

# 2009 University of Illinois Combined Research and Extension Annual Report of Accomplishments and Results

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## I. Report Overview

### 1. Executive Summary

#### The Strategic Goals of The College of ACES

The University of Illinois is facing unprecedented fiscal challenges with respect to its historic partnership with the State of Illinois. The State is seriously in arrears in its currently obligated funding to higher education, and the State's budget deficit is widening dramatically. The degree of financial uncertainty has increased significantly in the past year for the University and its units, including the College of Agricultural, Consumer and Environmental Sciences, which fulfills the University's land-grant mission. The College of ACES is responsible for the Illinois Agricultural Experiment Station and University of Illinois Extension, subsidiary units authorized by federal and state statutes that complement the University's academic programs. Urgent reviews of programs and initiatives will examine the central principles of the land-grant university and whether this mission is consistent with the escalating share of revenue borne by undergraduate students and the direction of a research-intensive university. The College has been fundamentally guided by the principles of the land-grant philosophy, which for ACES means actively discovering, advancing, and integrating new knowledge to ensure nutritious and safe food, sustainable and innovative agriculture, strong families and communities, and environmentally sound natural resource management to benefit the people of Illinois and the world. Our multidimensional mission requires capacity and functional programs in areas of fundamental and applied research, education, and public engagement that are highly relevant to the needs of students, employers, communities, and families, and support robust food, agricultural, and more recently, energy systems.

#### University of Illinois Cooperative Extension

Until last year, the statewide Extension program had shown strong growth over the previous three years, driven by local support, state investments in specific program areas, and increasing grant and contract activity. In FY 2009, total expenditures by University of Illinois Extension decreased 5.9% to \$86,860,436, reflecting the deteriorating economic situation. Extension still represented 49.7% of the total expenditures in ACES. Extension funding is constrained in specific ways, with increasing pressure on federal formula funding from USDA, state base funding for campus and center based activities, and specific state appropriations that are at risk. In particular, Extension is not considered equivalent to an academic tuition-generating unit. Since state-based funding is a combination of tuition and appropriated funds and as tuition constitutes a larger proportion of recurring state-base funding, units like Extension are more likely to experience deeper budget reductions. Consequently, a major review of Extension's structure and programs is underway in Illinois. The statewide Extension system employs approximately 343 professional field staff, a decrease of more than 50 FTE over the last two years, in anticipation of reduced county-based and university-based funds. University of Illinois Extension is assisted by over 40,000 volunteers in all 102 counties in the state. Extension reaches more than 2.7 million people face-to-face in Illinois with educational outreach programs in agriculture and natural resources; nutrition, family, and consumer sciences; 4-H youth development; and community and economic development.

#### The Illinois Agricultural Experiment Station [The Office of Research]

The research mission of ACES is closely aligned with the Illinois Agricultural Experiment Station [IAES], which operates as a statutory state-federal partnership. The IAES is directed by the Associate Dean for Research. The IAES/ACES research activities accounted for \$64,101,515 [36.7% of the expenditures in the College last year, increasing 11.5% from the previous year]. The long-term strategic goal of the College of ACES is to undertake new investments in research that are balanced between discovery and application, and between long-term and short-term outcomes, to insure both new knowledge creation and relevance to the state's food, agricultural, environmental and human interests. IAES research encompasses programs in the College of ACES and in other units funded in part through the IAES. These units include the Colleges of Veterinary Medicine, Engineering, LAS, and Law, as well as the Illinois Natural History Survey. The IAES also funds some research programs with partners in other institutions. The research portfolio of the Illinois Agricultural Experiment Station includes mandated and mission-oriented research to support stakeholders in Illinois, in partnership with USDA and entities in the state. Mission-oriented research is also being evaluated for its return on investment and contributions to the University in light of the financial situation in the State of Illinois.

## Changes In The College of ACES in 2009

Several significant staffing changes occurred in the College of ACES in 2009. Dean Robert Easter left the College to become the Chancellor and Provost for the University of Illinois Urbana-Champaign Campus over the Summer. He was replaced by Dr. Robert Hauser, formerly the Department Head for Agricultural and Consumer Economics. Dr. Robert Hoeft became the Associate Dean for Extension in late 2009. He was previously the Head of the Department of Crop Sciences and replaced Dr. Dennis Campion. Dr. Jeffery Brawn replaced Dr. Bruce Branham as the Department Head for Natural Resources and Environmental Sciences. Dr. Paul Ellinger replaced Dr. Hauser as the Head of the Department of Agricultural and Consumer Economics. Dr. German Bollero replaced Dr. Hoeft as the Head of the Department of Crop Sciences.

Over the Summer of 2009, 13 faculty members left the Department of Natural Resources and Environmental Sciences and joined the Department of Crop Sciences. They are Drs. Bruce Branham, Donald Briskin, John Juvik, Gary Kling, Mosbah Kushad, John Masiunas, Manfredo Seufferheld, Robert Skirvin, J. Ryan Stewart, Thomas Voigt, Daniel Warnock, Henry Wilkinson, and David Williams. These investigators are associated with the horticulture program on the University of Illinois at Urbana-Champaign campus. The majority of faculty members in this program initiated discussions in the Fall of 2007 to transfer the horticulture program in an effort to improve visibility, unify plant science programs, and to simplify the administrative structure. The goal of this merger is to strengthen the missions of teaching, research and outreach within the College of ACES.

## Additional Planned Programs

Stations received a request in late 2009 from Director Roger Beachy asking that additional planned programs be added to the Plan of Work and Annual Report focusing on [1] Global Food Security and Hunger, [2] Climate Change, [3] Sustainable Energy, [4] Childhood Obesity, and [5] Food Safety. Three of these Planned Programs have been added; for the fourth and fifth [Food Safety and Sustainable Energy] we renamed the already-existing Planned Programs on Food Product Development, Processing and Safety and Biofuels. We have made an effort to populate these new programs this year and expect them to be better populated in future years. These changes of course also affected existing Planned Programs as some projects were moved from the existing Programs to the new ones.

## The Planned Programs

**Plant Health, Systems and Production** - Activities in 2009 included continued research into the development of maize genotypes with improved nitrogen utilization, development of a new apple cultivar "WineCrisp", efforts to control the Asian soybean aphid, research on the use of the herbicide 2,4-D [one of the most serious problems confronting grape growers], efforts to limit the threat of phytophthora blight to the Illinois pumpkin industry, training Master Gardeners to provide information on environmentally-friendly plant production, digital diagnosis and recommendations for plant-related problems, and efforts to minimize the Emerald Ash Borer threat to Illinois' valuable private and public shade trees.

**Community Resource Planning and Development** - Activities in 2009 included a study on the impact of high food prices on the Latina/o community in Central Illinois, work designed to improve our understanding of forest landowners and watershed partnership members' interpretation of ecosystem services, management objectives, and risk perceptions, county official's certification programs, expanding data gathering assistance to communities for decision making and planning, enhancing non-profit and local government success in securing federal funding through grants, and disaster preparedness.

**Animal Health and Production** - Activities in 2009 included continued development of the Illinois Manure Management Plan Workbook and website, efforts to determine the amount of energy needed to optimize the performance of dairy cattle, a study of beef cattle grazing systems designed to both improve production and minimize environmental impacts, gene expression research in livestock species that offers critical information in identifying targets for gene selection to improve health and production, and a continuation of a wide variety of Extension annual statewide programs that addressed animal production and health for swine, beef, dairy, sheep, and horses including grazing programs.

**Natural Resources and the Environment** - Activities in 2009 included development of quantitative and qualitative models for managing natural resources, a study evaluating watershed-scale water quality models for TMDL planning, research assessing the effects of land use change on microbial communities, work on the rate at which Illinois streams can recover from sediment and phosphorus contamination, a statewide series of tillage workshops, soil and water workshops, piloting the newly developed Master Naturalist program, sustainable agriculture tours, pond management, and stewardship activities for youth.

**Human Nutrition, Diet Adequacy, Health and Wellbeing** - Activities in 2009 included work toward understanding the

characteristics of high protein ingredients and the resulting product qualities and to provide a guide for high-protein soy food development, efforts to understand the mechanism of fructose effects on macronutrient metabolism, and work to understand previously unidentified specific bioactive components in broccoli. Extension activities focused on managing diabetes, holistic self-management for adults who have ongoing health conditions, and activities for youth focused on cooking skills, food science and safety, food choices, and physical activity.

**Food Safety** - Activities in 2009 included the study of acoustic energy as a practical intervention for liquid food processing, efforts to modify milk fat composition for improved nutritional and market value, an ongoing study of the virulence of *listeria monocytogenes* grown as biofilms, work contributing to the goal of designing novel, advanced, sustainable materials for packaging, microbial inactivation tests which prove that ultrasound technology as a new food processing modality may provide a promising alternative to traditional thermal food preservation methods, and food safety training for volunteers and employees of establishments that prepare or serve food to the public.

**Agricultural and Consumer Economics** - Activities in 2009 included research on international and U.S. issues relating to agricultural biotechnology, continuing utilization of the Crop Insurance Decision Tool and the Varietal Information Program for Soybeans [VIPS], efforts to use the functional benefits transfers to forecast the impact of toxic waste sites on property values surrounding areas of concern, and Extension activities that addressed farm land ownership, risk management for small landowners, long-term care planning, coping with the current economic challenges, savings and investing strategies, choosing a financial adviser, and money management basics for limited resource audiences.

**Sustainable Energy** - Activities in 2009 included continuing research on the impact of biofuels on emission-reducing technologies, efforts to increase ethanol production efficiency from corn and cellulosic biomass, a successful effort to produce bio-butanol from low-value DDGS, work that will provide policy makers with information on the impact of crop residue removal for biofuels on soils, the continued establishment and nitrogen management of switchgrass for sustainable bioenergy feedstock, wind farm development, as well as youth hands-on experiments, demonstrations, and tours addressing energy resources.

**Human Development and Family Wellbeing** - Activities in 2009 included educational outreach efforts to assist couples in balancing work with their relationship, compilation of the "More Fun With Brothers and Sisters" program curriculum, research to identify chronic stressors in the lives of low-income African Americans, attempts to explain early racial SES gaps in school achievement, findings that lesbian and gay parents largely consider their downstate Illinois residential communities to be tolerant and that their sexual orientation is often not salient when out in public, child and elder care training, brain health strategies, character education, bullying prevention, work with survivors of domestic abuse, and collaborative community education outreach to parents of "at risk" newborns to provide resources and programs.

**4-H** - Activities in 2009 focused on volunteer training, teacher training on social emotional learning, character education curriculum development, and the three national areas of focus - science, engineering, and technology [SET]; healthy lifestyles; and youth leadership. SET activities included community mapping with GIS/GPS, robotics team competitions, national release of Illinois' Power of Wind curriculum, a Youth Informatics Forum, and overnight experiences such as Science Siesta and Illinois Summer Academies to create awareness and interest in science and science-related careers.

**Agricultural and Biological Engineering** - Activities in 2009 included the development of intelligence-enabled machinery to improve practices in biosystems such as in agriculture and forestry, experiments on the use of synthetic gene circuits as biological sensors, a study on the ventilation effectiveness of animal facilities, the development of a breath output simulator with the ultimate goal of monitoring livestock health through breath analysis, and certified livestock management workshops and online training.

**Climate Change** - Activities in 2009 included ongoing work by the National Atmospheric Deposition Program [which has provided measurement of the chemicals in precipitation since 1977], the development of results that will help us to better understand the forest landscape response to climate change and direct field experiments, a study of the impact of surface ozone on crop yields, proving information on carbon sequestration and trading through soil management and forestry management, and ways youth could reduce their carbon footprint.

**Childhood Obesity** - Activities in 2009 included studies on the effects of food insecurity on childhood obesity, ongoing work under the STRONG Kids project [testing the impact of media and marketing on children's weight status and health], continuing work under the PONDER-G project [Prevent Obesity and Nutrition-related Diseases: Environmental Resources and Genomics] which aims to establish and recognize the basis of predictive, preventative and personalized interventions in the context of obesity, and hands-on Extension activities with children and their parents regarding the Food Guide Pyramid healthy food choice guide including snack choices, portion sizes, and the importance of physical activity.

Global Food Security and Hunger - Activities in 2009 included National Soybean Research Laboratory-managed school lunch programs which are improving awareness of the benefits of soy among youth and providing technical assistance to microenterprises that use soy foods, the generation of new knowledge to keep the corn and soybean sectors increasingly efficient and competitive, improved screening of resistant cultivars for the soybean cyst nematode [the major pathogen of soybeans in the United States], and toxicological analysis of new emerging drinking water disinfection by-products. Extension conferences, clinics, websites and field days addressed crop management, pesticide safety, an interactive web-based market system used to connect food related enterprises, and ways to access resources to prevent hunger for limited resource families.

### Total Actual Amount of professional FTEs/SYs for this State

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	250.0	0.0	125.0	0.0
Actual	201.0	0.0	112.6	0.0

## II. Merit Review Process

### 1. The Merit Review Process that was Employed for this year

- Internal University Panel
- External Non-University Panel
- Combined External and Internal University Panel
- Expert Peer Review
- Other (Extension Program Review Teams )

### 2. Brief Explanation

As in previous years, Hatch projects are reviewed at the Department level before being submitted to CSREES, where they are again formally reviewed before being eligible for funding. Criteria for review of individual projects is established by the Department submitting the proposal for consideration. For example, in the Department of Agricultural and Biological Engineering reviewers are selected for each project by the Head and given general guidelines [that the proposal must "address a timely topic and contain approaches that are technically sound", for example]. Guidelines given to reviewers are more specific in the Department of Agricultural and Consumer Economics, as proposals are evaluated based on [1] Scientific merit - An important question that will provide new theoretical and/or methodological information; [2] Technical merit - Quality of the methods and procedures outlined by the Investigator; and [3] Capacity and Resources - The extent to which the scientist has the expertise, staff support, and laboratory equipment to effectively complete the project. Review panels in the Department of Natural Resources and Environmental Sciences range from two to four [with input on selection from the PI considered], and criteria for evaluation include: [1] Is the research adequately justified?; [2] Are objectives well-focused and can progress be measured?; [3] Are potential sources of collaboration identified?; [4] Does the proposal potentially duplicate existing efforts?; and [5] Are the key clientele who would be served by the research clearly identified?

Program Reviews were conducted in one-fifth of the County Extension Units. Review teams included four or five state and local Extension staff who visited local Extension units. Prior to the interactive review, the chair of the review committees reviewed a number of documents that are to be on file related to affirmative action and other regulation compliance. During the interactive program review, staff from a given local office presented an overview of their programs and responded to questions from the review team. Since the reviews are only one day in length, the presentation usually highlights a subset of programs and staff were asked to focus on those where impact on participants has been measured. Supporting materials were provided to reviewers via mail in advance of the review or at the actual review. In addition, local stakeholders were interviewed by the review team to seek their input on program scope, quality, and suggestions for program additions and improvements. The review team shared recommendations with the local staff and local Extension advisory council members at the end of the review. Council members are also welcomed to be a

part of the entire review and the Regional Director or Associate usually attends all or the review team recommendation section of the review. Following the review staff members in turn developed an action plan in response to recommendations. Local Extension advisory councils were involved in reviewing and providing input on the plans.

### III. Stakeholder Input

#### 1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals

#### Brief explanation.

The Illinois Council on Food and Agriculture Research [C-FAR] remains a very effective portal through which to seek stakeholder input. However, recent budget difficulties have called into question how much longer that will be the case. C-FAR received no funding from the General Assembly last year and is preparing to close its office housed at the University of Illinois. C-FAR Chairman Jerry Hicks has stated that "We remain committed to C-FAR as an organization" and that "we know it will continue to exist - just not look the same as in the past". The organization voted in early February of 2010 to reorganize and to change how research priorities are determined and how research funding is distributed. More information on C-FAR can be found at [<http://www.ilcfar.org/>].

The Vision for Illinois Agriculture program discussed in last year's report in greater detail is also ongoing, with an electronic newsletter "In Focus" being one avenue through which they seek additional stakeholder input. More information is available at [<http://www.illinoisagriculturevision.org/>].

At the Department Level [we will use Natural Resources and Environmental Sciences as an example for this report], several programs are held during the course of a year to obtain stakeholder input. Some of these programs include Stewardship Week [providing natural resource management to elementary educators and students]; Illinois Specialty Crop, Agritourism and Organic Conference [providing nationwide expertise to State farmers]; and the Illinois Conference on Soil and Water Science: Our Science and Society [bringing together University/Survey/Extension people and USDA/Industry representatives].

A formal statewide stakeholder Extension input process was completed last year through an online survey to seek public input on educational interests in ten broad issue areas and the 7-11 topics specific to each issue area. Paper copies were made available and both versions were provided in English and Spanish.

The State Program Planning Committee with support from the Extension Administrative group determined that a broad statewide assessment of the public's educational interests would provide for a focus on future programs likely to impact high priority issues in the state and broaden the public perception of Extension's value in addressing issues through outreach education. The content of the survey was based on issues identified at the local level and then communicated and discussed by County Directors at their annual meeting. These issues were then subsequently discussed with educators and specialists at a meeting held specifically to identify priority statewide programs.

A marketing sub-committee of the State Program Planning Committee was created to identify potential ways to promote participation. They identified a theme and worked with the Director of Program Planning and Assessment in developing a promotional guide and tools to recruit participation of both traditional and non-traditional cross-sections of the public. A professional designer was employed to design the logo and promotional items. Promotional methods to enlist participation included providing the survey graphic, an invitation, and a direct link to the survey on all county Extension websites and for posting on local and state organization and agency websites such as

Chambers of Commerce. Other promotional items included media releases, an email text to forward to those on local Extension's list-servs, and flyers for duplication and distribution at Extension programs and through retailers, utility bills, etc. In addition, a significant supply of table top posters with easel backs and business and bookmark sized cards professionally designed and printed with the logo and URL were distributed to each office location in the state with suggestions for their use such as on counters at local libraries, Department of Motor Vehicle license facilities, local government offices, or offices of groups that collaborate or partner with Extension. At the local level, Council members who represented agencies or groups distributed and collected paper copies of the survey to their clients to complete. The survey was accessed by 9,030 English respondents and 319 Spanish speaking respondents.

In addition to this statewide process development and implementation, other actions and methods to seek stakeholder input specific to ongoing issues and programs unique to a local area occurred. End-of-program evaluations distributed to Extension program participants sought ideas on additional informational needs as well as feedback on quality of the current program. Community planning and economic development Extension activities also by their very nature involved stakeholder input. For example, the development of hazard mitigation plans described in the planned program Community Resource Planning and Development has a stakeholder input component that involves surveys and community discussions. Program reviews in one-fifth of the local Extension units provided an opportunity to ascertain the actions taken with respect to gathering stakeholder input. The actions taken most often involved targeted invitations to individuals and groups of traditional and non-traditional stakeholders by Extension and by any collaborators that were working with Extension staff to initiate community planning or exploration of potential issues that needed to be addressed.

**2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them**

**1. Method to identify individuals and groups**

- Use Advisory Committees
- Needs Assessments
- Use Surveys

**Brief explanation.**

The Associate Dean of Research is active in several activities designed to identify stakeholders and collect input from them. The Experiment Station recently hosted a one-day conference with corn growers [and their advisory boards] to discuss current research activities and seek guidance for future research goals from the corn growing community. The Station Director also routinely travels the state to meet with commodity organizations to better understand their core needs [as do College faculty members]. The Director has also led several groups of faculty members to Washington D.C. to facilitate interaction between faculty members and representatives from major Federal agencies.

At the Department level faculty members have participated in national and statewide events and committees throughout the year to discuss topics ranging from disaster resilient communities, central U.S. grassland conservation and impact of biofuels on soils, soil erosion and crop yields. Local contact with organizations such as the Master Naturalist Program, the Community Emergency Response Team, and area park district and forest preserve managers provide ample opportunity for an exchange of information between researchers and stakeholders.

With respect to the statewide assessment of educational interests, the marketing subcommittee of the State Program Planning Committee discussed potential ways to promote participation on both a statewide and local basis to enlist participation of both traditional audiences and those who were not currently Extension users. [Note: 33% of the respondents had never used Extension's services]. Their ideas were shared through the promotional guide that was distributed by Extension staff. Local Extension staff members discussed these ideas and involved their Extension Councils in discussing the suggestions of who to invite and the process that should be used.

Extension Advisory Councils at the local level also provided advice on who should be targeted for an invitation to a specific program or a particular input opportunity. For example, based on Council observation and discussion of why attendance at agriculture programs is declining in a given county, a decision was made to survey identified audiences through a collaborative effort with other agriculture entities in the county. In addition, Extension staff members are very involved in community collaborations at the local level and those groups are both targets for input or for identifying and including other representative stakeholders. Extension leadership at the regional and state levels also network with traditional and non-traditional internal and external individuals and groups.

## **2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them**

### **1. Methods for collecting Stakeholder Input**

- Meeting with traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting with invited selected individuals from the general public

#### **Brief explanation.**

At the College level input is primarily collected through meetings with traditional stakeholder groups [several examples of which are mentioned in this report]. Of course, input from stakeholders is collected at all levels from the College to Departments and Units to individual faculty members and Extension educators. Again using NRES as an example at the department level, during the course of the year lectures were delivered to elementary educators working on advanced education degrees, and these lectures provided discussion opportunities that impacted the research focus. Seminars and workshops were held with landowners, forest preserve managers and natural resource professionals. Surveys of various focus groups were an integral part of several researchers' programs. In addition, one project used an in-depth literature review to update information made available to the public. Of course, a great deal of the collection of stakeholder input takes place through individual Extension educators and faculty members. These interactions take place in wide variety of settings, from conversations with individual farmers to interactions with individual producer organizations to events designed to draw a large group of participants such as Agronomy Day and "ExplorACES".

The Extension statewide survey of educational needs was opened online and remained open from March 1, 2009 to May 29, 2009. Paper copies were made available at local Extension offices and hand delivered and collected by staff, Extension Advisory Council members, and organizations and agencies that reached clientele that were less likely to have access to a computer or a comfort level in using one to complete the survey online. Extension staff members were able to enter survey responses manually online from the paper copies collected.

Results for the statewide survey of educational interests were available in real-time throughout the collection process. Demographic data collected from respondents indicated that the survey had tapped board representation of Illinois residents. Specifically with respect to race 64.8% were white, 24.1% were African-American, 6.4% were of Hispanic origin; 1% were Asian, and 0.7% were American Indian or Alaska native. In comparison to Illinois 2008 census estimates, African-American response percentages were nearly double the state's while survey percentages for Asian and those of Hispanic origin were lower. Seventy percent were females. By age group, Baby Boomers represented 44% of the respondents, twice the percentage of 31-43 year-olds, and three times the number of 18-30 year old respondents. Those living in a large city or suburb constituted 34.3% of the respondents; only 13.1% lived on a farm. The employment status of respondents was fairly equally divided among six categories with the highest being employees for a government or educational institution.

While this statewide Extension effort was in progress, diverse activities were used to collect input from stakeholders related to planning specific on-going and new programs. Formal meetings of Extension Councils at the local, regional, and state levels occurred on a regular basis and formally announced as open to the public by postings and media announcements. The primary focus of the Council is to discuss internal and external issues that Extension can or should address. In addition, staff used meetings with collaborations, attendance at stakeholder groups, or appointments with individuals to collect input to guide programming decisions.

### **3. A statement of how the input will be considered**

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Action Plans
- To Set Priorities

**Brief explanation.**

External stakeholder input is considered by the College at every level, from direct involvement in the development of the College's strategic plan to indirect influence on budgeting decisions. Examples at the individual unit level include [1] the Center for Advanced Bioenergy Research [CABER] which receives guidance from a steering committee whose membership includes representatives from Archer Daniels Midland, the Illinois Corn Marketing Board, IBIO, and the U.S. Department of Agriculture, and [2] the National Soybean Research Laboratory [NSRL] which has soybean stakeholders providing direct allocation oversight of funds received from soybean check-off sources.

At the Department level, input received from NRES stakeholders allows the department the opportunity to evaluate current programs within teaching, research and extension. An increased need for forestry-related research and Extension expertise prompted NRES to increase an employee's presence through the State, especially in southern Illinois. The growing importance of organics, soil quality and biofuels impacted the expansion of the annual conference dealing with these issues. As an added benefit, stakeholder input provides a guideline for trends that impacts course content for our undergraduate and graduate students.

After closing the data collection site, a summary of the survey of educational interests results was tabulated at the state level and for individual counties by early May. All Extension staff members were notified via email that the statewide results were posted on the program planning Extension internal website. County result reports were sent directly to the appropriate County Directors for sharing with other unit staff and posted on the program planning Extension internal website. Survey results were also presented and discussed briefly with staff in two Extension regions and seven program development statewide teams, as well as to the Extension Administrators in the spring and summer. Requests for sorts of the data by various demographic characteristics of the respondents were also provided during the summer. County staff members were encouraged to discuss the findings with their colleagues and Extension Councils using questions and guidelines provided to make local program decisions that should be reflected in local plans of work for the year beginning in September of 2010. Feedback from Cook County staff indicated that survey findings were shared and generated excellent discussion with the Extension Council and other community leaders invited to provide program direction. Note: Cook County respondents constituted 32.3% [2,588] of the total English speaking respondents and 90% [274] of the Spanish speaking respondents. Regional findings were used to select a region-wide interdisciplinary program focus in one area of the state.

The State Program Planning Committee had targeted using the results to set statewide priorities that would be incorporated in both state and the federal long range plans of work for 2010 and beyond; however, major funding deficits for the University and Extension has precipitated a major focus on reorganizing Extension and uncertainty regarding staff resources that are crucial in developing a realistic long-range plan of work. All statewide activity to develop state plans of work has been put on hold until staffing and funding issues are resolved. Program delivery remains at status quo or reduced in scope as staff vacancies continue to build. Local Extension Advisory Councils are involved to varying degrees in adjusting on-going traditional program offerings in light of staff vacancies and fiscal resources and are examining local budgets and awaiting plans for reorganizing that will then occupy their attention and decision-making for the next several months. However, staff members are using the survey findings in grant applications to support the need for the proposed programs for which they seek funding. In addition, the state 4-H Youth Development staff team has identified and prioritized five areas of focus using the data from this survey and from the last statewide effort that gathered information through some 200 focus groups with youth.

**Brief Explanation of what you learned from your Stakeholders**

Areas of focus at the joint meeting of the Illinois Corn Marketing Board and the Illinois Corn Growers Association hosted by the Experiment Station included the implications of biofuel mandates and subsidies on land allocation, progress toward the University of Illinois Integrated Bioprocessing Research Laboratory, recent genetic improvements in corn, the importance of individual crop management factors, and enterprise analysis of crop data by the Illinois Farm Business Management Association. We also recently learned about new interactions between the Illinois Soybean Association and the Iowa Soybean Association focusing on three major core research areas: [1] child and animal nutrition, [2] climate change, and [3] plant breeding. Stakeholders of the National Soybean Research Laboratory reported that NSRL data was valuable to farmers by allowing them to compare seed attributes across companies, and concepts of the Varietal Information Program for Soybeans [VIPS] are being adopted by other University trials. As an example at the individual Faculty member level, Dr. Hans Stein [a Professor in the Department of Animal Sciences] met with a group of sixty local producers to learn about group housed sows, meets with the Illinois Pork Producers and the Illinois Soybean Board several times a year at their board meetings to stay current on issues they feel are most pressing, and works with feed companies throughout the Midwest and into

Canada to evaluate feed ingredients.

The Extension survey's most frequently checked issues of educational interest by over 8,200 [88%] of the 9,349 respondents and topics checked most often under these four board areas on interest [respondents could check up to four under each of the 10 broad areas] were as follows: [1] High energy costs - managing home energy costs, energy efficiency, and alternative energy sources [wind, ethanol, etc]; [2] Managing individual and family resources - savings and investment strategies, health care costs, and planning for retirement; [3] Protecting the environment - water quality, global warming, and air pollution; and [4] Maintaining physical health and wellness - healthy food choices, stress [work, family, personal], and effects of physical activity on health. Under the other six issues areas, topics frequently checked were expanding youth interest in science, math and technology education, retaining youth in communities by expanding local business opportunities marital/couple relationships, home food preservation, availability of locally produced food, preparing for tornado disasters, and availability of employment options.

Although space does not permit a comprehensive listing of things learned, a few differences among demographic data were observed. Minority respondents expressed a higher interest in learning about health care costs and living within their incomes, personal safety in their communities, the quality of K-12 education, and home food preservation. Non-users of Extension more often checked interest in global warming, keeping and growing retail businesses, and flood disasters and less interest in effects of physical activity on health and the availability of locally produced food that Extension uses.

Approximately 30% of the respondents provided comments that identified other issues and areas of educational interest through an open-ended question. These included ones related to agriculture and gardening/horticulture which Extension has continued assessing through direct feedback from participants in programs related to these areas. Other issues of high interest related to infrastructure/community aesthetics/ and government/taxes. Extension staff had been encouraged to share results with agencies and group that may be better able to address these.

The survey findings match many of the on-going and traditional areas of Extension programming - healthy food choices, planning for retirement, water quality - and suggest that providing resources to continue support for these programs should be a high priority. Other areas of high educational interest mirror current national initiatives - climate change; sustainable energy; and science, engineering, and technology education for youth - suggest making adjustments to increase Illinois Extension capacity to meet these areas of high educational interest. Efforts will continue to identify what can be learned from the survey findings to guide fiscal resource and staffing decisions to ensure programming is highly relevant to Illinois issues and educational interests.

#### IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
9167594	0	6025443	0

2. Totalled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
<b>Actual Formula</b>	11532600	0	4765946	0
<b>Actual Matching</b>	9167594	0	4765946	0
<b>Actual All Other</b>	66160241	0	41286004	0
<b>Total Actual Expended</b>	86860435	0	50817896	0

<b>3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from</b>				
<b>Carryover</b>	2365005	0	3740070	0

## V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Plant Health, Systems and Production
2	Community Resource Planning and Development
3	Animal Health and Production
4	Natural Resources and the Environment
5	Human Nutrition, Diet Adequacy, Health and Wellbeing
6	Food Safety
7	Agricultural and Consumer Economics
8	Sustainable Energy
9	Human Development and Family Wellbeing
10	4-H Youth Development
11	Agricultural and Biological Engineering
12	Climate Change
13	Childhood Obesity
14	Global Food Security and Hunger

**V(A). Planned Program (Summary)****Program # 1****1. Name of the Planned Program**

Plant Health, Systems and Production

**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		15%	
202	Plant Genetic Resources	0%		10%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		10%	
205	Plant Management Systems	35%		10%	
206	Basic Plant Biology	10%		10%	
211	Insects, Mites, and Other Arthropods Affecting Plants	10%		10%	
212	Pathogens and Nematodes Affecting Plants	10%		10%	
213	Weeds Affecting Plants	5%		10%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	0%		5%	
216	Integrated Pest Management Systems	30%		10%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

<b>Year: 2009</b>	<b>Extension</b>		<b>Research</b>	
	<b>1862</b>	<b>1890</b>	<b>1862</b>	<b>1890</b>
Plan	41.5	0.0	29.0	0.0
Actual	19.3	0.0	18.6	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
1107130	0	757565	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
880089	0	757565	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
6351383	0	7947526	0

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

Activities under the sub-goal "Maximizing the benefits from specialty crop production systems" included research on one of the most serious problems confronting grape growers, the use of the herbicide 2,4-D in controlling weeds growing among cereal crops including corn [grapes are very sensitive to 2,4-D and can be killed by 1/100th of the rate used to treat corn]; studies to identify the physical and chemical traits that increase resistance to western flower thrips in impatiens plants; and efforts to manage Phytophthora blight in pumpkin fields [Phytophthora blight, caused by *Phytophthora capsici*, is the most serious threat to production in the pumpkin industry and other cucurbit crops in Illinois and worldwide].

Activities under the sub-goal "To increase the number of PhD graduates in plant breeding and expand research in plant breeding" included the continued evaluation of new breeding lines for disease and pest resistance [in addition to the SCN resistance, soybean breeding lines LDXG05241R-1-2 and LD05-16657 also carry the aphid resistance gene Rag1 and these represent the first aphid-resistant soybean varieties released by the public sector in the northern U.S.]; regulatory genomics and pathway discovery using high-performance computing; continued research toward the development of maize genotypes with improved N utilization [this will lead to better energy balance of crop production, lower input costs, and reduce environmental impacts associated with N fertilizer use]; and continued study of genomic and genetic manipulations in higher plants [the release of the new apple cultivar WineCrisp has been published in a refereed scientific publication, and also disseminated through popular magazine articles].

Activities under the sub-goal "To conduct cutting edge research that will increase crop production with minimal energy input and minimal negative impact on the environment and translate the results to producers and their advisors" included projects designed to control the Asian soybean aphid, comparisons of the agronomic performance of corn, soybean, winter wheat, alfalfa, and forage grass cultivars that are available to farmers in Illinois [the results of these trials, either through direct use by farmers or through use by seed companies, affect crop production on 9,490,000 hectares of five crops in Illinois and reports issued by this program are regarded as the premier source of unbiased performance information on current cultivars]; continued assessment of crop rotation effects in Illinois; continued study of herbicide resistance in weedy amaranthus species; improved management of fungal plant pathogens affecting soybeans; the development of high-yielding, commercially-acceptable corn hybrids with high levels of resistance to *Aspergillus* ear rot and low levels of aflatoxin in grain; and research findings dealing with the pathogenesis of C-4 carbon plants which will result in reduced use of fungicides for disease management because it allows for timed applications as opposed to preventative applications.

Activities under the sub-goal "To identify techniques that will obviate crop production factors that result in degradation of the environment" included the development of knowledge that is being used to educate farmers, the fertilizer industry, and crop advisors on the importance of managing nitrogen correctly by using the right source, amount, time, and placement; a continuing study designed to examine the response of continuous corn [*Zea mays* L.] to a set of crop inputs, including tillage, fertilizer [NPK], and, in recent years, foliar fungicide; and findings that are being used to develop fungicide guidelines for growers, crop consultants, extension personnel, and industry personnel [these guidelines will help with fungicide application decision-making, which will help growers be more profitable and will reduce the number of unwarranted fungicide applications].

Conferences and presentations related to Plant Health were made to the Illinois Specialty Growers Conference, Midwest Organic Growers Conference, Illinois and Wisconsin Fruit and Vegetable Growers Meeting, American Society for Horticultural Science, Weed Science Society of America, 4<sup>th</sup> International Cucurbitaceae Symposium, 2<sup>nd</sup> International Phytophthora Capsici Conference, 51<sup>st</sup> Annual Maize Genetics Conference, Ecological Society of America, Illinois Natural History Survey 150th Anniversary Jamboree, Lake Forest Open Lands Association, University of Illinois Agronomy Day, Illinois Soybean Association Soy Symposium, 18th Annual World Forum and Symposium of the International Food and Agribusiness Management Association, 8th International Conference on Management of AgriFood Chains and Networks, American Society of Plant Biology, International Congress for Plant Molecular Biology, International Symposium on Biotechnology of Fruit Species, International Plant Molecular Biology Meeting, American Phytopathological Society, Center for Physiology and Biochemical Research, North Central Extension Industry Conference, International Sweet Corn Development Association, and the Midwest Food Processors Association.

Extension activities focused on both non-food horticulture crops and pests. The Ask Extension-Hort Corner is a website that allows visitors to ask a question of a University of Illinois Extension Educator or review the questions asked and answers received by previous visitors via an online web form. A series of twelve horticulture distance education programs titled 4-Seasons are offered annually at Extension offices throughout the state during the fall and winter months. Extension Master Gardeners gave countless hours in providing horticulture information to the public. There are currently 3,400 active Master Gardeners in

Illinois. This past year, 560 new Master Gardeners completed training at various locations in the state and through an online course.

Master Gardeners are involved in teaching audiences how to grow, preserve, and share or sell excess produce to enhance the consumption of food rich in required nutrients for good health. For example, the Mini-Victory Garden program in one county engaged Master Gardeners in mentoring 49 senior citizens who received special containers and supplies to grow their own "Mini Victory Garden" growing alfalfa is also ongoing [See Animal Health and Production Planned Program].

