Indiana Academy of Science Meeting, held March 9, 2012 at Purdue University.	Not available	Unknown
Owens	3	Presentation (Conference)	Complete	Jenette Goodman* and Phillip Owens	2012	Field scale mapping for soil classification and property prediction.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Owens	3	Presentation (Conference)	Complete	Schulze, D.G., P.R. Owens, C.G. Miller, R.J. Giotzbaach, L.A. Kocur, R. Neely, M. Wiggington, and R. Neilson.	2011	Visualizing Indiana Soil Landscapes	Indiana Academy of Science, Indianapolis, IN, March 4-5, 2011.	http://www.indianaacademyofscience.org/Events-Meetings/Annual-IAS-Meetings-Archive.aspx	Unknown
Owens	3	White Paper/ Fact Sheet	Complete	Jenette Goodman and Phil Owens	2012	Understanding the Dynamics of Soil Diversity and Variability in the Field	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/doc/publications/Goodman-0115-2012.pdf	N/A

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Owens	3	Video	Complete	Jenette Goodman	2012	Understanding the Dynamics of Soil Diversity and Variability in the Field	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Anex/ Bowling/ Lal/ Miguez/ Gassman	3	Presentation (Conference)	Complete	Objective 3 Team. Presented by Rob Anex, Laura Bowling, Sandeep Kumar, Andrea Basche, and Phil Gassman	2012	Data Synthesis and Modeling	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	Not available	110
Miguez	3, 6	Proposal	Complete	Andrea Basche	2012	A climate needs assessment of Central Iowa cropping systems, SARE Grant Proposal		Not available	N/A
Miller/ Gassman	3, 6	Education Camp/Workshop	Complete	Phil Gassman, Cathy Kling, Matt Shultz	2012	Water Quality and Environmental Modeling	Iowa State University, Ames, IA, June 12, 2012.	Not available	18
Miller/ Miguez	3, 6	Education Camp/Workshop	Complete	Andrea Basche, Matt Shultz	2012	Introduction to the Greenhouse Effect and Global Climate Change.	Iowa State University, Ames, IA, June 10, 2012.	Not available	18
Miller/ Miguez	3, 6	Education Camp/Workshop	Complete	Andrea Basche, Matt Shultz	2012	Computer Modeling and Model Outputs	Iowa State University, Ames, IA, June 12, 2012.	Not available	18
Arbuckle	4	Presentation (Conference)	Complete	Arbuckle, J. Gordon*, Tricia Knoot, John C. Tyndall	2011	Corn belt farmers and climate change: Evaluating the socioeconomic acceptability of adaptive and mitigative cropping systems.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011. (Poster)	http://sustainablecorn.org/meetings/2011-posters.html	100
Arbuckle	4	Presentation (Conference)	Complete	Arbuckle, J. Gordon Jr.	2011	Corn Belt Farmers & Climate Change: Evaluating the Socioeconomic Acceptability of Adaptation & Mitigation in Cropping Systems.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011. (Presentation)	Not available	100
Arbuckle	4	Presentation (Conference)	Complete	Arbuckle, J. Gordon Jr.	2011	Farmer Perspectives on Climate Change and Agriculture.	Agricultural Decision Making with a Water and Climate Change Perspective Conference, Nebraska City, NE, November 1, 2011.	http://www.heartlandwq.iastate.edu/NR/onlyres/F6E4ABDB-6A8E-4775-97BE-99E20FB3CAC0/159533/Arbuckle.pdf	114
Arbuckle	4	Presentation (Conference)	Complete	J., G. Arbuckle Jr.* and John Tyndall	2012	Climate Change Beliefs, Perceived Risk, and Support for Adaptation and Mitigation among Corn Belt Farmers.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Arbuckle	4	Survey	Complete	J. Gordon Arbuckle, Jr. and Linda Prokopy	2012	Agriculture and Weather Variability in the Corn Belt	Sent February 2012	Not available	N/A
Arbuckle	4	White Paper/ Fact Sheet	Complete	J. Arbuckle	2012	Climate Change Beliefs, Concerns and Support for Adaptation and Mitigation among Corn Belt Farmers		http://sustainablecorn.org/7a6c/publications/Arbuckle-0-0117-2012.pdf	N/A
Arbuckle	4	Extension Publication	Complete	Arbuckle, J. Gordon Jr., Paul Lasley, and John Ferrell	2011	Iowa Farm and Rural Life Poll: 2011 Summary Report.	Extension Report PM3016, Ames, IA: Iowa State University Extension	http://www.soc.iastate.edu/wextension/itftp/PDF/PM3016.pdf	N/A
Arbuckle	4	Extension Publication	Complete	Arbuckle, J. Gordon Jr., Daren S. Mueller, and Adam Sisson	2011	Climate Change in the Classroom: A Survey of Iowa Agricultural Educators.	Iowa State University Extension Sociology, Ames, IA	http://sustainablecorn.org/7a6c/publications/CSCAP-0001-2011-IA.pdf	N/A
Arbuckle	4	Presentation (Extension/ Outreach)	Complete	Arbuckle, J. G., Jr.	2012	Farmer Perspectives on Climate Change and Agriculture	Adobe Connect to CSCAP Extension Educators	Not available	20
Arbuckle	4	Presentation (Extension/ Outreach)	Complete	Arbuckle, J. Gordon Jr.	2012	Farmer Perspectives on Climate Change and Agriculture.	Department of Agronomy Seminar, Iowa State University, Ames, IA, January 19, 2012.	http://www.agron.iastate.edu/news/podcasts/mediar/20120119arbuckleunx.mp4	40

