2010 University of Illinois Combined Research and Extension Annual Report of Accomplishments and Results

Status: Accepted

Date Accepted: 06/21/2011

I. Report Overview

1. Executive Summary

The College of Agricultural, Consumer and Environmental Sciences [ACES]

The College of Agricultural, Consumer and Environmental Sciences persisted in its pursuit of excellence, 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, renewable sources of energy, strong families and communities, and environmentally sound natural resource management to benefit the people of Illinois and the world. While the College's students, faculty, and staff strove to reach new milestones in these domains, no year in the past decade has been more challenging fiscally than the most recent one. The economic and financial condition of the State of Illinois remained very weak, compounding the effects of previous years' reallocations and reductions of state funding to the University of Illinois and its units. More than ever, a fundamental issue is how the multidimensional mission of the land-grant university is consistent with both the escalating share of cost borne by undergraduate students and the direction of a research intensive university.

Overall, the University of Illinois at Urbana-Champaign absorbed an 8.4% decrease in state appropriated general revenue funds in its base budget from FY 2010 to FY 2011, and for the first time, the tuition income fund accounted for more than twice the campus revenue from state appropriations. The state continues to operate in arrears for its currently obligated funding to higher education, and the state's budget deficit has widened despite recent passage of a substantial state income tax rate hike. To contend with the fiscal challenges posed by declining state appropriations, the University differentially allocated its permanent base budget to units, relying significantly on formulae that favored tuition-earning activities.

University of Illinois Extension

Recognizing that severe budget cuts were in the offing, Extension Administration began to develop a plan for budget reduction in 2009. At the outset of this process, the loss of funding was projected at $2-4 million. The new plan was introduced in March and adopted in mid-June of 2010. The plan included creating 27 multi-county units with an associated reduction of 49 county director positions, elimination of 74 educator positions located off campus, closure of 12 regional centers with relocation of educators to multi-county offices or research stations, and elimination of four Associate Regional director positions. All individuals in these named positions were issued notices of non-reappointment effective June 30, 2011 [or earlier based on years of service credit]. Options available to these staff included applying for remaining positions, a voluntary service incentive program offered by the campus for all academic professionals and civil service employees to reduce the size of the campus work force in order to save money over the long-term, or a search for other employment. The uncertainty of continued employment and the knowledge and expertise lost through the staff who took the voluntary reduction in service incentive program or accepted other employment affected productivity [scope and/or initiation of new programming] this past year. Although staffing decisions for the academic positions have been finalized, reductions in civil service support positions have yet to be initiated, and some of the current academic positions in counties remain unfilled in view of a projected $7.6 million reduction in funding for FY 2010.

An additional significant activity related to Extension's fiscal viability took place during this past year. As a part of Stewarding Excellence @ Illinois, an on-going initiative at the campus level to identify cost-savings measures across campus, a team representing diverse areas of campus and composed of faculty, staff and students was charged with exploring options for University of Illinois Extension. The team's report consisting of nine recommendations was submitted to the Chancellor in July of 2010 and posted for comments. A process to further explore those recommendations is in progress and will be used to guide future NIFA Plan of Work adjustments.

Illinois Agricultural Experiment Station [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. Research activities accounted for $61,445,177 [35.5%] of the FY 2010 expenditures in the College. The research portfolio of the Illinois Agricultural Experiment Station includes mandated and mission-oriented research to support stakeholders in Illinois, in partnership with the USDA and entities in the state. The level of mission-oriented research was also a factor in determining the permanent base budget reductions to the College of ACES in FY 2011, since the IAES is not considered a tuition-generating activity. A portion of the base budget reduction applied to the College and its departments stemmed from the proportion of investment in IAES activities. The state further reduced its contribution to mission-oriented research by failing to appropriate any funds for the Council on Food and Agricultural Research [C-FAR]. Despite minimal state investment and declining faculty capacity, investigators associated with the IAES/ACES have been very successful in achieving external funding growth. 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 ensure 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, Law and the Illinois Natural History Survey. The IAES also funds research with partners in other institutions.