The plant clinic and Digital Diagnostic System provided extensive outreach to homeowners and commercial producers in diagnosing and providing solutions for 777 samples of invasive and exotic species pests. Information on

## 2. Brief description of the target audience

Members of the target audience include corn, soybean, and wheat growers in the Midwestern U.S., crop consultants, Extension personnel, state agencies, industry personnel, university and governmental scientists, sweet corn seed and food processing industries, retail weed control interests, weed ecology academics, the green industries of the Midwest [including members of the nursery and landscape industries, botanical gardens and arboreta], agribusiness personnel, producers, processors, and consumers of corn and soybean products, weed management professionals, farmers involved in or interested in organic agriculture of crop species, horticultural industries including, turf, sports, golf, landscape, and sod production, apple growers, nurserymen, the apple industry, farm equipment manufacturers, homeowners, and Extension Master Gardeners.

### V(E). Planned Program (Outputs)

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	55000	45000	4000	0
<b>Actual</b>	90991	66227	18752	0

#### 2. Number of Patent Applications Submitted (Standard Research Output)

##### Patent Applications Submitted

Year: 2009

Plan: 1

Actual: 1

##### Patents listed

One patent application was submitted, related to using plant-derived biofungicide against soybean rust diseases.

#### 3. Publications (Standard General Output Measure)

##### Number of Peer Reviewed Publications

2009	Extension	Research	Total
<b>Plan</b>	1	85	
<b>Actual</b>	6	81	87

### V(F). State Defined Outputs

#### Output Target

**Output #1**

**Output Measure**

- Number Of Completed Hatch Research Projects

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	8	4

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

<b>O. No.</b>	<b>OUTCOME NAME</b>
1	Percentage Of Nitrogen Utilization By Wheat
2	More Careful Use Of Garden Chemicals (Pesticides, Fungicides, Fertilizer) And Water
3	Changes In Application Of Recommended Pest Control Practices For Field Crops
4	Increased Knowledge Of Pest Management In Field Crops
5	Self-Reported Increased Use Of Transgenic Crops And Pest Resistant Crop Varieties
6	Providing Management Information To Farmers With Regard To Managing Soybean Cyst Nematode Heteroda, Glycines
7	Improving The Tolerance Of Grapes To Herbicide 2,4-D
8	Limiting The Threat Of Phytophthora Blight To The United States Pumpkin Industry
9	Examining The Effect Of Rotational Sequence On Corn, Soybean, And Wheat
10	Identifying The Molecular Basis Of Resistance To PPO-Inhibiting Herbicides In Waterhemp
11	Creating High-Yielding, Commercially-Acceptable Corn Hybrids With High Levels Of Resistance To Aspergillus Ear Rot And Low Levels Of Aflatoxin In Grain
12	Improving The Ability of Crop Varieties And Cultivars To Withstand Herbicide Stress
13	Improving Sweet Corn Genetics And Management
14	More Informed Use Of Pesticides
15	Increased Knowledge of Exotic Plant Pests

**Outcome #1****1. Outcome Measures**

Percentage Of Nitrogen Utilization By Wheat

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	52	52

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Illinois is the second leading producer of soft red winter wheat in the United States. Only about 50% of nitrogen is currently utilized by wheat, and even a five to fifteen percent gain in N use would mean a significant gain in yield or reduction in N utilized [or perhaps both], resulting in benefits to both growers and the environment.

**What has been done**

We are currently evaluating new nitrogen technologies and both urease and nitrification inhibitors for increasing nitrogen use efficiency of wheat after soybeans and after corn.

**Results**

In 2009, although N losses were very high due to excessive rainfall during the wheat growth period, positive improvements in nitrogen utilization were achieved with the use of urease inhibitors and nitrification inhibitors, each by nearly 20% over UAN without an inhibitor. Urea had a significantly higher nitrogen recovery than UAN by about 13%, presumably because the 25% nitrate contained within the UAN would be easily lost from the system compared to urea which contains no nitrate. The study is being repeated in 2009-2010.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology

**Outcome #2****1. Outcome Measures**

More Careful Use Of Garden Chemicals (Pesticides, Fungicides, Fertilizer) And Water

Not Reporting on this Outcome Measure

### Outcome #3

#### 1. Outcome Measures

Changes In Application Of Recommended Pest Control Practices For Field Crops

Not Reporting on this Outcome Measure

### Outcome #4

#### 1. Outcome Measures

Increased Knowledge Of Pest Management In Field Crops

Not Reporting on this Outcome Measure

### Outcome #5

#### 1. Outcome Measures

Self-Reported Increased Use Of Transgenic Crops And Pest Resistant Crop Varieties

Not Reporting on this Outcome Measure

### Outcome #6

#### 1. Outcome Measures

Providing Management Information To Farmers With Regard To Managing Soybean Cyst Nematode Heteroda, Glycines

#### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

#### 3a. Outcome Type:

Change in Action Outcome Measure

#### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	2350

#### 3c. Qualitative Outcome or Impact Statement

##### **Issue (Who cares and Why)**

The soybean cyst nematode *Heterodera glycines* is the most economically important pathogen of soybean in the United States. In Illinois, over 83% of four million hectares of soybean are infested with yield-reducing population densities of the nematode. The primary means of managing *H. glycines* is through the use of resistant soybean cultivars; unfortunately, over 90% of the resistant cultivars are derived from the same source, known as plant

introduction [PI] 88788.

### What has been done

The nematode has responded to the wide deployment of this source of resistance by adapting to it. Rotation with cultivars derived from alternative sources of resistance [PI 548402 and PI 437654] is recommended for fields in which the *H. glycines* population has adapted to PI 88788. Field survey results suggested that these sources of resistance are not mutually exclusive; *H. glycines* populations adapted to one source of resistance do not revert [lose their adaptation] when challenged with a second source. Analysis of virulence profiles from nearly 2,000 *H. glycines* field populations confirmed that over 80% of the populations in Illinois are adapted to PI 88788 at some level. Virulence is measured as a female index: development of females on a soybean line relative to development of the same isolate on a standard susceptible soybean line under the same conditions. Analysis of yield trials conducted in 2008 and 2009 shows that although the nematode has adapted to PI 88788, cultivars with this source of resistance still yield significantly better than do susceptible cultivars in infested fields, even those with low to moderate infestations.

### Results

This research has resulted in two main outcomes. First, the management recommendations for soybean cyst nematode in Illinois have changed to emphasize monitoring population densities, as opposed to scouting for presence or absence. At least 2,350 individuals in agribusinesses including farming, consulting, and supplying production materials were provided with this information during 2009. Surveys showed that awareness of the change in emphasis has increased to 63%. Reduction of the cost of SCN Type testing, based on analysis that showed that use of the full HG Type test is not necessary for making cultivar recommendations to farmers, continues to increase the number of soil sample submissions for testing; increases were twofold in 2008 and about 38% in 2009.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

## Outcome #7

### 1. Outcome Measures

Improving The Tolerance Of Grapes To Herbicide 2,4-D

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Condition Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

One of the most serious problems confronting grape growers in the Midwestern U.S. is the herbicide 2,4-D. 2,4-D is used to control weeds growing among cereal crops including corn. Grapes are very sensitive to 2,4-D and can be killed by 1/100th of the rate used to treat corn.

#### What has been done

We used in vitro methods to make a 2,4-D tolerant form of an important wine grape, Chancellor, that we have named 'Improved Chancellor'. The cultivar was patented in October of 2009.

#### Results

We have shown that our new cultivar will tolerate at least 20X the concentration sprayed on corn. We plan to test the cultivar under field conditions in the summer of 2010. We continue to work with horseradish growers to develop an efficient certification program to deliver pathogen-free plants to commercial growers. We also plan to continue our efforts to identify and sequence the various thornless genes of blackberry.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology
213	Weeds Affecting Plants

### Outcome #8

#### 1. Outcome Measures

Limiting The Threat Of Phytophthora Blight To The United States Pumpkin Industry

#### 2. Associated Institution Types

- 1862 Research

#### 3a. Outcome Type:

Change in Condition Outcome Measure

#### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

#### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Illinois ranks first in pumpkin production among all states in the nation. More than 90% of processing pumpkins produced in the United States are grown and processed in Illinois. Phytophthora blight, caused by *Phytophthora capsici*, is the most serious threat to production and the pumpkin industry and other cucurbit crops in Illinois and worldwide. *P. capsici* survives as oospores [thick-walled spores] in soil and attacks host plants throughout the

growing season. The objective of this research is to develop effective strategies for management of Phytophthora blight in pumpkin fields.

#### What has been done

In 2009, 14 fungicides, including Aliette, Apron XL LS, BAS65100F, Bravo Weather Stik, Forum, Gavel, Kocide-3000, Presidio, Ranman, Revus, Ridomil Gold SC, Ridomil Gold Copper, Tanos, and an experimental fungicide, in 30 treatments, were evaluated for their efficacy for control of *P. capsici* on pumpkins. Percentage of vine infection with *P. capsici* in all treatments, except Ridomil Gold SC treatment only, was significantly lower than that in the untreated check. No vine infection was observed in the plots of two treatments, including the treatment with spray-applications of Tanos plus Activator-90 alternated with Gavel plus Activator-90 and the treatment with a soil application of Ridomil Gold SC and spray-applications of Revus plus Kocide-3000 plus Activator-90 alternated with Ridomil Gold Copper. Percent of fruit infection ranged from 2.70 to 41.05%. The lowest percentage of fruit infection [2.70%] was in the plots that received a soil-application of Ridomil Gold SC plus Presidio and spray-applications of Presidio plus Gavel alternated with Tanos plus Bravo Weather Stik.

#### Results

The pumpkin industry is the most valuable vegetable industry in Illinois. Results of this research are helping the pumpkin industry to continue to be a significant component of the Illinois agricultural economy. Production of pumpkins, particularly production of processing pumpkins, in Illinois is increasing. For example, the acreage of processing pumpkins increased by more than 80% in the past nine years. Due to the market demand and effectively controlling Phytophthora blight, processed pumpkin production is expected to exceed 13,000 acres in 2010 [an increase of about 20% over the 2009 production].

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

#### Outcome #9

##### 1. Outcome Measures

Examining The Effect Of Rotational Sequence On Corn, Soybean, And Wheat

##### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

**Issue (Who cares and Why)**

The study underway examines the effect of rotational sequence and sequence order on the yields of corn [*Zea mays* L.], soybean [*Glycine max* [L.] Merrill.], and wheat [*Triticum aestivum* L.].

**What has been done**

Data from 2006 through 2008 were combined to reflect the completion of one full cycle of the three-crop rotations. The study has been in place for more than ten years, with more recent data reflecting recent changes in cultivars. Treatments include continuous corn, corn and soybean in a 2-year rotation, and corn, soybean, and winter wheat in a three year rotation in both possible sequences [WSC and SWC]. Each rotation treatment is present from each phase of the rotation each year. Split within each rotation main plot is tillage, with half conventionally tilled and the other half no-till. The tillage split is not in place at Brownstown, where the wheat crop is always followed by doublecrop soybeans planted immediately after wheat harvest. Results have been summarized and used in Extension presentations and publications, including slidesets. Sites have been used as demonstrations at field days [one per year at each center] and for related research such as rotation effects on soybean nematodes. An economic analysis has been prepared and used in Extension meetings.

**Results**

These results have been presented at a number of producer and professional meetings, and are included in the newly-revised Illinois Agronomy Handbook, now in the hands of hundreds of producers and consultants. This work allows crop producers to assess relative economic returns to different cropping sequences and practices, particularly when including wheat in the rotation in areas where the corn-soybean rotation is common, and where wheat is a minor crop. Inserting wheat into the corn-soybean rotation produced lower returns at current costs and prices at the more productive locations but substantially increased returns at the less-productive site. The findings will assist those who contemplate broadening their cropping base by including a third crop. Another useful finding is that, with a few exceptions, no-till competes well with tillage in economic returns. It is also less likely to result in soil erosion, which should have longer-term soil benefits.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology

**Outcome #10****1. Outcome Measures**

Identifying The Molecular Basis Of Resistance To PPO-Inhibiting Herbicides In Waterhemp

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Waterhemp is one of the most challenging weeds facing Midwest crop producers. Numerous waterhemp populations have evolved resistance to various herbicides, including PPO-inhibiting herbicides and glyphosate.

**What has been done**

Previously, we identified the molecular basis of resistance to PPO-inhibiting herbicides in waterhemp. We have continued to extend this research to additional waterhemp populations to learn how common this mechanism is. By determining that this mechanism seems to be the primary [if not the only] mechanism of resistance to PPO-inhibiting herbicides in waterhemp, we have gained increasing confidence in the reliability of the rapid, DNA-based assay for this resistance. Research on glyphosate resistance is beginning to reveal the genetic basis of this resistance.

**Results**

Resultant information is being used to inform weed management clientele how to best manage this resistance, and mitigate its occurrence in their own fields. Because most Midwest producers rely heavily on glyphosate for weed control, particularly in soybean production, this research is having a significant impact throughout the region. Furthermore, since the PPO-inhibiting herbicides currently are the best alternative to control waterhemp if glyphosate fails to give satisfactory control, and with the expected increase in occurrence of glyphosate-resistant waterhemp, our rapid assay for resistance to the PPO-inhibiting herbicides will be of increasing importance.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
206	Basic Plant Biology
213	Weeds Affecting Plants

**Outcome #11****1. Outcome Measures**

Creating High-Yielding, Commercially-Acceptable Corn Hybrids With High Levels Of Resistance To Aspergillus Ear Rot And Low Levels Of Aflatoxin In Grain

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Aflatoxin is a serious problem in the central United States and often an annual problem in southern states. Unfortunately, most commercial seed corn companies have not done the extensive research necessary to create inbreds and hybrids that have low levels of aflatoxin in grain. Therefore, the basic research and development must first be done in the public sector.

#### **What has been done**

This research is demonstrating the usefulness of marker-assisted selection to incorporate resistance into commercially usable inbred lines. We are paving the way for commercial companies to incorporate resistance into their lines and hybrids without having to be concerned with yield drag and without the laborious task of evaluating for toxin each cycle of breeding for resistance. In work done by us and Monsanto we have clearly identified the value of backcrossing resistance into commercially usable inbred lines using molecular markers. This will pave the way for other seed companies to do the same.

#### **Results**

This project is creating high-yielding, commercially-acceptable corn hybrids with high levels of resistance to *Aspergillus* ear rot and low levels of aflatoxin in grain. This is being accomplished by moving chromosome regions associated with resistance from resistant inbreds Tex6 and Mp313E into the commercially elite, but susceptible, inbred lines FR1064, LH195RR, LH310, and LH311 using molecular marker assisted backcrossing. All of these susceptible lines are genetically related to many lines that are used as female parents of commercial hybrids in the United States. Backcrossing resistance into FR1064 has been completed. The resistant versions of FR1064 are similar in yield to the original susceptible FR1064 but have 40 to 60% less aflatoxin in trials over multiple years in the southern United States. The resistant inbreds can be obtained by commercial seed companies through Illinois Foundation Seeds. Backcrossing resistance into LH195RR, LH310, and LH311 is in various stages of backcrossing or selfing. With LH195RR backcrossing is complete and Monsanto is selfing to produce finished inbreds. In tests the last two years in Texas the backcross derived resistant lines had much lower aflatoxin and were similar in yield in hybrid test crosses.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
206	Basic Plant Biology

#### **Outcome #12**

##### **1. Outcome Measures**

Improving The Ability of Crop Varieties And Cultivars To Withstand Herbicide Stress

##### **2. Associated Institution Types**

- 1862 Research

##### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

##### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	{No Data Entered}	0

##### **3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Herbicide safeners are chemicals that coordinately induce the expression of herbicide-detoxifying enzymes in cereal crops in a tissue-specific manner, thereby protecting them from herbicide injury. The ultimate goal of this research is to improve the ability of crop varieties and cultivars to withstand herbicide stress.

**What has been done**

The diploid wheat *Triticum tauschii* [syn. *Aegilops tauschii*] has been used as a model plant for this research to study safener-inducible herbicide detoxification genes [including glutathione S-transferases; GSTs] in cereal crops. More recent research has also investigated the role of a unique cytochrome P-450 gene and herbicide-detoxifying enzyme in *Zea mays* that metabolizes multiple herbicide substrates from different chemical families. It also appears that the expression of this P-450 gene is inducible by herbicide safeners. The objective of this research is to better understand the expression of GSTs and cytochrome P-450s [such as when and where they are expressed in the plant] and determine how they are regulated by herbicide safeners. The recent finding that a single P450 gene controls tolerance to multiple herbicides in cereal crops such as maize and rice indicates that herbicide selectivity may be a qualitative trait, as opposed to a quantitative [multigenic] trait involving multiple herbicide-detoxifying enzymes. This finding may also explain why certain maize hybrids that are heterozygous for this gene [possessing only one functional allele] may be injured from certain herbicides under stressful environmental conditions, in that the rate of herbicide metabolism may not be sufficient to prevent herbicide injury. As a complement to genomic techniques, proteomics has recently emerged in plant biology to study the composition, structure, function, and interaction of the expressed proteins or proteome in a given cell, tissue, or organism. Together with transcriptomics, proteomics and metabolomics, these techniques for analyzing global patterns of gene expression offer new and novel techniques for better understanding biological questions of interest to weed scientists, including a comprehensive examination of the safener response in cereal crop tissues at the level of protein abundance.

**Results**

A unique finding from our recent research in *Zea mays* is that a single P-450 gene may control tolerance to herbicides from several different chemical families. A novel finding from our proteomic studies was that several proteins identified by mass spectrometry were classified into three major categories based on their expression patterns, and were further categorized into potential functional groups. As a result, our recent findings contribute significantly to understanding the proteins and enzymes involved in herbicide detoxification in cereal crops, as well as gaining a fundamental understanding of the mechanism of herbicide safeners for improving herbicide selectivity. Understanding detoxification mechanisms has great potential for increasing agricultural productivity by enhancing herbicide selectivity in crops and improving weed management systems in cereals.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
205	Plant Management Systems
206	Basic Plant Biology
213	Weeds Affecting Plants

**Outcome #13****1. Outcome Measures**

Improving Sweet Corn Genetics And Management

**2. Associated Institution Types**

- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Among vegetables, sweet corn [*Zea mays* L.] and broccoli [*Brassica oleracea* L. ssp. *italica*] are important sources of dietary carotenoids and tocopherols. Since medical evidence suggests that carotenoid and tocopherol health promoting activity acts in a dose dependent manner, conventional breeding to develop elite sweet corn and broccoli germplasm with enhanced levels of these phytochemicals will potentially promote health among the consuming public.

#### What has been done

This investigation includes the quantitative analysis of carotenoid and tocopherol content of 41 corn and 24 broccoli genotypes grown in multiple environments [years and seasons in one location] to partition the variation into genetic, environment, and genotype by environment interaction [GxE] components and measure the phenotypic stability of genotypes for these phytochemicals. The primary carotenoids and tocopherols in corn were lutein and gamma-tocopherol [65% and 73% of total carotenoid and tocopherol respectively] while beta-carotene and alpha-tocopherol were dominant in broccoli [65% and 79% of total carotenoid and tocopherol respectively]. Partitioning of the variance indicated that genetic differences among the genotypes averaged for the primary compounds in corn [lutein, zeaxanthin, and alpha- and gamma-tocopherol] and broccoli [beta-carotene, lutein, and alpha- and gamma-tocopherol] accounted for the largest proportion of the variation [67% and 55% of total phenotypic variation averaged across the phytochemicals in sweet corn and broccoli respectively]. Stability analysis identified several corn [IL451b sh2 and IL2027-8 sh2] and broccoli [Pirate and Baccus] genotypes with relatively high mean concentrations for the various carotenoids and tocopherols that were comparatively stable across seasons and years. The results of this investigation suggest that sweet corn and broccoli germplasm with substantially improved concentrations of carotenoids and tocopherols can be developed using conventional breeding protocols.

#### Results

The quantitative differences in carotenoid and tocopherol content detected in this investigation may reflect allelic variation of gene loci regulating the biosynthesis of these compounds. The results also suggest that currently available commercial and public germplasm can be utilized in breeding programs to develop new sweet corn and broccoli germplasm with elevated carotenoid and tocopherol content. Stability differences detected among genotypes tested in this study emphasize the need to survey over multiple environments. In conclusion, our results support the feasibility of conventional breeding to increase both carotenoid and tocopherol content in corn and broccoli. Extrapolation of the results obtained in this study to other corn and broccoli genotypes and growing environments is constrained by the fact that this investigation was conducted in a single location over multiple years.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
206	Basic Plant Biology

**Outcome #14****1. Outcome Measures**

More Informed Use Of Pesticides

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	835

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

The demand for good horticultural information for homeowners frequently outstrips the supply.

**What has been done**

Master Gardener multi-county training sessions and online training was completed by 562 new volunteers.

**Results**

The North Central Consumer Horticulture Working Group developed and distributed a 14 question survey to determine North Central States Extension Master Gardener's [MG] knowledge and use of Integrated Pest Management [IPM]. The online survey was completed by a total of 3,852 MGs with 623 [16%] from Illinois which represents 18% of the 3,400 active Illinois volunteers. A non-probability sampling approach was employed to gather data. Results of selected practices most often used include: [1] 543 [87.2%] choose plant varieties that are pest resistant; [2] 551 [88.6%] remove poorly adapted, exotic, or invasive plants from the yard; [3] 584 [93.8%] keep plants stress free by providing optimal growing conditions and maintenance; [4] 603 [96.9%] routinely inspect plants for insect pests or diseases; [5] 569 [91.5%] mulch plants with organic or synthetic materials; and [6] 514 [82.6%] read and follow all instructions on pesticide labels. Note: A similar survey conducted in 2007 in Illinois revealed a slightly higher percentage with respect to Item [1] and a nearly identical percentage for Item [6]. The recent North Central survey results revealed that the two practices least likely to be used were keeping records of pests and management practices used [only 25.2%] and using row-covers to block pests [24.8%].

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

**Outcome #15****1. Outcome Measures**

Increased Knowledge of Exotic Plant Pests

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	158

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

On June 6, 2006 the Emerald Ash Borer's [EAB] presence in Illinois was confirmed and since then its presence has been discovered in many northeastern counties. EAB can devastate the ash canopy in communities and significantly impact a municipality's budget with tree removal, stump grinding, restoration, replanting, staff, and equipment costs. The potential loss of the estimated 13 million Illinois ash trees [with an estimated value of \$9.1 million just to remove and replace], mostly located in urban areas, also can affect climate changes since they like other trees are able to sequester large quantities of carbon from the atmosphere into their biomass. The Emerald Ash Borer multi-state website [www.emeraldashborer.info](http://www.emeraldashborer.info) indicates that those suspecting EAB in ash trees should contact a local Illinois county Extension office to confirm an infestation.

**What has been done**

In the summer of 2009, six Emerald Ash Borer Awareness and First Detector trainings were offered in areas near major land and travel routes and near recreation areas. The agenda focused on EAB biology and management options including recommended ash replacement alternatives, quarantine and trapping, community action plans, using Extension's Diagnostics through Distance Digital Imaging system, and a tree injection demonstration. A total of 158 individuals including Extension Master Gardeners and Master Naturalists volunteers representing 34 Illinois counties and three out-of state counties received packets containing educational brochures and EAB samples. Counties represented received a portable poster display as well as multiple copies of various brochures and educational tools to distribute at local events. In addition first detector training was offered and all participants were certified. Additional programs are currently being conducted and more are planned for the future. An EAB website is in the developmental stage and will be posted on Extension's IPM website.

**Results**

A pre-and post-evaluation tool was administered at each training site to determine knowledge gained. Using the Turning Point system, responses indicated that on average knowledge increased by 87%.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants

## **V(H). Planned Program (External Factors)**

### **External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

### **Brief Explanation**

## **V(I). Planned Program (Evaluation Studies and Data Collection)**

### 1. Evaluation Studies Planned

### **Evaluation Results**

### **Key Items of Evaluation**

**V(A). Planned Program (Summary)**

**Program # 2**

**1. Name of the Planned Program**

Community Resource Planning and Development

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
608	Community Resource Planning and Development	80%		60%	
802	Human Development and Family Well-Being	5%		10%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	5%		10%	
805	Community Institutions, Health, and Social Services	5%		10%	
806	Youth Development	5%		10%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	65.0	0.0	3.5	0.0
Actual	16.4	0.0	1.9	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
945673	0	77444	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
751743	0	77444	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
5425140	0	368980	0

**V(D). Planned Program (Activity)**

1. Brief description of the Activity

Activities under the sub-goal "Researchers are studying community activism, mobilization and leadership in rural

communities to assist in developing strong institutions that will foster revitalization of rural life" included the impact high food prices and the ongoing recession have had on Latina/o immigrants in central Illinois [these problems have not resulted in large numbers of immigrants returning to their home countries, but many migrants have been forced to reduce their remittances but have avoided deep cuts by using whatever savings they have]; research designed to identify and confirm current issues by social movement organizations; and the synthesizing of findings from multiple research efforts on community response to ecosystem disturbance to enable generalized summaries with implications for policy and management initiatives.

Activities under the sub-goal "Researchers are studying teaching and learning in agricultural education programs in order to improve science education instruction" include work designed to improve our understanding of forest landowners and watershed partnership members interpretations of ecosystem services, management objectives, and risk perceptions.

Extension activities include a wide variety of methods and focus on community planning and design, organizational development, economic development/sustainable communities, leadership development and education, local governance & public policy, agricultural entrepreneurship, small business/entrepreneurial education and assistance, recreation and tourism development, and diversity.

**Illinois Resources Net [IRN]** is a funding access initiative providing Illinois nonprofits and local governments with the competitive assets to access federal funding. IRN offers organizations a unique approach to grant access centered on providing information and resources on an interactive website and working with experienced technical assistants to develop quality funding proposals. In partnership with University of Illinois at Chicago and the Great Cities Institute, eight University of Illinois Extension staff members [employed through the University of Illinois at Urban-Champaign] provide technical assistance to nonprofits and local governments.

The **Certified County Officials program** is a joint endeavor between University of Illinois Extension and the Illinois Association of County Board Members and Commissioners. Since its inception in 2006, 440 county officials have registered for classes. An orientation for newly elected officials and financial symposiums for county treasurers are examples of some of the courses offered each year; others are designed to address current issues.

**Community Assessment and Development Services [CADS]** and **Community Matters** are programs that aim to enhance the ability of communities and organizations to make decisions using current, reliable, and relevant data and citizen engagement. CADS provides a statewide system of professionals trained in applied research methods which strengthens the University's outreach to businesses, organizations, and local governments. Examples of CADS programming components include: questionnaire design, surveys, focus groups, strategic planning, feasibility studies, asset mapping, and demographic profiles.

Extension was also involved this past year in disaster preparedness activities. Moisture meters from a loan pool allowed homeowners affected by the 2008 floods to determine when it was safe to replace drywall, thus reducing the chances of mold buildup and subsequent health issues. In addition, listening sessions with local officials, agricultural producers, business operators, homeowners and others assessed the 2008 flood response and discussed long-term recovery needs and activities including the need for hazard mitigation plans. Extension staff also facilitated the second multi-state Earthquake Emergency Preparedness conference held in July and attended by over 160 individuals.

Other Extension programs include Customer First Service is Key!, U-Facilitate, and Engaging Generations targeted for businesses and organizations, Going Solo [guiding aspiring entrepreneurs into the world of business ownership], Poverty Simulation [designed to help youth and/or adult participants understand what it might be like to live in a typical low-income family trying to survive month-to-month], and Tomorrow's Leaders high school curriculum [designed to develop citizens who care about and contribute to their communities].

## **2. Brief description of the target audience**

The target audience includes financial/economic/consumer educators, Latinas/os, Extension educators [field based], community leaders interested in building local food systems, farmers growing or interested in growing food for local consumption, institutional food buyers [restaurants, schools, governmental agencies, hospitals, nursing homes], food entrepreneurs, private forest landowners, watershed partnerships, academic audiences for empirical and theoretical findings, community leaders, business leaders, agencies and organizations, local government officials involved in community and economic development, youth, and residents interested in starting small businesses.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

<b>2009</b>	<b>Direct Contacts Adults</b>	<b>Indirect Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Indirect Contacts Youth</b>
<b>Plan</b>	25000	40000	500	0
<b>Actual</b>	25653	34714	21505	0

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

Year: 2009

Plan: 0

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

<b>2009</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>	1	10	
<b>Actual</b>	0	6	6

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number Of Completed Hatch Research Projects

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	1	2

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Number Of Individuals Who Worked On/Gave Leadership To Specific Community Issues
2	Community Leaders Who Used Information And Data In Making Decisions That Improved Local Communities Or Organizations
3	Percent Completion Of A Community's Plan/Goals [Number Reported Will Be The Number Of Communities Reporting Progress On Their Community Plan Along With The Percent Completion]
4	Dollar Value Of Grants And Resources Leveraged/Generated [Includes Gifts, Grants, Private Investments, Equipment, Workforce Training, Budget Allocations, Etc.]
5	Improving Local Understanding Of Ecosystem Processes And Services
6	Number Of Plans Developed/Adopted/Adjusted By Communities Through Citizen Engagement

**Outcome #1****1. Outcome Measures**

Number Of Individuals Who Worked On/Gave Leadership To Specific Community Issues

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	500	1413

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Communities face issues associated with housing, schools, health, economic and business development, and disasters. Through the statewide Extension survey of the public's educational interests, over 5,000 of the 9,400 respondents indicated an interest in learning more about preparing for or managing natural and man-made disasters including some 2,000 interested in disaster planning for communities. The Disaster Mitigation Act of 2000 [DM2K] requires that any jurisdiction applying for Federal Emergency Management Agency [FEMA] Disaster Mitigation Funding [i.e. buyout, elevation, relocation, etc.] be covered by a FEMA Approved Hazard Mitigation Plan. While this act had been in place for nearly eight years by the summer of 2008, many of the 25 counties devastated by the flooding of June 2008 were not in compliance. This situation existed for many reasons, including [1] lack of paid local employees to lead the process; [2] lack of local capacity to engage in participatory community planning activities; and [3] lack of local funding to engage contractors.

**What has been done**

Four counties that declared disasters [Mercer, Henderson, Hancock, and Pike] requested Illinois ResourceNet Technical Assistance in completing the Grant Application for FEMA Hazard Mitigation Planning Grants. In addition, these same four rural counties requested proposals from University of Illinois Extension Community Assessment and Development Services [CADS] to facilitate their planning process. These proposals, which partnered CADS Facilitators with the Illinois State Water Survey, were selected in each of the four counties. Funding was released by FEMA in July of 2009, at which time the planning processes began in Mercer, Henderson, and Hancock Counties. Pike County, with no pressing mitigation projects pending, chose to begin their process in January 2010. As of February 2010, the Henderson County Plan has been viewed at the public meeting for submission to FEMA, both Mercer and Hancock have their Public Meetings scheduled for March. Activities that were accomplished to get the plans to this point included the Natural Hazard Risk assessment, plan goals identified, focus groups and community meetings held, surveys completed, and jurisdictional projects identified.

**Results**

Through the CADS projects, participating communities in four counties that were not covered by Hazard Mitigation Plans will have access to FEMA Hazard Mitigation Funds. Additionally, members of the steering committees in each county have learned the components of participatory community planning, and have engaged citizens in the planning process--880 completed surveys, over 300 on steering committees, 120 through focus groups, and 113 [to date] in public meetings. Each jurisdiction that participated in the plans will have a list of projects to move forward. FEMA requires annual meetings to maintain the plans, and with Extension's

assistance, these plans will be monitored for progress on each project, ensuring the communities have the tools and resources to make the plans a living document.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
608	Community Resource Planning and Development
802	Human Development and Family Well-Being
805	Community Institutions, Health, and Social Services
806	Youth Development

**Outcome #2**

**1. Outcome Measures**

Community Leaders Who Used Information And Data In Making Decisions That Improved Local Communities Or Organizations

Not Reporting on this Outcome Measure

**Outcome #3**

**1. Outcome Measures**

Percent Completion Of A Community's Plan/Goals [Number Reported Will Be The Number Of Communities Reporting Progress On Their Community Plan Along With The Percent Completion]

Not Reporting on this Outcome Measure

**Outcome #4**

**1. Outcome Measures**

Dollar Value Of Grants And Resources Leveraged/Generated [Includes Gifts, Grants, Private Investments, Equipment, Workforce Training, Budget Allocations, Etc.]

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	100000	5000000

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Federal funding is available to address and support a variety of issues facing local communities. An analysis of federal funding accessed through grant applications revealed that Illinois has not been successful in securing federal funding, due to [1] lack of knowledge of how to find and apply for grants, [2] competition with other

organizations for funding, [3] lack of staffing resources, [4] lack of proposal writing skills, and [5] lack of knowledge about fundraising planning.

#### **What has been done**

Illinois Resource Net [IRN] is a two-year-old university-based project providing Illinois nonprofits and local governments with the competitive assets necessary to access federal funding. IRN offers organizations a unique approach to grant access that emphasizes collaborative relationships, providing information and resources on an interactive website, working with experienced technical assistants to develop quality proposals, and training that is tailored to the community and organization's learning needs.

This second year of the Illinois Resource Net [IRN] project has been focused much more intensively on delivering its services. During this year, new resource development tools have been provided to approximately 3,685 individuals and organizations. IRN provides information and notification of resources through an e-newsletter [850 subscribers], websites [11,000 visits with nearly 400,000 page views], 14 videos on its YouTube account and through SlideShare, Flickr, and Facebook. This year IRN offered more than 45 separate presentations, conferences, trainings, and outreach sessions in Chicago and across the state outside of the Chicago area.

#### **Results**

With IRN assistance, a total of 39 proposals for federal funding have been submitted. Slightly less than \$3 million in federal funds has been awarded this year in response to those proposals making the total for the two years at slightly over \$5 million with another \$25,180,141 still pending. In addition, \$47,540 has been awarded in state funding and another \$173,148 is still pending. Of the 74 proposals submitted with IRN assistance during the past two years, 70 exit interviews were completed by the technical assistance recipients. The vast majority of IRN users found the resources useful and believed the proposals they prepared were of a better quality than ones they prepared in the past.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
608	Community Resource Planning and Development
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

#### **Outcome #5**

##### **1. Outcome Measures**

Improving Local Understanding Of Ecosystem Processes And Services

##### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

##### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

##### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
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2009 {No Data Entered} 0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Community response to stress and change has been addressed by large-scale regional community assessments using broad indicators of community well-being. Recent studies point to an increasing appreciation of the importance of locally-defined indicators of community sustainability. Whether or not communities respond to change or threats to their well-being provides an indication of their resilience and affects the relationship between social and ecological systems in the face of stress and disturbance. More work is needed which empirically measures such resiliency in natural resource based communities across multiple regional, biophysical, and social contexts. Given the cost and complexity of large multi-state regional community assessments and the ungeneralizable nature of single community case studies, a need exists to assess community well-being at a landscape scale. Building on previous community assessment and community indicator research as well as local history, this project seeks to explore a manageable and informative scale for evaluating critical local and landscape issues in Southern Illinois using multiple methodologies. The purpose of the project is to develop priorities for action based on community and regional assessments and bring multiple stakeholders together to discuss opportunities for ensuring that the Dixon Springs Agricultural Center robustly serves the Southern Illinois region and local communities.

**What has been done**

Materials collected in previous years continue to be disseminated to stakeholders in the Southern Illinois region upon request and they are available on the ACES Office of Research website. An undergraduate student was supported by this project as a summer intern at the Dixon Springs Agricultural Center. During this internship, interviews were conducted with private forest landowners. In a water-focused research effort tied to this Southern Illinois assessment project, secondary data collection and analysis of water quality indicators, GIS data integration, and interviews with watershed partnership members were also conducted with support from this project and used to bridge funding until NSF funds were obtained for our watershed research. Findings from this ongoing project framed empirical evidence for the development of theory related to community and regional field development.