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Arbuckle	4	Presentation (Extension/ Outreach)	Complete	J. G. Arbuckle, Jr., John Tyndall, and Lois Wright Morton	2012	Climate Change Beliefs, Perceived Risk, and Support for Adaptation and Mitigation among Corn Belt Farmers	New Technology Expo: Gulf of Mexico Hypoxia Task Force and National Association of State Departments of Agriculture, Sept 12, 2012. ISU BioCentury Farm.	Not available	120
Arbuckle	4	Video	Complete	J. Arbuckle	2011	Climate Change: Survey Results Show Attitudes and Opinions	Heartland Regional Water Quality Conference.	http://www.youtube.com/watch?v=NIzs7p9RVdE	N/A
Arbuckle	4	Video	Complete	J. Arbuckle	2012	Climate Change Beliefs, Concerns and Support for Adaptation and Mitigation among Corn Belt Farmers	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Arbuckle	4	Proposal	Complete	Arbuckle	2012	Resilience Under Climate Variability: Assessing Grain Producer Needs in Iowa Watersheds. Proposal to USDA Natural Resources Conservation Service.		Not available	N/A
Arbuckle	4	Press/News Releases	Complete	Press	2012	Iowa farmers already adapting to climate change	Wallaces Farmer	http://farmprogress.com/story-iowa-farmers-already-adapting-climate-change-0-60562	N/A
Arbuckle	4	Press/News Releases	Complete	Press	2012	Les fermiers américains toujours climatoscéptiques	Planete	http://www.lemonde.fr/planete/article/2012/08/17/les-fermiers-americains-toujours-climatoscéptiques_1747028_3244.html	N/A
Arbuckle	4	Press/News Releases	Complete	Press	2011	In Iowa, some farmers see changing climate	HARVEST	http://harvestpublicmedia.org/blog/854/iowa-some-farmers-see-changing-climate/5	N/A
Arbuckle	4	Press/News Releases	Complete	Press	2012	The farm bill is a climate bill	Huffington Post	http://www.huffingtonpost.com/donald-carr/the-farm-bill-is-a-climat_b_1197552.html	N/A
Arbuckle	4	Press/News Releases	Complete	Arbuckle, J. Gordon, Jr	2011	Iowa Farm and Rural Life Poll 2011 Results	Interview with Wallaces Farmer. Dec. 28, 2011.	http://farmprogress.com/wallaces-farmer-story-	N/A
Arbuckle	4	Press/News Releases	Complete	Arbuckle, J. Gordon, Jr	2011	Two-thirds in Iowa Farm Poll say climate change is occurring	Interview with Brownfield Ag News. Dec. 19, 2011.	http://brownfieldagnews.com/2011/12/19/iowa-	N/A
Arbuckle/ Wright Morton	4	Presentation (Conference)	Complete	McGuire, Jean*, J Gordon Arbuckle and Lois Wright Morton	2012	Who is a Good Farmer?	Rural Sociological Society Annual Meeting, Chicago, Illinois, July 26-29, 2012.	Not available	Unknown
Tyndall	4	White Paper/ Fact Sheet	Complete	John Tyndall, J. Arbuckle, and Gabrielle Roesch	2012	Qualitative Farmer Assessment of Adaptive Management	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/doc/publications/Tyndall-	N/A
Tyndall	4	Video	Complete	John Tyndall	2012	Qualitative Farmer Assessment of Adaptive Management	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Wright Morton	4	Refereed Journal	Complete	McGuire, J. *, L.W. Morton A. Cast	2012	Reconstructing the Good Farmer Identity: Changing Attitudes and Behaviors through Environmental Performance-based Management.	Agriculture & Human Values	DOI: 10.1007/s10460-012-9381-y	N/A
Wright Morton	4	Refereed Journal	Complete	Hu, Zhihua* and L.W. Morton	2011	US Midwestern Residents Perceptions of Water Quality.	Water	doi:10.3390/w3010217	N/A
Wright Morton	4	Refereed Journal	Complete	Hu, Zhihua*, L.W. Morton, and R. Mahler	2011	Bottled Water: Consumers in the U.S. and their Perceptions of Water Quality.	International Journal of Environmental Research and Public Health	doi:10.3390/ijerph8020565	N/A

PI	Obj.	Type of Output/Product	Status	Final Author List	Year	Final Title	Journal or Source	Online Source	Attendance
Wright Morton	4	Refereed Journal	Complete	Olson, K.R. and L.W. Morton	2012	The impacts of induced levee breaches on agricultural lands of the Ohio and Mississippi River Valleys.	Journal of Soil and Water Conservation.	doi:10.2489/jswc.67.1.5A	N/A
Wright Morton	4	Refereed Journal	Complete	Olson, K.R., M. Reed, L.W. Morton	2011	Multifunctional Mississippi River leveed bottomlands and settling basins: Sny Island Levee Drainage District.	Journal of Soil and Water Conservation.	doi: 10.2489/jswc.66.4.104A	N/A
Wright Morton	4	Refereed Journal	Complete	Olson, K.R. and L.W. Morton	2012	The Effects of 2011 Ohio and Mississippi River Valley Flooding on Cairo, Illinois	Journal of Soil and Water Conservation.	doi: 10.2489/jswc.67.2.42A	N/A
Wright Morton	4	Presentation (Conference)	Complete	Olson, K.R. and L.W. Morton	2012	The Effects of 2011 Ohio and Mississippi River Valley Flooding on Cairo, Illinois	Soil & Water Conservation Society Annual Meeting, Ft Worth, TX. July 24, 2012.	Not available	Unknown
Wright Morton	4	Presentation (Conference)	Complete	Olson, K.R. and L.W. Morton	2012	The Impact of 2011 Induced Levee Breaches on Agricultural Lands of Mississippi River Valley	Soil & Water Conservation Society Annual Meeting, Ft Worth, TX. July 24, 2012.	Not available	Unknown
Wright Morton	4	Presentation (Conference)	Complete	Adam Wilke	2012	Diffusing Scientific Climate Information for Agriculture Management	2012 American Association of State Climatologists Annual Meeting, Miramar Beach, Florida, July 11, 2012.	Not available	Unknown
Wright Morton	4	Presentation (Conference)	Complete	Wilke, Adam* and Lois Wright Morton	2012	Climatologists and Farmers: Diffusing scientific climate information into agricultural management support tools	Rural Sociological Society Annual Meeting, Chicago, Illinois, July 26-29, 2012.	Not available	Unknown
Wright Morton	4	Presentation (Conference)	Complete	Carter, Angie*, Rebecca Christoffel and Lois Wright Morton	2012	Navigating the Waters: Engaging Women Land Owners and Agency Partners in Water Conservation	Rural Sociological Society Annual Meeting, Chicago, Illinois, July 26-29, 2012.	Not available	Unknown
Wright Morton	4	Presentation (Conference)	Complete	McGuire, Jean* and Tonya Haigh	2012	Climate Change Concerns, Beliefs and Information Needs of Agricultural Advisors in the Midwestern United States	Rural Sociological Society Annual Meeting, Chicago, Illinois, July 26-29, 2012.	Not available	Unknown
Wright Morton	4	Presentation (Conference)	Complete	Lois Wright Morton	2012	The Heartland Region: Iowa, Nebraska, Kansas, Missouri.	National USDA Water Conference. May 2012.	Not available	Unknown
Wright Morton	4	Presentation (Conference)	Complete	Adam K. Wilke*, Lois Wright Morton and Jamie Benning	2012	Diffusing scientific climate information for use in agriculture management.	CSCAP Annual Conference. Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Wright Morton	4	Presentation (Conference)	Complete	Lois Wright Morton	2011	Problem Solving Together.	Iowa Water Conference. March 8, 2011.	Not available	Unknown
Wright Morton	4	Presentation (Conference)	Complete	Lois Wright Morton	2011	Agricultural Producers' Management Decisions Under Perceptions of Uncertainty and Risk.	Climate, Water and Ecosystems – Shaping the Great Plains. Oct. 13, 2011. Lincoln, NE.	Not available	Unknown
Wright Morton	4	Presentation (Conference)	Complete	Lois Wright Morton	2011	Sustainability and Resilience Concepts Applied to Cultivated Ecosystems.	2011 BIGMAP Symposium: Co-existence, Choice and Sustainability for Crop Production. April 19, 2011.	Not available	Unknown
Wright Morton	4	Presentation (Conference)	Complete	Lois Wright Morton	2012	What does social science tell us about farmer perceptions of climate change, adaptation and mitigation?	Climate Session at the National USDA Water Conference, Portland, Oregon. May 23, 2012.	Not available	Unknown
Wright Morton	4	White Paper/ Fact Sheet	Complete	Jon Hobbs, J. Arbuckle, and Lois Wright Morton	2012	Exploring Relationships Among Farmer Perceptions on Climate Change	CSCAP Annual Conference. Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/766c/publications/Hobbs-0112-2012.pdf	N/A