The Planned Programs

Plant Health, Systems and Production - Activities in 2010 included a genomics analysis of the apple maggot [a major apple pest], improvements in cultivar evaluation trials through the use of spatial analytical tools, the use of corn rootworm behavior to improve resistance management in transgenic corn [and reduce output costs], research focusing on improving nitrogen use efficiency in maize [and reducing both energy inputs and greenhouse gas emissions], efforts to inform weed management clientele on how to best manage waterhemp populations, management of Phytophthora blight in pumpkins [Illinois leads the nation in pumpkin production], the development of new techniques to increase detection limits for gene expression in soybean, and the development of improved soft red winter wheat varieties. Extension activities focused on training Master Gardeners to provide information on environmentally friendly plant production, digital diagnosis and recommendations for plant-related problems, and production and insurance management programs for plant nurseries.

Community Resource Planning and Development - Activities in 2010 included research on positive youth development that led to an awarded grant proposal from the W.T. Grant Foundation, a study of the factors that influence the mental and physical health of poor rural mothers and their children, an investigation into how the recession affects the Latino community in their lives in Illinois as well as the impacts on family members in their birth countries, and a project that considered the role school factors such as racial segregation and poverty play in shaping student's educational trajectories during the elementary and secondary school years. Extension activities encompassed county official certification

programs, providing 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 2010 included efforts to better understand the PRRSV-S. suis superinfection in an effort to develop better treatment and prevention methods, a study to monitor environmental conditions on swine transport trailers during journeys from the farm to the slaughter plant, a significant expansion of the base for teaching manure nutrient management plan development through the Illinois Manure Management Plan program, improved treatments for pig castration, the first survey and characterization of the prohormones in three main livestock species [cattle, chicken, and pig], the development of design constructs to improve the safety of the very effective Pinnacle IN vaccine in treating strangles in horses, the application of microfluidics to embryo production in vitro, a project designed to develop a behavioral assay for neonatal piglets to determine the effects of acute viral infection on learning and memory, and continuation of a wide variety of Extension annual statewide programs that addressed animal production and health for swine, beef, dairy, sheep, and horses for owners, producers, and 4-H youth. Local program offerings were reduced in scope due to the retirement of two of the six field-based educators.

Natural Resources and the Environment - Activities in 2010 included the development of new knowledge on the impact of pesticides on mosquito population dynamics and potential disease transmission, efforts to reduce nutrients in stream waters to improve local conditions and decrease downstream loads, a study of tile drainage modifications to reduce nitrate losses in agricultural watersheds, the development of data that was used by USDA APHIS personnel to identify leafhoppers intercepted at ports of entry [to prevent delays in shipping and reduce the possibility of introduction of exotic agricultural pests], research resulting in better-developed forest harvest rules, an improved understanding of short-term and long-term interactions among soil conditions, fertilization, residue management, cropping history and soil organic matter deposition, and the dissemination of publications designed to assist in the implementation of best management practices in tile-drained watersheds for enhancing water quality while maintaining productivity. Extension activities included a statewide series of tillage workshops, soil and water workshops, timber harvesting webinars, continued curriculum development and piloting of the Master Naturalist program, sustainable agriculture tours, pond management, and stewardship activities for youth.

Human Nutrition, Diet Adequacy, Health and Wellbeing - Activities in 2010 included research to identify the lack of systemic activity from over-cooked broccoli or a broccoli supplement as compared to the activity of unheated whole broccoli [this will help consumers obtain the health benefits of broccoli], findings that begin to provide a mechanistic basis for the inhibition of RV infectivity induced by isoflavones in vitro [rotavirus infection is a primary cause of diarrheal diseases worldwide], a study of dietary soy genistein and its effects on WNT signaling pathways in colon cancer cells, and a study of the mechanisms of probiotic functionality. Extension activities focused on managing diabetes, holistic self-management for adults who have ongoing health conditions, and activities focused on cooking skills, food science, food choices, and physical activity.

Food Safety - Activities in 2010 included research designed to guide the food industry on how to control microstructure and cell wall material properties through ingredients, processing and storage strategies in order to obtain food products that consumers will like, the utilization of ultrasound in combination with moderate pressure and/or mild heat to ensure the food safety and quality of juice products, results that provide industry with information to make informed decisions regarding the efficacy of various antioxidants in stored ground beef and pork, the study of moisture sorption isotherms which are useful for a variety of processing and product stability applications, and the utilization of zein to develop films for coating and protecting foods from degradation. Extension provided food safety and sanitation training for youth, food safety training for volunteers and employees of establishments that prepare or

serve food to the public, and production practices to prevent food contamination.