**Results**

A change in knowledge has occurred in terms of this project's influence on the understanding of forest landowner's and watershed partnership member's interpretations of ecosystem services, management objectives, and risk perceptions. Local understanding of ecosystem processes and services is more integrated than typically reflected in relevant literature. The synthesis of Southern Illinois agricultural producers' disaster and risk experiences and preparedness efforts obtained through this project has provided a framework for further comparative research in central Illinois. Findings relating forest landowner management objectives with their attitudes regarding climate change have important ramifications for climate change policy. The majority of forest landowners in Southern Illinois are reluctant to change their management strategies in light of climate change. Thus, policies should be worded carefully in order to promote common ground where landowner objectives and policy objectives can be reconciled. The same is true for watershed management efforts as well. This project continues to inform understanding of rural community and regional response and action to larger scale policies, ecosystem disturbances, and changes.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services

**Outcome #6****1. Outcome Measures**

Number Of Plans Developed/Adopted/Adjusted By Communities Through Citizen Engagement

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	3

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Communities face issues associated with housing, schools, health, economic and business development, and disasters. Through the statewide Extension survey of the public's educational interests, over 5,000 of the 9,400 respondents indicated an interest in learning more about preparing for or managing natural and man-made disasters including some 2,000 interested in disaster planning for communities. The Disaster Mitigation Act of 2000 [DM2K] requires that any jurisdiction applying for Federal Emergency Management Agency [FEMA] Disaster Mitigation Funding [i.e. buyout, elevation, relocation, etc.] be covered by a FEMA Approved Hazard Mitigation Plan. While this act had been in place for nearly eight years by the summer of 2008, many of the 25 counties devastated by the flooding of June 2008 were not in compliance. This situation existed for many reasons, including [1] lack of paid local employees to lead the process; [2] lack of local capacity to engage in participatory community planning activities; and [3] lack of local funding to engage contractors.

**What has been done**

Four counties that declared disasters [Mercer, Henderson, Hancock, and Pike] requested Illinois Resource Net Technical Assistance in completing the Grant Application for FEMA Hazard Mitigation Planning Grants. In addition, these same four rural counties requested proposals from University of Illinois Extension Community Assessment and Development Services [CADS] to facilitate their planning process. These proposals, which partnered CADS Facilitators with the Illinois State Water Survey, were selected in each of the four counties. Funding was released by FEMA in July of 2009, at which time the planning processes began in Mercer, Henderson, and Hancock Counties. Pike County, with no pressing mitigation projects pending, chose to begin their process in January 2010. As of February 2010, the Henderson County Plan has been viewed at the public meeting for submission to FEMA, both Mercer and Hancock have their Public Meetings scheduled for March. Activities that were accomplished to get the plans to this point included the Natural Hazard Risk assessment, plan goals identified, focus groups and community meetings held, surveys completed, and jurisdictional projects identified.

**Results**

Through the CADS projects, participating communities in four counties that were not covered by Hazard Mitigation Plans will have access to FEMA Hazard Mitigation Funds. Additionally, members of the steering committees in each county have learned the components of participatory community planning, and have engaged citizens in the planning process--880 completed surveys, over 300 on steering committees, 120 through focus groups, and 113 [to date] in public meetings. Each jurisdiction that participated in the plans will have a list of projects to move forward. FEMA requires annual meetings to maintain the plans, and with Extension's

assistance, these plans will be monitored for progress on each project, ensuring the communities have the tools and resources to make the plans a living document

#### 4. Associated Knowledge Areas

<b>KA Code</b>	<b>Knowledge Area</b>
608	Community Resource Planning and Development
802	Human Development and Family Well-Being
805	Community Institutions, Health, and Social Services
806	Youth Development

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Public Policy changes
- Government Regulations
- Competing Public priorities

##### Brief Explanation

#### V(I). Planned Program (Evaluation Studies and Data Collection)

##### 1. Evaluation Studies Planned

##### Evaluation Results

##### Key Items of Evaluation

**V(A). Planned Program (Summary)****Program # 3****1. Name of the Planned Program**

Animal Health and Production

**V(B). Program Knowledge Area(s)**

## 1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals	15%		15%	
302	Nutrient Utilization in Animals	15%		15%	
303	Genetic Improvement of Animals	0%		15%	
305	Animal Physiological Processes	0%		15%	
307	Animal Management Systems	30%		10%	
311	Animal Diseases	0%		15%	
315	Animal Welfare/Well-Being and Protection	0%		10%	
806	Youth Development	40%		5%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

## 1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	16.0	0.0	25.0	0.0
Actual	13.1	0.0	29.3	0.0

## 2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
749619	0	1036572	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
595894	0	1036572	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
4300416	0	13576164	0

**V(D). Planned Program (Activity)**

## 1. Brief description of the Activity

Activities under the sub-goal "To develop management practices that enhance efficiency of production by food-producing

animals" included outcomes that help define best practices for dry period management of dairy cows to decrease incidence of health problems around calving; a study of beef cattle grazing systems that improves production and profitability while minimizing risk and environmental impacts; and continued distribution of the Illinois Manure Management Plan Workbook and website [to help producers meet compliance guidelines with existing and new water quality regulations].

Activities under the sub-goal "To develop nutritional and management practices that optimize health of domestic animals" included a finding that DDGS or insoluble fiber does not prevent enteric disease but only shortens the duration of the disease; research that increased our understanding of a key neural pathway involved in initiating feeding and provided novel information necessary to develop new strategies to regulate food intake in domestic animals; research that demonstrated the potential impact of inflammation-induced hormone resistance on muscle growth and development; and ongoing studies focused on developing clinically-feasible strategies to use synovial progenitor populations for the treatment of equine arthritic conditions.

Activities under the sub-goal "To develop management practices that enhance animal well-being and minimize impacts of animal production on the environment" included a study designed to evaluate if limit feeding varying levels of DDGS with corn, wheat middlings, and soybean hulls in molt diets would result in a total cessation of egg production during the molt period and provide for acceptable postmolt performance in a nonfeed withdrawal molt program for laying hens; a study that was conducted to determine if it is beneficial to use concentrated yeast culture and oligosaccharides in dairy calf diets; and a study conducted to determine the reliability of using body core temperature as an indicator of pig well-being in response to various stressors including LPS, social stress [mixing], and thermal stress [cold].

Activities under the sub-goal "To improve methods for diagnosis, prevention and treatment of infectious diseases in food animals" included the use of the porcine alveolar macrophage cell line ZMAC to isolate PRRS virus from field samples [this will enable us to better understand this virus and to develop methods to control its spread]; a project designed to evaluate the safety and efficacy of a triple deletion mutant modified live vaccine [MLV] candidate against equine strangles; and data and methods developed to interpret diagnostic and experimentally-derived PRRSV sequence data with greater insight into its likely derivation and importance [improvement of PRRSV control methods and strategies through development of better vaccines is an anticipated outcome of this project].

Activities in the area of Animal Genomics under the sub-goal "To develop and utilize tools of genomic biology for study of influence of management practices on expression of genes important to animal production and health" included a comprehensive study of the representation and expression of neuropeptide genes in chickens; a study of gene expression differences that are elucidating our knowledge of the control of oocyte competence and leading to new perspectives on how oocyte quality may be controlled and manipulated in vitro; a study of gene expression profiles in livestock species that offers critical information on potential targets for genetic selection and treatment with the goal of improving health, development, and production; the development of data that suggest three co-dominant bacterial phyla in the canine hindgut and findings that a relatively small amount of dietary fiber changed the structure of the gut microbiome detectably [our data are among the first to characterize the healthy canine gut microbiome using pyrosequencing and provide a basis for studies focused on devising dietary interventions for microbiome-associated diseases]; and genome-enabled analysis of carbon and nitrogen metabolism in *Prevotella ruminicola* to enhance rumen function.

Conferences and presentations related to Animal Health included the Society for the Study of Reproduction, Gordon Conference on Fertilization and Activation of Development, American Society for Cell Biology, Joint Annual Meeting of the American Dairy Science Association and the American Society of Animal Science, 7th Transgenic Animal Conference, Second Australian Equine Science Symposium, Experimental Biology 2009, Digestive Diseases Week, Annual Meeting of the Orthopedic Research Society, 2009 World Conference on Regenerative Medicine, and the American Association of Avian Pathologists/American Veterinary Medical Association.

Conferences and presentations related to Animal Genomics were made to the Society for Neuroscience annual meeting, the 35th International Embryo Transfer Society annual meeting, the 42nd annual meeting of the Society for the Study of Reproduction [this abstract was selected for the Lalor Foundation Merit Travel Award], the American Society of Reproductive Medicine, and the American College of Veterinary Medicine Internal Medicine Forum.

The use of technology is a growing delivery system for Extension programs addressing animal production and health. The Illinois Livestock Trail website is the key source for a wealth of information related to livestock production and manure management. MarketMaker, an interactive web-based multi-state market system developed by the University of Illinois that locates businesses and markets for agricultural products, has expanded geographically with over half the states in the nation considering a formal partnership in developing the network. The data currently encompasses 350,000 profiles of farmers and other food-related enterprises in Illinois, Iowa, Georgia, Mississippi, Nebraska, Kentucky, Michigan, Indiana, Ohio, and New York that can be queried by users [See Global Food Security and Hunger Planned Program]. Illinois Horse Breeders Short Course, Swine Reproductive Programming for Spanish Speaking Employees, Illinois Dairy Days, and Pet Extravaganza are examples of programs delivered by Extension staff to audiences at campus and off-campus sites. In addition, 1305 Illinois 4-H and FFA members completed the seven modules of the online Quality Assurance and Ethics Certification training and quiz for 2009 for beef, dairy, goats, horses, sheep and swine covering topics related to care and administration of medicine for livestock. This year's annual report will focus on livestock grazing programs.

## 2. Brief description of the target audience

The target audience includes beef producers, animal scientists, Extension field staff and educators, veterinarians and equine researchers, practicing nutritionists and other feed industry personnel, biomedical and veterinary scientists concerned with gut health, stem cell and regenerative biology researchers, the commercial poultry industry, diagnostic laboratories, researchers doing molecular biology work [genomic or proteomic], groups working on the genetic improvement of cattle and chicken, scientists in the field of reproductive physiology and clinical reproductive endocrinologists that treat human infertility, and researchers working on understanding the basic molecular biology of livestock. Extension targets livestock producers, custom manure haulers, regulatory agency representatives, livestock commodity group representatives, horse owners and breeders, the livestock feed industry, companion animal owners, community leaders, and youth.

### V(E). Planned Program (Outputs)

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	50000	25000	28000	0
<b>Actual</b>	42867	37104	29533	0

#### 2. Number of Patent Applications Submitted (Standard Research Output)

##### Patent Applications Submitted

Year: 2009  
Plan: 0  
Actual: 2

##### Patents listed

Two patent applications were submitted related to improving nutritional quality of soybean meal and for facilitating the internalization of a therapeutic agent into a cell.

#### 3. Publications (Standard General Output Measure)

##### Number of Peer Reviewed Publications

2009	Extension	Research	Total
<b>Plan</b>	1	70	
<b>Actual</b>	1	58	59

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number Of Completed Hatch Research Projects

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	12	13

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

<b>O. No.</b>	<b>OUTCOME NAME</b>
1	Percent Of Sequence In A 3x Coverage Of The Porcine Genome And Deposit It In A Public Database
2	Youth Passing A Livestock Ethics Knowledge Quiz After Participating In Extension Training
3	Increased The Grazing Rotational Rate Based On Forage Height
4	Utilization Of Waste Management Tools Such As The Illinois Manure Management Plan Workbook And Website
5	A Comprehensive Study Of The Representation And Expression Of Neuropeptide Genes In Chicken
6	Determining The Amount Of Energy Needed To Optimize The Performance Of Dairy Cattle
7	Understanding The Impact Of Alternative Technologies On The Total Beef System
8	Understanding The Fundamental Processes That Control The Transport Of Antibiotic Residues From Swine Waste To Surface Water

**Outcome #1****1. Outcome Measures**

Percent Of Sequence In A 3x Coverage Of The Porcine Genome And Deposit It In A Public Database

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	15	15

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

The genome of the pig [*Sus scrofa*] comprises 18 autosomes, with X and Y sex chromosomes. The genome size is similar to that of a human and is estimated at 2.7Gb. There is extensive conserved homology with the human genome. The pig is a member of the artiodactyls, [cloven-hoofed mammal], which are an evolutionary clade distinct from primates and rodents. It is an important model for human health and particularly for understanding complex traits such as obesity and cardiovascular disease. The funding for the clone-based sequencing project at the Wellcome Trust Sanger Institute runs to 2010. In the time remaining we anticipate further refinement to the fingerprint map and sequence coverage of >90% of the genome.

**What has been done**

The sequencing of the porcine genome at the Wellcome Trust Sanger Institute in Hinxton, UK is close to its initial goal of finalizing a 4x improved quality genome sequence of the porcine genome. The sequencing effort is based on a CHORI-242 BAC minimal tiling path and directed improvement will provide an equivalent quality of 6X genomic coverage. Genome sequence data have been assembled and annotated using automated tools and published through the Ensembl genome browser [currently the *Sscrofa9* genome build is available at: [http://www.ensembl.org/Sus\\_scrofa/Info/Index](http://www.ensembl.org/Sus_scrofa/Info/Index)].

**Results**

This team has remained committed to creating a program that supports the rapid deployment of the information and how to use the generated sequence information. As of early 2010 a total of 16,974 clones have been selected for sequencing and sent to the pipeline. This covers about 98.29% of the physical map. Improved sequence from 91% [120 Mb of this is of finished quality] of the genome is available to the public on the Sanger website [[http://www.sanger.ac.uk/Projects/S\\_scrofa/](http://www.sanger.ac.uk/Projects/S_scrofa/)]. The Sanger Institute organized and hosted the Pig Genome III Conference November 2-4, 2009 to bring together researchers from the pig community to celebrate the completion of sequencing. This meeting provided an essential opportunity to convene the broader pig genomics community as well as end-users to ensure rapid and full deployment of the sequence information. Future work is scheduled to improve the sequence to gold standard quality which means that 99.9% coverage with only one error in 100kbp. Work will continue on the X and Y chromosomes.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
303	Genetic Improvement of Animals

## Outcome #2

### 1. Outcome Measures

Youth Passing A Livestock Ethics Knowledge Quiz After Participating In Extension Training

### 2. Associated Institution Types

- 1862 Extension

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1000	1305

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Humane care of animals helps develop youth social and emotional skills.

#### What has been done

Training is provided to 4-H youth enrolled in livestock projects via an online module on ethical treatment of animals that also includes an examination to certify that they have the required knowledge. In addition, face-to-face training is offered in some locations that combines ethics and actual livestock production basics.

#### Results

Online module training records indicate that 1305 youth were successfully certified.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection
806	Youth Development

## Outcome #3

### 1. Outcome Measures

Increased The Grazing Rotational Rate Based On Forage Height

### 2. Associated Institution Types

- 1862 Extension

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	200	32

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Livestock producers face management challenges, including grazing management, in achieving a profitable enterprise.

#### What has been done

Since 2006 alfalfa workshops have been conducted annually via distance delivery [webinar format]. Promotional materials [news releases and flyers] were provided to participating Extension offices three months prior to the workshop. Just prior to the workshop, an agenda, evaluation, Certified Crop Advisor sign-in form, and CD of the presentations were mailed to the local Extension sites. During the past four year period, 22 to 36 offices have hosted 424 participants and featured a variety of topics addressed by speakers from different universities and industries. This past year 69 participated in the workshop that included information on leafhoppers and weevils, forages as a biomass crop, fertilizing alfalfa, producing alfalfa in times of high corn prices, as well as an introductory overview of Illinois alfalfa.

#### Results

Evaluations distributed at the end of the workshop for the past four years and collected from 82% of the participants indicated that 97% will use knowledge gained to make more informed management decisions. Of this past year's participants, 32 of the 69 listed techniques learned from the program that they plan to implement including: following recommended fertilization application rates to reduce production costs [14], adjusting the number and times of cuttings [8], insect control based on recommended economic thresholds [5], adding more alfalfa to their crop rotation [4], and harvest equipment adjustments [1].

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems

## Outcome #4

### 1. Outcome Measures

Utilization Of Waste Management Tools Such As The Illinois Manure Management Plan Workbook And Website

### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

### 3a. Outcome Type:

Change in Action Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	26

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

This project studies improvements of livestock waste management and emissions control in two contexts, specific technologies and the overall impact of livestock production on the surroundings.

#### What has been done

The Illinois Manure Management Plan website [www.immp.uiuc.edu] was further developed and training sessions were held to encourage producers and consultants to implement the IMMP planning and recordkeeping tools. IMMP is one of several products available, but is the only one that purposely combines Illinois-specific requirements and information for livestock production. It is supplied free of charge to users. Approximately 1,000 Illinois livestock producers now have access to a reporting and recordkeeping tool, the Illinois Manure Management Plan Workbook and website, which can help producers meet compliance guidelines with existing and new water quality regulations. The IMMP tools are useful to Illinois livestock facilities of all sizes. We conducted on-farm interviews of a few users in 2009 to learn how IMMP was being adopted and how we could improve the tools. Users indicated that IMMP vastly improved ease of recordkeeping and information retrieval, as well as helping to plan the rates and timing of manure on cropland. During the 2008-2009 workshop series "Certified Livestock Manager Training", we used anonymous polling at 13 workshops around the state to get answers to the question "My manure plan is: [1] in my head [13%]; [2] a work in progress [22%]; [3] written, but not updated regularly [27%]; or [4] written, updated annually and constantly used [39%]." The last choice is the desirable situation. Attendance at the CLM training series every three years is required by Illinois state law for producers having large facilities, and in 2009 we had 587 producers and consultants participating. The results of the poll indicate that progress is being made in the area of manure management planning, but there is much work to be done; IMMP is one example of tools that producers have available to help them.

#### Results

Web usage data of limited detail are available to IMMP site administrators. Of the large pool of producers who have access to the IMMP planning tool, we have seen an average of 106 new plans created per year, where "new plan created" means that some amount of data has been added to a new plan. In 2009, there were 26 producers or consultants who made considerable use of the IMMP tools. If we estimate that each facility using IMMP manages 1,000 animal units [animal units are a standardized measurement based roughly on animal body weight; we estimate that there are around 400-500 dairy, swine, beef, and poultry farms in Illinois that are 1,000 animal units or more], this implies that in 2009 there were approximately 26,000 animal units in Illinois benefiting from IMMP's features. Utilization included more accurate quantification of manure generation at the facility, better recordkeeping on lab testing of manure and soil samples, improved planning of land application of manure, and better overall planning of manure management in order to improve environmental quality and regulatory compliance.

In 2010 we plan to advertise IMMP and hold a series of training workshops around the state to assist producers and consultants in adopting IMMP as a manure management planning tool. We will continue to interview users in order to get information on how to expand the user base and improve the application.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection

#### Outcome #5

##### 1. Outcome Measures

A Comprehensive Study Of The Representation And Expression Of Neuropeptide Genes In Chicken

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

The role of neuropeptides on reproduction, development, growth, and health has been widely recognized. However, a comprehensive study of the representation and expression of neuropeptide genes in chicken has never been undertaken until now.

###### What has been done

Our complete survey and characterization facilitates understanding of neuropeptide genes in the chicken, an animal of importance to biomedical and agricultural research. The integration of multiple bioinformatic resources allowed us to uncover evidence supporting five new neuropeptide genes, in addition to the 62 previously reported in the chicken genome.

###### Results

The most remarkable finding was that for most of the missing genes, another gene in the same neuropeptide family has been identified in the chicken genome. This finding suggests that neuropeptide genes have undergone less duplication, more gene loss, or both processes in the chicken than in human. The high correct prediction of cleavage and non-cleavage sites in prohormones obtained with a model trained in human sequences indicates that the processing of prohormones into neuropeptides does not differ substantially between chicken and human.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
305	Animal Physiological Processes

**Outcome #6****1. Outcome Measures**

Determining The Amount Of Energy Needed To Optimize The Performance Of Dairy Cattle

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Additional information is needed to determine the amount of protein, amino acids, and energy that are needed to optimize performance of dairy cattle. Feeding, digestibility, and metabolism trials will be conducted to determine the combination of feedstuffs that should be fed to lactating dairy cows to optimize the production of milk and milk components while maintaining cow health.

**What has been done**

We continued our research efforts to determine the effects of energy intake during the dry period on adaptations to lactation. Three experiments were completed during this reporting period. In the first, we measured mRNA abundance for specific metabolic enzymes and mediators of inflammatory processes in subcutaneous adipose tissue. Samples were obtained from cows that were fed slightly under their requirements, at requirements, or over their requirements for energy. The second experiment compared a conventional two-stage dry cow dietary program with a single-group. This involved three groups of cows during the last 50 days before expected calving and then through the first 9 weeks of lactation. The final experiment measured changes in internal adipose tissue mass in non-lactating cows either fed to requirements or overfed. Results of these experiments have been disseminated through presentations at the annual meeting of the American Dairy Science Association, through numerous presentations at nutrition and dairy conferences, and through the extension publication Illinois Dairy Report.

**Results**

In the first study, we determined that adipose tissue from cows that are allowed to consume more energy than they require during the dry period has marked changes in expression of numerous genes involved in lipid metabolism. In contrast, adipose tissue from cows fed to their requirements had much fewer changes in gene expression as cows moved through the transition from pregnancy to lactation. We believe that the large changes in the overfed cows are detrimental to metabolic adaptations to lactation and may be a contributing factor to increased incidence of metabolic disorders around calving. In the second study, cows allowed to consume more energy than required for the entire dry period or just the last 3 weeks before parturition had more fat accumulation in the liver and higher ketone body concentrations in blood than cows that were fed to their requirements. There was no benefit to providing a higher-nutrient-density "close-up" ration during the last 3 weeks prior to calving. Finally, we determined that cows overfed during an 8-week dry period have much greater masses of internal adipose tissues [mesenteric, omental, and perirenal] than cows fed closer to their requirements. Because some of these internal adipose depots drain directly to the liver, this enlargement of adipose mass may flood the liver with

fatty acids around calving, and also contribute to inflammatory responses similar to those seen in obesity and metabolic syndrome in humans. These outcomes help define best practices for dry period management of dairy cows to decrease incidence of health problems around calving. Our outcomes indicate that cows should be fed high-bulk rations during the dry period to control intake to requirements without either underfeeding or overfeeding.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
305	Animal Physiological Processes

### Outcome #7

#### 1. Outcome Measures

Understanding The Impact Of Alternative Technologies On The Total Beef System

#### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

#### 3a. Outcome Type:

Change in Knowledge Outcome Measure

#### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

#### 3c. Qualitative Outcome or Impact Statement

##### Issue (Who cares and Why)

There are several alternative technologies available that can increase cattle performance or reduce input costs of forage-based beef production systems. How these technologies affect other aspects of the total beef system [eg. animal performance, fertilizer needs, water quality, purchased feed, grazing time, amount of harvested feed, equipment needs], however, is not completely understood.

##### What has been done

We studied year-round beef production systems for cow/calf producers. Detailed records were kept so that economic analyses of the systems can be conducted. We studied cattle grazed crop residues and deferred pasture when possible in the winter to reduce input costs for harvested and supplemental feedstuffs. Crossbred cows and their calves with similar genetic potential were utilized in these systems. Animals were assigned randomly to each system and each system was replicated each year. It was necessary to evaluate the systems during several years to account for year to year variation. The relative economic value of each of the grazing systems was determined by calculating revenue and costs associated with each system. Only costs that vary due to differences in the systems were considered. These costs included fertilizer, legume seeding, supplemental feed supplies, hay harvest costs for excess pasture growth, and any other practice associated with the different management practices among the grazing units. The economic analysis showed that grazing cornstalks was the most effective method of reducing winter feeding costs, and that legume inclusion in pastures was the most effective way to increase pasture productivity, reduce fertilizer usage, and reduce summer grazing costs.

**Results**

This research, financial and economic information developed by evaluating year around grazing systems will provide information that can be used to: [1] help producers improve production efficiency while lowering production cost; [2] serve as a key to beef industry educators in deciding what production and management areas are a concern and where educational programs can be developed to help producers; and [3] help producers set realistic goals. This information can be used to compare these systems to others throughout the country.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems

**Outcome #8****1. Outcome Measures**

Understanding The Fundamental Processes That Control The Transport Of Antibiotic Residues From Swine Waste To Surface Water

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Our research is aimed at understanding the fundamental processes that control the origin, fate, and transport of antibiotic residues and antibiotic resistance genes from swine waste into surface water, soil after land application of manure, and underlying groundwater. This will impact the siting of Confined Animal Feeding Operations [CAFO's] and the disposal of animal wastes by land application based on their resistance gene diversity and load and their impact on water quality. Issues of animal waste treatment and water quality control must be addressed in ways that minimize the risk of chemical and microbiological contamination in the environment. The nation's water resources are fundamental to the productivity and health of crop, range, and forested lands and our future is dependent on a reliable and sustainable supply of fresh unpolluted water.

**What has been done**

Based on the findings of this study, we envision multiple sources and interactions of antibiotic resistance genes in the environment. It is likely that both contaminated and uncontaminated environments each have a unique indigenous resistance gene pool, and that a part of this diverse gene pool could be shared within the immediate surrounding environment. The extent of contamination from CAFO's would likely depend on the level and type of antibiotics used and the transport and flow of these genes between pools in the environment. In this concept, gene sequences shared between animal waste and the impacted environment are considered as the candidate[s] for the disseminative agent of antibiotic resistant determinants from CAFO's into the surrounding environment. In

conclusion, animal waste seeping from unlined lagoons at two swine confinement facilities had an impact on the dissemination of tetracycline resistance genes into groundwater underlying the facility. Thus, these types of facilities can be a reservoir of antibiotic resistance genes. However, the magnitude and extent of antibiotic resistance gene migration resulting from lagoon seepage will likely depend on local hydro-geological conditions.

### Results

These results highlight the difficulty of establishing proper "negative controls" for environmental antibiotic resistance work, and, more importantly, they point to the existence of a "native" antibiotic resistance gene pool within the environmental microbiota. However, the spatial and temporal patterns of antibiotic resistance genes at these three sites suggests that exposure to swine waste is an important factor in the spread of antibiotic resistance. Different genes have differential abilities to persist in soils and waters, which suggests that a "gene ecology" perspective, which includes the recognition that genes may differ in their capacity to find new hosts via horizontal gene transfer, will be important for assessing the impact of agricultural activities on antibiotic resistance.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

### V(H). Planned Program (External Factors)

#### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Government Regulations
- Competing Programmatic Challenges

#### Brief Explanation

### V(I). Planned Program (Evaluation Studies and Data Collection)

#### 1. Evaluation Studies Planned

#### Evaluation Results

#### Key Items of Evaluation

**V(A). Planned Program (Summary)****Program # 4****1. Name of the Planned Program**

Natural Resources and the Environment

**V(B). Program Knowledge Area(s)**

## 1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	30%		30%	
112	Watershed Protection and Management	35%		25%	
123	Management and Sustainability of Forest Resources	15%		15%	
133	Pollution Prevention and Mitigation	0%		10%	
405	Drainage and Irrigation Systems and Facilities	0%		10%	
605	Natural Resource and Environmental Economics	0%		5%	
806	Youth Development	20%		5%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

## 1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	12.4	0.0	16.0	0.0
Actual	9.5	0.0	11.8	0.0

## 2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
542032	0	588178	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
430877	0	588178	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
3109531	0	3164249	0

**V(D). Planned Program (Activity)**

## 1. Brief description of the Activity

Activities under the sub-goal "Ensuring environmental friendliness and resource utilization efficiency" included a study evaluating watershed-scale water quality models for TMDL Planning [specifically, the components being examined are tile flow,

direct runoff, and base flow]; the development of performance curves for subsurface bioreactors as part of the development of a Practice Standard; the development of new analytical methods for simultaneous detection of multiple target pharmaceuticals and pesticides via high performance liquid chromatography coupled with continuous liquid scintillation counting [these methods reduce the cost and analytical effort associated with bench-scale treatability studies using natural waters spiked with pharmaceuticals and pesticides]; work designed to inform management activities on public lands and provide a basis for understanding the consequences of hemlock collapse on nutrient cycling [the results of this study will also help land managers to identify priority areas for mitigation efforts, to anticipate challenges to restoring ecosystem function across the region, and to educate the public about changes ensuing from the loss of foundation species]; and a project designed to determine if mussel community impairment is more or less common in Illinois streams associated with agricultural land use compared to urban, forested, and other land use types.

Activities under the sub-goal "Best utilizing insect management in agricultural cropping systems" included the development of a new model of European corn borer infesting transgenic insecticidal corn; development of quantitative and qualitative models to manage natural resources; completion of work on a comprehensive taxonomic revision of New World Erythroneurini and final versions of the interactive keys to all 520 valid species [the keys developed so far are the most comprehensive identification keys available for the two most diverse and agriculturally important groups of microleafhoppers]; and work toward discerning Japanese beetle abundance relationships between the accessible edge and difficult to examine interior of a field [this will give growers a new tool make better decisions about the value of a management action].

Activities under the sub-goal "Minimizing agricultural impacts on the environment" included a study of the effects of stressors associated with land use patterns on freshwater fish [and the implications for conservation]; work on stream sediments and phosphorus that showed that streams in Illinois are likely to recover quickly if inputs of phosphorus could be reduced; work that will inform management activities on public lands and provide a basis for the use of fire and grazing as conservation tools to improve habitat for grassland-dependent bird species; and research assessing the effects of land use change on microbial communities.

Conferences and presentations made in 2009 related to the Planned Program Natural Resources and the Environment included the 2009 Research Symposium of the American Water Works Association, Wisconsin Crop Management and Trade Show, International Soil and Water Conservation Meeting, Annual Meeting of the American Chemical Society, Annual Meeting of the Clay Minerals Society, French Academy of Science on Environmental Mineralogy, U.S. Geological Survey and the North American Pollinator Protection Campaign, Biodiversity Information Standards [TDWG] 2009 Conference, Illinois Soybean Association, Soil Science Society of America Annual Meeting, National Turfgrass Evaluation Program, International Turfgrass Research Conference, Illinois Turfgrass Exposition, American Society of Agronomy, 109th General Meeting of the American Society for Microbiology, 2009 Great Lakes Regional Biogeochemistry Conference, and the 94th Ecological Society of America Annual Meeting.

Extension activities encompassed a variety of delivery methods to provide education regarding soil and water management, forestry, and environmental stewardship. A description of some of these major areas of focus follows. Other natural resource related efforts are described in the Sustainable Energy and Climate Change Planned Programs.

The statewide Illinois Tillage Seminar was held in the center of the state where Illinois Extension staff, specialists from other in-state and out-of state universities, government officials, and a representative of a commodity group provided presentations that addressed various tillage topics. Soil and water workshops were conducted via webinar with 22 Extension offices hosting the participants. [See information in Climate Change Planned Program]. Other audio-conferences are provided periodically on timely topics such as pond management.

The majority of forestry-related education focuses on forest landowner education and outreach that extends beyond management to include urban forestry, forest product marketing and utilization, and carbon sequestration. Presentations, seminars, workshops and field days reached 3,474 individuals, while email, telephone calls, walk-ins, and Ask A Forester resulted in another 500+ contacts. In response to a severe ice storm, Extension partnered with the Illinois Forest Resource Center to host a five-day chainsaw safety course this past year in southern Illinois. Extension also helped plan and coordinate the annual Tri-State Forest Stewardship Conference, continued the Urban Timber Harvesting and Hardwood Lumber Utilization and Recovery workshop for arborists, and launched a new web site that serves as a location to market urban and community forest trees that need to be removed.

The Illinois Master Naturalist [ILMN] program completed a second year of statewide implementation drawing on internal grant funds for this pilot initiative. Participation this year more than tripled and expanded to five new locations where some 135 volunteers are now trained and engaging in a wide variety of projects as environmental stewards. ILMN continues to partner with a variety of statewide and local businesses, agencies, and organizations that share or support a natural resource education and stewardship ethic. Final chapters of a core training curriculum model are nearly complete. Evaluation tools and strategies have been developed and provided for improving local program delivery and impact. [Results will be included in future reports.] Issues of *The Illinois Steward* now contain pages specifically designed for ILMN continuing education. An internal website serves as a forum to allow the volunteers and Extension staff to communicate and exchange news. All materials have been branded including service mark protection and will be marketed to external agencies.

Extension activities also included six sustainable agriculture tours with 124 producer participants, an online student guide for individuals wishing to pass the licensing exam for installation and maintenance of private waste water treatments, leadership for planning the Governor's Biennial Conference on the Management of the Illinois River System, online courses for Certified Crop Advisers required continuing education units, and Stewardship Days conducted for youth.

## 2. Brief description of the target audience

The target audience includes watershed partners and citizens, professional organizations, government agencies, policy makers, forest preserve district land managers, environmental educators, Illinois homeowner associations, professional land managers, soil, clay, and environmental scientists engaged in agriculture, industry, and environmental remediation, plant diagnosticians and other professional insect identifiers who encounter unknown leafhoppers during their work, urban planners, businesses, farm bureau organizations, corn belt soybean and corn producers as well as Illinois homeowners who experience difficulty with periodic infestations of overwintering ladybird beetles and Japanese beetles of local origin, natural resource professionals, the Nature Conservancy, and researchers affiliated with the Patch-Burn Grazing Network. In addition, Extension targeted citizens interested in environmental stewardship, youth, and pond managers.

### V(E). Planned Program (Outputs)

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	9800	170	10000	0
<b>Actual</b>	35091	14917	29649	0

#### 2. Number of Patent Applications Submitted (Standard Research Output)

##### Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 0

### Patents listed

#### 3. Publications (Standard General Output Measure)

##### Number of Peer Reviewed Publications

2009	Extension	Research	Total
<b>Plan</b>	1	40	
<b>Actual</b>	0	40	40

### V(F). State Defined Outputs

#### Output Target

**Output #1**

**Output Measure**

- Number Of Completed Hatch Projects

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	7	8

**Output #2**

**Output Measure**

- Continuing Education Units Awarded To Certified Crop Advisers Who Complete Online Natural Resource Management Courses  
Not reporting on this Output for this Annual Report

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

<b>O. No.</b>	<b>OUTCOME NAME</b>
1	Number Of Drainage Water Management System Acres
2	Reduction Of Nitrate Levels In Lake Bloomington, Illinois, A Largely Agricultural Watershed [Assuming A 100% Baseline For 2008]
3	Application Of Reduced Tillage Or Soil And Water Management Practices
4	Dissemination Of Air Quality And Atmospheric Deposition Data Through Web Hits On The National Atmospheric Deposition Program Website
5	Reducing The Overuse Of Pesticides In Response To Japanese Beetles
6	Improving Measurement Methods For Dissolved Methylmercury In Water
7	Improving Wetland Assessment Protocols To Include Below-Ground Processes That Affect Water Quality
8	Increased Knowledge Of Natural Resources, Science, And Environmental Stewardship

**Outcome #1**

**1. Outcome Measures**

Number Of Drainage Water Management System Acres

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	1200	3200

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Drainage systems are designed to accelerate the movement of water from the soil profile, and an unintended consequence is the accelerated removal of nutrients, reducing their exposure to attenuating soil processes.

**What has been done**

While for most of its history agricultural drainage has been directed towards improving crop production, in recent years conservation drainage practices [practices that are optimized for production, water quality and water harvesting] have become the main focus of researchers in Illinois and other Midwestern states. One such practice, drainage water management, has gained widespread acceptance and is now cost shareable in Illinois. Drainage Water Management Plans were developed, significantly increasing the acreage under management.