PI	Obj.	Type of Output/Product	Status	Final Author List	Year	Final Title	Journal or Source	Online Source	Attendance
Wright Morton	4	Presentation (Extension/ Outreach)	Complete	Adam Wilke, Lois Wright Morton, and Jamie Benning.	2012	Diffusing scientific climate information for use in agriculture management.	New Technology Expo: Gulf of Mexico Hypoxia Task Force and National Association of State Departments of Agriculture, Sept 12, 2012. ISU Biocentury Farm.	Not available	120
Wright Morton	4	Presentation (Extension/ Outreach)	Complete	Wright Morton	2012	The Catalytic Influence of Local Champions in Watershed Management	New Technology Expo: Gulf of Mexico Hypoxia Task Force and National Association of State Departments of Agriculture, Sept 12, 2012. ISU Biocentury Farm.	Not available	120
Wright Morton	4	Video	Complete	Jon Hobbs	2012	Exploring Relationships Among Farmer Perceptions on Climate Change	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Wright Morton	4	Book	Complete	Comito J., J. Wolseth, L.W. Morton	2011	Water Quality Matters to Us All	Iowa Learning Farms	www.extension.iastate.edu/ijif	N/A
Wright Morton	4	Book Chapter	Complete	Hu, Z* and L.W. Morton	2012	Don't Know Responses in Water Quality Surveys	Water Quality, K Voudouris (ed)	http://www.intechopen.com/books/water-quality-20001-2011-IA.pdf	N/A
Wright Morton/ Arbuckle	4	Presentation (Conference)	Complete	Shin, Benjamin*, Lois Wright Morton and J Gordon Arbuckle	2012	Practices and Water Quality: Developing a Social Model to Understand the Practices of Farmers and their Effects on Nitrogen Output	Rural Sociological Society Annual Meeting, Chicago, Illinois, July 26-29, 2012.	Not available	Unknown
Arbuckle/ Mueller	4, IPM	Extension Publication	Complete	Arbuckle, J. Gordon Jr., Daren S. Mueller, and Adam Sisson.	2011	Climate Change in the Classroom: A Survey of Iowa Agricultural Educators.	Iowa State University Extension Sociology, Ames, IA.	http://sustainablecorn.org/doc/publications/CSCAP-0001-2011-IA.pdf	N/A
Miller/ Arbuckle	4, 6	Education Camp/Workshop	Complete	J. Arbuckle, Matt Shultz	2012	Farmer Perceptions of Climate Change	Iowa State University, Ames, IA, June 13, 2012.	Not available	18
Moore	4, 6	Presentation (Conference)	Complete	Bethany L. Herman*, Richard H. Moore, Rachel Hintz, and J. Arbuckle	2012	What Makes a Good Farmer: The Difference in Beliefs of Amish/Mennonite Farmers in the Sugar Creek Watershed Area and Non-Amish/Non-Mennonite Farmers.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Advisory Board	5	Press/News Releases	Complete	Dick Sloan	2012	Lime Creek producer tries cover crops	Iowa Watershed Groups	http://limecreekwatershed.wordpress.com/news/	N/A
Benning	5	Presentation (Conference)	Complete	Benning, Jamie*, Chad Ingels, John Tyndall, J. Gordon Arbuckle, Richard Moore, and Lois Wright Morton	2011	Extension-facilitated participatory exchanges and action with farmer-led watershed groups.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Benning	5	Video	Complete	Jamie Benning, Tim Recker, Richard Sloan, Jeff Gochnauer, and Brian Rennecker	2012	Iowa and Ohio Farmer Panel	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Benning	5	Proposal	Complete	Jamie Benning and Lois Wright Morton	2012	Building Capacity for Climate Extension	2012 North Central Region SARE Professional Development Program Proposal	Not available	N/A
Benning	5	Proposal	Complete	Chad Kruger, Georgine Yorgey, Tara Zimmerman, Jamie Benning, Chad Ingels, Lori Abendroth, Steve Petrie, and John Stevenson	2012	Climate Change and Grain-Based Cropping Systems Community of Practice	Proposal submitted to eXtension	Not available	N/A