Agricultural and Consumer Economics - Activities in 2010 included ongoing research into international and U.S. biotechnology law, a study which focused on property rights regimes for geologic carbon sequestration, regulation of carbon offset provisions and the regulation of ecosystem service payments to agricultural operations, a study of functional benefits transfer to forecast the economic impacts of contamination in Great Lakes Areas of Concern, the integration of a biophysical model that simulates the yields of bioenergy crops in the U.S. with an economic model to assess the biophysical and economic potential of biofuel production, a project which is substantially improving scientific knowledge about risk modeling and evaluation for crop farms in Illinois and throughout the cornbelt, and an investigation designed to identify how value is created in rural communities where broad acre commodity crops are being produced. Extension activities focused on farm land ownership and leasing, risk management for small landowners, long-term personal care planning, coping with the current economic challenges, saving and investing, choosing a financial adviser, and money management basics for limited resource audiences including adolescents.

Sustainable Energy - Activities in 2010 included results that support previous suppositions that herbicides used in corn are safe to use on M. x giganteus, work focusing on the characterization of the properties of biofuels and their impact on combustion and emissions, the development of a systems informatics infrastructure to allow researchers involved in biomass feedstock production to access data, the discovery of a never-described ploidy cytotype, a study of the use of GSHE in the dry grind process [which could eventually eliminate the high temperature cooking and liquefaction steps required in the conventional process, can save energy, and can simplify the dry grind process], and the development of a method of glycerol utilization that could be used as a biodiesel fuel additive or fuel extender. Extension activities included exploration and discussion of biomass conversion for heat and electricity as well as wind farm development.

Human Development and Family Wellbeing - Activities in 2010 included a study that provides one of the most comprehensive assessments of the mother-toddler attachment relationship during the third year of life, research with the goal of identifying 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, efforts to better understand the strengths and needs of non-metropolitan gay and lesbian parents, work to examine how young preschool children develop cognitive belief structures and expectations about different relationships through their daily interactions with caregivers, the development of a curriculum that will teach children a set of social and emotional competencies that have been found to be necessary for successful sibling interactions in middle childhood, and work updating previous estimates on the success of the Uniform Interstate Family Support Act [UIFSA] on improving collection of child support in Illinois. Extension continued delivery of work-life management curriculum, child and elder care training, bullying prevention, and collaborative community education outreach to parents of "at risk" newborns to provide resources and programs.

4-H Youth Development - Activities in 2010 focused on volunteer training to ensure positive youth development and the three national areas of focus - science, engineering, and technology [SET]; healthy lifestyles; and youth leadership. SET activities included robotics team competitions, new hands-on science experiments, new youth groups learning about video production, and overnight experiences such as Science Siesta and Illinois Summer Academies to create awareness and interest in science and science-related careers and leadership.

Agricultural and Biological Engineering - Activities in 2010 included the development of an in-situ moisture sensing system for biofilters, efforts to lower agricultural chemical input costs and reduce environmental impact through the use of improved chemical equipment [nozzles] and application methods both air and ground], the development of new analytical methods that greatly reduce the analytical costs of

bench-scale GAC treatability studies, project outcomes that are providing dry grind processors with information to cause them to consider other benefits and possibilities provided by filtration, and a project with the goal of producing a sampling technique and procedure suitable for PM measurement in agricultural operations. Extension activities focused on certified livestock manure management workshops and online training and programming on wind and biomass energy.

Climate Change - Activities in 2010 included ongoing data collection by the National Trends Network [the NTN provides the only long-term nationwide record of wet deposition in the U.S.], the development of thermal ecology data that indicate that the ability of ratsnakes to switch between diurnal and nocturnal activity is a critical adaptation for dealing with climate variation, research results that continue to be part of a national program that improves our understanding of atmospheric inputs of nutrients, continuing work at the SoyFACE [Soybean Free Air Concentration Enrichment] facility, and a project that will provide the modelers, managers and policy makers of forest carbon with knowledge, methods, and guidelines to reduce uncertainties and improve decision-making. Extension provided information on carbon sequestration and carbon trading through soil management and forestry management, an experiment to help youth discover how to reduce their carbon footprint, and training for natural resource volunteers on climate and weather.