**Results**

[1] A template for developing drainage water management plans was produced and placed on the Illinois Drainage Guide; [2] A workshop on drainage water management was held in September; [3] A Midwest Conservation Drainage Guide is being developed; and [4] Field observations demonstrated that drainage water management did not have an adverse effect on yields.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
405	Drainage and Irrigation Systems and Facilities

**Outcome #2****1. Outcome Measures**

Reduction Of Nitrate Levels In Lake Bloomington, Illinois, A Largely Agricultural Watershed [Assuming A 100% Baseline For 2008]

Not Reporting on this Outcome Measure

**Outcome #3****1. Outcome Measures**

Application Of Reduced Tillage Or Soil And Water Management Practices

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	100	41

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

The Illinois T-Transect Survey measures the progress which has occurred in reducing soil erosion to T or a tolerable soil loss level statewide. This was initially part of the T by 2000 program which was begun in 1982 as part of the Illinois Erosion Control Guidelines issued by the Illinois General Assembly. The tolerable soil loss for most soils is between three and five tons per acre per year. This is the amount of soil loss that can theoretically occur and be replaced by natural soil building processes. Reducing soil loss to T is essential to maintaining long-term agricultural productivity of the soil and to protecting water resources from sedimentation due to soil erosion. In addition, maintenance of soil productivity is dependent on understanding soil types and preserving nutrient content to support crop production. Contacts by owner/managers of farm ponds and retention ponds in urban areas evidence the need for educational programming to respond to the questions and problems associated with pond management including weed control, sedimentation, and fish stocking.

**What has been done**

A total of 210 farm owner/operators, agribusiness owners, and agency staff attended the 2009 Illinois tillage seminar with a theme of "Tillage & Technology: Impacts Above and Below the Soil Surface." Topics covered by Extension staff encompassed cover crops tillage and managing residue and tillage. An evaluation was distributed to each of the attendees and 99 [49.5%] completed and returned the evaluation. Of this number 67 [68%] had previously attended a seminar; [29%] had not and three did not answer the question. Natural resource management educators have conducted programs for pond owners and managers during the past six years and offered a statewide audio-conference on pond management for the first time in 2007-2008. Local Extension offices hosted the participants and local staff provided the visual aids, handouts, led discussions, and distributed and collected evaluation forms. An evaluation was mailed to the 210 individuals who had attended the seminars held in central Illinois over the past six years. They included participants from six counties, two of which have large urban areas. The evaluation also asked for suggestions regarding topics of interest to be used in designing subsequent

seminars.

**Results**

Participants who had attended a previous tillage seminar [67] identified the following changes which they had made to their farming/tillage system based on previous years' presentations: 15 [22.4%] planted more no-till crops; 5 [7.5%] began strip-tilling; 12 [17.9%] updated no-till/strip planters; 22 [32.8%] investigated or purchased guidance systems and 17 [25.4%] purchased/used yield monitors. Only 28 of the 210 surveys have been returned; representing only 13.3% of the pond management seminar attendees. Respondents represented pond owners [53.6%], those who lived on or near a pond [42.9%], and one who was a landowner. Seventeen [5.3%] indicated that the seminars "improved" or "greatly improved" their understanding of pond management and 19 [70.4%] indicated they have used the knowledge gained through the seminars to change the way they manage their pond. Of those 19, twelve [63.2%] had made changes in shoreline protection/repair and aquatic vegetation/management. Eleven [57.9%] had changed their fish population monitoring/management practices. Seven [36.8%] reporting reducing mowing and nutrient inputs adjacent to the shoreline; six [31.6%] implemented nuisance wildlife management practices; and two [10.2%] naturalized the areas around the pond with native plants and trees.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

**Outcome #4**

**1. Outcome Measures**

Dissemination Of Air Quality And Atmospheric Deposition Data Through Web Hits On The National Atmospheric Deposition Program Website

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

This Outcome Indicator has been moved to the newly-created "Climate Change" Planned Program.

**What has been done**

**Results**

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

#### Outcome #5

##### 1. Outcome Measures

Reducing The Overuse Of Pesticides In Response To Japanese Beetles

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

As commodity prices rise, producers are increasingly aware of threats to maximum yield in soybean and other crops. The disturbing trend toward prophylactic treatment of crops for insect pests and the lack of reliable economic thresholds for pests like Japanese beetle [JB] mean that there is likely overuse of pesticide in response to JB presence in fields.

###### What has been done

Soybean and maize are the two most important agricultural crops in Illinois. Rotated with corn, soybean plays a role in management of maize pests like western corn rootworm [WCR]. Soybean producers face troublesome pests that move between soybean and corn. Prominent among these are Japanese beetles [JB] and WCR. For both pests, movement is a factor that determines the severity of pest impact. In 2009, expertise developed on this project was applied to aid a new graduate student in studies of Japanese beetle [JB] distribution and abundance in soybean fields. The goal is to develop an economic threshold to account for greater JB densities at field edges vs. interiors. The work involves on-farm cooperators from across Illinois; the widescale sampling is focusing special attention on the number of JB present at the field edge vs. the interior. Initial results indicate a significant difference between JB abundance on the edge [i.e. the first ten 30 inch-rows] of the field vs. the interior. Other analyses are in progress. Though JB pressure was only modest in 2009, identifying a relationship between JB abundance, defoliation, and yield at edge vs. interior field areas will give growers the option to control where infestations are causing damage.

###### Results

The work toward discerning JB abundance relationships between the accessible edge and difficult to examine interior of a field will give growers a new tool make better decisions about the value of a management action. Re-examining the JB question is very timely as some pests in other rotated crops seem to be on the decline; producers may become too willing to apply insurance sprays. Given the history of JB resistance and the likelihood

of dosing other non-targets in soybean, refining threshold recommendations and establishing a relationship between the accessible and inaccessible portions of a field may save more than just money and fuel. Elements of this activity were reported at Agronomy Day on the University of Illinois campus and also to the major sponsor of the grad student project, the Illinois Soybean Association. Observation of soybean pest responses to phenology of adjacent non-host plants suggests that there may be indirect interactions occurring in these landscapes that link unexpected pests and crops. These are worthy of study since the increased occurrence of similar surprises may indicate something [a new pest, weed, or disease] has imbalanced the existing trophic relationships.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

#### Outcome #6

##### 1. Outcome Measures

Improving Measurement Methods For Dissolved Methylmercury In Water

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

The primary activities of this project can be divided into two types: [1] Experiments conducted in order to develop a new method for measuring dissolved methylmercury in water; and [2] Surveys of the methylmercury concentrations in the Piasa Creek watershed near Alton, Illinois.

###### What has been done

The main products of the project were: [1] a new chemical method for measuring methylmercury in water samples from streams and lakes; and [2] a database generated during a year-long survey of methylmercury in streamwater and fish from the Piasa Creek watershed. The project personnel gave presentations on this work at two conferences, the Illinois State Academy of Sciences and the American Chemical Society. The societal need for this work is derived from the ubiquity of mercury pollution in the U.S. and the fact that the most toxic and bioaccumulative form of Hg is methylmercury [MeHg]. This form of mercury is produced from Hg pollution by bacteria in aquatic ecosystems. Although a small fraction of this production is natural, recent research has shown that current rates of production are elevated due to mercury pollution and acid rain. Once formed, methylmercury efficiently accumulates in aquatic food webs, building up to levels that can make fish and other wildlife unhealthy to consume. Most of what we know about the production and distribution of methylmercury in natural waters is based on measurements made using a single analytical method. As useful as this method has proven to be, one cannot be sure that it actually extracts all methylmercury from natural waters without comparing it to other, more potent

methods. Thus, part of this project involved making a comparison between the most sophisticated variant of the standard method and the new method developed during this project at the University of Illinois. Water samples collected from streams, wetlands, and lakes in the Great Lakes region were divided and analyzed using both methods.

### Results

Our efforts to develop a new method for measuring dissolved methylmercury succeeded and thus resulted in the beginning of an important change in knowledge. The new analytical method is radically different from the conventional method for making this measurement. Thus, it was essential to make quantitative comparisons to the current standard method. To document this, we conducted a method comparison study, as described above. Although the results of the new and standard methods of MeHg analysis are well correlated, the new method frequently recovers more methylmercury than the standard method does. These results suggest that natural waters may contain a previously unknown form of methylmercury that was previously undetectable due to its being tightly bound to other compounds in natural waters. If this hypothesis proves correct, measuring the distribution of this form of mercury will help us better understand how methylmercury moves from wetlands and other locations, where it is produced, and where it accumulates in fish. It is too early to assess the societal impact of this work, but it will eventually have an impact by virtue of the fact that it quantifies methylmercury at natural levels much better than the standard method. Careful comparisons to document this fact have been made and are in the process of being published. The positive outcome of this method development and comparison work lead to a change in action. The method was adopted in the P.I.'s lab and used to conduct two substantial geochemical studies of methylmercury in streams and wetlands of Illinois and Indiana.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
405	Drainage and Irrigation Systems and Facilities

## Outcome #7

### 1. Outcome Measures

Improving Wetland Assessment Protocols To Include Below-Ground Processes That Affect Water Quality

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Land use change and increased nutrient inputs in combination with wetland losses exacerbate degradation of Illinois waterways and downstream waters. Wetland restoration can potentially mitigate nutrient loading and

improve water quality. Soil microorganisms are responsible for removal of nitrate from the terrestrial ecosystem and reducing pollution of surface waters. Understanding the response of microbial communities and processes to land use change is essential for restoring wetland water quality functions. Links between currently measured environmental parameters and microbial community structure and function could help develop monitoring indicators for specific ecosystem functions. This research will help to improve wetland assessment protocols to include below-ground processes that affect water quality. We are using the data collected in this research to generate models of soil chemical and physical variables and plant community variables that influence denitrification data. Results of our wetland microbial ecology investigations may also aid in development of management prescriptions to enhance the nutrient-removal function of constructed and restored wetlands in Illinois. Outputs will include recommendations for soil parameters that could be included in assessment and monitoring approaches. We will also improve our capacity to predict the effect of land use changes on microbially-mediated processes.

### **What has been done**

Our research has explored the hypothesis that current wetland restoration efforts are not effectively restoring microbial community structure and wetland ecosystem functions lost due to land use change. Soil samples collected from paired natural and constructed wetlands throughout Illinois were assayed for denitrification activity using the acetylene block method. Molecular "DNA fingerprinting" approaches were used to evaluate the composition of the soil microbial community, and to compare the microbial populations involved in denitrification using the *nosZ* gene [a bacterial gene involved in denitrification]. Plant community and soil chemistry data were also collected. Canonical correspondence analysis was used to compare microbial assemblages among the different wetland sites, and to elucidate potential ecological drivers.

### **Results**

Our results indicate that microbial community structure and denitrification activity differed significantly between natural and constructed wetlands. Soil nitrogen, total organic carbon, C:N, and moisture were the most significant explanatory variables. Constructed wetland sites that meet the criteria for jurisdictional wetlands [for vegetation, soil, and hydrology] are not performing the water quality functions expected of natural wetlands. Results suggest that the legacy of prior land use may influence the activity and composition of wetland microbial communities. Our results have also generated hypotheses about the ecological drivers that are most important for shaping microbial community structure and function in floodplain forest wetlands. Soil moisture, soil organic matter concentration, and available nitrogen were highly correlated to microbial community structure and denitrification function. Establishing the link between these ecological drivers and the functions carried out by wetland microbial communities will help to develop and refine assessment and monitoring tools that are closely related to the delivery of ecosystem services. We have demonstrated that denitrification rates are significantly lower in constructed/restored wetlands. Though some of the constructed wetland sites meet the criteria for jurisdictional wetlands, they are not currently performing some of the water quality functions expected of natural wetlands. This suggests that criteria for wetland classification may not be relevant to determining the successful restoration of denitrification and other microbially-mediated processes. These findings have important implications for water quality as well. Our findings suggest that wetlands constructed under current wetland assessment criteria will not likely replace the nutrient removal function of natural wetlands. Dissemination of our results [through publications, conference proceedings, and news articles] should lead to recommendations to improve wetland assessment.

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
405	Drainage and Irrigation Systems and Facilities

**Outcome #8****1. Outcome Measures**

Increased Knowledge Of Natural Resources, Science, And Environmental Stewardship

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	1200

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Human behavior can both harm and sustain the environment that affects the quality and sustainability of life. Developing an appreciation and understanding of the environment and the value of good stewardship at an early age has the potential to mitigate environmental degradation.

**What has been done**

The Natural Resource Management Extension team facilitates and presents many outdoor educational events for students in the kindergarten through 6th grade age group. These events provide students with an opportunity for an interactive experience in an outdoor setting and an opportunity to learn about natural resources and science. Stewardship Days is an example of one of these events. These one-day events are divided into 1st-3rd and 4th-6th grade levels. Each class rotates through six twenty-five minute sessions dealing with such topics as forestry, recycling, wildlife in Illinois, fish in Illinois, stream formation, rocks and minerals, energy and energy conservation, soil erosion, and water quality. Most of the sessions provide interactivity either through playing a game associated with the topic or seeing demonstrations. Approximately 1,200 students participate in Stewardship Days each year.

**Results**

As part of a teacher survey, one of the questions asked was what teachers believed students learned from the experience. The following are selected responses that describe areas of learning that evidence its occurrence:

"I feel that the majority of the students retained the information that came from the recycling station. They have been discussing ways that we can reuse different materials in our classroom and when someone throws away trash they always want to know if it could be recycled. It is nice to see them so conscientious of the world around us. Some of them have even started telling me what their parents may have thrown away the previous night and how they tried to tell them that they needed to recycle."

"This year District 117 used the Stewardship Days as a writing prompt. Most of my slow learners surprised me with the quantity and quality of what they remembered. They mentioned the different weights of the rocks and that they were surprised all rocks didn't weigh the same."

"The students learned that curves slow rivers down, levees can break from the bottom, macro-invertebrates keep streams healthy, macro-invertebrates have no backbones, and that raindrops are spheres and fall in an arc."

"Yes, I feel my students learned a great deal. The next week in Science we began talking about how rivers and

glaciers change land. The book talked about a meander in the river and the students were able to recall the stream table presentation. They better understood the unit we were doing because of the stream table presentation."

#### 4. Associated Knowledge Areas

<b>KA Code</b>	<b>Knowledge Area</b>
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
806	Youth Development

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

##### Brief Explanation

#### V(I). Planned Program (Evaluation Studies and Data Collection)

##### 1. Evaluation Studies Planned

##### Evaluation Results

##### Key Items of Evaluation

**V(A). Planned Program (Summary)****Program # 5****1. Name of the Planned Program**

Human Nutrition, Diet Adequacy, Health and Wellbeing

**V(B). Program Knowledge Area(s)**

## 1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
604	Marketing and Distribution Practices	5%		20%	
701	Nutrient Composition of Food	0%		10%	
702	Requirements and Function of Nutrients and Other Food Components	0%		10%	
703	Nutrition Education and Behavior	50%		20%	
704	Nutrition and Hunger in the Population	15%		20%	
723	Hazards to Human Health and Safety	5%		10%	
724	Healthy Lifestyle	10%		10%	
806	Youth Development	15%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

## 1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	45.4	0.0	7.0	0.0
Actual	23.7	0.0	3.4	0.0

## 2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1360847	0	265505	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1081776	0	265505	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
7806909	0	2283397	0

**V(D). Planned Program (Activity)**

## 1. Brief description of the Activity

Activities under the sub-goal "To determine the effects of dietary and environmental factors on human health and disease" included the discovery of evidence of potential adverse effects of soy isoflavones genistein and daidzein from experimental

animal studies [soy isoflavones are widely consumed in soy-based foods and dietary supplements for their putative health benefits]; a study which has found that adding FOS and inulin to the diet has the potential to enhance intestinal adaptation and provide therapeutic advantages to children with gastrointestinal disorders; efforts to identify the specific bioactive components in broccoli [in addition to those already reported]; studies of the beneficial and adverse effects of natural, bioactive dietary chemicals on human health and food safety; a project with the goal of investigating the metabolic products of tomato carotenoids such as lycopene, phytoene, and phytofluene in mammalian tissues; efforts to understand the mechanism of fructose effects on macronutrient metabolism [this will contribute to improving dietary recommendations for optimal health and producing healthier products by the agriculture and food industries]; work toward understanding the characteristics of high protein ingredients and the resulting product qualities and to provide a guide for high protein soy foods development [which will provide more choices for better nutrition to consumers]; and a study of the use of garlic for its cardiovascular benefits and antimicrobial activity [the beneficial cardiovascular effects include reduction of blood cholesterol and triglyceride levels].

A significant investment of Extension's effort is focused on helping limited resource families and youth improve knowledge of nutrition practices through the Supplemental Nutrition Assistance Program [SNAP] and developing materials that are shared through the Wellness Ways website. "Live Well Be Well" is new program in the pilot stage that addresses holistic self-management for adults with any type of ongoing health condition[s]. The program meets once a week for six to seven weeks and is taught by trained lay-leaders and professionals.

A number of Extension programs focus on chronic diseases including osteoporosis, heart disease, and diabetes. "Dining with Diabetes" was taught as a three-part Extension program that combines lecture, food demonstrations, activities, and samples of healthy foods. In addition a second series "Eating Well with Diabetes," a three-part program following the format of Dining with Diabetes, is also offered. One time diabetes programs include "Eating to Reduce the Risk of Diabetes", "Diabetes and the Holidays", and related topics on awareness and managing diabetes. Two websites also make information available to the public. "Diabetes Lifelines" provides information in both English and Spanish to clientele on a variety of diabetes-related topics <http://www.urbanext.uiuc.edu/diabetes> [over 65,000 English page views and over 100,000 Spanish page views recorded].

## 2. Brief description of the target audience

The target audience includes parents, physicians, the soy industry, infant formula manufacturers, biochemists, food scientists, nutritional scientists who work on carotenoid metabolism and carotenoid production, researchers and educators in nutrition for better understanding of fructose effects on health, product developers who are interested in properties and processing technologies of high protein snack foods, medicinal crop growers, research scientists in the fields of medicinal plants and phytochemistry, and consumers and youth with limited resources, chronic diseases, and/or Spanish-speaking.

### V(E). Planned Program (Outputs)

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	500000	100000	400000	0
Actual	505051	145891	372043	0

#### 2. Number of Patent Applications Submitted (Standard Research Output)

##### Patent Applications Submitted

Year: 2009

Plan: 1

Actual: 0

#### Patents listed

#### 3. Publications (Standard General Output Measure)

##### Number of Peer Reviewed Publications

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<b>2009</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>	1	15	
<b>Actual</b>	8	17	25

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number Of Completed Hatch Projects

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	5	4

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Self-Reported Increase In Knowledge Of Types Of Foods That Affect Blood Glucose Levels
2	Planning Appropriate Meals For Diabetics
3	Maximizing The Health Benefits Of Soy
4	Enhancing Our Understanding Of Potential Mechanisms Of Tomato Carotenoids And Health Promotion
5	Studying The Health Benefits Of Dietary Fiber In Patients With Irritable Bowel Syndrome
6	Increased Knowledge Of Safe And Nutritional Food Preparation Skills

**Outcome #1****1. Outcome Measures**

Self-Reported Increase In Knowledge Of Types Of Foods That Affect Blood Glucose Levels

Not Reporting on this Outcome Measure

**Outcome #2****1. Outcome Measures**

Planning Appropriate Meals For Diabetics

Not Reporting on this Outcome Measure

**Outcome #3****1. Outcome Measures**

Maximizing The Health Benefits Of Soy

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Soy isoflavones, genistein and daidzein, are widely consumed in soy-based foods and dietary supplements for their putative health benefits; however, evidence for potential adverse effects has been obtained from experimental animal studies. An important prerequisite for understanding the pharmacodynamics of isoflavones is better information about pharmacokinetics and bioavailability.

**What has been done**

This study determined the bioavailability of genistein and daidzein in a mouse model by comparing plasma pharmacokinetics of their aglycone and conjugated forms following administration of identical doses [1.2 mg/kg genistein and 0.55 mg/kg daidzein] by either an intravenous injection or gavage of the aglycones in 90% aqueous solution vs. a bolus administration of equimolar doses delivered in a food pellet prepared using commercial soy protein isolate [SPI] as the isoflavone source. The bioavailability of genistein and daidzein were equivalent for the gavage and dietary routes of administration despite the use of isoflavone aglycones in the former and SPI-derived glucosides in the latter. While absorption of total isoflavones was nearly quantitative from both oral routes [>84% of AUCs for IV], presystemic and systemic Phase II conjugation greatly attenuated internal exposures to the receptor-active aglycone isoflavones [9-14% for genistein and 29-34% for daidzein based on AUCs for IV]. These results

show that SPI is an efficient isoflavone delivery vehicle capable of providing significant proportions of the total dose into the circulation in the active aglycone form for distribution to receptor-bearing tissues and subsequent pharmacological effects that determine possible health benefits and/or risks. Results from the studies have been presented at scientific meetings and are in press for publication in the Journal of Agriculture and Food Chemistry.

### Results

The impact of the studies suggests that the form in which soy is consumed can have a major impact on its bioavailability and potential action in vivo.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior

## Outcome #4

### 1. Outcome Measures

Enhancing Our Understanding Of Potential Mechanisms Of Tomato Carotenoids And Health Promotion

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

The goal of this project has been to investigate metabolic products of tomato carotenoids such as lycopene, phytoene, and phytofluene in mammalian tissues.

#### What has been done

In order to produce phytoene and phytofluene for cell culture studies and enzyme reaction assays, our laboratory has developed and optimized a tomato cell suspension culture system. In addition, since bacteria are known to have an excellent ability to accumulate carotenoids, we have been utilizing *E. coli* as a host to express GGDP synthase [crtE], phytoene synthase [crtB], and phytoene desaturase [crtI] to produce phytoene, phytofluene, and lycopene. So far, lycopene accumulating *E. coli* [crtE+crtB+crtI] and phytoene accumulating *E. coli* [crtE+crtB] have been established, and phytofluene accumulating *E. coli* is being established. Recently, two carotenoid cleavage enzymes, CMO-I and CMO-II, have been identified in human, rat, mouse, and ferret. CMO-I is thought to cleave beta-carotene at 15, 15' double bond, and CMO-II is thought to cleave beta-carotene at 9', 10' double bond. Among them, CMO-II is also thought to cleave acyclic carotenoids like lycopene to form metabolic products, and therefore the project has been modified to focus on studying carotenoid metabolites produced by CMO-II instead of hepatoma cell culture and animal models. We transformed CMO-II into lycopene-accumulating *E. coli* and observed a lighter color compared to lycopene-accumulating *E. coli*. We also observed less lycopene

accumulation, and metabolic products are being identified. We developed a LC-APCI-MS method to separate and identify some putative metabolic products of lycopene, including apo-8'-lycopenal, apo-10'-lycopenal, apo-12'-lycopenal, and apo-15'-lycopenoic acid.

### Results

The phytoene-accumulating and phytofluene-accumulating *E. coli* strains will provide invaluable tools for carotenoid researchers to discover the biological functions of these two carotenoids. Also, the newly developed LC-APCI-MS method to detect lycopene metabolic products can also separate carotenoids like lutein, zeaxanthin, beta-carotene, and alpha-carotene in a single run for a more efficient analysis. Most importantly, the elucidation of tomato carotenoid metabolic products will enhance our understanding of potential mechanisms of tomato carotenoids and health promotion.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

## Outcome #5

### 1. Outcome Measures

Studying The Health Benefits Of Dietary Fiber In Patients With Irritable Bowel Syndrome

### 2. Associated Institution Types

- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Dietary fiber has gained attention for its health benefits in patients with irritable bowel syndrome [IBS]. Since IBS is an inflammatory condition we posited that dietary soluble fiber would have an anti-inflammatory action. Critically, the anti-inflammatory mechanisms of soluble fiber are not known.

#### What has been done

We found that soluble fiber alters Th1/Th2 balance and improved lipopolysacchride [LPS]-induced febrile response, anorexia, and food-intake. Mice fed soluble fiber recovered 44% faster from fever, lost 40% less weight, and had a 229% increase in food intake post-intraperitoneal LPS as compared to mice fed insoluble fiber. Con A stimulated splenocytes from mice fed soluble fiber had a 2.9- and 4.9-fold increase in IL-4 and IL-5, respectively, and a decrease in IL-2, IL-12 and IFN-gamma production when compared to mice fed insoluble fiber. IL-4, a key to Th2 polarization, is enhanced by histone acetylation, and butyrate, a histone deacetylase inhibitor, was increased by 3.4-fold in mice fed soluble fiber as compared to mice fed insoluble fiber. Importantly, Th2 cell polarization is

linked to alternatively activated macrophages, and peritoneal macrophages from mice fed soluble fiber demonstrated a phenotype of alternative activation including increased production of IL-1RA. Finally, the effect of soluble fiber on Con A stimulated splenocytes and LPS activated macrophages was ablated in IL-4 knockout mice.

### Results

These data show that soluble fiber polarizes mice towards a Th2 phenotype promoting alternative activation of peritoneal macrophages, ameliorating LPS-induced fever and anorexia. The significance of these findings to type two diabetes is that IL-1RA is now in clinical trials as a modifier of hyperglycemia. Anti-inflammatory dietary intervention with soluble fiber which raises body IL-1RA may prove to be an effective restrictor of diabetes complications.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
723	Hazards to Human Health and Safety
724	Healthy Lifestyle

## Outcome #6

### 1. Outcome Measures

Increased Knowledge Of Safe And Nutritional Food Preparation Skills

### 2. Associated Institution Types

- 1862 Extension

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	583

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Youth lack skills in preparing safe and nutritional foods.

#### What has been done

Youth cooking schools have been conducted annually for 8-13 year olds using the format of five half days of "hands-on" educational activities that include food safety, basic nutrition, and food preparation. The targeted audience is youth from low-income families. Pre- and post-tests were collected from 830 youth participants this past year asking them to indicate their perceived level of knowledge or skill related to following six areas: [1] following directions in a recipe, [2] measuring ingredients, [3] handling a sharp knife, [4] using kitchen tools and equipment, [5] keeping hand clean, and [6] reading food labels. [Answer choices were "I have not learned or am just learning to do this", "I can do this but need more practice", or "I can do this easily by myself."]

**Results**

Pre- and post-test results indicated that of the 830 youth participants in cooking schools who completed pre- and post-tests, 70.5% [583] indicated perceived improvement in at least one of the six areas of focus. Of the remaining youth, 16.5% [137] indicated they could already easily do all things listed on the pre-test. When examining the number of youth who perceived that they increased their skill after the cooking school, findings indicated that 35.6% increased post-test skills related to following recipes; 36.7% increased measuring skills; 33.3% increased skill in handling a sharp knife; 25.5% increased kitchen tools/equipment use skills; and 33.4% increased skill in reading food labels. Food sanitation/hand washing skills perception increased for only 5.8% of the youth participants, but must be interpreted in light of pre-test responses that indicated that 94% of the youth felt they could easily do this before the cooking session began.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
703	Nutrition Education and Behavior
806	Youth Development

**V(H). Planned Program (External Factors)****External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Appropriations changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

**Brief Explanation****V(I). Planned Program (Evaluation Studies and Data Collection)**

## 1. Evaluation Studies Planned

**Evaluation Results****Key Items of Evaluation**

**V(A). Planned Program (Summary)****Program # 6****1. Name of the Planned Program**

Food Safety

**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
501	New and Improved Food Processing Technologies	0%		25%	
502	New and Improved Food Products	0%		30%	
503	Quality Maintenance in Storing and Marketing Food Products	20%		10%	
702	Requirements and Function of Nutrients and Other Food Components	0%		15%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	60%		20%	
806	Youth Development	20%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

<b>Year: 2009</b>	<b>Extension</b>		<b>Research</b>	
	<b>1862</b>	<b>1890</b>	<b>1862</b>	<b>1890</b>
Plan	2.1	0.0	6.0	0.0
Actual	2.0	0.0	5.5	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
115326	0	339519	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
91676	0	339519	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
661602	0	2100612	0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

Please note that this Planned program was previously titled "Food Product Development, Processing and Safety".

Activities under the sub-goal "To determine form, stability, and/or function of food components and the effects of processing and/or stability of food or fiber" included experiments being conducted related to the optimization of human health through creating an optimal, nutritious diet guarding against oxidative stress in humans and protecting against oxidation in food [thereby enhancing food product stability [particularly lipid stability] and ultimately quality]; the development of hypoallergenic fermented soybean products; the study of acoustic energy as a practical food safety intervention for liquid food processing; a study comparing three levels of grape seed extract [GSE] to commonly used antioxidants in a pre-cooked, frozen, stored meat model system; work contributing to the goal of designing novel, advanced, sustainable materials for packaging and other industrial and consumer applications; and microbial inactivation tests which prove that ultrasound technology as a new food processing modality may provide a promising alternative to traditional thermal food preservation methods, especially those dealing with liquid food processing.

Activities under the sub-goal "To determine chemical and/or microbial parameters related to chemical and/or microbial safety and/or stability of food and fiber" included efforts to modify milk fat composition for improved nutritional and market value; an ongoing study of the virulence of *Listeria monocytogenes* grown as biofilms [if cells of *Listeria monocytogenes* growing as biofilms are more virulent than planktonic cells, the implications for the food industry could be significant because *Listeria monocytogenes* grows in a biofilm on products like sliced luncheon meats, cheese and other food products and thus more virulent biofilm-grown listerial cells would be of greater health concern]; a project which has identified the major mechanism underlying the main quality defect in sugar gum pastes and will thus be useful to formulators and users of sugar gum paste including quality assurance personnel in the food industry; and continuing biosecurity and food safety research related to mycotoxins.

Conferences and presentations under this Planned Program included the Institute of Food Technologists, American Chemical Society National Meeting, Annual Meeting of the Taiwan Association for Food Science and Technology, Conference of Food Engineering, Experimental Biology General Meetings, ACS National Meeting, Annual International Food Technologists Meeting, International Symposium on Rumen Physiology, and the Society of Toxicology.

University of Illinois Extension provides food safety training annually to employees of establishments and volunteers that prepare or serve food to the public. These include [1] the five hour Food Sanitation Refresher Course workshops that helped 348 participants maintain their Illinois Food Services Sanitation Managers Certification in 2009, [2] a four-session fifteen-hour Food Services Sanitation Manager's Certification Course in selected areas of Illinois, [3] Serve it Safely food classes for volunteers who serve food for fundraisers, community organizations and family events, and [4] Extension Master Food Preserver Training for 100+ volunteers who teach others about safe home preservation of food.

Another major area of Extension programming focused on food safety is targeted at teaching approximately 2,000 youth and their parents and teachers correct hand washing and cleanliness habits when preparing food. Information is shared through presentations in pre-schools, schools, and 4-H materials and workshops.

## **2. Brief description of the target audience**

Members of the target audience include farmers, meat processors who manufacture ready-to-eat meat products in which lipid oxidation can significantly reduce quality, researchers in academia and industry working on design and development of sustainable materials for packaging and agricultural applications, academic and industry researchers and students interested in the design and characterization of biomaterials, small chocolate manufacturers, food manufactures, and federal and state regulatory agencies. Extension programs target youth, certified food handlers, and volunteers who serve food to the public in communities for fundraisers, community organizations and family events such as reunions and weddings. In addition, producers of food distributed through local systems are targeted and growing in numbers as a priority audience.

## **V(E). Planned Program (Outputs)**

### **1. Standard output measures**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	3000	2000	3500	0
<b>Actual</b>	4003	2309	2338	0

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

Year: 2009

Plan: 0

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>	1	25	
<b>Actual</b>	0	28	28

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number Of Completed Hatch Projects

Year	Target	Actual
2009	3	3

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

<b>O. No.</b>	<b>OUTCOME NAME</b>
1	Percent Increase In The Use Of Biodegradable Packaging Materials Throughout The Food Industry
2	Completion Of A Food Safety Sanitation Refresher Course And Recertification Exam By Employees Of Establishments That Prepare Food For Public Consumption
3	Program Participants Self-Report Cooking And Reheating Protein Food To Correct Temperatures
4	Developing A Better Understanding Of The Impact Of Different Emulsifiers On Physical, Chemical, And Structural Properties In Dark Chocolate
5	Efforts To Prevent Pathogens From Entering Drinking Water Supplies

## **Outcome #1**

### **1. Outcome Measures**

Percent Increase In The Use Of Biodegradable Packaging Materials Throughout The Food Industry

Not Reporting on this Outcome Measure

## **Outcome #2**

### **1. Outcome Measures**

Completion Of A Food Safety Sanitation Refresher Course And Recertification Exam By Employees Of Establishments That Prepare Food For Public Consumption

Not Reporting on this Outcome Measure

## **Outcome #3**

### **1. Outcome Measures**

Program Participants Self-Report Cooking And Reheating Protein Food To Correct Temperatures

### **2. Associated Institution Types**

- 1862 Extension

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Quantitative Target</b>	<b>Actual</b>
2009	100	128

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

As of October 1, 1999, the Food Service Sanitation Code required Illinois certified food service sanitation managers to attend food safety training with a minimum of five hours or to complete a re-certification exam to be eligible for re-certification that is required every five years.

#### **What has been done**

Workshops on food safety have been conducted statewide by Extension educators. Classroom presentations have been presented by professional and hourly staff to youth. The Refresher Course for Food Handlers training was conducted for 348 individuals who serve food to the public.

#### **Results**

Based on data from a follow-up study with participants in the Refresher Course for Food Handlers conducted last year, 156 [73%] of this year's participants likely adopted one or more of 18 food safety handling practices as a result of this or previous Extension training. Slightly less than 60% or 128 participants likely changed practices related to monitoring the temperature of the food they served. Those monitoring practices include cooking and reheating micro-waved protein food 25 degrees higher than conventional temperature; chilling ingredients for

mixed food before combining; posting a consumer advisory if undercooked food is served; and checking thermometers regularly for accuracy and recalibrating when needed.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

#### Outcome #4

##### 1. Outcome Measures

Developing A Better Understanding Of The Impact Of Different Emulsifiers On Physical, Chemical, And Structural Properties In Dark Chocolate

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

Our research has focused on the chemistry of lipids in chocolate as affected by storage conditions and the translation of this into the impact on human perception of chocolate texture and flavor release. Previous research indicates that different temperature cycling regimens have widely varying, dramatic impacts on the physical and chemical structural aspects of chocolate. Emulsifiers have long been used to modify the texture of chocolate and can be used to influence many structural properties that impact consumer perception of texture and flavor.

###### What has been done

Our research focused on determination of the effect of different emulsifiers on fat bloom formation, sensory attributes, melting points, and surface properties of dark chocolate during long term storage. A trained descriptive analysis sensory panel identified textural, flavor, taste, and structural differences between stored samples. Emulsifiers added during dark chocolate preparation included soy lecithin, polyglycerol polyricinoleate [PGPR], and ammonium phosphatide at 0.2% [w/w]. Chocolates were stored eight weeks at 23C and 34C. Chocolate stored at 34C was harder, grainier, more crumbly, had drier mouthfeel, and was more bland than those stored at room temperature. Soy lecithin [control] samples were highest in creaminess, cohesiveness, and fatty mouth coating attributes. No significant difference was detected in bitterness, sweetness, tooth packing, or aftertaste for all samples. Descriptive analysis results complemented textural data, surface topographical images generated by Atomic Force Microscopy, and structural changes reflected by DSC. After eight weeks storage the melting point for samples stored at 34C was higher than samples stored at 23C for all emulsifiers. Overall, PGPR had lowest melting points and time intensity melting results in all storage conditions.

###### Results

Specific details from sensory and instrumental analyses will lead to a better understanding of impact of different emulsifiers on physical, chemical, and structural properties in dark chocolate, allowing for optimization of quality during storage. This will provide insight into emulsifier selection for chocolate manufacturing. Results have been

incorporated into our summer workshops.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products

#### Outcome #5

##### 1. Outcome Measures

Efforts To Prevent Pathogens From Entering Drinking Water Supplies

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Preventing pathogens from entering drinking water supplies is of great importance worldwide. Eighty-eight percent of diarrheal disease in humans is attributed to unsafe water supply, inadequate sanitation and hygiene. Approximately 39% of this diarrheal disease in humans is caused by rotavirus. Rotaviruses can be transmitted to both humans and animals in various ways, including the use of manure as a fertilizer for food crops and by stormwater runoff that contains manure. Therefore, it is necessary to determine the survival and fate of viruses after the application of wastewater on land since secondary treatment of sewage does not remove all viruses present in domestic sewage.