PI	Obj.	Type of Output/Product	Status	Final Author List	Year	Final Title	Journal or Source	Online Source	Attendance
Extension	5	Presentation (Extension/ Outreach)	Complete	Thelen, M.	2012	Overview of Corn CAP	Clinton County Corn Growers Annual Meeting	Not available	Unknown
Ingels	5	Presentation (Extension/ Outreach)	Complete	Ingels	2012	A Successful Model for Citizen-led Watershed Management	New Technology Expo: Gulf of Mexico Hypoxia Task Force and National Association of State Departments of Agriculture, Sept 12, 2012. ISU BioCentury Farm.	Not available	120
Ingels	5	Press/News Releases	Complete	Carol Brown, John Lundvall, Chad Ingels	2012	Iowa Learning Farms Field Day is Aug. 24 near Brandon	Iowa State University Extension	http://www.extension.iastate.edu/article/iowa-ate	N/A
Ingels	5	Press/News Releases	Complete	Chad Ingels, Willy Klein	2012	Extension Watershed Specialist Participates in White House Roundtable	Iowa State University Extension	http://www.extension.iastate.edu/article/extension-watershed-specialist-	N/A
Today	5	Presentation (Conference)	Complete	Dennis Today	2011	Midwestern Climate Trends and Agriculture.	Ag Horizons Meeting, Pierre, SD.	Not available	Unknown
Today	5	Presentation (Conference)	Complete	Dennis Today	2011	Midwestern Climate Trends.	DTN Ag Summit 2011: Rebalancing Risk and Reward. Dec. 8, 2011. Chicago, IL.	Not available	Unknown
Today	5	Presentation (Extension/ Outreach)	Complete	Dennis Today	2012	Central Region Drought Outlook - 3 July 2012	Hosted by NOAA in conjunction with MRCC and HPRCC.	http://mrcc.isws.illinois.edu/webinars.htm	Unknown
Today	5	Presentation (Extension/ Outreach)	Complete	Dennis Today	2012	Central Region Drought Outlook - 16 August 2012	Hosted by NOAA in conjunction with MRCC and HPRCC.	http://mrcc.isws.illinois.edu/webinars.htm	Unknown
Today	5	Proposal	Complete	Dennis Today	2011	Development of Agricultural Decision Calendar	Proposal submitted to the American Meteorological Society, late 2011.	Not available	N/A
Wright Morton	5	Presentation (Conference)	Complete	Wilke, Adam*, Jamie Benning, Chad Ingels, Dayl Herzmann, and Lois Wright Morton	2011	Making climate change visible to farmers.	CSCAP Annual Conference, Chicago, IL. Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	Unknown
Miller/ Benning	5, 6	Education Camp/Workshop	Complete	Jamie Benning, Matt Shultz	2012	CSCAP Extension Component and Risk Assessment Models	Iowa State University, Ames, IA. June 13, 2012.	Not available	18
Extension/ Today	5, 6	Teaching (Formal Education)	Complete	Laura Edwards	2012	Teacher Education, South Dakota		Not available	Unknown
Miller	6	Presentation (Conference)	Complete	Miller, W. Wade and Jessica Peter	2011	Utilization of WebQuests to bridge the gap between research and information dissemination.	CSCAP Annual Conference, Chicago, IL. Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Miller	6	Presentation (Conference)	Complete	Matthew J. Shultz and W. Wade Miller*	2012	2012 Climate Camp at Iowa State University: Design, Approach, and Lessons Learned	CSCAP Annual Conference, Wooster, OH. Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Miller	6	Teaching (Formal Education)	Complete	Wade Miller	2012	Climate and Crops, Graduate Seminar (0 or 1 credit)		Not available	22
Miller	6	Education Camp/Workshop	Complete	Matt Shultz and Wade Miller	2012	Eight day camp at Iowa State University Campus with numerous speakers and activities.	Iowa State University, Ames, IA. June 13, 2012.	Not available	18
Miller	6	Education Camp/Workshop	Complete	Dustin Perry, Matt Shultz	2012	Efficiency Through Technology	Iowa State University, Ames, IA. June 11, 2012.	Not available	18
Miller	6	Education Camp/Workshop	Complete	Gina Nichols, Matt Shultz	2012	Shading Structures/ CO2 Variations	Iowa State University, Ames, IA. June 12, 2012.	Not available	18
Miller	6	Education Camp/Workshop	Complete	Susan Jasper, Matt Shultz	2012	Water Recycling and Reclamation	Iowa State University, Ames, IA. June 12, 2012.	Not available	18