Childhood Obesity - Research activities in 2010 included the development of a body of knowledge that will serve to guide the development of self-efficacy based nutrition and physical activity teaching materials for a course that will be offered to undergraduates, a study which was the first to show that without gestational complications, a maternal high fat diet is enough to cause an increase in fetal glucose, the use of a holistic approach to better understand the global problem of obesity by focusing on both the social and biological sources of the problem, research designed to develop a better understanding of 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 the consumers], 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 2010 included projects that focused on creating marketable products from corn and soybean ranging from increasing oil content in soybean to influencing the agricultural biotechnology regulatory process in countries that are deemed potential importers of corn and soybeans with biotechnology traits, work with soy dairy and soy applications in baking in Vietnam and Honduras, work to determine the potential of improving maize for food processing quality and yield [in cooperation with industry partners such as Kellogg's and Bunge North America], work at the National Soybean Research Laboratory with a local, Kenyan NGO that has resulted in the development of a school lunch program using soy protein in meals for schools in the Masai Mara, research demonstrating the usefulness of marker-assisted selection to incorporate resistance into commercially usable inbred lines and the discovery that disease-resistant apple cultivars have marketing and nutritional qualities comporable to commercially popular cultivars. Extension activities included conferences, clinics, websites and field days addressing pesticide safety, crop management, and local food production and distribution, an interactive web-based market system used to connect food related enterprises, and hunger mediation for limited resource families.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	204.0	0.0	135.0	0.0
Actual	234.0	0.0	110.4	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
- Other (Extension Staff Program Teams)

2. Brief Explanation

As in previous years, Hatch projects are required to undergo peer review at the Department level before being submitted to NIFA, where they are again formally reviewed before being eligible for funding. The 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 in the Department of Agricultural and Consumer Economics require that proposals be 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 were 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 highlighted a subset of programs and staff members were asked to focus on those where impact on participants had been measured. Supporting materials were provided to reviewers. 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. The Regional Director or Associate Regional Director usually participates in the review. Following the review, local staff members developed an action plan in

response to recommendations. Local Extension advisory councils were involved in reviewing and providing input on the action 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 groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals

Brief explanation.

At the College level, the Associate Dean of Research is the primary contact for state and national stakeholders to learn about ongoing research and provide guidance for future programs. For example, the Associate Dean's office hosted a Research Advisory Board meeting in September of 2010. The College Research Advisory Board includes members from a broad range of stakeholder groups, including the Illinois Farm Bureau, the Illinois Beef Association, the Illinois Pork Producers' Association, the University of Missouri, the U.S. Forest Service, the University of Minnesota, and the Illinois Soybean Association, as well as from local farmers and private industry. Items of discussion included a report from the Director of the Agricultural Experiment Station, reports from several Department Heads and Multidisciplinary Center Directors, an opportunity for junior faculty members to interact with the Advisory Board, and a final meeting which allowed the Board to provide their input to the Station Director with regard to ongoing activities and future directions.

The Vision for Illinois Agriculture program has continued to be an active process for engaging stakeholders. In August of 2010 the group hosted a Forum on Fiscal Integrity. Presentation topics included Economic Performance and the State Budget [Illinois Policy Institute], the Illinois Fiscal Crisis [Taxpayers' Federation of Illinois], Fiscal Integrity and Social Responsibility [Voices for Illinois Children] and Monitoring the Illinois Economy [University of Illinois Institute of Government and Public Affairs]. The group's Steering Committee includes representatives from Archer Daniels Midland, Growmark, Greenview Nursery Company, First Farm Credit Services, the Illinois Soybean Association, the Illinois Farm Bureau, Illinois State University, the University of Illinois, the Illinois Department of Commerce and Economic Opportunity, Kraft Foods, Monsanto, Advance BioNutrition, and Southern Illinois University.