###### **What has been done**

The objective of this study is to understand the fate and transport of rotavirus in the environment. Since the survival of rotavirus in soil and soil components has not been previously studied, this research focused on developing the necessary methods for extracting and analyzing rotavirus in the soil-water environment. Our investigation focused on the kinetics of survival of infective rotavirus in clay, sand, and intact soil at three temperatures ranging from 4 to 37C. The results of this research are important because they contribute to an improved understanding of the risks of rotavirus transmission due to environmental contamination and survival, to the design of systems to control its overland transport in natural animal agricultural environments, and to providing sustainable best management practices for animal producers. The phylum, Apicomplexa, contains some of the most significant pathogens infecting humans and animals. Of the more than 4,000 species of apicomplexan parasites, malaria parasites, *Toxoplasma gondii*, and *Cryptosporidia* are the most important pathogens of humans, causing death or disability for millions of people each year. The goal of our research in this area is to define the early mechanisms of Apicomplexa-host interactions and to identify new drug candidates that can block these interactions.

###### **Results**

We have developed a battery of complementary in vitro and in vivo assays that allow us to quantify *Cryptosporidium*, *Toxoplasma*, and *Plasmodium* microbial adhesion, microneme secretion, gliding motility, in vitro and in vivo infectivity, and to determine the mechanism by which the infectivity of these parasites is inhibited by L-UFFA. Our results thus far provide hope that small molecule natural products, such as L-UFFA or their derivatives, will be valuable for the development of new drugs that show broad efficacy for treatment of apicomplexan parasitic diseases. As far as we are aware, we are the only investigators who have observed inhibition of parasite-host cell infectivity across divergent species of Apicomplexa by a single class of compounds, namely L-UFFA or type A free fatty acids. Accordingly, L-UFFA represent a unique opportunity to identify a common mechanism used by the Apicomplexa to infect host cells and thus a potential "Achilles heel" target for the development of new anti-parasitic drugs.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

##### Brief Explanation

#### V(I). Planned Program (Evaluation Studies and Data Collection)

##### 1. Evaluation Studies Planned

##### Evaluation Results

##### Key Items of Evaluation

**V(A). Planned Program (Summary)****Program # 7****1. Name of the Planned Program**

Agricultural and Consumer Economics

**V(B). Program Knowledge Area(s)**

## 1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
602	Business Management, Finance, and Taxation	40%		40%	
603	Market Economics	0%		15%	
605	Natural Resource and Environmental Economics	0%		15%	
607	Consumer Economics	10%		10%	
610	Domestic Policy Analysis	0%		10%	
801	Individual and Family Resource Management	50%		10%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

## 1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	7.0	0.0	22.0	0.0
Actual	21.4	0.0	16.5	0.0

## 2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1222455	0	679072	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
971765	0	679072	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
7012986	0	3102849	0

**V(D). Planned Program (Activity)**

## 1. Brief description of the Activity

Ongoing activities under this Planned Program under the sub-goal "To inform and improve decisions related to Midwest commercial food and agricultural sectors involving production, financing, marketing, and risk management" included continued research on international and U.S. issues relating to agricultural biotechnology including regulatory measures, economic liability risks, intellectual property rights, and private law liability; continued utilization of the Crop Insurance Decision Tool [measures of

change include that Illinois, where efforts were centered, had some of the highest switching to enterprise units from other unit structures]; as well as continued utilization of the Varietal Information Program for Soybeans [VIPS] website [Illinois soybean producers have the opportunity to access this unique, web-based soybean variety information database at [www.vipsoybean.org](http://www.vipsoybean.org)].

Activities under the sub-goal "To identify and estimate the impact of federal and state policies on rural communities, agricultural producers, and society; and to help inform the policy making process" included an analysis of spatial patterns of rain barrel purchases in Chicago that might reduce problems with stormwater runoff; work on forest conservation payments in China and Mexico; efforts to estimate the benefits of environmental improvement; continued research on watershed-scale spatial analysis of water resource management; research examining the welfare impacts of existing agricultural and biofuel policies; the use of functional benefits transfers to forecast the effects of toxic waste sites on property values surrounding areas of concern [AOCs] in the U.S. Great Lakes [based on Census data for median home values, the methods used here suggest that approximately \$5.2 billion [in 2005 dollars] has been lost in residential property values around 23 of the AOCs]; research focused on agricultural policies and technologies in developing countries and their impacts on the welfare of local populations as well as their impacts on developed economies including the U.S.; a study focused on the impact of policies and technologies on poverty and hunger in Africa; and research into the ability of decision makers to understand and quantify the effects of energy infrastructure, land use, soybean disease, and legislative boundary-making on society.

Activities under the sub-goal "To describe and measure the well being of individual consumers, families, and communities resulting from changes in economic and regulatory conditions" included work to update previous estimates on the success of the Uniform Interstate Family Support Act [UIFSA] on improving collection of child support in Illinois when the non-custodial parent resides out-of-state; a study that shows that adult children are more likely to purchase long-term care insurance if their parents are using more formal, institutional care and are less likely if their parents are relying on more informal, familial care; and research on industry clustering [a widely applied concept for understanding the interdependence among industries and its implications for rural economic development and growth].

Conferences and presentations under this Planned Program included the American Agricultural Law Association, XXV European Agricultural Law Congress and Colloquium, International Food and Agribusiness Management Association, Iowa Soybean Association, Agricultural and Applied Economics Association, International Grain Quality and Technology Conference, World Soybean Research Conference, American Economic Association, Midwest Economics Association, Society of Labor Economics, and the American Council on Consumer Interests.

**Farm Land Ownership** is an online course developed to help farmland owners know how much to charge for rent, what kind of lease agreement is best, and what they should expect from the farmer who is leasing their land. Other educational activities related to agricultural economics included Farm Analysis Solution Tool [FAST] workshops, Annie's Project multi-session workshop focused on farm management for women, estate planning workshops, farmland leasing presentations, five Illinois Farm Economics Summits dispersed throughout the state, and MarketMaker, an interactive online mapping system that finds producers and markets for agricultural products and serves as a resource for all businesses in the food supply chain [See Global Food Security And Hunger Planned Program].

Three new consumer economics programs were developed and evaluated for impact this year. **Your Money and Your Life** financial education program provided help to nearly 200 low-income individuals and families to gain skills they need to effectively manage their money. **Long Term Care: Talking, Deciding, and Taking Action**, a multidisciplinary curriculum targeted to help older adults in rural Illinois plan for long-term care needs was piloted and evaluated in six locations. **Choosing a Financial Professional** was a newly initiated program dealing with evaluating a financial adviser's experience and credentials.

The **Getting Through Tough Financial Times** program initiated last year in response to the current economic situation that consumers are still facing includes a website [<http://www.ToughTimes.illinois.edu>] that provides timely resources, links to related money management resources, and a listing of events being held throughout Illinois. This continues to be a "one-stop" shop for all University of Illinois Extension resources to help people whose financial security is threatened. Other products related to this initiative include *Spend Smart, Save Smart* tip sheets - with each of the twelve sheets offers ten practical tips to help consumers spend wisely or save money and an audio-conference entitled *Saving & Investing in Turbulent Times* featuring a panel discussion by Extension educators and professors.

Other consumer-focused Extension programs included *Credit Card Smarts* and *Plan Well Retire Well* websites [Spanish and English] and presentations, consumer fraud and identity theft presentations, and *Welcome to the Real World*, a simulation that

gives students [age 12 through young adults] a taste of future income and expenses. In addition, *Money Smart Week*, an annual April public awareness effort led by the Federal Reserve Bank of Chicago, provided an opportunity for Extension staff to present 41 separate face-to-face workshops to 950 teens, adults, and teachers and media releases on a wide variety of topics.

## 2. Brief description of the target audience

Members of the target audience include practicing lawyers and academic lawyers in the U.S. and abroad, farmers, processors and retail distributors of natural and organic products, government regulatory agencies and private firms with agricultural interests, crop insurance agents, agricultural industry personnel, agribusiness managers and executives, Illinois soybean producers, farm managers, seed companies, university research faculty, university Extension educators, farm bureaus and other on-farm service providers, state and federal land conservation agencies and non-profit private conservation organizations, real estate developers and builders, community planning and building officials, federal and state policy makers, local citizens' groups, and researchers in family and consumer economics along with others who have an interest in enhancing human security for individuals and families within the U.S. and around the world. Extension targeted audiences this past year included providers working with youth and limited resource audiences through non-profit organizations, community groups, and government agencies, and families facing financial challenges.

### V(E). Planned Program (Outputs)

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	12000	20000	2500	0
<b>Actual</b>	26565	13257	9476	0

#### 2. Number of Patent Applications Submitted (Standard Research Output)

##### Patent Applications Submitted

Year: 2009  
Plan: 0  
Actual: 0

#### Patents listed

#### 3. Publications (Standard General Output Measure)

##### Number of Peer Reviewed Publications

2009	Extension	Research	Total
<b>Plan</b>	2	45	
<b>Actual</b>	22	35	57

### V(F). State Defined Outputs

#### Output Target

##### Output #1

##### Output Measure

- Number Of Completed Hatch Projects

Year

Target

Actual

2009

2

1

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

<b>O. No.</b>	<b>OUTCOME NAME</b>
1	Page File Requests Made To Farmdoc
2	Successful Completion Of The Home Buying Process
3	Knowledge Of Practices That Affect Your Credit Rating
4	Knowledge Of Planning For The Expenses Of Home Ownership
5	Aspiration To Compare Prices And Review Bills More Carefully
6	Number Of Web Hits On The Varietal Information Program For Soybeans Website
7	Increased Knowledge Needed to Make Land Ownership Decisions
8	Decisions Made To Reduce Risks In Agriculture Production
9	Increased Knowledge Of Asset Allocation And Investment Management
10	Number Applying Skills In Managing Limited Financial Resouces
11	Increased Knowledge Of Communication Skills Needed In Managing Long-Term Care Family Conflicts

**Outcome #1****1. Outcome Measures**

Page File Requests Made To Farmdoc

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	195000	6305000

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Successful risk management strategies depend on accurate characterization of the uncertainties being faced. Of primary importance for crop farmers is revenue variability arising from uncertain crop yields and prices. In response to the difficulty in managing this risk, the Federal government has developed numerous crop yield and revenue insurance products, and has provided incentives to purchase crop insurance by subsidizing insurance premiums. However, attempts to better understand participation, loss rating, and improve product design and participation have been hampered by uncertainty about the most appropriate characterization of farm-level yield and revenue distributions. This project seeks to fill that gap by developing a robust means to condition yield and price distributions that can be accurately and readily estimated using NASS and FBFM data on variables that are readily available to the farmer reflecting their management and cropping practices and structural characteristics.

**What has been done**

Farmdoc is a website containing online crop insurance tools including a premium calculator for crop insurance products and a decision tool that computes payoffs and risk statistics for representative farms in each of the counties in Illinois, Indiana, and Iowa. The results can be implemented in a very useable model by both farmers and crop insurance agents to further customize their risk assessments and improve crop insurance decisions. Crop insurance decisions were the major focus of activities for the last year. The highly popular premium calculator that estimates the premiums of crop insurance products for corn, soybeans, wheat, and grain sorghum in the North Central Region was revised and made available for 2008 crop insurance decisions. The calculator included premiums for basic, optional and enterprise units. Finally, new premium calculators were created for fall seeded wheat for most of the great plains states. This greatly expanded the total coverage of the crop insurance tools across the U.S. Over 180,000 page and file requests were made to these tools during 2008. Thousands of FAST CDs were also distributed with spreadsheet versions of the tools.

**Results**

This project is substantially improving risk management decisions for crop farms in Illinois, the U.S. cornbelt, and the U.S. great plains. The incorporation of this information into enhanced models provides farmers with an important tool to use in evaluating specific farm risk management strategies, particularly as it relates to crop insurance decisions, which have quickly become one of the most important risk management decisions made by farmers. The demand for this type of tool is well established, and is being met through delivery channels that are well-suited for the proposed research information and tools. In total, this project provides highly valuable information and modeling tools to evaluate available risk management alternatives for crop farmers in an

effective, useable, and timely form. Please note that in the indicator above page requests refer to the number of mouse 'clicks' that a user makes each visit. The site averaged over 80,000 visitors per month in 2009. This means that each time a person visited the site in 2009 they used visited about six pages. About 95% of the hits to the farmdoc site are to materials beyond the first [home] page.

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
602	Business Management, Finance, and Taxation
603	Market Economics
605	Natural Resource and Environmental Economics

#### **Outcome #2**

##### **1. Outcome Measures**

Successful Completion Of The Home Buying Process

Not Reporting on this Outcome Measure

#### **Outcome #3**

##### **1. Outcome Measures**

Knowledge Of Practices That Affect Your Credit Rating

Not Reporting on this Outcome Measure

#### **Outcome #4**

##### **1. Outcome Measures**

Knowledge Of Planning For The Expenses Of Home Ownership

Not Reporting on this Outcome Measure

#### **Outcome #5**

##### **1. Outcome Measures**

Aspiration To Compare Prices And Review Bills More Carefully

Not Reporting on this Outcome Measure

#### **Outcome #6**

##### **1. Outcome Measures**

Number Of Web Hits On The Varietal Information Program For Soybeans Website

##### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	67336

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

The Varietal Information Program for Soybeans [VIPS] is a unique web-based tool for soybean producers and agribusinesses. The VIPS database, viewed at [www.vipsoybeans.org](http://www.vipsoybeans.org), provides comprehensive performance information including yield, protein and oil data, and disease and pest resistance information for over 650 varieties annually. Each year, seed companies are invited to send varieties and experimental soybean germplasm for evaluation in the University of Illinois Variety Trials and for resistance screening for all major yield reducing diseases and pests including soybean cyst nematode, aphids, viruses, and fungal diseases. Additionally, Illinois soybean producers select varieties of interest to them for evaluation in the trials. All performance data are available online by November 15, and a booklet is widely distributed throughout the year. The variety performance trials not only provide unbiased information for soybean producers but also are a reliable source to assist private industry with validation of information for their varieties.

#### What has been done

In January, about 16,000 Illinois soybean producers were asked by postcard mailing to suggest varieties to be evaluated in the 2009 VIPS program, and over 150 varieties were identified for the trails. Seed companies submitted nearly 500 varieties for evaluations. The University of Illinois Variety Trial program includes 13 locations that represent the major soil and environmental categories in Illinois. Based on maturity group, soybean varieties were planted at either four or six of the 13 possible trial locations. Scientists at both the University of Illinois and Southern Illinois University worked together to screen varieties for resistance to four soybean cyst nematode population types, aphid feeding, Phytophthora root rot, sudden death syndrome, Sclerotinia stem rot, soybean mosaic virus, and green stem disorder. All participating companies were asked to submit both their SCN resistance source and their Phytophthora root rot resistance for each variety in the program. The University of Illinois variety trials unit conducted protein and oil analysis for all samples in the trials. Sample analysis was accomplished using near infrared [NIR] technology. All 2009 data have been made available on the VIPS website, and nearly 3,000 copies of the VIPS booklet have been printed for distribution in the next six months. A program to enable tracking of website usage by the day, week, and month is implemented, and recently, a program to track location of VIPS users has been put into service. This tracking capability allows website administrators to assess the extent of usage and the impact that media releases about VIPS have on usage of the VIPS website.

#### Results

The VIPS database annually provides Illinois soybean producers and agribusinesses with unbiased soybean variety production information for over 650 varieties. The VIPS one-stop website is an easy-to-use searchable database that can help soybean producers select varieties to match their local geographic area, weather conditions and soil types. The VIPS database is the most comprehensive source for SCN population type information in the state. Seed companies benefit from the public database by comparing their field evaluation data with the VIPS data and making information updates for their soybean varieties as needed. The VIPS cooperators contact specific seed companies when the company's online data disagree with the VIPS data, and annually participating companies make corrections about variety traits viewed on seed company websites. The VIPS homepage includes an interactive map showing the 13 trail locations. By clicking on a trial location, the viewer quickly sees all the information from that particular trial. Also, throughout the year when new soybean variety information becomes available, an email update is sent out to the VIPS listserve.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
603	Market Economics
605	Natural Resource and Environmental Economics

#### Outcome #7

##### 1. Outcome Measures

Increased Knowledge Needed to Make Land Ownership Decisions

##### 2. Associated Institution Types

- 1862 Extension

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	11

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

Landowners have many issues with which to deal, from how much to charge for rent, to what kind of lease agreement is best, to what they should expect from the farmer who is leasing the land.

###### What has been done

To help landowners sort through these decisions, University of Illinois Extension developed an online course for landowners and agricultural professionals. Participants downloaded materials and then studied at their own pace. The fall 2009 enrolled participants were asked to complete an online end-of-course evaluation regarding knowledge change, suggestions for improving the course, and interest in other internet-based agricultural programs.

###### Results

Responses to the evaluation were received from 19 of the participants [approximately 2/3 of the fall enrollees]. When asked "to indicate the degree to which you gained new knowledge related to the follow topics covered in the course," only 11 responded. Responses indicated that 10 of the 11 [91%] "learned much" regarding cash rent calculations. More than half of the respondents to the question also checked "learned much" with respect to crop share leases, farmer profitability, USDA programs, and fence law and drainage code. For the other course topics [land values, crop insurance, written contracts, and terminating a lease] nearly half "learned some" new knowledge regarding the topics. When asked "what was the most valuable information you learned", most respondents elaborated on facets of cash rent calculations, and several commented on the value of knowing where to locate information regarding production costs and determining productivity and value of farmland. Seven [7] indicated that they had or planned to use the information to set cash rent levels.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
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**Outcome #8****1. Outcome Measures**

Decisions Made To Reduce Risks In Agriculture Production

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	16

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Rules and regulations related to food production, processing, and marketing of food tend to be confusing and complex. Knowledge of these rules and their application is crucial to the success and continued sustainability of small businesses that are involved with organic and sustainable agricultural products.

**What has been done**

Through a multi-state collaborative effort with the Land Connection and North Central Risk Management Education Center of USDA, five regional workshops throughout different geographic regions in the state of Illinois were conducted. The workshops were designed as panels consisting of representatives from county health officials, legal advisors, Department of Agriculture officials, and local sustainable organic farmers. Workshops were attended by farmer/producers, educators, legislators, and community members.

**Results**

Using a mixed method approach evaluations were distributed at all five workshops, 147 were collected from the 204 total participants to assess participants' opinions of how effective the workshops were in enhancing knowledge of key rules and regulations and how to comply with those. A second phase of the evaluation was conducted six months after the final workshop in March, 2010 and focused on behavioral changes in ability to manage the risks of alternative production and marketing practices. Only 46 of the 202 surveys distributed were returned. Pre- and post-workshop evaluations indicated an increase in the percentage of those who rated themselves as increasing knowledge of rules and regulations [from 78.1% to 91.7%]; knowledge of risk management issues and strategies [from 28.3% to 43.4%]; and knowledge of appropriate resources to support their regulation compliance and risk management efforts [from 29.0% to 42.8%]. Farmers/producers who responded to follow-up surveys [16] reported that they changed business decisions since participating in the workshop and [11] "agreed" or "strongly agreed" that they had reduced their risk of violating federal and state policies and regulations.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation

**Outcome #9****1. Outcome Measures**

Increased Knowledge Of Asset Allocation And Investment Management

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	203

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Low savings rates, record levels of consumer debt, rising foreclosure rates, and mounting bankruptcies are signs that a large number of U.S. consumers are financially in trouble. Through a recent Extension survey of the public's educational interests, 4,574 [48.9%] of the 9,349 who responded were interested in learning more about savings and investment strategies. Choosing a financial planner or other financial adviser is also a daunting task for many people. Increasingly, middle-income consumers as well as high net worth families feel the need for financial advice. Some individuals simply want a review of their financial situation, others want someone else to manage their investments, and many people want advice about a particular financial issue such as saving for college or handling stock options. Current government regulations do not protect the consumer very well.

**What has been done**

Extension educators and specialists in consumer and family economics, family life, and nutrition and wellness developed materials for the new Getting Through Tough Financial Times website. In addition, twelve Spend Smart, Save Smart tip sheets offering 10 practical tips to help consumers spend wisely or save money and a statewide teleconference panel discussion entitled "Saving and Investing in Turbulent Times" were developed this past year. The website went live in the fall of 2008 and was aggressively promoted to the public. At least seven other states have run Illinois news articles. Local business and legislators have assisted in promoting the website resulting in a peak of 62,276 monthly hits in January of 2009. Extension offices hosted a "Saving and Investing in Turbulent Times" audio-conference.

The lesson "Choosing a Financial Professional" deals with critical areas of knowledge that consumers may need to consider. These include who is a fiduciary and what that means, regulation and requirements of brokers compared to registered investment advisers, evaluating an adviser's experience and credentials, and how financial professionals are paid. Handouts provide sources for identifying candidates and an Interview Guide. The lesson has been taught to the general public in face-to-face presentations, as a teleconference lesson, and as train-the-trainer presentations throughout Illinois and at two national professional conferences. A related website is also available at <http://web.extension.uiuc.edu/financialpro>.

**Results**

In addition to the impact reported last year for 116 participants in the "Saving and Investing in Turbulent Times" audio-conference, another 47 have since participated in an additional audio-conference with 26 completing an evaluation at the end of the program. Of those that didn't reply "already knew," the following percentage of the 26 respondents stated they "agreed" or "strongly agreed" with these statements: [93%] I am more aware of how

diversification can help me meet my long-term investment goals; [81%] I feel more confident about my ability to choose a financial professional; [78%] I am better able to avoid investment fraud; [78%] My knowledge about investment topics has increased; [78%] I am better able to manage my investments in a turbulent market; and [56%] I have a better understanding of asset allocation.

After each Choosing a Financial Professional workshop, participants were asked to complete a two-page questionnaire measuring change in knowledge and attitude. One hundred and ninety-eight [198] questionnaires were collected. From the responses, it's clear that participants increased their knowledge level. Before the class only 17% [34] of the participants knew what a fiduciary was while after the class 90% [179] responded, "I know what a fiduciary is." Seventy percent of respondents [80 of 114] said they now had new questions to ask their current financial professionals. A change in participants' attitude was also evidenced. Ninety-two percent [182] of the respondents reported feeling more comfortable about asking financial professionals questions about their qualifications and how they're paid. Seventy-two [72] participants listed one action step they plan to take as a result of the workshop such as asking questions of their current financial professional, comparing financial professionals, and interview planning before selecting one.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics

#### Outcome #10

##### 1. Outcome Measures

Number Applying Skills In Managing Limited Financial Resources

##### 2. Associated Institution Types

- 1862 Extension

##### 3a. Outcome Type:

Change in Action Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	111

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Low-income individuals often operate outside of the economic mainstream and lack information that could help them make sound choices with their money. As a result, they are particularly vulnerable to payday loans and other kinds of predatory lending, high-cost check-cashing services, and the financial crises that can occur when families don't have savings.

###### **What has been done**

Your Money & Your Life is a statewide financial education program designed to help low-income individuals and families gain the skills they need to effectively manage their money. It offers ten lessons on topics that include managing debt, avoiding money traps, choosing insurance, learning about job benefits, and understanding taxes. Train-the-trainer workshops teach staff of community-based organizations and social service and faith-based agencies to use the materials with their clientele.

## Results

Results of a comprehensive evaluation of past Your Money & Your Life programs conducted by the University of Illinois School of Social Work showed that graduates of the program achieved significant knowledge gains, improved their financial habits, and began planning better for the future. For example, 75% of the graduates saved more, 85% changed their household budgeting practices, 38% opened a checking account for the first time, and 42% made a long-term investment such as home purchase or retirement savings. An expanded report of the findings is included in the Evaluation section of this planned program.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
801	Individual and Family Resource Management

### Outcome #11

#### 1. Outcome Measures

Increased Knowledge Of Communication Skills Needed In Managing Long-Term Care Family Conflicts

#### 2. Associated Institution Types

- 1862 Extension

#### 3a. Outcome Type:

Change in Knowledge Outcome Measure

#### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	100

#### 3c. Qualitative Outcome or Impact Statement

##### Issue (Who cares and Why)

Many people worry about the affordability of health care as they age, including long-term care costs. Unfortunately, many fail to plan for long-term care expenses and needs, and thus, family members must make difficult decisions. Research conducted by McNamara and Lee [2004] show that many people buy long-term care insurance and then drop the policy within just a few years.

##### What has been done

University of Illinois Extension professionals from across discipline areas came together to create an education program to help people plan for long-term care needs. A curriculum for day-long workshops for older adults in rural Illinois was developed and presented. The educational information presented during the Long-Term: Talking, Deciding, Taking Action workshops combined both family life and financial management topics including housing options, family dynamics and communication, care giving issues, and financing long-term care. Depending on a community's needs, between three and four of these topics were presented using PowerPoint presentations and participant handouts and activities. The presentations were a combination of lecture, discussion and activities. The issue will continue to be addressed with delivery expanded to include caregivers and service providers and the addition of a website about this topic.

## Results

The six workshops in rural Illinois served as pilot groups for these workshops. Participants were asked to complete a short questionnaire at the end of each workshop to assess change in knowledge and awareness as well as plans for action. Preliminary data analysis indicates that participants increased their understanding and intend to take action towards planning for long-term care needs. According to respondents' answers from questionnaires [using a 5-point scale ranging from strongly agree to strongly disagree]:

- 82% strongly agree or agree, "I have a better understanding of the potential costs of long-term care"
- 83% strongly agree or agree, "I know the pros and cons of aging in place"
- 81% strongly agree or agree, "I realize that family conflict can be reduced by using communication skills"
- 80% strongly agree or agree, "I have gained ideas for managing caregiver stress"

In addition, 65% of respondents said they plan to discuss their plans for long-term care with family members and others. Communicating plans is an overlapping theme throughout the workshop.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

##### Brief Explanation

#### V(I). Planned Program (Evaluation Studies and Data Collection)

##### 1. Evaluation Studies Planned

- Before-After (before and after program)

#### Evaluation Results

Pre- and post-training surveys were distributed to participants at four Your Money & Your Life Financial Education Program delivery sites; 159 were collected. Evaluators then conducted interviews with a sample of 30 participants 3-6 months after the training.

Pre- Post-Survey Results: Probably the most encouraging aspect of the financial education training program was the large positive changes reported in budgeting, bill paying, and saving practices after training was completed. There were gains of over 30 percentage points in several basic positive financial practices after training completion. For example, 70% of respondents reported keeping a monthly written record of all bills paid, compared to only 31% before training. Similarly, the percentage reporting that they wrote down a monthly spending plan or budget rose from 27% to 60%, and the percentage that indicated that they had set financial goals in the last three months increased from 40% to 70%. These findings

demonstrate both the relatively low beginning level of sound basic practices among study participants as well as the strong effects of the training in improving such practices.

Data also indicated solid increases in the percentage that reported being able to save any money in the last three months, with the percentage rising from 11% to 47%. It should be noted that discussions with respondents suggested that these savings increases tended to be very modest, largely due to the continued lack of adequate incomes among respondents [average income of \$372 per month]. Nonetheless, many respondents indicated that such limited savings were made possible because of better adherence to basic budgeting, bill paying, and shopping practices that they learned about in the training.

Changes in the use of both mainstream financial institutions and fringe financial companies [payday lenders, money stores, or pawn shops] after training were much more modest.

Consistent with the very low income status of participants, no respondent had borrowed from a bank or credit union either before or after training. The main source of borrowing was from family members and friends. The percentage of money borrowed decreased from 58% to a still substantial 33% after training was completed.

Credit card use remained fairly stable before and after training, but there were some positive changes in selected behaviors related to credit cards. In particular, the percentage indicating that they had paid at least the minimum amount due on their credit cards each month rose from 36% to 57%.

Changes in the numbers of participants holding different types of insurance were modest but in the desired directions. Specifically, there were 3-9 percentage point increases in the number of participants who held homeowners and renters, automobile, and health insurance after training completion.

Interview Results: When participants were interviewed and directly asked if they had experienced selected types of changes based on the training they received, the reported changes were consistent with the data gather through pre- and post-surveys:

- 90% reported doing a better job of keeping track of expenses
- 87% reported changing the way that household budgets money in some important ways
- 60% have changed the way that bills are paid
- 57% have done a better job of managing credit cards since completing training
- 63% have been able to save more money in a typical month
- 13% opened new checking accounts
- 10% opened new savings accounts
- 10% changed existing checking or savings accounts
- 11% started applying for benefits [government or job]
- 3% started receiving government benefits or tax credits
- 3% purchased new insurance
- 18% used currency exchanges less often
- 25% use payday loans less often
- 57% stated that they had done a better job of managing their cards since completing training

## Key Items of Evaluation

The findings on behavior changes attributable to the Your Money & Your Life training are very positive, especially when considered in the context of the very disadvantaged circumstances of most participants. Participants reported very high levels of behavior changes in the most basic areas of financial practices: budgeting, tracking expenditures, and paying bills. In addition, the saving figures reported suggest that even those with very limited financial prospects can make some gains through judicious budgeting and spending practices. Most of these individuals were not enjoying advances in their earnings and income, so the progress they reported making in many of these critical financial practices is striking. These findings therefore are very promising, and suggest the usefulness of very basic financial education training for the most financially disadvantaged. However, gains from learning to better manage very minimal resources may be likely to have limits unless economic circumstances and access to additional financial resources improves.

**V(A). Planned Program (Summary)****Program # 8****1. Name of the Planned Program**

Sustainable Energy

**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		40%	
206	Basic Plant Biology	0%		20%	
402	Engineering Systems and Equipment	70%		25%	
601	Economics of Agricultural Production and Farm Management	0%		15%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	10%		0%	
806	Youth Development	20%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

<b>Year: 2009</b>	<b>Extension</b>		<b>Research</b>	
	<b>1862</b>	<b>1890</b>	<b>1862</b>	<b>1890</b>
Plan	2.0	0.0	3.0	0.0
Actual	1.0	0.0	8.0	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
57663	0	284848	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
45838	0	284848	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
330801	0	3800250	0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

Please note that this Planned Program was previously included under the title "Biofuels" and has been renamed

"Sustainable Energy" in late 2009.

Activities under the sub-goal "Providing fuel and materials for sustainability" include the engineering of plant cell wall hydrolyzing enzymes [as a means to increase the potential of cellulosic material as feedstock for biofuel production]; increasing utilization of co-products from the biofuels industry by growing pigs; efforts to decrease fouling of evaporator surfaces [resulting in lower heat transfer and evaporators that are over-designed in terms of capacity]; continuing research into the impact of biofuels on emissions-reducing technologies for off-road diesel engines; efforts to increase ethanol production efficiency from corn and cellulosic biomass; efforts to assist in selection of appropriate corn fractionation technologies [which would help dry grind ethanol producers increase plant throughput, increase value of coproducts, and improve plant profitability]; an economic assessment of changes in trade arrangements, bio-terrorism threats and renewable fuels requirements; and the continued establishment and nitrogen management of switchgrass for sustainable bioenergy feedstock production in Illinois.

Activities under the sub-goal "Improving biofuel production and carbon sequestration" include a successful effort to produce bio-butanol from low value DDGS [which will provide corn ethanol producers with an alternative means of utilizing DDGS and thereby increase the economic viability of corn ethanol production facilities]; an investigation designed to improve the selection and management of grasses for landscape and biomass accumulation; and work that will provide information for policy makers on the impact of crop residue removal for biofuels on soils, soil erosion and crop yields [crop residue is thought to contribute to the maintenance of soil organic carbon levels and is needed to reduce soil erosion on sloping lands].

Activities under the sub-goal "To develop a research base that will allow for the development of management systems that efficiently and economically produce bioenergy crops" include a project designed to provide key information and appropriate germplasm to maize geneticists and breeders in order to enable genetic studies to elucidate the inheritance of western corn rootworm [WCR] resistance and design efficient breeding programs for improving the non-transgenic host plant resistance of maize against WCR; continued analysis and further development of maize germplasm for use in functional genomics approaches to gene discovery for nitrogen [N] response traits; and the location within the collection of wild perennial Glycine species of the sources of resistance for six of the major economic pathogens affecting soybean yields.

Conferences and presentations made by Investigators under this Planned Program in 2009 include the Society for Industrial Microbiology, the Society of Automotive Engineers, the American Society of Agricultural and Biological Engineers, the U.S. Department of Energy [DOE] Working Group Workshops on Homogenous Charge Compression Ignition [HCCI] at the Sandia National Laboratory, Navistar Corporation, the National Defense University Fellows, the National Soybean Research Laboratory Conference, the International Fuel Ethanol Workshop, the American Cereal Chemists Association, the Renewable Fuels Association, the 6<sup>th</sup> Annual Bioenergy Feedstock Symposium, the 2009 Conference on Food Engineering, the ASABE BioEnergy Engineering Conference, the 2009 AIChE Annual Meeting, the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America.

The most significant statewide Extension activities focused on wind energy and biofuels. Six workshops were held around the central and northern parts of the state to educate 460 landowners about the economic and fiscal implications of wind farm development in Illinois. The other activity conducted in conjunction with the national 4-H Extension initiative involved 2,300 4-H club members in the Biofuel Blast experiment. Other reported Extension activities that were limited in geographic scope included presentations on energy efficiency, a science exploration program with a wind energy component for 40 largely low-income African American or Hispanic urban youth, and a 4-H technology tour of a wind farm, ethanol industry, and solar energy demonstration for 24 older 4-H members and their parents. In addition, the Illinois Energy Education Council, a cooperative effort of University of Illinois Extension and the investor-owned electric utilities, rural electric cooperatives, and municipal power suppliers, actively promoted their website as a source of information to increase energy efficiency:

[www.energycouncil.org](http://www.energycouncil.org). The first Environmental Leadership Conference was hosted by Extension and 200 community leaders from 66 municipalities learned how local governments can make environmentally and financially responsible changes. One park district attendee has already made plans for energy audits of three recreation centers and expects to reduce energy bills by at least 10% through programs she learned about at the conference.

## 2. Brief description of the target audience

Seed and dry grind ethanol companies, producers of energy crops and local conservation groups, crop consultants, farm input suppliers, regional and national agriculture industries, state and national governmental agencies, farmers, agricultural professionals and the broader public interested in soil conservation and renewable energy production from biomass crops, academics and individuals associated with the corn ethanol fermentation industry, wheat producers in Illinois and other Midwestern states, and businesses, individuals [adults and youth], and families who wish to reduce energy consumption and

expenses.

### V(E). Planned Program (Outputs)

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	500	0	0	0
<b>Actual</b>	938	764	2300	0

#### 2. Number of Patent Applications Submitted (Standard Research Output)

##### Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 2

##### Patents listed

Two patent applications were submitted in 2009, the first relating to the degrading of miscanthus to soluble sugars for production of biofuels and the second to deconstructing lignocellulosic biomass.

#### 3. Publications (Standard General Output Measure)

##### Number of Peer Reviewed Publications

2009	Extension	Research	Total
<b>Plan</b>	0	15	
<b>Actual</b>	1	38	39

### V(F). State Defined Outputs

#### Output Target

##### Output #1

##### Output Measure

- Number Of Completed Hatch Projects

Year	Target	Actual
2009	1	3

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

<b>O. No.</b>	<b>OUTCOME NAME</b>
1	Proportion Of The Use Of Biomass Relative To Total Energy [Currently At 3-4%]
2	Percent Reduction In NOx Emissions From Biodiesel
3	Improvement In The Biomass Yields Of Perennial Grasses For Cellulosic Ethanol Relative To Current Maximum Switchgrass Yields
4	Reducing Evaporator Fouling To Lower Costs And Increase Efficiency
5	Development Of Algae-Based Biofuels
6	Improving The Multigenic Host Plant Resistance In Corn To Western Corn Rootworm
7	Reducing The Amount of Supplemental Nitrogen Required For High Cereal Yields
8	Increased Knowledge Of Current And Future Energy Source Options

**Outcome #1****1. Outcome Measures**

Proportion Of The Use Of Biomass Relative To Total Energy [Currently At 3-4%]

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	8	5

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Alternative energy sources play an important role in supporting national economic growth, national energy policy, and increasingly important environmental goals. With petroleum prices increasing, strategies involving development of alternative and renewable energy sources are increasingly being driven by economics, national security and environmental concerns [in particular global warming].