PI	Obj.	Type of Output/Product	Status	Final Author List	Year	Final Title	Journal or Source	Online Source	Attendance
Miller/ Today	6	Education Camp/Workshop	Complete	Dennis Today, Matt Shultz	2012	Climatology Overview	Iowa State University, Ames, IA, June 15, 2012.	Not available	18
Moore	6	Presentation (Conference)	Complete	Moore, Richard H. *, Deana Hudgins, Warren Dick, Liming Chen, Clay Dygert, Rattan Lal, Sandeep Kumar, Atsunobu Kadono, Rachel Hintz, James Bonta, Lloyd Owens, Martin Shipitalo, Norman R. Fausey	2011	CSCAP Activities in Ohio	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Moore	6	Presentation (Conference)	Complete	Moore, Richard and Rattan Lal	2012	Corn and climate change: a transdisciplinary approach to measurement and mitigation for U.S. corn belt cropping systems.	The Ohio State University Environmental Science Graduate Program Seminar Series, Jan. 13, 2012	Not available	Unknown
Moore	6	Presentation (Conference)	Complete	Tashina S. Robinson *, Ethan B. Tope *, Yang Xing and Richard H. Moore	2012	Establishing the relationship of substrate and nutrients to the biology of Primary Headwater Habitat Streams near cornfields by the OARDC.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Moore	6	Presentation (Conference)	Complete	Gretchen Pleuss *, Richard Moore and Rachel Hintz	2012	A Comparative Study: Demographic Differentiation of Opinion Regarding Climate Change in Sugar Creek Watershed Area Farmers.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Moore	6	Presentation (Conference)	Complete	Lindsay M. Doerr *, Caleb Halfhill, Yang Xing and Richard H. Moore	2012	Potential effects of corn production and riparian zone quality on primary headwater habitats in the Upper Sugar Creek Watershed, Ohio.	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	110
Moore	6	Presentation (Conference)	Complete	Richard Moore	2012	Bridging and Exploring New Frontiers of Science	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	Not available	110
Moore	6	White Paper/ Fact Sheet	Complete	Rachel Hintz	2012	Science Teacher Education		http://sustainablecorn.org/doc/publications/Hintz-2012-08-01.pdf	N/A
Moore	6	Video	Complete	Rachel Hintz	2012	Science Teacher Education	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	http://sustainablecorn.org/resources.html	N/A
Moore	6	Proposal	Complete	Moore et al.	2012	CCEP-II Camel hi res highlighting risk to ecosystem services		Not available	N/A
Moore	6	Education Camp/Workshop	Complete	Richard Moore and Rachel Hintz	2012	Series of presentations and activities on climate and sustainability.	The Ohio State University Stone Laboratory, July 29-August 4, 2012.	http://stonelab.osu.edu/courses/upper1077	8
Moore	6	Education Camp/Workshop	Complete	Richard Moore and Rachel Hintz	2012	Series of presentations and activities on climate and sustainability.	The Ohio State University Stone Laboratory, July 29-August 4, 2012.	http://stonelab.osu.edu/courses/educator1077	3
Miller/ Project	Project	Education Camp/Workshop	Complete	Lori Abendroth, Matt Shultz	2012	CSCAP Project Overview	Iowa State University, Ames, IA, June 11, 2012.	Not available	18
Project	Project	Presentation (Conference)	Complete	Lori Abendroth	2012	Climate Change, Mitigation & Adaptation in Corn-based Cropping Systems CAP.	PINEMAP Annual Meeting 2012, Atlanta, Georgia	Not available	85
Project	Project	Presentation (Conference)	Complete	Wright Morton	2012	Climate Change, Mitigation & Adaptation in Corn-based Cropping Systems CAP.	REACH Annual Meeting 2012, Pendleton, OR.	Not available	80
Project	Project	Presentation (Conference)	Complete	Lori Abendroth	2012	Project Management	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	Not available	110

PI	Obj.	Type of Output/Product	Status	Final Author List	Year	Final Title	Journal or Source	Online Source	Attendance
Project	Project	Presentation (Conference)	Complete	Wright Morton, Lois	2011	Climate Change, Mitigation & Adaptation in Corn-based Cropping Systems CAP.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	Not available	100
Project	Project	Presentation (Conference)	Complete	Lois Wright Morton	2012	Strengthening Transdisciplinary Science	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	Not available	110
Project	Project	Presentation (Conference)	Complete	Lois Wright Morton	2012	Science Wall Summary	CSCAP Annual Conference, Wooster, OH, Aug. 7-9, 2012.	Not available	110
Project	Project	Presentation (Conference)	Complete	Wright Morton, Lois, Lori Abendroth, Adam Bartelt*, and Lori Oh	2011	Climate and Corn Systems CAP: Overview and flowchart.	CSCAP Annual Conference, Chicago, IL, Nov. 8-10, 2011.	http://sustainablecorn.org/meetings/2011-posters.html	100
Project	Project	Presentation (Conference)	Complete	Lois Wright Morton	2011	Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems	Agricultural Decision Making with a Water and Climate Change Perspective Conference, Nebraska City, NE, November 1, 2011.	http://www.heartlandwg.iastate.edu/NR/rdonlyres/F6E-4ABDB-6A8E-4775-97BE-99E20FB3CAC0/159558/	114
Project	Project	Presentation (Conference)	Complete	Lois Wright Morton	2012	Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems Coordinated Agricultural Project	Climate Session at the National USDA Water Conference, Portland, Oregon, May 23, 2012.	Not available	Unknown
Project	Project	Presentation (Extension/Outreach)	Complete	Lois Wright Morton and Lori Abendroth. Presented by Lynn Laws.	2012	Climate and Corn-based Cropping Systems CAP: Overview and Flowchart.	New Technology Expo: Gulf of Mexico Hypoxia Task Force and National Association of State Departments of Agriculture, Sept 12, 2012. ISU BioCentury Farm.	Not available	120
Project	Project	Radio	Complete	Lois Wright Morton	2012	Interview discussing the CSCAP	KRVN/Rural Radio network. Interview by Mike LePorte. June 27, 2012	Not available	N/A
Project	Project	Website	On-going	Abendroth, Herzmann	2011+	Internal Website		Not available for external audiences	N/A
Project	Project	Website	On-going	Laws, Bartelt, Herzmann	2011+	Sustainablecorn.org Website		http://sustainablecorn.org/	N/A
Project	Project	Press/News Releases	Complete	Lois Wright Morton, Joe Colletti, and Barbara McBreen	2011	Iowa State Wins \$20 million Grant to Research Impacts of Climate on Corn-based Cropping Systems.	Iowa State University College of Agriculture and Life Sciences	http://sustainablecorn.org/doc/news/2011/2011-02-18_isu-release.pdf	N/A
Project	Project	Press/News Releases	Complete	Project	2011	Farmers Voice Opinions on Climate Change in 2011 Iowa Farm and Rural Life Poll.		http://www.extension.iastate.edu/article/farmers-voice-opinions-2011-	N/A
Project	Project	Press/News Releases	Complete	Project	2011	American farmers rethink their ways in the face of climate change	Deutsche Welle, November 11, 2011	http://www.dw.de/dw/article0,,15510542,00.html	N/A
Project	Project	Press/News Releases	Complete	Cheryl Tevis	2012	Agriculture's Promised Land?	Successful Farming	http://www.agriculture.com/farm-	N/A
Project	Project	Press/News Releases	Complete	Project	2011	Purdue included in \$20 million USDA climate research grant.		http://sustainablecorn.org/doc/news/2011/2011-02-	N/A
Project	Project	Press/News Releases	Complete	Project	2011	Ohio State Shares in \$20M USDA Grant for Sustainability of Corn Production in the Midwest.		http://extension.osu.edu/news-releases/archives/2011/f	N/A
Project	Project	Press/News Releases	Complete	Project	2011	MU scientist joins 5-year project studying climate change, corn production in Midwest.		http://extension.missouri.edu/news/DisplayStory.aspx?N=1052	N/A
Project	Project	Press/News Releases	Complete	Project	2011	SDSU among universities to receive \$20 million USDA research grant to keep Midwestern corn-based cropping systems resilient.		http://sustainablecorn.org/doc/news/2011/2011-02-18_sdstate-release.pdf	N/A