News releases and letters/emails targeted to Extension Advisory Council members and past Extension program participants were used to announce a series of meetings held throughout the state, first with Extension field staff and then with the public, to provide them with information on the organization and an opportunity to provide input into the reorganization process. The Director of Extension led the process and interaction with the stakeholders who attended these meetings. The Director also met with statewide organizations, legislators, and local groups to seek their input or to respond to their inquiries and seek their input regarding the reorganization process.

County Directors were encouraged to continue using the findings of the statewide online survey of educational needs conducted in March of 2009 and that was accessed by 9,030 English-speaking respondents and 319 Spanish-speaking respondents recruited through media releases, an email text forwarded to Extension list-servs, flyers distributed at Extension programs, table-top posters, business cards, and bookmarks displayed at libraries, government offices, or by Extension's collaborative partners. In addition, end-of-program evaluations distributed to Extension program participants sought ideas on additional informational needs as well as feedback on quality of the current programs.

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
- Use Internal Focus Groups
- Use External Focus Groups
- Needs Assessments
- Use Surveys

Brief explanation.

Since 1993, the Illinois Council for Food and Agriculture Research has been a significant contributor to the ability of the College to interact with stakeholders throughout the state and throughout the region. Due to state budget limitations C-FAR received no appropriation in either FY 2010 or FY 2011. As a result, the Council was forced to close its main office in 2010. The decision was made not to decommission the organization, but to reorganize the group in a manner that will serve as a placeholder in the hope that it will allow members to continue discussions and will position them to begin to rebuild the organization when funding levels improve.

The Office of Research continues to support several initiatives designed to identify and learn from an increasingly diverse group of stakeholders. Recent examples include meetings throughout the state [and throughout the nation] in which the Station Director met with commodity groups, other Station Directors from the region and beyond, the College's Multidisciplinary Centers [a planning "Charrette" took place at the Dixon Springs Agricultural Center in the Summer of 2010 to identify research and economic development opportunities for the center and the region, which was sponsored by the Illinois Department of Commerce and Economic Opportunity], and industry representatives. As in previous years, the Office of Research arranged to have faculty members travel to Washington, D.C. in January of 2011 to interact with the national Program Leaders of several major federal agencies.

Extension Advisory Council members [county, regional, and state] and representatives of both current Extension funding sources and past programs were identified by Extension staff as key sources of input with respect to input on the reorganization of Extension. A website was also available for those seeking to ask questions or provide input. Extension leadership at the regional and state level also networked with traditional and non-traditional internal and external individuals and groups.

Extension Advisory Councils at the local level also provided advice on who should be invited to a specific program or a particular input opportunity. In addition, Extension staff members were very involved in community collaborations at the local level. Those groups were both targets for input and for identifying and including other representative stakeholders. Community planning and

economic development Extension activities also involved stakeholder input through surveys and community discussions.

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

Brief explanation.

At the College level, input is collected primarily through meetings with traditional stakeholder groups. Of course, input from stakeholders is collected at all levels, from the College to the Departments and Units to individual faculty members and Extension educators, to the graduate and undergraduate students who play significant roles in hosting College events.

At the Department level, actions are both formal [for example, through an established Department External Advisory Committee] and informal [at events such as Stewardship week, a field day related to grassland management for private landowners, and an upcoming workshop for forest-farm owners].

Using the Department of Natural Resources and Environmental Sciences as one example, faculty have participated in national and statewide events and committees throughout the year to discuss topics ranging from cultural service assessment, restoring wetland water quality functions, topsoil investigations and impact of reduced air pollution on soil properties, forest landowner perspectives, and soil management and sustainability. Local contact with organizations has provided information on children's reactions to an environmentally-oriented program [Brookfield Zoo] and students' perceptions of their place in nature [University of Illinois Arboretum]. Work with State of Illinois agencies, in particular the Department of Natural Resources, has provided research opportunities such as urbanization as a potential threat to wildlife species.

As mentioned in section III-1, a series of public meetings with traditional Extension stakeholders conducted by the Director of Extension was the primary process used this past year. The Director presented the situation necessitating reorganization and then listened to those present. Subsequent meetings occurred to meet with groups who provided funding for Extension or who were beneficiaries or collaborators in program delivery.