**What has been done**

Fuels derived from cellulosic biomass [the fibrous, woody and generally inedible portions of plant matter] offer an alternative to conventional energy sources. Efforts are underway to deconstruct the cell wall [biomass]. It is anticipated that when cellulosic biomass can be deconstructed in an economically viable environment, that second generation biofuels will take on important significance with respect to the total portfolio of liquid fuels. A federal mandate to produce 100 million gallons of ethanol next year from cellulose is unlikely to be met, because credit and legal troubles have hurt the fledgling industry. Cellulosic ethanol, made from such sources as grass and wood, is starting slowly but is expected to provide at least 16 billion gallons of the fuel by 2022 under federal renewable-energy goals. As a result of the troubles, the Environmental Protection Agency was considering lowering the 100 million gallon goal for 2010, according to Margo Oge, the director of the EPA Office of Transportation and Air Quality. A copy of her remarks at a recent energy conference in Nevada was made available by OPIS, an energy information company that sponsored the conference. EPA spokesman Dave Ryan said in a statement: "We are continuing to assess the viability of the various technologies and companies in supplying cellulosic biofuel as we finalize the standards and in particular the cellulosic biofuel standard for 2010."

**Results**

The percentages and projections on the proportional use of biomass relative to total energy are consistent with the literature. One of the bottlenecks appears to be the deconstruction technology and scale-up. In a decade or so, it is anticipated that these percentages would increase exponentially, consistent with solving the bottlenecks. While there have been some individual recent reports on solving the cellulosic deconstruction bottleneck, this has not yet translated to commercial applications and will likely take some additional years to work through the pipeline to commercialization.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms

- 402 Engineering Systems and Equipment
- 601 Economics of Agricultural Production and Farm Management

**Outcome #2**

**1. Outcome Measures**

Percent Reduction In NOx Emissions From Biodiesel

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	50	50

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Biofuels such as ethanol, butanol and biodiesel have been receiving attention as alternatives to petroleum-based fuel because they are renewable and they potentially can have a positive effect on reducing emissions.

**What has been done**

Both experimental work and modeling of the properties, combustion and emissions of biodiesel and next generation fuels for diesel engines have revealed major benefits of these fuels in reducing soot and carbon monoxide emissions. Achieving a simultaneous reduction in NOx emissions has required the exploration of novel fuel injection and low temperature combustion strategies. Detailed measurements of key fuel properties impacting combustion and emissions show important differences relative to petroleum-based fuels. Fuel blends of butanol, biodiesel and diesel fuel may be formulated so that the properties fall within the required ASTM standards. A preliminary study of the properties of biodiesel produced from micro-algae has also been carried out. Further work will focus on the next generation fuels involving algae-derived biodiesel and butanol.

**Results**

Compared to ethanol, the properties of bio-butanol are more closely aligned with diesel fuel with the differences being corrected effectively with the addition of biodiesel. Blending bio-butanol with biodiesel and diesel fuel helps to reduce the higher cloud point limit caused by biodiesel fuel. The fatty acid composition of biodiesel made from micro-algae will have a strong impact on fuel properties. It should be possible to select algae strains that lead to optimum combustion characteristics. For example, a higher concentration of saturated fatty acids may provide a higher cetane number thereby improving the combustion characteristics of the fuel.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
206	Basic Plant Biology
402	Engineering Systems and Equipment

**Outcome #3****1. Outcome Measures**

Improvement In The Biomass Yields Of Perennial Grasses For Cellulosic Ethanol Relative To Current Maximum Switchgrass Yields

Not Reporting on this Outcome Measure

**Outcome #4****1. Outcome Measures**

Reducing Evaporator Fouling To Lower Costs And Increase Efficiency

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Multi-effect evaporation is used at nearly every fuel ethanol plant in the U.S. In December 2009, there were 200 biorefineries producing ethanol; 80% of these were dry grind facilities that typically use evaporation to produce syrup [condensed distillers solubles] prior to blending with wet grains to produce distillers dried grains with solubles [DDGS]. While energy to run the evaporators is typically recovered from the distillation system, evaporators still represent a major operational and capital cost to ethanol producers. Due to fouling of evaporator surfaces, heat transfer is reduced, resulting in evaporator installations that are over-designed in terms of capacity. Fouling requires periodic evaporator cleaning, resulting in additional maintenance costs, chemical use and cleaning solution waste treatment.

**What has been done**

Membrane filtration may be used as an alternative to evaporation or to provide additional dewatering capacity to increase syrup [condensed distillers solubles] production capacity when dry grind plants are expanding. Microfiltration of thin stillage prior to evaporation could have a positive impact on energy use, since microfiltration does not require evaporation [phase change] to remove water. Removal of solids, protein and fat from thin stillage may generate a permeate stream that may improve water removal efficiency and be used to increase water recycling within the dry grind process. Cleaning and maintenance of evaporators is a major expense at dry grind facilities. Microfiltration may reduce maintenance costs and increase energy efficiency of evaporators if used as a prefiltration step prior to evaporation.

**Results**

Work showed that microfiltered thin stillage had much lower fouling rates than unfiltered thin stillage or thin stillage diluted to the same solids contents as microfiltered thin stillage. Research results show there are a number of parameters to consider when selecting membrane processes and filtration materials for water removal

in the dry grind process.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
206	Basic Plant Biology
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management

#### Outcome #5

##### 1. Outcome Measures

Development Of Algae-Based Biofuels

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

Some algae species have been shown to be sufficiently high in oil content that less than 20 million hectares [10% of arable U.S. land] could potentially produce the entire oil consumption of the U.S. transportation sector [approximately 35 quads per year].

###### What has been done

We found that the ppk and ppx genes that encoded polyphosphatase kinase and exopolyphosphatase respectively did not affect significantly the rate of polysaccharides production. However, preliminary observations suggested that Agrobacterium with this mutation are more prone to lose the Ti plasmid. This observation is important since it allows the formulation of new questions about the regulatory functions of polyphosphates [polyP] on virulence. We know that polyP can influence the transcription and translation of specific genes and act as a metabolic regulator. However, we do not know the role of polyP on plasmid's retention. Agrobacterium Ti plasmid is key in tumorigenesis. This plasmid is very stable since Agrobacterium depends on it for survival within the host plant. The isolation of bacteria strains resistant to several environmental stresses from high altitude wetlands of South America's Andes resulted in the discovery of a new species Halomonas villanesis. Preliminary results of a Chlamydomonas mutant evaluation showed that this mutant exhibits several important stress-resistant characteristics including the ability to survive extreme nutrient deprivation, better tolerance of high-light intensity, and higher production rates for biomass, oils, and carbohydrates. Microalgae such as Chlamydomonas have several key characteristics for environmentally sustainable production of biofuel including higher growth rates than other plant species, the ability to grow on marginal lands, the ability to consume excess nutrients including phosphorous in eutrophic waters, and high oil content in certain species.

###### Results

Thus, algae-based biofuels could effectively replace liquid petroleum fuels without significantly compromising the availability of land for food production-- a critical limitation of current bioenergy scenarios. Furthermore, because algae can be grown on degraded lands and water bodies that are not suitable for agriculture, the competition between food and fuel can be fully mitigated. Algae naturally thrive in eutrophied watercourses and their extraordinary ability to assimilate nutrients from degraded source waters means they can actually help to increase the quantity of water resources.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
206	Basic Plant Biology

#### Outcome #6

##### 1. Outcome Measures

Improving The Multigenic Host Plant Resistance In Corn To Western Corn Rootworm

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

The WCR is a serious pest of maize in the U.S. and of growing importance in Europe. Soil insecticides, the use of transgenic maize hybrids producing a Bt toxin, and the rotation of maize with other crops are successfully used to manage WCR populations. However, the occurrence of WCR populations resistant to insecticides and adapted to cultural practices raises the question of how sustainable transgenic control measures against WCR are. In addition, monogenic resistances, like the Bt resistance, might be overcome by the target pest within a short time as amply documented in the literature. It seems, therefore, to make sense to invest in improving the multigenic host plant resistance in corn and to investigate its genetic basis.

###### What has been done

A major roadblock towards WCR host plant resistant maize genotypes is the apparent lack of genetic variation for these traits in the Midwestern maize pools. This lack of diversity is in stark contrast to the diversity available for improving other quantitative and agronomically important traits like grain yield, early maturity, or grain composition and emphasizes the need for broadening the genetic basis of the Midwestern maize pools using exotic maize germplasm. We established an efficient screening method as a key prerequisite of a successful breeding program.

###### Results

The developed protocol allowed the screening of a large number of maize genotypes for WCR resistance and, therefore, provided the means to conduct experiments designed to estimate quantitative-genetic parameters associated with WCR resistance. These estimates were critical for optimizing the applied breeding techniques. In order to broaden the genetic base of WCR resistance in maize germplasm adapted to the U.S. Corn Belt, we

used source populations provided by the USDA-ARS GEM project, which were derived from crosses between adapted and exotic maize germplasm. In support of our underlying hypotheses that exotic maize germplasm contains unique resistance genes against WCR and that genomic regions carrying resistance genes with an exotic origin can be retained in an adapted maize background if inbred development and selection is conducted under adequate WCR pressure, we selected maize inbred lines with significantly improved WCR resistance. These materials are now used to further investigate the genetic basis and the underlying mechanisms of WCR resistance in maize. In an initial study, inbred AR17059-16 had less root feeding damage, fewer larvae recovered, smaller larvae recovered, and fewer adults recovered than the susceptible controls. These results might indicate that the resistance of AR17056-16 is based on a combination of antibiosis and tolerance.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
206	Basic Plant Biology

#### Outcome #7

##### 1. Outcome Measures

Reducing The Amount of Supplemental Nitrogen Required For High Cereal Yields

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

Grain yields of maize are highly responsive to supplemental nitrogen [N], with significant amounts of supplemental N required to achieve maximal yields. As a result, an estimated five million tons of N fertilizer are applied annually to fields of maize production worldwide. Such high usage not only increases crop input costs, but also negatively impacts the environment by altering water quality and raising the energy balance for crop production. Thus, reducing the amount of supplemental N required for high cereal yields will have significant benefits to world agriculture. Despite the dramatic yield responses of maize to N and the economic importance of this trait worldwide, relatively little is known about the genes that control nitrogen use efficiency [NUE]. Efforts to understand the control of maize NUE have been limited by the complex interplay between many genes acting in both vegetative source and reproductive sink tissues. Thus, functional genomics approaches that integrate both genetic and physiological studies of whole plant N responses are both appropriate and essential to elucidating the gene networks regulating NUE. This project will develop populations that facilitate the use of existing maize genomics resources to discover genes associated with maize responses to N in agriculturally-relevant maize production environments. The results will provide more information on the genetic control of NUE in maize. In addition, the genetic resources created here will be valuable to other maize gene discovery efforts.

###### What has been done

Activities for this project during 2009 continued the analysis and further development of maize germplasm for use in functional genomics approaches to gene discovery for nitrogen [N] response traits. Populations with utility in genetic mapping were evaluated for biomass and N accumulation in field trials at sites managed for soil N availability. Genetic crosses were performed to advance or increase seeds of populations that vary for traits associated with biomass production and the response to supplemental N. Tissue samples were also collected to characterize changes in gene expression or metabolism that correlate with phenotypic differences. Experiments conducted during 2009 included evaluation of seven sets of germplasm resources: 1. 138 representative recombinant inbred lines from a larger population of 500 lines derived from the cross of Illinois High Protein [IHP] and Illinois Low Protein [ILP]; 2. the B73 x Mo17 recombinant inbred [IBMRI] population; 3. hybrids where the IHP1 or ILP1 inbred lines are crossed to the IBMRIs; 4. hybrids where either ILP1, IHP1 or B73 is crossed to a set of 25 inbred lines selected to represent the majority of allelic diversity in maize; 5. hybrids where B73 was crossed to a series of inbred lines that were also parents of recent commercially successful hybrids; 6. hybrids derived from crosses between temperate-adapted and tropical-adapted that show relatively high total biomass accumulation with low N inputs; and 7. a set of inbreds where Brazilian germplasm had been introgressed into either B73 or Mo17, and hybrids produced by crossing to the other parent [e.g. Brazilian introgressions into B73 were crossed to Mo17].

### Results

The primary products from this project are new knowledge and methods for analysis of nitrogen-responsive traits and gene expression in maize and related crop plants. New knowledge includes estimates of breeding values for specific allelic combinations of genes that function in the uptake, assimilation, transport, and storage of nitrogen in corn tissues at developmental stages important to grain and stover biomass yield. Methods were devised for rapidly sampling tissues from large numbers of plants, and conducting parallel analyses of multiple phenotypes from the same sample. Seed increases were conducted for each of the germplasm sources described above, plus populations derived from crosses of the IBMRI population to the recent elite inbred line LH82. In addition to the germplasm and knowledge created, collaborative efforts to evaluate the germplasm has provided training to graduate and undergraduate students in a program linking genomics, plant physiology, and crop improvement research in both laboratory and field settings. Research results were presented at two international conferences. During the past reporting year, two postdoctoral scientists, six graduate, and eight undergraduate students participated in the project.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
206	Basic Plant Biology

### Outcome #8

#### 1. Outcome Measures

Increased Knowledge Of Current And Future Energy Source Options

#### 2. Associated Institution Types

- 1862 Extension

#### 3a. Outcome Type:

Change in Knowledge Outcome Measure

#### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	2464

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

Respondents to Extension's statewide survey of the public to identify educational needs checked topics and made direct comments that education related to alternative energy sources was an area of high interest. As in other states the development of wind farms is expanding in Illinois accelerated by the interest of both landowners and developers. In addition, attention to identifying sustainable energy sources is critical to meeting the needs of future generations and the current generation of youth need knowledge of energy sources and a willingness to pursue careers in science that can ensure sustainable energy sources are discovered and applied.

#### What has been done

With the goal of helping landowners and communities to work effectively with wind energy developers from start to finish, Extension partnered with Illinois State University [home of the Illinois Wind Working Group], and an attorney to deliver Wind Energy101: From a Landowner's Perspective at six separate locations that included 460 participants in 4 face-to-face settings and two audio conferences settings. Topics included: [1] introduction to wind energy basics such as benefits, growth capacity, types, current locations, economic impact, cost, and opponents arguments, [2] development of a wind project with a timeline handout, and [3] related laws and regulation. Presentations drew on resources from the U.S. Department of Labor, the National Renewable Energy Laboratory, and the American Wind Energy Association. A list of wind energy education resources was distributed to participants. A question and answer session followed the presentations. Note: Additional workshops are being conducted in 2009-2010.

Materials developed by 4-H national leaders to conduct and promote a nationwide hands-on Biofuels Blast experiment were distributed to 4-H groups by Extension staff throughout Illinois to increase the number of youth excited about science. After conducting the experiment, 4-H leaders and volunteer facilitators for the experiment asked the youth questions to be answered with a show of hands regarding the impact of their participation in the experiment.

#### Results

An evaluation was distributed at the end of the Wind Energy 101 workshop to collect suggestions on format changes, questions that weren't answered, additional topics for future forums or workshops, information on how they learned about the workshop, and impact on their need for knowledge. Of the 460 participants, 196 [42%] completed the evaluation. Sixty-five percent [129] of the respondents rated the "usefulness of the handouts" 4 or 5 on a scale of Poor=1 to 5=Excellent; 164 [83%] rated the "relevance of topics to my needs" 4 or 5; and 180 [92%] rated "amount of useful information" 4 or 5. Additional information submitted for this report from the Extension staff presenter [Ag Engineer] documented that at least one person and often more said that the program would help them make an informed decision about wind leases and development after the workshop, with many also indicating a better understanding of the complex issues and need for a "wind knowledgeable" lawyer to review the contracts. In addition at least 15 participants during the course of the meetings said "I wish I had heard this before signing the lease on my land." This Extension staff member has received more than 25 follow-up contacts from landowners wanting more information or to clarify details they were sharing with family and neighbors.

Of the 2,300 youth participating in the Biofuel Blast Experiment, 95% indicated they would like to learn more about biofuels, and 98% would like to participate in future science experiments pertaining to other science topics. Plans are moving forward to focus the coming year's national and Illinois 4-H science experiment day on harnessing the power of wind to produce electricity.

### 4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management
806	Youth Development

## **V(H). Planned Program (External Factors)**

### **External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

### **Brief Explanation**

## **V(I). Planned Program (Evaluation Studies and Data Collection)**

### 1. Evaluation Studies Planned

### **Evaluation Results**

### **Key Items of Evaluation**

**V(A). Planned Program (Summary)****Program # 9****1. Name of the Planned Program**

Human Development and Family Wellbeing

**V(B). Program Knowledge Area(s)**

## 1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
802	Human Development and Family Well-Being	100%		100%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	16.6	0.0	8.0	0.0
Actual	13.1	0.0	6.3	0.0

## 2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
749619	0	241709	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
595894	0	241709	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
4300416	0	1838147	0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

Activities under the sub-goal "Researchers are studying the factors that enhance or hinder resilience in families in order to create programs and policies that will foster healthy families" included initiation of a biannual educational outreach effort in the form of a newsletter called "Love Notes" based on Intentional Harmony: Managing Work and Your Couple Relationship; cross-national studies of developmental risk and resilience in migrant families; research on co-parenting after separation and research on intimate partner violence; compilation of the More Fun with Sisters and Brothers Program curriculum; new analyses concerning the varying patterns of marital status and employment status associated with fatherhood; research to identify chronic stressors in the lives of low-income, African American families living in inner-city neighborhoods and the coping strategies used to address these stressors; and findings that lesbian and gay parents largely consider their downstate Illinois residential communities to be tolerant and that their sexual orientation is often not salient when out in public.

Activities under the sub-goal "Researchers are studying the processes of positive social and emotional development in

children and adolescents in order develop ways in which parents and other adults can foster healthy development " included youth programs as contexts for development of real-world skills in rural youth; a project designed to examine how young preschool children develop cognitive belief structures and expectations about different relationships through their daily interactions with caregivers; a study that provides one of the most comprehensive assessments, to date, of the mother-toddler attachment relationship during the third year of life; an investigation into immigrant and second-generation youth building political capital in their families and communities; attempts to explain early racial and SES gaps in school achievement; findings that everyday exposure to green spaces can have wide-ranging, positive impacts for human health and functioning; and work conducted on children's perceptions of nature and the natural world [these findings will advance not only basic understandings of children's understandings of nature but also applications in the form of similar exhibits in children's zoological parks worldwide].

Conferences and presentations under this Planned Program included the National Council on Family Relations, National Association for the Education of Young Children Annual Meeting, Illinois Council on Family Relations, Child Care Directors of Champaign County, Society for Research in Child Development, XVI Biennial International Conference on Infant Studies, American Sociological Association, 11th Leisure, Recreation and Tourism Research Symposium and International Forum, Society for Plant-People Relationships, National Institute of Medicine's Roundtable on Environmental Health Sciences, Research, and Medicine, Environment and Health Curriculum Workshop, Center for Disease Control and Prevention, and the Chicago Botanic Garden's series on Healthcare Garden Design.

*Parenting 24/7* is a web-based resource that serves as a "one-stop" repository for parenting information that is produced by the University of Illinois Family Life team [newsletter, brochures, etc.]. The site is organized by age of children, and includes a] research based articles; b] links to breaking news on child development, parenting, and family life; c] links to recommended websites; and d] video clips of actual parents talking about how they manage the challenges of raising children. The site also features: 1] the ability to receive monthly updates on new content added to the site; 2] the ability to rate and make comments on all content; and 3] the ability to easily share content by emailing to others or printing materials. The program is marketed by Extension offices using promotional materials developed by the Family Life Team of Extension Educators.

*Partners in Parenting* is a statewide project funded by USDA's Children, Youth, and Families at Risk [CYFAR] program. Through a community collaboration approach to support systems change in communities located in Cook County and four sites in southern Illinois, the program offers parents of newborns] basic child development and parenting information, 2] guided activities designed to promote positive parenting, and 3] support for seeking additional information and resources from their community through local resources and program opportunities. Networking with other local agencies is an important component of this program.

Other Extension activities include Your Young Child, a research-based curriculum and customized brochures that help parents of infants and toddlers manage seven difficult stages and behaviors that are linked to child abuse and neglect, Intentional Harmony work-life stress presentations and web-based self-study, Teachable Moments character education tips, Breaking the Code bullying simulation, long-term care workshops, Parenting Again newsletter series for grandparents raising grandchildren, a Latino Childcare Video/DVD, and Nurturing Creativity DVD and lesson guide for child care providers, Building a Better Memory brain health education, and the third annual Cook County "*Survivors of Domestic Violence: Empowering for a New Beginning*" conference for practitioners.

## 2. Brief description of the target audience

Members of the target audience included community and service agency personnel, practitioners, policy makers, mothers who co-parent after separation who experienced violence during marriage, developers of educational and intervention programs, policy makers and service providers concerned with building strong communities and families, parents, children, and child care providers, academics in sociology, education, and psychology, state policymakers and local school boards, public housing leaders, Mayors, city managers, elected officials, parks and recreation leaders, and federal officials who manage landscapes.

Extension is also focusing on individuals who work for pay and parents/grandparents of newborns in communities where at least 20% of the population lives in households with incomes below the poverty level and meet at least 50% of the following characteristics: [1] family qualifies for public assistance program; [2] family income falls below the poverty threshold; [3] family income is less than 75% of the state or county median income; [4] a parent did not complete high school; and [5] youth/family on record with community juvenile justice and law enforcement or social service agencies for various risk indicators.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

<b>2009</b>	<b>Direct Contacts Adults</b>	<b>Indirect Contacts Adults</b>	<b>Direct Contacts Youth</b>	<b>Indirect Contacts Youth</b>
<b>Plan</b>	14700	20000	2100	0
<b>Actual</b>	19020	10160	13078	0

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

Year: 2009

Plan: 0

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

<b>2009</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>	1	7	
<b>Actual</b>	0	10	10

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number Of Completed Hatch Projects

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	1	3

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Number Of Research Projects Utilizing The Child Development Laboratory Research Database
2	Increased Knowledge Of Children's Behavior At A Given Stage Of Development And Parenting Practices To Foster That Behavior
3	Reduction In Physical And Emotional Strain In Handling The Challenges Of Work And Family
4	The Extent Of The Disadvantages Of Early Fatherhood
5	Chronic Stressors And Coping Strategies Of African-American Families
6	Understanding Aspects Of Parent-Child Interactions That Impact The Social Outcomes Of Children And Families
7	Investigating Racial And Ethnic Gaps In Student Achievement
8	Increased Confidence And Competence In Functioning As A Parent

**Outcome #1****1. Outcome Measures**

Number Of Research Projects Utilizing The Child Development Laboratory Research Database

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	20	20

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

The Child Development Laboratory [CDL] Research Database Project is a unique way to capitalize on the resources available within the program that can be explicitly used to support the generation of new knowledge in the areas of child development, early childhood education and parent-child relationships by researchers on the University of Illinois at Urbana/Champaign campus.

**What has been done**

During the current reporting year, procedures were refined for gathering baseline data on all children enrolled in the CDL program. Two standardized assessment tools commonly used with young children [i.e., The Bayley Infant Neurodevelopmental Screener used with the infants and toddlers, and the DENVER II developmental screening tool used with preschool-aged children] were added to the baseline data collection process, as well as anecdotal records from teachers' portfolio assessments used to document children's growth and development. The Bayley and Denver screening tools were selected in order to provide researchers with baseline information on children's basic neurological functions, perceptual/motor skills, receptive and expressive language skills, and general overall cognitive functioning, while the anecdotal records were identified to provide researchers with insight on children's social skills and peer relationships. A research internship course was also developed during the reporting period in which undergraduate students received instruction on the appropriate and inappropriate uses of standardized assessments with young children, as well as specific training on how to conduct assessments using the Bayley and Denver screening tools. Students completing this research internship course were charged with conducting the baseline assessments using these two tools for all children currently enrolled in the CDL.

**Results**

The primary beneficiary of this project during the current reporting period has been the investigators that have accessed the CDL program as part of the data collection for their research projects. The intent of the CDL Research Database Project is to facilitate interdepartmental and cross-departmental investigations of children's development. As can be seen in the wide variety of disciplines represented in the studies undertaken during the current reporting period [e.g., Human Development and Family Studies; Curriculum and Instruction, Special Education; Community Health; Landscape Architecture; Speech and Hearing Sciences; Communications; Music Education; etc.] this project has been instrumental in broadening the scope of research projects that have come through the CDL program. A second beneficiary of the project during the reporting period has been the 19 undergraduate students that have participated in the research internship course that was developed and implemented as part of this project. These students developed a working understanding of the strengths and

limitations of standardized assessments with young children, as well as competencies in how to use such tools when screening children. Such skills and understanding will serve them well as they begin careers providing support services to children and families. Finally, children and families throughout Illinois and the U.S. have benefited from the knowledge being generated through research projects being conducted as part of this project.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

#### Outcome #2

##### 1. Outcome Measures

Increased Knowledge Of Children's Behavior At A Given Stage Of Development And Parenting Practices To Foster That Behavior

##### 2. Associated Institution Types

- 1862 Extension

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	100	168

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

Attendance at traditional face-to-face parent education programs has been decreasing over time. Contemporary families that have two working parents and busy lifestyles have less time to commit to educational opportunities. At the same time, parents continue to express the need for information on parenting and child development that will help them solve common child rearing challenges. For those parents considered "at-risk" there are additional barriers to participation in programs including lack of convenient and affordable transportation and child care, as well as lack of awareness of information to help parents of newborns manage seven difficult stages and behaviors that are linked to child abuse and neglect.

###### What has been done

The Parenting 24/7 website, Just in Time Parenting newsletters, and Your Young Child parenting programs and brochures provided information designed to help parents feel confident and empowered during developmental stages, to manage their stress, to understand normal child behavior, to have realistic expectations, and to develop positive workable parenting strategies. Extension staff offered 68 parenting programs attended by 815 participants. An evaluation was conducted using the Partners in Parenting registration form for parents of "at-risk" newborns and newsletter surveys including an instrument developed by the eXtension Community of Practice for evaluating knowledge gains attributable to age-paced newsletters.

###### Results

Evaluations were distributed to 603 [287 in 2008 and 316 in 2009] participants who have received one year of newsletters through the Partners in Parenting program with 193 respondents [81 in 2008 and 112 in 2009]. In terms of knowledge gained, over 90% [100] of the 112 survey respondents in 2009 "agreed or "strongly agreed" that the newsletters helped them learn to: [1] know what to expect my baby to be able to do at each age; [2] understand that some annoying things my baby does are normal for that age; [3] notice my baby's clues; [4] have

more ideas about ways I can play with my baby to help him/her learn; [5] have more ideas about disciplining my child without spanking or slapping; [6] understand that my baby is not trying to be bad or to make me mad on purpose; and [7] know when to schedule well-baby checkups and immunizations. In addition, a survey of Parenting 24/7 web site users indicated that 68 parents gained knowledge of children's behavior and development through the web site [See Evaluation section].

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

#### Outcome #3

##### 1. Outcome Measures

Reduction In Physical And Emotional Strain In Handling The Challenges Of Work And Family

Not Reporting on this Outcome Measure

#### Outcome #4

##### 1. Outcome Measures

The Extent Of The Disadvantages Of Early Fatherhood

##### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

New analyses were undertaken using the NLSY 1979 dataset concerning the varying patterns of marital status and employment status associated with fatherhood occurring either [1] early, [2] on-time, or [3] late. It was expected that among men becoming fathers for the first time at a given age, there would be heterogeneous patterns of marital and employment status. It was further expected that these varying patterns would be differentially associated with socioeconomic background characteristics, and with later life circumstances [earnings, educational attainment, marital status, and incarceration].

###### What has been done

With data on fatherhood status, marital status, and employment status at 10 observations between age 18 and 37, we used a newly-developed advanced statistical method, Latent Class Growth Analysis [LCGA], to empirically derive the varying patterns of the acquisition of these roles over the life course, marriage, and full-time employment taking into account their sequencing and timing. Fifteen latent classes were derived. The first paper concerned the

latent classes with median ages of first fatherhood below the cohort median [26.4], comprising 32.4 percent of NLSY men. These five latent classes can be interpreted as distinct early fatherhood pathways [EFPs]: [A] the Married Fully-Employed Young Father pathway, [B] the Married Fully-Employed Teen Father pathway, [C] the Married Partially-Employed Teen/Young Father pathway, [D] the Unmarried Partially-Employed Teen/Young Father pathway, and [E] the Initially Unmarried Fully-Employed Young Father pathway. A sixth latent class of men who become fathers around the cohort median, following full-time employment and marriage, is the comparison group.

### Results

With socio-demographic background controlled, all early fatherhood pathways show disadvantage in at least some later life circumstances [earnings, educational attainment, marital status, and incarceration]. The extent of disadvantage is greater when early fatherhood occurs at relatively younger ages [before age 20], occurs outside marriage, or occurs outside full-time employment. The relative disadvantage associated with early fatherhood, unlike early motherhood, increases over the life course. Work was begun on a second paper analyzing the five latent classes of men who became fathers for the first time at an age older than the cohort median, termed fatherhood postponers.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

## Outcome #5

### 1. Outcome Measures

Chronic Stressors And Coping Strategies Of African-American Families

### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

### 3a. Outcome Type:

Change in Knowledge Outcome Measure

### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

### 3c. Qualitative Outcome or Impact Statement

#### Issue (Who cares and Why)

The goal of the research was to identify chronic stressors in the lives of low-income, African American families living in inner-city neighborhoods and the coping strategies used to address these stressors. This research was a response to theoretical discussions that argued that the compositional, social, institutional, and normative elements of impoverished inner-city communities undermine family organization and functioning. According to theorists, families are unable to develop stable domestic routines or properly socialize their children in environments with large numbers of disadvantaged neighbors, few social or institutional supports, and ghetto-oriented value systems. In contrast, our research examined how families overcame the adversity of living in low-resource, high-risk neighborhoods.

#### What has been done

The research was informed by a family resilience framework. This approach focuses on family strengths, how families marshal resources to promote stability in the face of adversity, and the ecological context of coping. Methodologically, an interpretive framework characterized the qualitative data collection; we sought to capture and describe the daily lived experiences of participants and to understand the meanings that the women gave to those experiences. Multiple data collection strategies were used: these included neighborhood observations, participant observation with families, open-ended, in-depth interviews, and photo elicitation interviews. The interview and observational data examined topics that illuminated coping strategies, such as family routines, social networks and social support, use of neighborhood resources, nutrition, health and well-being, and parenting and childrearing. To analyze the data we used an inductive approach that facilitated the discovery of meanings and social processes as they emerged from the data in addition to sensitizing concepts from extant literatures. We transcribed and coded the interview and observational data to identify key themes. To further facilitate the conceptualization processes and identify patterns among the families, we used data displays and analytic memos.

## Results

Key findings have emerged concerning family coping strategies: Extended kinship relationships proved to be a major factor affecting low-income, African American families' coping abilities. Effective extended kin networks bolstered mothers of young children in critical ways: they provided instrumental support, including money, housing, food and clothing, child care, and domestic services. Extended kin also provided affective and social support to its members. Positive kin support was a critical response to limited local resources. Well-functioning families also were able to manage local dangers through a range of protective strategies: adult members avoided or restricted social relations with troublesome residents, instead limiting much of their social life to kin-based activities. They also confined their activities in the neighborhood to 'safe' locations. With respect to young children, mothers found local resources that benefitted their children's development, including Head Start. Mothers also closely monitored their children's activities and kept them close to home. Our inquiries into nutrition, health and well-being revealed how resilient families addressed neighborhoods saturated with fast food restaurants, corner stores and limited safe recreational outlets. Families' ability to maintain good physical health through recreation and dietary practices are, in part, related to managing neighborhood constraints, such as locating good quality grocery stores outside of the local neighborhood and participating in recreational activities in safe neighborhood niches. Extended kin were also relevant to members' health: within resilient families, members pooled monetary resources to enlarge families' food budgets, and assisted mothers with the feeding of young children. Mothers also used a range of nutritional management strategies to enhance the nutrition of their children, such as selective food purchases, restricted access to less healthy foods, and providing food for children when they were outside of the home. The research findings provide substantive, theoretical, and applied insights. Substantively, these data provide first-hand insights into patterns of family organization and interaction patterns among low-income, African American families living in inner-city neighborhoods. From a theoretical perspective, our data contribute to neighborhood effects theories and family resilience theory. Our findings suggest patterns that buffer families from negative neighborhood conditions. Contrary to neighborhood effects models, some families are able to overcome the very real adversity of living in low-resource, high-risk neighborhoods. Our findings also contribute to family resilience theory. We specifically identify family patterns that promote positive family coping, some of which reflect subcultural traditions. Applied programs that seek to improve the lives of low-income, African American families will need to take into account subcultural practices exemplified within extended kin networks. In addition to culturally relevant practices, practitioners will need to take into account the constraints and resources found in inner-city neighborhoods.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

**Outcome #6****1. Outcome Measures**

Understanding Aspects Of Parent-Child Interactions That Impact The Social Outcomes Of Children And Families

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

This project was designed to examine how young preschool children develop cognitive belief structures and expectations about different relationships through their daily interactions with caregivers.

**What has been done**

In order to examine these relations, we have used different methodological approaches such as observation and self reports as well as multiple informants such as parents and teachers. This research is also longitudinal which requires following families over time. Data to date have been collected on 60 families and 200 preschool-age children. The participants in this research include three to four year old children who attend the University-affiliated Child Development Laboratory [CDL] and their primary caregivers. The children participate in a laboratory procedure in which they are interviewed regarding their attachment representations and understanding of different emotions. During this time, the children are also asked to complete a measure that assesses perceptual asymmetries in the processing of emotion. Observational data are also obtained in the preschool setting. These data include how often children express positive and negative affects as well as the positive and negative initiations of social interactions among peers. Teachers and parents provide information on the children's social behavior, cognitive abilities, and on children's temperament. Our data analysis thus far has revealed important relations between hemispheric processing of emotion and observations of children's affect in the classroom setting. Children who have a right bias in perceptually processing emotions are more likely to have insecure attachment relationships and to express more negative affect in the peer group. These specific findings have been used to leverage additional funds to examine neurobiological correlates of attachment relationships, and have fostered a collaborative project with cognitive neuroscientists. Additional data from home and laboratory procedures are currently being transcribed and coded.

**Results**

The data generated from this project are valuable for the development of education materials that can be distributed to child care teachers, parents, and community programs that focus on families. The results of this research are important for understanding aspects of parent-child interactions that impact the social outcomes of children and families. In addition, child care providers receive evidence-based materials that directly address the most pressing issues faced by teachers and parents. Finally, this program of research serves as an important educational experience for undergraduate students. For example, over 40 undergraduate students have participated in activities such as honors projects, research-related course credit, and some of these students are now graduate students in our program. Additionally, three doctoral students from the Department of Human and

Community Development, two doctoral students from Clinical Psychology, and two doctoral students in Developmental Psychology have participated in this research.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

#### Outcome #7

##### 1. Outcome Measures

Investigating Racial And Ethnic Gaps In Student Achievement

##### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

Persistent racial/ethnic gaps in student achievement and school-related behaviors have consequences for student's educational and occupational success. The goal of this project is to examine the roots of educational inequality and specifically what role schools play in either fostering or reducing racial/ethnic and class differences in early educational trajectories, with particular attention to the development of early school-related attitudes and behavior, among a national, longitudinal sample of elementary school children.

###### What has been done

Over the past year, we have completed four studies on this project. The first study examined whether racial minority students were more likely to be placed in lower reading groups and the impact of group placement versus non-placement on reading achievement, school-related attitudes and behavior. The second study built upon this work by examining whether African American and Hispanic children who were lower grouped for reading instruction had slower reading growth compared to similar students who were not grouped for reading in the classroom. The third study examined another potential source of early educational inequality, residential and school changes, and how these moves impact school attachment and engagement as well as the likelihood that a student will develop behavioral problems. The final study explored the role of parent involvement in early educational outcomes. Specifically, this study examined whether parent-teacher relationships, parent involvement in school and parental monitoring and engagement in educational activities at home explained early race and class differences in school related behaviors and behavioral problems.