PI	Obj.	Type of Output/Product	Status	Final Author List	Year	Final Title	Journal or Source	Online Source	Attendance
Project	Project	Press/News Releases	Complete	Project	2011	New research funding will show how climate change affects corn-based cropping systems.		http://sustainablecorn.org/doc/news/2011/2011-02-18_minnesotarelease.	N/A
Project	Project	Press/News Releases	Complete	Project	2011	NIFA Announces Grant to Study the Effects of Climate Change on Agricultural and Forest Production.		http://sustainablecorn.org/doc/news/2011/2011-02-18_usda-release.pdf	N/A
Project	Project	Promotional/Project Report	Complete	Project	2012	Project Informational One-Pager		http://sustainablecorn.org/doc/Info_2012.pdf	N/A
Project	Project	Promotional/Project Report	Complete	Project	2012	Project Postcard (Landscape Version)		Not available	N/A
Project	Project	Promotional/Project Report	Complete	Project	2012	Project Postcard (Flowchart Version)		Not available	N/A
Project	Project	Promotional/Project Report	Complete	Project	2012	2011 CSCAP Annual Report to USDA		http://sustainablecorn.org/doc/reports/2011_CSCA	N/A
Project	Project	Promotional/Project Report	Complete	Project	2012	2011 CSCAP Annual Report Executive Summary to USDA		http://sustainablecorn.org/doc/reports/2011_CSCA	N/A
Project	Project	Promotional/Project Report	Complete	Project	2012	Organic Marketing Piece: THE CSCAP TEAM		Not available	N/A
Project	Project	Promotional/Project Report	Complete	Project	2012	Organic Marketing Piece: INVESTMENT		Not available	N/A
Project	Project	Promotional/Project Report	Complete	Project	2012	Organic Marketing Piece: BREAKTHROUGH RESEARCH		Not available	N/A

APPENDIX C. CSCAP Personnel Listing and Training Efforts
Principal Investigators, Technical Staff, Post-Doctoral, Graduate, and Undergraduate Personnel

PI	First Name	Last Name	Position	Organization	email
	Lois	Wright Morton	Professor & Project Director	Iowa State University	lworton@iastate.edu
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CASTELLANO	Javed	Iqbal	Post-Doctoral Researcher & GHG Measurement Coordinator	Iowa State University	
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DICK	Sengupta	Aditi	PhD Graduate Student	The Ohio State University	
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EXTENSION	Angie	Peltier	Extension Educator	University of Illinois	
EXTENSION	Robert	Bellm	Extension Educator	University of Illinois	
EXTENSION	Bryan	Overstreet	Extension Educator	Purdue University	
EXTENSION	Hans	Schmitz	Extension Educator	Purdue University	
EXTENSION	Jon	Neufelder	Extension Educator	Purdue University	
EXTENSION	Marilyn	Thelen	Extension Educator	Michigan State University	
EXTENSION	Shawn	Wohnoutka	Watershed Coordinator	Minnesota	
EXTENSION	Doug	Goodrich	Watershed Coordinator	Minnesota	
EXTENSION	Jan	Voit	Watershed Coordinator	Minnesota	
EXTENSION	Ross	Behrends	Watershed Coordinator	Minnesota	
EXTENSION	Richard	Hoormann	Extension Educator	University of Missouri	
EXTENSION	Charles	Ellis	Extension Educator	University of Missouri	
EXTENSION	Todd	Higgins	Extension Educator, Associate Professor	Lincoln University	
EXTENSION	Richard	Wolkowski	Extension Educator	University of Wisconsin	
EXTENSION/ MOORE	Deana	Hudgins	Extension Educator	The Ohio State University	
EXTENSION/ TODEY	Laura	Edwards	Extension Climate Educator	South Dakota State University	
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FAUSEY	Vickie	Dreher	Research Staff	OARDC	
FAUSEY	James	Buxton	Research Staff	OARDC	
FAUSEY	Sarah	Hess	Hydrologic Technician	Ohio ARS - Columbus	
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**Personnel support provided by additional funding from United Soybean Board.*

Undergraduate Employees and Internships working with CSCAP Personnel

PI	Institution	Undergraduate Student	Position
CASTELLANO	Iowa State University	Samantha Lodge	Undergraduate Research Assistant
CASTELLANO	Iowa State University	Danielle Koester	Undergraduate Research Assistant
CASTELLANO	Iowa State University	Steven Ward	Undergraduate Research Assistant
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KLADIVKO	Purdue University	Anna Keller	Undergraduate Research Assistant
KLADIVKO	Purdue University	Joe Rorick	Undergraduate Research Assistant
KLADIVKO	Purdue University	Lauren Trepanier	Undergraduate Research Assistant
KLADIVKO	Purdue University	Kaileigh Calhoun	Undergraduate Research Assistant
KRAVCHENKO	Michigan State University	Joe Devota	Undergraduate Research Assistant
KRAVCHENKO	Michigan State University	Vance Gawel	Undergraduate Research Assistant
DICK	The Ohio State University	Sarah Pinkham	Internship Experience
MOORE	The Ohio State University	Cali Granger	Internship Experience
MOORE	The Ohio State University	Bethany Herman	Internship Experience
MOORE	The Ohio State University	Gretchen Pleuss	Internship Experience
MOORE	The Ohio State University	Ethan Tope	Internship Experience
MOORE	The Ohio State University	Caleb Halfhill	Internship Experience
MOORE	The Ohio State University	Tashina Robinson	Internship Experience
MOORE	The Ohio State University	Lindsay Doerr	Internship Experience
<i>Non-CSCAP faculty</i>	Iowa State University	Moriah Bilenky	Internship Experience
<i>Non-CSCAP faculty</i>	The Ohio State University	Erin Gorrell	Internship Experience
<i>Non-CSCAP faculty</i>	The Ohio State University	Joseph Jabour	Internship Experience
<i>Non-CSCAP faculty</i>	The Ohio State University	Sonia Manish	Internship Experience
<i>Non-CSCAP faculty</i>	The Ohio State University	Krithika Vanamali	Internship Experience
<i>Non-CSCAP faculty</i>	The Ohio State University	Catherine Lorentz	Internship Experience
<i>Non-CSCAP faculty</i>	The Ohio State University	Kimberly Carter	Internship Experience
<i>Non-CSCAP faculty</i>	The Ohio State University	Elizabeth Kalikasingh	Internship Experience
<i>Non-CSCAP faculty</i>	The Ohio State University	Taylor Jackwood	Internship Experience
<i>Non-CSCAP faculty</i>	The Ohio State University	Kara Henn	Internship Experience
<i>Non-CSCAP faculty</i>	The Ohio State University	Jonathan Velasquez	Internship Experience

**Climate and Corn-based Cropping Systems CAP
Team Publication Guidelines
Agreed upon at Annual Meeting, November 2011
Minor adjustments made afterwards by Project Operations to clarify formatting issues, etc.**

This document and other project-based templates and materials are at the internal website.

Guidelines developed by the CSCAP Publications Committee: Lois Wright Morton, Eileen Kladvko, Dennis Todey, Cathy Kling, and Lori Abendroth

OVERVIEW

Guidelines developed for research, extension, and education publications developed by CSCAP faculty, staff, and students. Recommendations for proper citation, credit, and acknowledgement vary based on type of publication and complexity. Recommendations are given for each category of publication; exceptions and variations are possible but should be brought to the committee prior to publication for verification. Contact Lori Abendroth (labend@iastate.edu) with questions and she will bring to the committee as necessary or address herself.

These guidelines apply to publications derived from CSCAP data secured on a password protected central database. One exception to these guidelines is the socio-economic survey data jointly funded and collected in conjunction with U2U, a USDA-NIFA standard climate grant. These survey data will be secured on the password protected site of each group and used under the same guidelines as stated in this document.

Guidelines are developed for five types of team output:

- 1 – Refereed Journal Articles and Technical Reports
- 2 - Education and Extension Curricula and Publications
- 3 – Presentations: Field, Conferences, and Societal Meetings
- 4 – Theses and Dissertations
- 5 – Media: Videos, Web Site, Etc.

CATEGORY 1: Refereed Journal Articles and Technical Reports

- [1.] Using field/primary data from state level sites
 - [a] List lead author and coauthor(s) as typically done per respective journal.
 - [b] Include personnel only directly involved with field/primary research.
 - [c] Include Acknowledgement option [1].
- [2.] Combining field/primary data from 2 or more states' scope of work
 - [a] List lead author and coauthor(s) as typically done per respective journal.
 - [b] Include personnel only directly involved with field/primary research.
 - [c] Include Acknowledgement option [1].
- [3.] Using primary data for secondary analysis (e.g. modeling and/or survey analyses)
 - [a] List lead author and coauthor(s) as typically done per respective journal.
 - [b] Next, include PI's whose field research/primary data comprise the dataset used for analysis and/or modeling. Include PI names in alphabetical order. This may or may not include all PI's* on CSCAP dependent on which field sites/primary data are used in the paper.
**PI needs to decide whether a staff or student should be listed instead of themselves based on time spent on respective dataset.*
 - [c] Agreement form (page 6) must be initiated prior to publication by the first author with a copy submitted to the CSCAP operations team. It is recommended that secondary users initially consult with data owners prior to analysis for clear communication and agreement.
 - [d] Include Acknowledgement option [2].

CATEGORY 2: Education and Extension Curricula & Publications (Peer Review or Not Peer Review)

- [1.] State-based publication
 - [a] List lead author and coauthor(s) as typically done.
 - [b] Include Acknowledgement option [3].
 - [c] Include Publication number as described on page 5, if possible.
 - [d] Include institution logo as primary logo at page header.
 - [e] Include the Sustainablecorn.org logo at the page footer.
 - [f] Include the USDA logo next to the CSCAP logo at the page footer.
 - [g] Include disclaimer on bottom of last page (see page 5).
- [2.] Publication from 2 or more states' scope of work
 - [a] List lead author and coauthor(s) as typically done.
 - [b] Include Acknowledgement option [3].
 - [c] Include Publication number as described on page 5, if possible.
 - [d] Include multiple institution logos if desired.
 - [e] Include the Sustainablecorn.org logo as primary logo at page header or footer.
 - [f] Include the USDA logo next to the CSCAP logo at page header or footer.
 - [g] Include disclaimer on bottom of last page (see page 5).

CATEGORY 3: Presentations: Field, Conferences, and Societal Meetings

- [1.] Individual PI or state-based
 - [a] Use standardized PowerPoint (PPT) or poster template if possible, provided by CSCAP operations. If not using the standardized version, please adhere to points [c, d, e, f] listed here.
 - [b] List lead author and coauthor(s) as typically done.
 - [c] Include Acknowledgement [1] on last slide or bottom of poster.
 - [d] Include institution logo at the top left of poster or in the bottom left of PPT slide.
 - [e] Include the Sustainablecorn.org logo at the top right of poster or in the bottom right of PPT slide.
 - [f] Include the USDA logo next to the CSCAP logo at the top right of poster or in the bottom right of PPT slide.
- [2.] Group presentations and/or using multi-state data in presentation
 - [a] Use standardized PowerPoint (PPT) or poster template if possible, provided by CSCAP operations. If not using the standardized version, please adhere to points [c, d, e, f] listed here.
 - [b] List lead author and coauthor(s) as typically done.
 - [c] Include Acknowledgement [1] on last slide or bottom of poster.
 - [d] Include multiple institution logos, if desired, at the top left of poster or in the bottom left of PPT slide.
 - [e] Include the Sustainablecorn.org logo at the top right of poster or in the bottom right of PPT slide.
 - [f] Include the USDA logo next to the CSCAP logo at the top right of poster or in the bottom right of PPT slide.