###### Results

To date, the results suggest that schools do matter and can play an important role in producing or reducing educational inequality between students from different social class and racial/ethnic backgrounds. Our studies have shown that African American, Hispanic and low-income students are more likely to be placed in lower groups for instruction early in elementary school and being lower grouped has a negative impact on multiple

educational outcomes. More specifically, the results from the first two studies suggest that grouping practices have a dual impact on educational inequality during the earliest years of schooling by: [1] delaying the reading skills of racial minority and low-income students; and [2] imbuing lower-grouped students with noxious school-related attitudes and behaviors. We have also shown that parent involvement can make a difference and may help to explain some of the behavioral differences between students from lower socioeconomic backgrounds and middle class families. The results from the first and second study were used to develop a grant proposal to the Spencer Foundation which was awarded in May. The results from this project have direct implications for improving the organizational resources that lead to better teacher practices and enhanced learning for all students by highlighting how a specific classroom practice, ability grouping, negatively impacts the learning and behavioral development of certain groups of students and in doing so, contributes to racial and socioeconomic gaps in achievement during elementary school.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

#### Outcome #8

##### 1. Outcome Measures

Increased Confidence And Competence In Functioning As A Parent

##### 2. Associated Institution Types

- 1862 Extension

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	158

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Attendance at traditional face-to-face parent education programs has been decreasing over time. Contemporary families that have two working parents and busy lifestyles have less time to commit to educational opportunities. At the same time, parents continue to express the need for information on parenting and child development that will help them solve common child rearing challenges. For those parents considered "at-risk" there are additional barriers to participation in programs including lack of convenient and affordable transportation and child care, as well as lack of awareness of information to help parents of newborns manage seven difficult stages and behaviors that are linked to child abuse and neglect.

###### **What has been done**

The Parenting 24/7 website, Just in Time Parenting newsletters, and Your Young Child parenting programs and brochures provided information designed to help parents feel confident and empowered during developmental stages, to manage their stress, to understand normal child behavior, to have realistic expectations, and to develop positive workable parenting strategies. An evaluation was conducted using the Partners in Parenting registration form for parents of "at-risk" newborns and newsletter surveys including an instrument developed by the eXtension Community of Practice for evaluating knowledge gains attributable to age-paced newsletters.

## Results

Evaluations were distributed to 603 [287 in 2008 and 316 in 2009] participants who have received one year of newsletters through the Partners in Parenting program with 193 respondents [81 in 2008 and 112 in 2009]. Eighty-nine percent [112] of 2009 survey returnees "agreed" or "strongly agreed" that they felt more confident in their skills as a parent from reading the newsletter, while 88% said they now felt more comfortable talking with their doctor when they had a question or concern. In addition, a survey of Parenting 24/7 web site users indicated that 58 parents felt more confident in their parenting skills [See Evaluation Section].

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

### V(H). Planned Program (External Factors)

#### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

#### Brief Explanation

### V(I). Planned Program (Evaluation Studies and Data Collection)

#### 1. Evaluation Studies Planned

- Retrospective (post program)
- Before-After (before and after program)
- Time series (multiple points before and after program)
- Other (Compare parents and professionals )

## Evaluation Results

The purpose of this study was to: [1] evaluate the use and effectiveness of the Parenting 24/7 website, and [2] better understand the educational and technological needs and preferences of online users in order to develop the next generation of online educational resources and how best to promote those to users most likely to use and benefit from them. Two types of data were collected: [1] web site usage [page views] between September, 2005 and November, 2009 and [2] an online survey of users of the site [registered to receive emails or monthly parenting newsletters] conducted in 2006 and 2009 and an open invitation to complete the survey to those visiting the web site in 2009. Respondents included 68 [29%] of the registered users in 2006 and 67 [19%] of the registered users in 2009. Given the low response rate and small sample size, the reviewer is cautioned to interpret these finding carefully and to consider the results as under representing those users who did not find the website to be useful.

Results represent the combined 2006 and 2009 survey responses since few demographic differences in

the samples were observed. Overall the majority of respondents [77%] rated the site as being "very" or "extremely useful." Of the 87 parents who responded [excluding the 39 professionals who work with parents], 78 [90%] claimed the site helped them to understand their child's behavior and development; 77 [89%] learned useful parenting practices or strategies; 67 [77%] learned ways to manage challenges of family life; 61 [70%] feel less anxious or worried about their child's development; 62 [70%] learned ways to cope with the stresses of parenting; and 58 [67%] feel more confident about their skills as a parent. However, parents [those who are not also trained to work with families] were less positive than professionals about the usefulness of the site and thus, may have different perspectives on the "usefulness" of research-based information and "expert advice."

Other study findings of interest but not related to impact on users include: [1] Interest in information on parenting issues related to teens and school-aged children has grown, [2] Parents are not as concerned about checking website "credentials" as family life professionals might want them to be, [3] Parents rated the information and advice they got from informal sources of support much more positively than professionals, [4] Parenting 24/7 users indicated that the website features most likely to be used [if added] would be online workshops or classes, being able to share information or advice in forums or discussion boards, and having online chats with experts; text messages was the least likely feature to be used, [5] Parents seem to value network site interactivity much more than professionals who work with parents, and [6] Although sample sizes are small in comparing current use of technology and don't meet minimum requirements for statistical reliability, trends are instructive and show that parents are more sophisticated users of technology than professionals who work with parents.

### **Key Items of Evaluation**

Findings provide support for the use of web-based resources as a source of information, education, and advice for parents. Interest in parenting issues related to teens is growing and suggests the need to develop an online resource site. Contrary to other research that women are concerned about the credibility of sources that did not hold true with this study's findings. Family life educators need to seriously consider how changes in technology use among young parents [and soon-to-be-parents] might influence the delivery [and marketing] of future educational efforts.

**V(A). Planned Program (Summary)****Program # 10****1. Name of the Planned Program**

4-H Youth Development

**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
724	Healthy Lifestyle	10%		0%	
806	Youth Development	90%		0%	
	<b>Total</b>	100%		0%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	39.0	0.0	0.0	0.0
Actual	47.8	0.0	0.0	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
2744759	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
2181886	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
15746137	0	0	0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

4-H Youth Development draws on research generated by non-Extension faculty on campus as well as Extension and non-Extension research throughout the country to offer a variety of educational delivery systems to help youth develop into adults who contribute in positive ways to their families and communities. Delivery included community clubs, after-school programs, teacher training, conferences, and camps. The current curriculum included science, engineering, and technology [SET], healthy lifestyles, and youth leadership, the three national areas of focus. In addition, social emotional learning teacher training, character education curriculum expansion, and healthy relationships programs received attention through interdisciplinary efforts between Extension youth development staff and other Extension staff efforts to develop education in these areas. Examples follow.

Science, Engineering, and Technology [SET]: A variety of activities occurred this year related to SET including ESRI grant

supported community mapping projects using GIS/GPS that helped double 4-H geospatial enrollment to 2,228 youth, robotics projects and team competitions which expanded statewide enrollment to 2,480 youth, and club participation in a nationwide science experiment. [See Sustainable Energy Planned Program]. Extension's State 4-H Office and the Graduate School of Library and Informational Science collaborated in developing a youth community informatics curriculum of interactive web-based modules on computer refurbishing, computer networking, podcasting, multimedia design, game design, and library resources which will be posted for use in 4-H statewide this spring. A youth forum was also conducted this past year focused on the use of technology. Cook County continued to offer youth science classes through its Mobile Science Laboratory [bus]. Since its launch, the lab has provided programming to more than 8,400 students and 4,700 adults. Some 300 teachers in Cook County experience professional development through math workshops. Cook as well as other counties used a forensic approach to interest youth through school settings in science and the application of scientific investigation skills.

Science Siesta and Advanced Science Siesta: These programs designed for girls in grades 4-6 and 7-8 introduced them to fun hands-on science activities and career opportunities. The program aims to dispel myths that science is too difficult, not fun, and more suited to males. Illinois Summer Academies are three-day conferences on the University of Illinois campus that provided high school teens with opportunities to explore a college campus, hands-on workshops on potential careers in SET, or leadership development training.

Volunteer Training: Volunteers are key in delivering 4-H youth development programs and are instrumental as caring adults who create an environment that is a critical element of positive youth development. This past year 23,658 volunteers gave time and talents to the 4-H youth development program in Illinois. Volunteer training included an orientation series of six one-hour modules for new volunteers that addressed the role of the 4-H volunteer, club organization, program planning, positive youth development, communications with a 4-H club, parental involvement, experiential learning, and public presentations.

Social and Emotional Learning [SEL]: An interdisciplinary effort between 4-H Youth Development and Family Life Extension staff provided extensive training to schools and agencies on the importance of social and emotional learning and the new Illinois SEL learning standards. This training also addressed information to assist participants in sharing their knowledge with colleagues and parents and to develop plans to integrate SEL standards in to classrooms.

## 2. Brief description of the target audience

Youth between the ages of 8 and 19 including children of military families; volunteers who work with youth, teachers, parents, and community members.

### V(E). Planned Program (Outputs)

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	9200	0	200000	100000
<b>Actual</b>	140762	0	317473	175523

#### 2. Number of Patent Applications Submitted (Standard Research Output)

##### Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 0

##### Patents listed

#### 3. Publications (Standard General Output Measure)

##### Number of Peer Reviewed Publications

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<b>2009</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>	2	2	
<b>Actual</b>	1	0	4

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- New Extension Program Curricula Developed

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	2	3

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Increased Knowledge About Science And Health Careers
2	Increased Knowledge Of Strategies To Manage Risk In Planning Events For Youth
3	Increased Knowledge Of Positive Youth Development Stratgies

**Outcome #1****1. Outcome Measures**

Increased Knowledge About Science And Health Careers

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	200	17

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Extension's most recent statewide survey of the public related to educational needs revealed that 2,273 respondents expressed interest in expanding youth interest in science, math, and technology. In addition this area of interest was selected by more respondents than any other area related to the issue of education and workforce preparation. Even though jobs requiring advanced degrees in science and math continue to flourish, women remain underrepresented in these careers. While women make up 46.3% of the workforce in the United States they account for only about 28% of those employed in computer and mathematical, engineering, and life, physical, and social science occupations.

**What has been done**

4-H clubs in 20 counties engaged in mapping community assets using geospatial technologies including GIS and GPS supported by ESRI grants. Extension educators in Crop Sciences and Community and Economic Development conducted two statewide professional development opportunities for staff and also conducted trainings in counties for volunteers and youth. Robotics kits were purchased and loaned to 22 counties for use in county or club activities. The first 4-H State Robotics Challenge was hosted on campus with 16 participating teams judged by 25 College of Engineering students. Three county tech teams attended Nebraska 4-H Summer Robotics Camp and also helped pilot Nebraska 4-H's newly developed online robotics curriculum. To address building interest in health careers that draw heavily on science, math, and technology, Extension's 4-H youth development staff focused this year's annual Advanced Science Siesta on exploring those careers through discussion with professors and students in the University of Illinois Colleges of Pharmacy and Applied Health Sciences. Participants learned about the tools of the pharmacological trade, physical therapy and occupational therapy concepts, the implications of nutrition, and symptoms, treatments, and long term effects of asthma, diabetes, and hypertension. Education staff at the Chicago Museum of Science and Industry then provided the 40 female participants [ages 13-15] with opportunities to learn about the human heart that included observing open heart surgery via a live video feed and interaction with staff from a local hospital followed by practicing medical procedures and skills through a medical SIM LAB experience.

**Results**

Youth demonstrated their science knowledge and skills at the state and national level in the following ways: [1] 51 were conference judged in robotics at the Illinois State Fair, [2] the 4-H State Robotics Challenge [over 50 youth], and [3] the three members of the winning state 4-H State Robotics Challenge team placed second in robotics competition at the National 4-H Engineering Conference. An evaluation completed by 20 participants in the Youth Community Informatics Forum documented that seven youth learned new technology skills, 18

indicated that they would pursue technology projects following the forum, and most agreed that the research they completed using technology was relevant to issues their community faced [e.g. violence, poverty, school dropouts]. Of the 18 participants who completed the evaluation at the end of Advanced Science Siesta, all indicated they learned science techniques they didn't know before and gained confidence in their ability to study science. Over 90% [17] who completed the evaluation indicated that their interest in studying science in college and interest in science-related careers increased as a result of this two day experience.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

### Outcome #2

#### 1. Outcome Measures

Increased Knowledge Of Strategies To Manage Risk In Planning Events For Youth

#### 2. Associated Institution Types

- 1862 Extension

#### 3a. Outcome Type:

Change in Knowledge Outcome Measure

#### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	100	18

#### 3c. Qualitative Outcome or Impact Statement

##### Issue (Who cares and Why)

Volunteers need to recognize how to create a safe and structured environment for youth activities as well as creating a caring relationship with youth in order to effect their development in a positive manner. Creating an emotionally and physically safe environment is one of the essential elements of positive youth development under the key concept of "belonging".

##### What has been done

Volunteer training was conducted for 22 4-H volunteers on following a risk management planning process that helped them to identify, analyze, and manage risks when planning for 4-H events and activities.

##### Results

In the end-of-session evaluation, 15 of the 22 participants indicated that they had increased their knowledge of risk management terms, 16 indicated an increase in knowledge of insurance and risk management practices related to general and automotive liability, medical insurance, "hold harm less coverage" bus coverage, and miscellaneous property coverage. In addition, 18 volunteers indicated an increase in knowledge related to strategies to retain, share, reduce, and avoid risks. Volunteers also shared a number of strategies that they intended to implement in the near future. These included having written risk plans for events, letting the Extension office know of plans, teaching proper tool usage, using medical forms, and identifying trained medical personnel among volunteers and parents. In the follow-up evaluation, leaders indicated that they used informed consent forms and paid more attention to releasing youth at the end of meetings. They intended to conduct orientation sessions for youth and adults leading specific activities, planned to follow procedures for documenting

medical/behavior incidents, and planned to share risk management plans with other leaders and parents.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

#### Outcome #3

##### 1. Outcome Measures

Increased Knowledge Of Positive Youth Development Stratgies

##### 2. Associated Institution Types

- 1862 Extension

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	549

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Volunteers need to recognize how to create a safe and structured environment for youth activities as well as creating a caring relationship with youth in order to effect their development in a positive manner. A growing body of research and an increasing concern about the mental well-being of young people resulted in the Illinois Children's Mental Health Act. This act required the State Board of Education to create new Social and Emotional Learning [SEL] standards and all school districts to submit policies for how they will address the social and emotional needs of all students. Extension staff discovered that school personnel lacked knowledge regarding these new learning standards and the resources to implement them.

###### **What has been done**

A variety of volunteer training was conducted for 4-H volunteers. Two hundred sixty [260] volunteers attended the Valued Volunteer Orientation series that included face-to-face and distance training on the role of the 4-H volunteer, club organization, program planning, positive youth development, communications with a 4-H club, and parental involvement, experiential learning, and public presentations. University of Illinois Extension contracted to identify audiences and deliver presentations to school personnel. These presentations were developed through a collaborative effort with the Illinois Children's Mental Health Partnership, the Collaborative for Academic, Social and Emotional Learning [CASEL], and the Illinois State Board of Education [ISBE]. The presentations introduced participants to the state SEL learning standards, why SEL is important to the academic and life successes of young people and suggested key actions for implementing the standards in their schools. Extension delivered 27 presentations reaching 898 participants from 38 counties and 130 school districts. Extension staff created and implemented an evaluation process to collect information about participants' changes in their awareness and interest in SEL and the new SEL learning standards, their perceived next steps, and actions taken.

###### **Results**

Post training evaluations were developed and distributed to participants for all volunteer training modules and follow-up evaluation instruments to identify practice changes were available for some of the training modules. Due to variations in participation and evaluation response rates, quantitative measures of knowledge or practice changes varied greatly with respect to the six modules in the Valued Volunteer Orientation Series. Space limits of this reporting format do not allow for comprehensive qualitative description of participant feedback. However, 24 volunteers shared ideas of how they might incorporate positive youth development principles into their club meetings and 24 volunteer leaders reported key ideas they gained in improving communications with parents and youth in their clubs. At the end of the module addressing parental involvement, 25 volunteers indicated they increased their knowledge of parenting styles and how they could use that information to maximize parent involvement. A follow-up evaluation of the module on public presentations revealed that 26 4-H leaders had shared tools with members, provided them with information about related events, and felt that the quality of their club presentations had improved as a result of the training.

According to evaluation data collected from 597 participants at the conclusion of each SEL presentation, 519 [78%] indicated that they had increased their understanding of social and emotional learning, and 525 [88%] increased their understanding of the important role of SEL for young people's success in school and life. A large majority of respondents also selected multiple next steps they planned to take as a result of the training. Those next steps checked by over three hundred respondents included [1] modeling positive social and emotional behaviors in school, [2] engaging in conversations with other teachers, parents/caregivers about young people's social and emotional development, and [3] personally learning more about SEL. Extension staff follow-up with each school several months after the presentations discovered the following examples of action take by some of the schools: [1] providing professional development opportunities for additional school personnel, as well as parents/caregivers and exploring and [2] developing school SEL implementation plans.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

- Appropriations changes

##### Brief Explanation

#### V(I). Planned Program (Evaluation Studies and Data Collection)

##### 1. Evaluation Studies Planned

##### Evaluation Results

##### Key Items of Evaluation

**V(A). Planned Program (Summary)****Program # 11****1. Name of the Planned Program**

Agricultural and Biological Engineering

**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
112	Watershed Protection and Management	20%		10%	
141	Air Resource Protection and Management	10%		0%	
401	Structures, Facilities, and General Purpose Farm Supplies	45%		15%	
402	Engineering Systems and Equipment	15%		10%	
403	Waste Disposal, Recycling, and Reuse	0%		20%	
404	Instrumentation and Control Systems	10%		20%	
405	Drainage and Irrigation Systems and Facilities	0%		10%	
511	New and Improved Non-Food Products and Processes	0%		15%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

<b>Year: 2009</b>	<b>Extension</b>		<b>Research</b>	
	<b>1862</b>	<b>1890</b>	<b>1862</b>	<b>1890</b>
Plan	3.0	0.0	6.0	0.0
Actual	2.6	0.0	4.6	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
149924	0	235874	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
119179	0	235874	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
860083	0	970372	0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

Activities under the sub-goal "To improve agricultural productivity through the use of intelligent machines" included the development of intelligence-enabled machinery to improve practices in bio-systems such as in agriculture for food/fiber/energy production as well as forestry; work toward the creation of a capable system for crop growers to safely and efficiently practice effective and profitable mechanized precision farming operations; and the completion of two studies of the impact of nozzle type, droplet size, and spray adjuvants on the aerial application of fungicides to corn.

Activities under the sub-goal "To integrate biological science and engineering for enhancement of living systems" included an investigation of the spread of antimicrobial resistance near animal facilities [in particular mechanisms of extracellular DNA transport and transfer]; conducting and analyzing experiments on the use of synthetic gene circuits as biological sensors; improvements in the application of pest control substances [the results of this project will reduce the overall chemical input cost of crop production and reduce the negative environmental impact of agriculture production practices]; research designed to optimize poultry production and welfare using physiological, behavioral and physical assessments; a study of pollutants transport and the ventilation effectiveness inside animal facilities to provide information for better ventilation systems to improve the indoor environment in animal facilities; and the development of a breath output simulator which will be used in testing the design of breath sampling and sensing technologies toward the ultimate goal of using this information to monitor the health of livestock via breath analysis.

Activities under the sub-goal "To utilize holistic approaches to provide engineering solutions" included observed changes of behavior within our research community where meta-information suitable for systems analysis is being collected for further analysis [it is anticipated that this information will be useful for the improvement of research efficiency in delivering future bioenergy systems] and work toward establishing a preliminary database of particle size distributions for concentrated animal feeding operations as well as a protocol to evaluate the performance of PM samplers used in agricultural operations.

Conferences and presentations under this Planned Program include the American Geophysical Union Fall Meeting, American Environmental Engineering and Science Professors Biennial Conference, Annual Meeting of the Institute for Biological Engineers, American Society of Agricultural and Biological Engineers, and the Bioenergy Engineering Conference.

Extension activities related to this planned program are interdisciplinary in nature and relate to other planned programs featured in this report [such as Sustainable Energy and Animal Health and Production]. Much effort is devoted to education focused on livestock manure management through statewide **Certified Livestock Manager Training** workshops and an online five-part quiz series, both of which meet state training requirements for livestock producers. Livestock producers with 300 or more animal units must be recertified through training and/or exam passage every three years. Slightly over 600 livestock producers attended one of 13 workshops and over 30 completed the online five-part quiz series to meet training requirements.

With limited Extension specialist FTE's, Extension has chosen to expand outreach through websites. **The Illinois Manure Management Program** website [[www.immp.uiuc.edu](http://www.immp.uiuc.edu)] helped livestock producers to develop manure management plans to more efficiently and safely use manure as a fertilizer. The website allows customizing the plan to meet a given producer's needs and facilitates any required annual updates. Currently 448 producers are using the website to hold and modify their plans. Other websites created this past year include: 1) Manure Share, an exchange program that brings gardeners and landscapers searching for organic materials for use in composting or field applications in contact with livestock owners with excess manure and 2) Small Farms Manure Management website for individuals with less than 300 animal units. Use of the EZregs website has been expanded and currently has 590 users who have established accounts to store their questions and Extension responses related to identifying environmental regulations that pertain to specific agricultural and horticultural operations and practices in Illinois. In addition, radon education continues to be delivered in a variety of ways including a dedicated website.

## 2. Brief description of the target audience

Agricultural pesticide applicators [both ground and aerial] as well as pesticide manufacturers who make recommendations on how their products should be applied, environmental and agricultural engineers, animal scientists, farmers, industrial groups engaged in agricultural, industrial and pharmaceutical biotechnology, equipment and chemical companies, government regulation agencies related to air quality and animal facilities, and industry firms related to air quality control technologies.

### V(E). Planned Program (Outputs)

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	5000	2500	100	100
<b>Actual</b>	4624	3690	2075	0

## 2. Number of Patent Applications Submitted (Standard Research Output)

### Patent Applications Submitted

Year: 2009

Plan: 1

Actual: 1

### Patents listed

One patent application was submitted, related to developing a method for facilitating fermentation of high solids.

## 3. Publications (Standard General Output Measure)

### Number of Peer Reviewed Publications

2009	Extension	Research	Total
<b>Plan</b>	1	25	
<b>Actual</b>	2	16	18

## V(F). State Defined Outputs

### Output Target

#### Output #1

##### Output Measure

- Number Of Completed Hatch Projects

Year	Target	Actual
2009	2	4

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

<b>O. No.</b>	<b>OUTCOME NAME</b>
1	Number Of Subsurface Bioreactor Acres In Illinois
2	Producer Reported Changes/Improvement In Manure Management And Application Method To Reduce Odor And Notification Of Neighbors Of Planned Action
3	Radon Level In Homes Checked And Mitigated Where Discovered
4	Development Of The Core Technologies For Agricultural Infotronic Systems
5	Improving Pesticide Applications To Maximize Efficacy While Minimizing Drift
6	Improving The Indoor Environment And Air Quality Of Animal Facilities

**Outcome #1****1. Outcome Measures**

Number Of Subsurface Bioreactor Acres In Illinois

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	600	420

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Agricultural drainage is almost as old as agriculture itself, and the practice has produced thousands of hectares of fertile cropland in the Midwestern United States. Drainage systems have a significant effect on the hydrology and water quality of the watersheds in which they occur; there is a strong correlation between improved drainage and elevated nutrient transport from cropped land, for example.

**What has been done**

While for most of its history agricultural drainage has been directed towards improving crop production, in recent years conservation drainage practices, that is, practices that are optimized for both production and water quality, have become the main focus of researchers in Illinois. One such practice is the use of passive subsurface bioreactors, which are underground trenches filled with wood chips through which tile water is passed. We are developing and testing these systems.

**Results**

We have modified the design to eliminate the formation of methyl mercury in these systems. This work has been incorporated into the Bioreactor Design Standard adopted by the Iowa NRCS. We are under contract from the Illinois NRCS to develop performance curves for Illinois, relating loading rate to efficacy. There are currently approximately 420 acres served by bioreactors.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
112	Watershed Protection and Management
402	Engineering Systems and Equipment
405	Drainage and Irrigation Systems and Facilities

**Outcome #2****1. Outcome Measures**

Producer Reported Changes/Improvement In Manure Management And Application Method To Reduce Odor And Notification Of Neighbors Of Planned Action

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	60	169

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Air and surface water contamination can result from improper livestock manure handling.

**What has been done**

Since the implementation 13 years ago of livestock manure management regulations that include required training and certification testing, Extension has accepted responsibility for the training delivered through workshops and an online quiz series per regulations administered by the Illinois Department of Agriculture. This past year 13 workshops attended by 612 participants were conducted across Illinois with a certification exam administered following the workshop. Content for 2008-2009 training workshops addressed concrete construction, carcass disposal, latest odor control research, manure sampling, marketing manure based on the value of manure as fertilizer, and feeding ethanol by-products and how they affect the manure management plan. The Illinois Department of Agriculture staff taught a segment related to regulations established by the Illinois livestock Management Facilities Act of 1997 and administered a certification test following the training workshops that is required of all livestock producers with 1,000 or more animal units.

**Results**

Based on evaluation response rates from 2007-2008 workshop participants, one might expect similar findings for the producers who were seeking recertification in 2008-2009. The 2007-2008 findings would suggest that an additional 165 [27% of 612] have a manure management plan that was "written, but not updated regularly" and 238 [39% of 612] have a plan that is "written, updated annually, and constantly used." A follow-up of certified livestock manager workshop attendees in 2003 assessed specific practices changed as a result of the training. Based on this year's attendance [612] and using percentages from the 2003 assessment, results could be extrapolated to suggest that 48 [8%] increased frequency of manure testing, 169 [27.7%] changed/improved manure application methods to be neighbor-friendly, 104 [16.7%] now regularly notify neighbors prior to manure storage, and 28 [4.6%] changed their method/type of storage.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
112	Watershed Protection and Management
401	Structures, Facilities, and General Purpose Farm Supplies

403 Waste Disposal, Recycling, and Reuse

**Outcome #3****1. Outcome Measures**

Radon Level In Homes Checked And Mitigated Where Discovered

Not Reporting on this Outcome Measure

**Outcome #4****1. Outcome Measures**

Development Of The Core Technologies For Agricultural Infotronic Systems

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

This research aims to develop the core technologies for agricultural infotronic systems, including the automated data collection, processing and presentation technologies, intelligent task planning and automated implementation functions. Such integrated agricultural infotronic systems technology can be used to support more effective mechanized precision crop production.

**What has been done**

Research has been focused on creating an innovative concept of visual situation awareness and automated calibration technologies for field agricultural machinery. A stereovision surrounding observation technology can provide a reliable and accurate means to gain the situation awareness for enhancing safe operation. It is anticipated to provide farmers a means of more productive and safer operation, and therefore promises an incalculable societal and economic benefit to agricultural producers and their families. An automated system calibration technology can remove one of the major service obstacles for growers to adopting the visual situation awareness technology on their automated machinery.

**Results**

A pilot study has verified that it is technically feasible to estimate the vehicle motion status based on visual cues. The other major research activities of this year include the preliminary study on fundamental technologies for biomass feedstock harvesting. Based on the outcomes from this research program, four peer-reviewed articles have been published in various professional journals, and six research papers have been represented on several national and international technical conferences. In addition, one graduate student has completed his study in the program and received his Ph.D. degree in the Fall of 2009.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
401	Structures, Facilities, and General Purpose Farm Supplies
402	Engineering Systems and Equipment
404	Instrumentation and Control Systems
511	New and Improved Non-Food Products and Processes

#### Outcome #5

##### 1. Outcome Measures

Improving Pesticide Applications To Maximize Efficacy While Minimizing Drift

##### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Action Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

The goal of this investigation is to provide guidelines for aerial applicators on how to adjust nozzle setup for different types of pesticide formulations and adjuvants to maximize efficacy while minimizing drift.

###### What has been done

A spray table was partially fabricated to test, in conjunction with a new droplet size analyzing system, the impact of pressure changes called for with automatic rate controllers on spray pattern width and droplet size. The spray table should be completed in 2010; testing will begin after its completion. Information generated by this project is disseminated through talks at various applicator meetings, at both national and state levels, at state-based aerial pattern testing clinics, and through personal communications with partner organizations who make the recommendations for how their products are applied.

###### Results

The results from the aerial fungicide applications on corn studies have shown that the critical variable for making an efficacious application is droplet size, and that including crop oil concentrate in the spray solution improves coverage. Various nozzle types can be used for these applications, provided they are set up and operated correctly. The impact of these studies will be the effective use of lower spray application rates, allowing more acres to be treated in a reduced time period. This will be critical if multiple applications to prevent various insect and disease outbreaks are required during a single growing season. The study on the impact of pesticide formulations and adjuvants has resulted in a preliminary database of the impacts on droplet size and pattern uniformity. The impact of these compounds on spray pattern uniformity and droplet size are thought to be a major contributor to streaking in the field, poor product performance, and drift. Once testing of various formulations and adjuvants is completed, the next round of the project will determine how to compensate for the effects of these

compounds via nozzle angle adjustment, pressure, rotary atomizer cage speed, and the use of deposition aides.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
401	Structures, Facilities, and General Purpose Farm Supplies
402	Engineering Systems and Equipment
404	Instrumentation and Control Systems
511	New and Improved Non-Food Products and Processes

#### Outcome #6

##### 1. Outcome Measures

Improving The Indoor Environment And Air Quality Of Animal Facilities

##### 2. Associated Institution Types

- 1862 Research

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

The consolidating livestock industry has created environmental problems such as poor air quality inside buildings and air pollutants in adjacent areas. The objectives of the project were to study pollutant transport and the ventilation effectiveness inside animal facilities, therefore to provide information for better ventilation systems to improve the indoor environment in animal facilities. A clear understanding of airborne particulate matter spatial distribution can provide important information for improvement of ventilation system design and control strategies.

###### What has been done

In this project, the dust mass spatial distributions were measured using a multi-point sampler in a full-scale mechanically ventilated laboratory room under controlled conditions and in typical swine buildings. The experimental results showed that the particle mass spatial concentrations varied widely as a result of ventilation. Increasing the ventilation rate within the same ventilation system reduced the overall mean particle concentration. At the same ventilation rate, the ventilation effectiveness varied widely with different ventilation systems. The experimental results also showed that the air outlet location had a substantial effect on the dust spatial distribution and the overall dust mass concentration. Ventilation system design was therefore shown to be critical to dust control in a mechanically ventilated airspace. Positioning the air outlet at the dustiest location can substantially improve dust removal effectiveness. The air inlet location also had an effect on the dust spatial distribution because air inlet location changed the air flow pattern. The effectiveness of the ventilation system, as well as other control measures, can be characterized by how well it removes the contaminant from representative locations. The spatial distributions of the concentrations of total suspended particulate matter [TSP], PM10 and PM2.5 were measured in a wean-to-finish swine building during winter and summer weather conditions. Results showed that the spatial distribution of particles differ in winter and summer due to different airflow patterns. The results provided

information for better ventilation system design. The airflows and particle transport in a ventilated room were numerically investigated by applying different CFD turbulence models. Quantitative and qualitative comparisons were made between the numerical results and corresponding experimental data. The numerical simulation indicated that dust spatial distribution was highly related to the airflow pattern, dust source strength, and gravitational sedimentation of particles. Air distribution plays a major role in the dust transport in a ventilated airspace.

### Results

The experimental results and numerical simulations from this project are useful to design a better ventilation system to keep the animals comfortable and performing well by providing an optimal thermal environment and improving ventilation effectiveness. The spatial distribution of airborne pollutants is useful in the design of sampling strategies that require limited sampling locations. This information can provide guidelines to reduce the sampling costs while having better sampling accuracy. The results of spatial concentration of gases and dust from this study will also be useful for researchers and scientists in studying contaminant transport, in evaluating the effectiveness of contaminant control measures, and in designing effective ventilation systems to improve indoor air quality. For example, one finding shows that the location of the ventilation outlet has a substantial effect on the overall dust concentration. Positioning the air outlet in a dustier, rather than a cleaner, area is a more effective means to control indoor dust concentration. This information can be applied to improving livestock building ventilation design, such as pit ventilation.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
401	Structures, Facilities, and General Purpose Farm Supplies
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
404	Instrumentation and Control Systems

## V(H). Planned Program (External Factors)

### External factors which affected outcomes

- Government Regulations

### Brief Explanation

## V(I). Planned Program (Evaluation Studies and Data Collection)

### 1. Evaluation Studies Planned

- Retrospective (post program)
- Before-After (before and after program)
- Time series (multiple points before and after program)
- Other ( )

## Evaluation Results

## Key Items of Evaluation

**V(A). Planned Program (Summary)****Program # 12****1. Name of the Planned Program**

Climate Change

**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
102	Soil, Plant, Water, Nutrient Relationships	15%		15%	
104	Protect Soil from Harmful Effects of Natural Elements	0%		15%	
111	Conservation and Efficient Use of Water	0%		15%	
124	Urban Forestry	10%		0%	
125	Agroforestry	10%		0%	
132	Weather and Climate	30%		20%	
133	Pollution Prevention and Mitigation	30%		20%	
136	Conservation of Biological Diversity	0%		15%	
806	Youth Development	5%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

<b>Year: 2009</b>	<b>Extension</b>		<b>Research</b>	
	<b>1862</b>	<b>1890</b>	<b>1862</b>	<b>1890</b>
Actual	0.2	0.0	1.5	0.0

Actual	0.2	0.0	1.5	0.0
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**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
11533	0	158278	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
9168	0	158278	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
66160	0	976292	0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

Current activities include efforts to align the goals of agricultural production with the complex interactions and cycles present in both managed and unmanaged systems [our current agricultural system is one that is typically maintained in an over-simplified and unstable state that "evolved" only with heavy inputs of cheap energy in the form of synthetic chemical fertilizers and pesticides]; work to compare the ecology of ratsnakes across the complete range of this species to assess how the snakes' ecology is likely to be affected by climate change; ongoing work by the National Atmospheric Deposition Program which has provided measurements of the chemicals in precipitation since 1977 [scientists at State Agricultural Experiment Stations recognize the need for measuring the acidic substances, nutrients, and mercury in precipitation in order to assess their potential impact on our nation's natural and cultural resources]; the development of results that will help us to better understand the forest landscape response to climatic change and direct field experiments; and a study of the impact of surface ozone on crop and soybean yields.

The annual state Extension Soil and Water Management program focused on carbon, water, and soils and was delivered via webinar hosted at 22 locations this past year with 210 participating. Carbon Sequestration and Carbon Trading in Illinois were two of the half-hour presentations along with others that addressed the latest research in soil and water management. Forestry programs and the Emerald Ash Borer educational efforts described in the Natural Resources and the Environment and Plant Health Systems and Production Planned Programs also addressed carbon sequestration. In addition, youth programs that directly addressed this national priority included "Why Green? Reducing Our Carbon Footprint" that focused on global warming, greenhouse gases and sea level rise using experiments showing sea-level rise due to melting ice and a simulation of the greenhouse effect. Another program, "Reducing Our Carbon Footprint," was conducted at two Neighborhood Resource Centers that serve a largely low-income African or Hispanic population.

The Environmental Change Institute [ECI] was created in 2008, with a gift from the Alvin H. Baum Family Fund and matching funds from the College of Agricultural, Consumer and Environmental Sciences; the College of Business; and the College of Law. Under the leadership of the interim Director of the ECI [who has a partial Extension appointment], a Cap and Trade Summit held in Chicago in May, 2009 brought together 100 scientists, traders, business people, environmentalists, policy-makers, and students to hear and see the visual evidence of global climate change. Presentations addressed [1] the link between science and policy recommendations to mitigate climate change, [2] the challenges of designing a cap and trade system and how different designs might play out in the market place, [3] the benefits for companies to begin to measure and manage their carbon footprint using GHG protocol and the tools of the Chicago Climate Registry, [4] how the Chicago Climate Exchange is working worldwide to provide a trading platform for carbon financial instruments and futures and options, [5] the rational and history of the regional Green House Gas Initiative, [6] an overview of the programs already underway in Illinois to mitigate environmental damage and increase the use of renewable energy and energy efficiency technologies, and [7] local efforts led by the City of Chicago to be a model global city in the fight against climate change.