CATEGORY 4: Theses and Dissertations

- [1.] Research on individual component of CSCAP, within state scope of work.
 - [a] List student and committee as typically done.
 - [b] Include Acknowledgement option [1].
 - [c] If part of the thesis or dissertation is published in a refereed journal, follow the respective guidelines (see CATEGORY 1).
- [2.] Research using CSCAP data for secondary analyses (e.g. modeling and/or survey analyses), within or across state's scope of work.
 - [a] List student and committee as typically done.
 - [b] In the Acknowledgement section or Materials & Methods, include PI's who conducted field research/survey collection that comprise the dataset used for analyses and/or modeling. Include PI names in alphabetical order. This may or may not include all PI's on CSCAP dependent on which primary data are used in paper.
 - [c] Include Acknowledgement option [2].
 - [d] If part of the thesis or dissertation is published in a refereed journal, follow the respective guidelines (see CATEGORY 1).

CATEGORY 5: Media: Videos, Web site, etc.

- [1.] Individual PI
 - [a] List presenter as typically done, by title and institution.
 - [b] Include institution logo where appropriate.
 - [c] Reference the funding source when speaking or at the bottom of webpages; e.g. use Acknowledgment [1].
 - [d] Include the Sustainablecorn.org logo.
 - [e] Include the USDA logo.

ACKNOWLEDGEMENT TEXT

All publications will include a reference to the funding agencies* and scope of CSCAP in the Acknowledgements section. Insert one of the following text options based on type of publication.

**If funding beyond the USDA-NIFA grant was acquired, insert acknowledgement to additional agencies/sources next to or following the CSCAP reference.*

[1] 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." Project Web site: sustainablecorn.org.

[If space exists, also include:]

The 11 institutions comprising the project team include the following Land Grant Universities and USDA Agricultural Research Service (ARS): 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.

[2] 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." The dataset used in this paper was derived from field research experiments conducted by *name 1, name 2, ..., name X* (listed in alphabetical order) as part of the Cropping Systems CAP. Project Web site: sustainablecorn.org.

[If space exists, also include:]

The 11 institutions comprising the project team include the following Land Grant Universities and USDA Agricultural Research Service (ARS): 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.

[3] The information contained within this *[insert: publication/module/etc.]* is based on extensive scientific research conducted at sites across the Midwest. This regional collaborative project is 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." Project Web site: sustainablecorn.org.

[If space exists, also include:]

The 11 institutions comprising the project team include the following Land Grant Universities and USDA Agricultural Research Service (ARS): 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.

IDENTIFICATION AND FORMALITY ISSUES

Publication Number

Many of the publications produced by CSCAP personnel will have the capability and need for a reference number. The following structure will be inserted at the bottom right corner of the publication. Contact Lori Abendroth (labend@iastate.edu) for this reference number to include.

Publication numbers will be set as: CSCAP-Number of publication in system-Year-State or Region

Example, the first CSCAP publication produced for an Iowa audience is: CSCAP-0001-2011-IA

Logos, Style, and Templates

It is recommended that all affiliated publications and materials utilize standard publication guidelines whenever possible to remain consistent with the project's visual identity and style.

General guidelines:

- Font: Arial, 11 point
- Spacing: Single-spaced, paragraphs separated by line breaks
- Colors: Based primarily off those listed as part of the visual identity (orange and blue)

Logos are available in black/white or color. Use color logo for all print and web material when possible. Attain high resolution version of logos from CSCAP internal site.

A large amount of resources are available on the internal site to help meet these guidelines:

<https://sites.google.com/site/sustainablecorn/publications>

Disclaimer for University Produced Materials

This is the most recent statement (as of 22 Nov 2011 via the USDA). You may use this or another version provided by your University. This is included here as a reference, if needed.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, DC 20250-9410 or call 800-795-3272 (voice) or 202-720-6382 (TDD). USDA is an equal opportunity provider and employer.

AGREEMENT FOR PUBLICATION

The Cropping Systems Coordinated Agricultural Project (CSCAP): Climate Change, Mitigation, and Adaptation in Corn-based Cropping Systems is a multi-faceted, complex project aimed at answering questions important to researchers, policy makers, and citizens. To provide results and recommendations to others, we must work cooperatively in sharing and publishing data. Primary data, whether collected in field research plots, surveys, or landowner meetings, are needed for secondary analysis, e.g. crop, climate, and societal analyses and modeling.

Use of primary data must be authorized by the data owners prior to publication. A reasonable amount of time must be given to primary owners of data to publish in their respective journals. It is expected secondary users of the data will know their journal's stipulations regarding the disclosure of the dataset at time of publishing. This is an important clarification so that any published work on modeling does not unknowingly disqualify future publications of the dataset from occurring.

It is the role of the data owner to assure the data is of highest quality with no known errors or changes expected to occur once it is uploaded to the team database. Secondary users may access and initially work with data contained in the database but must attain PI agreement prior to publication.

I have discussed this publication with all involved data owners and have followed the guidelines as stated in this document for my specific type of publication.

Title of Publication: _____

Publisher: _____

Lead Author of Publication: _____ Date _____

I agree to use of the data, which was collected by myself and/or my team, for use in the lead author's publication. My name, or someone on my team, will be included in the author list for this publication.

Data Owners:	_____	Date_____
	_____	Date_____
	_____	Date_____
	_____	Date_____
	_____	Date_____
	_____	Date_____
	_____	Date_____
	_____	Date_____
	_____	Date_____
	_____	Date_____