## 2. Brief description of the target audience

The target audience includes policy makers, concerned citizens, farmers, land managers, natural resource specialists, researchers, Extension educators, land managers, regulators, youth, and local elected officials and business decision makers.

### V(E). Planned Program (Outputs)

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
<b>Actual</b>	310	0	49	0

## 2. Number of Patent Applications Submitted (Standard Research Output)

### Patent Applications Submitted

Year: 2009

Plan:

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

<b>2009</b>	<b>Extension</b>	<b>Research</b>	<b>Total</b>
<b>Plan</b>			
<b>Actual</b>	0	6	6

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number Of Completed Hatch Projects

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	2

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Dissemination Of Air Quality And Atmospheric Deposition Data Through Web Hits On The National Atmospheric Deposition Program Website
2	Evaluating The Impact Of Climate Change On Ratsnake Habitats
3	Identifying The Impact Of Ozone On Corn And Soybean Yields

**Outcome #1****1. Outcome Measures**

Dissemination Of Air Quality And Atmospheric Deposition Data Through Web Hits On The National Atmospheric Deposition Program Website

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	1650000

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

The National Atmospheric Deposition Program/National Trends Network [NADP/NTN] is a nationwide network of precipitation monitoring sites. The network is a cooperative effort between many different groups, including the State Agricultural Experiment Stations, U.S. Geological Survey, U.S. Department of Agriculture, and numerous other governmental and private entities. The purpose of the network is to collect data on the chemistry of precipitation for monitoring of geographical and temporal long-term trends. The precipitation at each station is collected weekly according to strict clean-handling procedures. It is then sent to the Central Analytical Laboratory where it is analyzed for hydrogen [acidity as pH], sulfate, nitrate, ammonium, chloride, and base cations [such as calcium, magnesium, potassium and sodium].

**What has been done**

During the year, the National Trends Network coordinated the activities at 250 NTN stations. Sites collect precipitation-only samples weekly in 48 states, Puerto Rico, and the Virgin Islands [<http://nadp.isws.illinois.edu/sites/ntnmap.asp>]. The NTN is the only long-term nationwide record of wet deposition in the U.S. This project coordinated and analyzed 18,454 samples which were delivered to the National Atmospheric Deposition Program database. Measured concentration, precipitation amounts, wet deposition rates and quality assurance flags and ratings are available online. The 7-site AIRMoN [<http://nadp.isws.illinois.edu/AIRMoN/>] collects daily precipitation samples and supports research of atmospheric transport and removal of air pollutants, focusing on individual precipitation events. During the past year, the AIRMoN coordinated and analyzed more than 1,390 samples, which were delivered to the NADP database [ongoing]. The Mercury Deposition Network has 113 sites [<http://nadp.isws.illinois.edu/mdn/>] and offers the only regional measurements of mercury [Hg] in North American precipitation. For the year, the MDN coordinated and analyzed approximately 6,001 precipitation samples, and delivered the data to the NADP database [ongoing].

**Results**

Our website continues to be the primary data dissemination tool. This site received ~ 1.65 million "hits" and 90,000 unique visitors in the past 12 months, and has almost 40,000 registered users. More importantly, users retrieved 26,000 data files. One-third of users are from federal and state agencies, another third from universities, and one-fifth from K-to-12 schools. These statistics demonstrate that NADP continues to be relevant to these communities. The EPA Clean Air Markets Division has produced a new Web-based data tool for on-demand mapping of wet deposition [nitrate, sulfate, ammonium, etc.] and total deposition and other factors [emissions, etc]. This web-based tool can be found at: [<http://camddataandmaps.epa.gov/gdm/>]. NADP also continues to

assist authors and publishers using NADP data and products in new science textbooks.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
132	Weather and Climate
133	Pollution Prevention and Mitigation
136	Conservation of Biological Diversity

**Outcome #2**

**1. Outcome Measures**

Evaluating The Impact Of Climate Change On Ratsnake Habitats

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Wildlife in agricultural landscapes faces pressure on two fronts. Habitat loss and alteration reduces the availability and quality of habitat required by wildlife, and climate change is also altering habitat suitability.

**What has been done**

This study is examining habitat use and thermal ecology of ratsnakes across the snake's range from Texas to Canada. By determining how the snakes are affected by climate across this latitudinal range it will be possible to predict how the snakes are likely to be affected by global warming. The interacting effects of climate and habitat are likely to affect the role of ratsnakes as important predators of breeding birds, and in turn the conservation efforts aimed at some of the endangered birds on which the snakes prey.

**Results**

The goal is to identify ways in which habitat can be managed to modify the snakes' behavior in ways that reduce their impact on bird species of conservation concern. The first analysis examining activity and mortality patterns has been completed, with the more complex analysis of thermal ecology ongoing.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
132	Weather and Climate
133	Pollution Prevention and Mitigation

**Outcome #3****1. Outcome Measures**

Identifying The Impact Of Ozone On Corn And Soybean Yields

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

Ozone pollution standards are based solely on the effect on human health. Evidence of direct effects on crops has been rejected until now, because it comes from chamber and greenhouse experiments of uncertain relevance to the situation in farm fields.

**What has been done**

By combining direct measurements of surface ozone over the past 30 years with yield data in the counties monitored we developed regression equations relating year-year variation in yield with year-year variation in growing season temperature, precipitation, and surface ozone. This analysis showed that although temperature and precipitation accounted for much of the variation, that ozone accounted for a statistically significant proportion of the residual variation.

**Results**

By a regression approach and after separating out related variables, we have found that ozone is resulting today in about a 10% yield loss for soybean, and unexpectedly a similar proportionate loss for corn. This provides important evidence for the value of the work of others at Illinois, who are using the SoyFACE facility to understand the basis of genetic variation in ozone tolerance in soybean. For more information on SoyFACE please see [www.soyface.illinois.edu](http://www.soyface.illinois.edu)].

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
132	Weather and Climate
133	Pollution Prevention and Mitigation

**V(H). Planned Program (External Factors)**

**External factors which affected outcomes**

- Competing Programmatic Challenges

**Brief Explanation**

**V(I). Planned Program (Evaluation Studies and Data Collection)**

1. Evaluation Studies Planned

**Evaluation Results**

**Key Items of Evaluation**

**V(A). Planned Program (Summary)****Program # 13****1. Name of the Planned Program**

Childhood Obesity

**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
703	Nutrition Education and Behavior	40%		15%	
704	Nutrition and Hunger in the Population	5%		35%	
724	Healthy Lifestyle	20%		15%	
802	Human Development and Family Well-Being	5%		20%	
805	Community Institutions, Health, and Social Services	10%		15%	
806	Youth Development	20%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

<b>Year: 2009</b>	<b>Extension</b>		<b>Research</b>	
	<b>1862</b>	<b>1890</b>	<b>1862</b>	<b>1890</b>
Actual	7.8	0.0	0.7	0.0

**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
449771	0	39515	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
357536	0	39515	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
2580249	0	172386	0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

Current activities include studies on the effect of food insecurity on childhood obesity and on the effect of stress on childhood obesity; ongoing work under the STRONG Kids project [a comprehensive and interdisciplinary approach to the study of childhood obesity and health with the primary purpose of obtaining rich and integrative data in order to test theory-driven models of the effects of media and marketing on children's weight status and health within family and community contexts]; efforts to

understand the characteristics of high protein ingredients and the resulting product qualities and to provide a guide for high protein soy foods development [which will provide more choices for better nutrition to consumers]; as well as continued work under the PONDER-G project [Prevent Obesity and Nutrition-related Diseases: Environmental Resources and Genomics], which aims to establish and recognize the basis of predictive, preventive and personalized interventions in the context of obesity.

Most Extension activities that address healthy food choices are delivered by Expanded Food and Nutrition Education Program [EFNEP] staff and Supplemental Nutrition Assistance Program [SNAP] staff who conduct hands-on activities with children and their parents who have limited incomes. Education regarding the Food Guide Pyramid, food safety, and the importance of physical activity is stressed in preschool, school classrooms, and summer cooking schools. Materials are being designed and delivered to both youth and their parents.

For example, OrganWise Guys-based programs are being delivered to approximately 6,000 youth in 16 counties. Show Stopping Healthy Hopping is a jump rope competitive program that also provides opportunities to address youth's basic developmental needs. Healthy Hopping is a series of 6-8 lessons offered to Chicago youth that included nutrition activities, jump rope skills, and preparing a healthy snack. Get Up and Move is a series of activities for incorporation into 4-H club activities. For parents, Extension offers Grow and Go, a series of newsletters for parents of preschoolers including ones that address portion sizing, preventing overeating, healthy snacks and activities. Using a Hispanic interpreter, a staff member designed and offered low-income parents several sessions on preventing disease in children. A family chronic disease history was used as the approach that included a discussion of preventable factors, determining childhood obesity, and the effect of marketing, family structure, and culture as it relates to body image and food consumption with children.

## 2. Brief description of the target audience

Child care providers, health professionals, researchers in the fields of economics, public health, and nutrition, policymakers charged with improving the well-being of low-income Americans, and program administrators overseeing food assistance programs, pre-school and elementary youth and their parents.

### V(E). Planned Program (Outputs)

#### 1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
<b>Actual</b>	233000	67000	161000	0

#### 2. Number of Patent Applications Submitted (Standard Research Output)

##### Patent Applications Submitted

Year: 2009

Plan:

Actual: 0

### Patents listed

#### 3. Publications (Standard General Output Measure)

##### Number of Peer Reviewed Publications

2009	Extension	Research	Total
<b>Plan</b>			
<b>Actual</b>	0	8	8

### V(F). State Defined Outputs

**Output Target**

**Output #1**

**Output Measure**

- Number Of Completed Hatch Research Projects

<b>Year</b>	<b>Target</b>	<b>Actual</b>
2009	{No Data Entered}	0

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Efforts To Understand How Food Insecurity Affects Childhood Obesity In The United States
2	Increased Consumption Of Foods Low In Fat And High In Fiber And Increasing Physical Activity

**Outcome #1****1. Outcome Measures**

Efforts To Understand How Food Insecurity Affects Childhood Obesity In The United States

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

The central goal of this project is to understand how food insecurity and stress affect childhood obesity in the United States.

**What has been done**

To this end, in the past year, we have published three papers in refereed journals, one paper in the Rural Connections newsletter, and one paper under review at a refereed journal. Based on this work, we have given several presentations at conferences and universities. Abbreviated abstracts for the three papers published in refereed journals are as follows. "Food Insecurity is not Associated with Childhood Obesity as Assessed Using Multiple Measures of Obesity": There has been extensive previous research examining the connection between obesity and food insecurity with the use of BMI to categorize a child as obese. Although BMI is one way to categorize the obesity status of a child, other measures have not been used to understand the connection between food insecurity and obesity. In response, this study used multiple measures of obesity taken from the 2001 to 2004 NHANES. The results from logistic regression models indicated that food-insecure children were no more likely to be obese than their food-secure counterparts across all measures of obesity. This relationship held after controlling for other factors and examining subpopulations based on race/ethnicity and gender. "Adolescent Overweight and Obesity: Links to Food Insecurity and Individual, Maternal, and Family Stressors": A high proportion of adolescents living in low-income households in the United States are overweight or obese, food insecure, and/or exposed to high levels of stress. The aim of this paper was to identify the associations of food insecurity and stress with an adolescent's propensity to be overweight or obese. Using logistic regression models, the paper found that higher levels of individual stressors increased the probability of being overweight or obese for adolescents, whereas there was no direct association between food insecurity, maternal, or family stressors and being overweight or obese. The interaction of food insecurity and maternal stressors was significantly linked to the probability of being overweight or obese. "Family Stressors and Child Obesity": Child obesity is a public health priority with numerous and complex causes. This study focuses on factors within the family, namely stressful experiences, which may be associated with child obesity. We examine data from the Child Development Supplement of the Panel Study of Income Dynamics. Results from an ordered probit regression model of child weight categorizations [healthy weight, overweight, obese] indicate positive associations between a range of family stressors [lack of cognitive stimulation and emotional support in the household among younger children, and mental and physical health problems and financial strain in the household among older children] and child obesity.

**Results**

In the past year, papers from this project have appeared in three leading journals, the Journal of Nutrition, the

Journal of Adolescent Health, and Social Science Research. This is in addition to papers from this project that appeared in leading journals in previous years of the project including Pediatrics and the Journal of Nutrition. Combined, our work has generated enormous media interest with articles appearing in print and on-line in publications across the world. This press coverage is a reflection of the impacts of food insecurity, stress, and childhood obesity on millions of low-income children in the U.S. Along with publications, in total, the work from this project has been presented at several national conferences where papers were selected via a competitive process [Association of Public Policy Analysis and Management [APPAM], Population Association of America [PAA], and American Agricultural Economic Association [AAEA]] and in several invited seminars at universities [University of Tennessee Obesity Research Center; Institute for Government and Public Affairs at the University of Illinois; and the Department of Human and Community Development at the University of Illinois].

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

#### Outcome #2

##### 1. Outcome Measures

Increased Consumption Of Foods Low In Fat And High In Fiber And Increasing Physical Activity

##### 2. Associated Institution Types

- 1862 Extension

##### 3a. Outcome Type:

Change in Action Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	216

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

Childhood obesity is rising and can lead to health problems that were once confined to adults such as diabetes, high blood pressure, and high cholesterol.

###### What has been done

Show-Stopping Healthy Hopping [SSHH] was conducted at nine neighborhood or school-based resource centers that provide after school and summer programs to the largely low-income, minority, and socio-economically disadvantaged children who live in the areas. The eight week program included a variety of recognition opportunities including individual and group competitions related to time spent exercising [jumping rope], creativity, and teamwork. 4-H summer staff visited each center twice per week to deliver the one hour curriculum which includes team-building, stretching, jump rope instruction, and jump rope time. The third day of jumping was led by Resource Center Staff. Three hundred thirty-three [333] children were enrolled in the program.

###### Results

Evaluation included an analysis of minutes spent jumping rope, the increase in the number of consecutive jumps

completed without missing, and jumps per minute. In addition, a survey was administered to youth who were in attendance the last day of the program and another was sent to Center Directors after the program ended. With respect to the program goal of increasing time spent in physical activity, of the three centers that tracked minutes, 50.5% of the youth were able to jump the minimum of 20 minutes three times a week. Data indicated variations between four centers regarding the percent of youth who improved their ability to complete more consecutive jumps and the number of jumps completed in one minute between week two and week five. The percentage of youth showing these increases ranged from 41% at one center to 90% at another. In addition, 85% of the youth surveyed indicated that jumping rope was more fun than they thought it was before the summer program, is a fun way to be with friends, and is a way to show creativity. Plans are underway to offer the program again and add a nutrition component. Surveys collected from youth and Center Directors also evidenced that the youth experienced a sense of belonging as part of teams, independence in making decisions, mastery of jump rope skills, generosity in teaching or helping their peers, and gaining confidence through their accomplishments.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

##### Brief Explanation

#### V(I). Planned Program (Evaluation Studies and Data Collection)

##### 1. Evaluation Studies Planned

##### Evaluation Results

##### Key Items of Evaluation

**V(A). Planned Program (Summary)****Program # 14****1. Name of the Planned Program**

Global Food Security and Hunger

**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
111	Conservation and Efficient Use of Water	0%		10%	
133	Pollution Prevention and Mitigation	0%		10%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		25%	
204	Plant Product Quality and Utility (Preharvest)	25%		0%	
216	Integrated Pest Management Systems	25%		0%	
604	Marketing and Distribution Practices	10%		10%	
701	Nutrient Composition of Food	5%		20%	
703	Nutrition Education and Behavior	30%		10%	
704	Nutrition and Hunger in the Population	5%		15%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)****1. Actual amount of professional FTE/SYs expended this Program**

<b>Year: 2009</b>	<b>Extension</b>		<b>Research</b>	
	<b>1862</b>	<b>1890</b>	<b>1862</b>	<b>1890</b>
Actual	23.1	0.0	4.5	0.0

Actual	23.1	0.0	4.5	0.0
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**2. Actual dollars expended in this Program (includes Carryover Funds from previous years)**

<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
1326249	0	61867	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
1054273	0	61867	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
7608428	0	984780	0

**V(D). Planned Program (Activity)****1. Brief description of the Activity**

Please note that this is a new Planned Program added at the request of Director Roger Beachy.

Activities under this Planned Program included National Soybean Research Laboratory-managed school lunch projects which are improving the awareness of the benefits of soy among youth, providing technical assistance to microenterprises that use soy foods [helping in-country businesses to become a part of creating nutrition solutions to the challenges of fighting malnutrition and diseases such as HIV/AIDS in their country]; continued work under the Illinois-Missouri Biotechnology Alliance [a USDA Grant Program partially supported with Hatch funds] that generates new knowledge that helps keep the corn and soybean sectors increasingly efficient and competitive and produces innovations and new ideas that contribute to education, the policy process, profitability, and environmental and/or health benefits for producers and consumers; efforts to break the negative relationship between grain yield and grain protein concentration in maize, and in developing high-yielding genotypes with good grain quality [through an improved understanding of how the amount and the form of assimilates provided from the mother plant [source] influences grain composition]; improved screening of resistant cultivars for the soybean cyst nematode [SCN is the major pathogen of soybeans in the U.S. and effective management of this pathogen is contingent on the use of resistant cultivars; thus screening for resistant cultivars is essential]; toxicological analysis of new emerging drinking water disinfection by-products; and a study of sensory characteristics affected by the food system in soy products.

State and regional conferences/clinics and field days reach large numbers of corn and soybean producers with information on fertility and pest management. Corn and Soybean Classic meetings [6 regional-based meetings] that address the latest research concerning weed management, fertility, stewardship, and pest management reached producers and agricultural consultants who are estimated to be responsible for managing 18.4 million corn/soybean acres which equates to 85% of the total acres planted in 2009 across Illinois. Extension of research to the public also includes the Varietal Information Program for Soybeans, a website and publication that provided information on yield, protein and oil, and disease and pest susceptibility. Two-day Regional Crop Management Conferences were held in four locations in 2009. The primary audience was 370 certified crop advisers.

Pesticide safety education was conducted using PowerPoint presentations at numerous locations with teaching contacts numbering 9109 through commercial training and 6,526 through private pesticide training. Operation S.A.F.E. fly-in was conducted in nine locations [including one in Colorado] to ensure aerial applications of fungicides to corn are accurately and safely made. Extension worked with the Illinois Agricultural Aviation Association to check the spray pattern and droplet size of 61 aircraft and adjustments were made to the aircraft setup if needed. The plant clinic and Digital Diagnostic System provided extensive outreach to homeowners and commercial producers in diagnosing and providing solutions for 777 samples of invasive and exotic species pests.

Extension activities that addressed hunger within Illinois are delivered by Expanded Food and Nutrition Education Program [EFNEP] staff and Supplemental Nutrition Assistance Program [SNAP] staff who conduct hands-on activities with children and their parents with limited incomes. These activities include using food stamps, meal planning, wise shopping, and use of food pantries. For example, more than 200 individuals in one county recruited from the local food pantry and the public housing authority participated in a 12 month program of lessons, sampling meals using commodity food items. Vouchers to purchase food and free tomato plants were given to entice participation with 90% reporting using the tomato plants in their garden. Over the last three years, Cook County's Urban Horticulture program has developed over 150 community gardens, providing nutritious vegetables, spurring community pride, and encouraging redevelopment. Each community garden yields between 500 and 1,000 pounds of food.

Other initiatives receiving attention focused on small tract farming and local food systems through workshops, conferences, and demonstrations. Other programs related to food production and consumption are encompassed in the Animal Health and Production planned program.

## **2. Brief description of the target audience**

The target audience includes populations living in underdeveloped parts of the world, producers, processors, and consumers of corn and soybean products, scientists involved in trying to improve grain composition in corn, policy makers, regulators, water scientists, state and federal agencies involved in water issues, soy food manufacturers, distributors, and producers, and limited resource audiences that are food stamp eligible.

### **V(E). Planned Program (Outputs)**

**1. Standard output measures**

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Plan</b>	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
<b>Actual</b>	70670	27718	35393	0

**2. Number of Patent Applications Submitted (Standard Research Output)**

**Patent Applications Submitted**

Year: 2009

Plan:

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2009	Extension	Research	Total
<b>Plan</b>			
<b>Actual</b>	27	15	42

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number Of Completed Hatch Projects

Year	Target	Actual
2009	{No Data Entered}	1

**V(G). State Defined Outcomes****V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Boosting U.S. Soybean Production Through Effective Management Of The Soybean Cyst Nematode
2	Addressing The Need For Safe, Abundant, Potable Drinking Water On National And Global Scales
3	Number Of Food-Related Enterprises Profiled Who Make Business Connections/Transactions After Accessing Posted Information On MarketMaker
4	Implementation Of Recommended Crop Production Integrated Pest Management Practices
5	Number Of Expanded, Adoption Of Existing, Or Newly Developed Outreach Programs For Small Farmers And Ranchers

**Outcome #1****1. Outcome Measures**

Boosting U.S. Soybean Production Through Effective Management Of The Soybean Cyst Nematode

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

*Heterodera glycines*, the soybean cyst nematode [SCN], is the major pathogen of *Glycine max* [soybean] in the U.S. Effective management of this pathogen is contingent on the use of resistant cultivars; thus screening for resistant cultivars is essential.

**What has been done**

A method was published for standardization of assessment of resistance, based on traditional techniques. In addition, a method was developed to assess infection of soybean roots by SCN with real-time quantitative Polymerase Chain Reaction [qPCR], a prelude to differentiation of resistance levels in soybean cultivars. Two experiments were conducted. In the first one, a consistent inoculation method was developed to provide active second-stage juveniles [J2]. Two-day-old soybean roots were infested with 0 and 1,000 J2/mL. Twenty-four hours after infestation, the roots were surface sterilized and DNA was extracted. For the qPCR assay, a primer pair for the single copy gene *HgSNO*, which codes for a protein involved in the production of vitamin B6, was selected for SCN DNA amplification within soybean roots. In the second experiment, compatible Lee 74, incompatible Peking and cultivars with different levels of SCN resistance were inoculated with 0 and 1,000 J2/seedlings. Twenty-four hours post inoculation they were transplanted into pasteurized soil. Subsequently they were harvested at 1, 7, 10, 14 and 21 days post inoculation for DNA extraction. With the qPCR assay, the time needed to differentiate highly resistant cultivars from the rest was reduced.

**Results**

Use of the standard method for assessing resistance to SCN in soybean will allow soybean farmers to make direct comparisons of soybean cultivars with respect to resistance levels. Currently, there is no requirement that cultivars be labeled with either their sources or levels of SCN resistance. Quantification of SCN infection by traditional means [numbers of females produced in 30 days] is a time-consuming practice; the qPCR method can replace the traditional one and improve precision in determining infection levels.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
704	Nutrition and Hunger in the Population

**Outcome #2****1. Outcome Measures**

Addressing The Need For Safe, Abundant, Potable Drinking Water On National And Global Scales

**2. Associated Institution Types**

- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

**3c. Qualitative Outcome or Impact Statement****Issue (Who cares and Why)**

The United Nations stated that safe, abundant, potable drinking water is a major concern of the 21st century. The disinfection of drinking water in public facilities primarily employs chemical disinfectants such as chlorine, chloramines, ozone, and chlorine dioxide. These disinfectants are oxidants that convert naturally-occurring and synthetic organic material, bromide, and iodide in the raw water into chemical disinfection by-products [DBPs]. Each disinfection method generates a different spectrum and distribution of DBPs; to date over 600 DBPs have been identified. While reducing the public health risk to acute infection by waterborne pathogens, the unintended generation of DBPs poses a chronic health risk. DBPs represent an important class of environmentally-hazardous chemicals that are regulated by the U.S. Environmental Protection Agency and carry long-term human health implications.

**What has been done**

The drinking water community provides an important public health service for the nation by its generation of high quality, safe and palatable tap water. The vast majority of DBPs have not been chemically or biologically characterized. Due to the lack of quantitative biological data, concerns exist over which DBPs pose the greatest health and environmental risks, and, therefore, which DBPs should be the focus of heightened federal regulation. There is generally less total organic halogen [TOX] formed in water treated with alternative disinfectants as compared to chlorine. However, there is a predominance of unknown DBPs as a percentage of TOX for these alternative disinfectants. As some water utilities move from chlorine to alternative disinfectants to meet the new U.S. EPA Stage 2 DBP Rule, they may generate greater amounts of emerging DBPs for which we have little data. The objective of this research was to develop a database on the mammalian cell chronic cytotoxicity and acute genotoxicity of DBPs and structurally related agents. Using this database we compared the impact of the halogenated species of DBP analogues as well as the toxicity of specific DBP chemical classes. This database may aid in identifying highly toxic emerging DBPs that warrant concern and further attention. This study has been a cooperative project with the U.S. EPA, American Water Works Research Foundation, and the Illinois-Indiana Sea Grant College Program. We have presented our data at conferences focused on water issues and in our publications. This work was highlighted at the 2009 Gordon Research Conference and was given at an invited presentation to Region 9 U.S. EPA.

**Results**

In order to generate a quantitative, direct comparison amongst classes of drinking water disinfection by-products [DBPs], we developed and calibrated in vitro mammalian cell cytotoxicity and genotoxicity assays to integrate the analytical biology with the analytical chemistry of these important environmental contaminants. The generated

database demonstrates the universality of the comparative toxicity of iodo- > bromo- >> chloro-DBPs across different structural DBP classes and the substantially greater toxicity of nitrogen-containing DBPs [N-DBPs] compared to carbonaceous DBPs [C-DBPs]. These results are important in light of the generation of iodinated-DBPs and N-DBPs that may result from the use of alternative disinfectants. In a second research area we studied the DNA repair kinetics of the haloacetic acids. Haloacetic acids [HAAs] are the second most common class of chlorinated water disinfection by-products [DBPs]. The single-cell gel electrophoresis genotoxicity assay using Chinese hamster ovary [CHO] cells was modified to include liquid holding recovery time to measure genomic DNA damage and repair kinetics of three monoHAAs: chloroacetic acid [CAA], bromoacetic acid [BAA], and iodoacetic acid [IAA]. The rank order of genotoxic potency was IAA > BAA > CAA from previous research. The concentration of each HAA was chosen to generate approximately the same level of genotoxic damage. No cytotoxicity was expressed during the 24 hour liquid holding period. Nuclei from CHO cells treated with BAA showed the lowest rate of DNA repair [t50 = 296 minutes] compared to CAA or IAA [t50 = 134 and 84 minutes, respectively]. The different rates of genomic repair expressed by IAA or CAA versus BAA suggest that different distributions of DNA lesions are induced. The use of DNA repair coupled with genomic technologies may lead to the understanding of the biological and genetic mechanisms involved in toxic responses induced by DBPs. These results will be added to the required review of the U.S. EPA revision of the Stage 2 Regulations and will serve as a foundation for long term epidemiological studies.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
133	Pollution Prevention and Mitigation

#### Outcome #3

##### 1. Outcome Measures

Number Of Food-Related Enterprises Profiled Who Make Business Connections/Transactions After Accessing Posted Information On MarketMaker

##### 2. Associated Institution Types

- 1862 Extension

##### 3a. Outcome Type:

Change in Knowledge Outcome Measure

##### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

##### 3c. Qualitative Outcome or Impact Statement

###### Issue (Who cares and Why)

Linking food producers with processors, retailers, consumers, and other food supply chain participants is critical in meeting the need for fresh and adequate food.

###### What has been done

MarketMaker, an interactive web-based multi-state market system developed by the University of Illinois and launched in Illinois in 2005 locates businesses and markets for agricultural products. The data currently encompasses 350,000 profiles of farmers and other food related enterprises in 10 states that can be queried by users. This past year several actions were initiated to improve this outreach effort. To build awareness among non-

farm food related enterprises, MarketMaker was demonstrated to seven major national and/or state enterprises. A second effort involved using focus groups and interviews to solicit food industry feedback to determine ways to improve MarketMaker's usefulness to the industry. Focus groups were completed with producers and suppliers in Illinois and Michigan and with chefs in Denver. Interviews were completed with two companies' executives and with the Chefs Collaborative. A third goal to identify key metrics to determine the commercial readiness of farmers to meet food industry expectations was expedited through interviews with chefs and food service industries. A fourth improvement involved working groups using expertise from partner states to design a new business registration template for the site.

### Results

As a result of the activities and effort related to building awareness among non-farm food related enterprises, MarketMaker has experienced an approximate 4-fold increase in website hits and a 3 to 4-fold increase in total users. Business profiles have been redesigned and expanded for the following industries: fruit and nuts, vegetables, meat and meat products, fish/shellfish/seafood products, dairy, herbs, and grains. Using information from the focus groups and interviews, a MarketMaker Retail Ready Curriculum consisting of twelve modules has been developed and piloted in several states this coming year. The curriculum goals are to make MarketMaker more user friendly for those purchasing food products, provide a checklist for growers to self-select into a searchable retail ready category, and provide training for growers, especially small and mid-sized producers, to develop new marketing channels.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices

### Outcome #4

#### 1. Outcome Measures

Implementation Of Recommended Crop Production Integrated Pest Management Practices

#### 2. Associated Institution Types

- 1862 Extension

#### 3a. Outcome Type:

Change in Action Outcome Measure

#### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	1426

#### 3c. Qualitative Outcome or Impact Statement

##### Issue (Who cares and Why)

Application of pesticides has potential adverse impacts on the environment, crops grown, and the pesticide applicator.

##### What has been done

Pesticide training sessions focus on pesticide characteristics, correct application procedures, problems that may occur with the use of pesticides, where information can be obtained and steps to take if a problem occurs with the use of a pesticide. Private applicator training was delivered by Extension staff in over 100 settings across the state

to a total of 6,526 individuals in 2008-2009 that included agricultural producers, agriculture and horticulture sales associates, and Extension master volunteers. Following the training, Illinois Department of Agriculture staff administered a certification test. A survey of practice changes was distributed at all the pesticide trainings prior to beginning of each training session and will be repeated for the next two years of the three year renewal process for certification to apply pesticides.

### Results

A survey of practice changes was conducted prior to beginning private applicator training sessions this year. The 1,420 completed surveys represent approximately 20% of those who completed the training and had participated in previous training sessions. In response to the question "Because of knowledge gained in previous PSEP training session, I have made the following practice changes" respondents could check up to 15 practice changes. Those most frequently checked included [1] reading and following label directions for proper pesticide application methods and rates [1227--89%]; [2] scouting to determine proper identification of pest before determining if control is needed [1221--88.9%]; [3] Take precautions to minimize spray drift when applying pesticides [1193--86.8%]; and [4] taking steps to prevent contamination caused by pesticides [1186--86.3%]. At least 70% of the respondents attributed at least 14 of 15 possible changes to the PSEP training provided by Extension. Only 658 [47.9%] made changes to prominently label and secure their pesticide storage areas. In response to the question "By successfully passing my private applicators exam, I estimate that I save \$\_\_ yearly by being able to protect my production and apply appropriate pesticides when necessary to my farming operation", 551 [38.8%] chose to respond. The total estimated dollars for those 541 who responded was \$5,892,308.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

### Outcome #5

#### 1. Outcome Measures

Number Of Expanded, Adoption Of Existing, Or Newly Developed Outreach Programs For Small Farmers And Ranchers

#### 2. Associated Institution Types

- 1862 Extension

#### 3a. Outcome Type:

Change in Knowledge Outcome Measure

#### 3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	168

#### 3c. Qualitative Outcome or Impact Statement

##### Issue (Who cares and Why)

Small farmers and ranchers are increasing in number, may lack resources, and may have newly engaged in food production lacking knowledge to be successful in their chosen income producing endeavors.

##### What has been done

The 5th National Small Farm Conference "Roadmap to Success for Small Farmers and Ranchers" was held in September of 2009 in Springfield, Illinois. The conference, held every three to four years, brought together land grant universities, community-based organizations and other stake holders who work with small farmers and

ranchers. The conference aimed to strengthen collaboration and partnership among groups and provided an opportunity to share new ideas in research, Extension and outreach. The conference format featured pre-conference short courses, concurrent sessions, posters, exhibits, plenary sessions and educational tours and was a joint endeavor with multiple USDA agencies, University of Illinois Extension, The Farm Credit Council, Illinois Department of Agriculture and the SARE Program.

### Results

A total of 264 [45%] of the 583 conference attendees responded to the online survey. Key findings include: When asked "How many new strategies or tools for improving small farm programming did you learn about at the conference [e.g. new software programs, new educational delivery methods, new worksheet or assessments?]", responses were: None=13.2% [31]; 1-5=76.1% [178]; 6-10=10.3% [24]; more than 10=2.1% [5]; 26 skipped the question. When asked to select a response regarding actions they planned to take as a result of the conference, 60.8% [138] planned to expand an existing education or outreach program; 46.3% [105] planned to adopt an existing program to better meet the needs of small-scale farmers; 38.3% [87] planned to design and implement a new education or outreach program; 30.8% [70] planned to adapt an existing program to target an underserved population; eight made other suggestions; and 37 skipped the question.

## 4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
204	Plant Product Quality and Utility (Preharvest)
604	Marketing and Distribution Practices

### V(H). Planned Program (External Factors)

#### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

#### Brief Explanation

### V(I). Planned Program (Evaluation Studies and Data Collection)

#### 1. Evaluation Studies Planned

- Retrospective (post program)
- Before-After (before and after program)
- Time series (multiple points before and after program)
- Other ()

### Evaluation Results

A survey of practice changes was distributed for completion prior to beginning private applicator training sessions this year. The 1,420 completed surveys represent approximately 20% of those who

completed the training and had participated in previous training sessions. In response to the question "Because of knowledge gained in previous PSEP training session, I have made the following practice changes" respondents could check up to 15 practice changes. Results follow.

- 89.3% [1227] read and follow label directions for proper pesticide application methods and rates.
- 88.9% [1221] scout to determine proper identification of pests before determining if control is needed.
- 86.8% [1193] take precautions to minimize spray drift when making pesticide applications.
- 86.3% [1186] understand how pesticides can cause contamination and take steps to prevent it.
- 83.6% [1148] know how to respond to pesticide exposures if they should occur
- 82.0% [1126] mix and load pesticides in a well-lit open-air area to minimize exposure to pesticides.
- 81.0% [1113] store pesticides in a secure location separate from any feed stuffs.
- 80.9% [1112] use recommended personal protective equipment when working with pesticides.
- 80.5% [1106] refer to treatment thresholds to decide if a pest needs to be controlled.
- 77.1% [1060] have adopted IPM practices in managing pests in my farming operation.
- 75.5% [1038] inform family, friends, employees of the safety precautions to follow around pesticides.
- 73.9% [1016] calibrate their sprayer regularly to ensure accurate application rates.
- 72.0% [989] select the safest pesticides possible to control/manage pest populations.
- 71.5% [983] adjust cultural practices whenever practical to control/manage pest populations.
- 47.9% [658] have their pesticide storage areas prominently labeled and secured.

Five hundred eleven of the respondents indicated that they had saved money by successfully passing the private applicators exam and applying appropriate pesticides when necessary to their farming operation. Estimated dollars saved totaled \$5,892,308 which averages to slightly over \$11,500 per operation. The 1265 respondents who provided information on acres treated with pesticides reported application to 1,149,408 acres.

### **Key Items of Evaluation**

Although private pesticide applicators would prefer not to take the required Illinois Department of Agriculture administered certification exam every three years nor the optional training provided by Extension, those who attended recertification training and completed a survey indicated that the information taught during the training had been applied as a part of their farming operation. Although some of the practices applied relate to regulations concerning pesticide use, others clearly reflect actions taken to protect themselves, their friends, family, neighbors, livestock, and the environment from contamination. Attention needs to be given to address how to increase the prominent labeling of pesticide storage areas in future trainings.