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 Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

On the research side, external funding decisions continue to be a major driver in determining the research direction of the College [especially in an era of declining state resources]. By selecting grant proposals for funding, granting agencies not only have a direct impact on the research conducted but also have an indirect impact on planning, staffing, budgeting, and resource allocation decisions. The College receives grant awards from the full spectrum of potential sources, including major federal agencies [with the USDA, of course, being the major player], commodity organizations [such as the National Pork Board], private industry and state agencies.

In a series of public meetings, stakeholders and users of Extension made clear their appreciation of and priorities for continuation of specific Extension programs. Their input was used to develop next steps in the planning process, which included meetings among Councils to identify multi-county configurations and staffing recommendations including number/expertise of staff with various areas of expertise and program delivery responsibility. For county program reviews conducted in the early part of last year, input was used by local staff to reconsider program priorities or direction that could be implemented in view of available resources. Input through program evaluations was used by the staff who delivered the programs to alter the format or content.

Brief Explanation of what you learned from your Stakeholders

From the Association of Public and Land-Grant Universities annual meeting we learned that the concept of a "Community of Scholars" program is drawing increasing interest at the national level. The College of ACES has Communities established focusing on Agricultural Sustainability, Wellness, Carbon Management, Agricultural Issues in Water, International Nutrition, Agricultural Uses for Nanotechnology and Photosynthesis. We also learned that NIFA grant program priorities are having a significant impact in guiding research in areas such as climate change and obesity and that institutions are increasingly working toward developing more flexible structures to further stimulate multi-state, multidisciplinary, and integrated research programs.

Based on input from state and federal agencies, one principal investigator served as a consultant to the EPA Science Advisory Board Ecological Processes and Effects committee to review nutrient criteria guidance for Florida. A conference hosted by the non-profit Growers Science Network in March 2010 allowed for interaction with agricultural producers. As an offshoot of this conference, other informal meetings were held through the remainder of the calendar year to discuss similar topics. Materials from a southern Illinois regional assessment were provided to regional development specialists to support planning efforts for the Dixon Springs Agricultural Center. The assessment has led to creation of faculty and external advisory committees as well as an ongoing internship program created three years ago.

Extension stakeholders who attended the public meetings communicated strong support for the 4-H Youth Development program, Master Gardener program, and urban program initiatives. They also adamantly asked for retention of a local presence [office and staff] in each county. There were also specific suggestions for dealing with the projected funding shortfalls. Extension program participants at those meetings and at unit program reviews were highly complimentary of the quality content of Extension programs.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
9486737	0	6216060	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	7705505	0	5407756	0
Actual Matching	7705505	0	5407756	0
Actual All Other	71555097	0	39606986	0
Total Actual Expended	86966107	0	50422498	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	3952519	0	4999552	0

V. Planned Program Table of Content

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

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	0%		10%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		10%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		10%	
205	Plant Management Systems	35%		15%	
206	Basic Plant Biology	10%		15%	
211	Insects, Mites, and Other Arthropods Affecting Plants	10%		5%	
212	Pathogens and Nematodes Affecting Plants	10%		10%	
213	Weeds Affecting Plants	5%		10%	
216	Integrated Pest Management Systems	30%		15%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	35.0	0.0	29.0	0.0
Actual	20.2	0.0	18.5	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**
662673	0	865687	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
662673	0	865687	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
6153738	0	7012794	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2010 included genomics analysis of the apple maggot [a major apple pest], improvements in cultivar evaluation trials through the use of spatial analytical tools, use of corn rootworm behavior to improve resistance management in transgenic corn [and reduce output costs], the development of software tools to analyze promoter sequences from crop plants, research focusing on improving nitrogen use efficiency in maize [and reducing both energy inputs and greenhouse gas emissions], efforts to inform weed management clientele on how to best manage waterhemp populations, management of Phytophthora blight in pumpkins [Illinois leads the nation in pumpkin production], and the development of new techniques to increase detection limits for gene expression in soybean.

Additional research activities included efforts to identify the genomic structure of the fungus that causes soybean rust, ongoing work with 'Improved Chancellor' [a recently-patented wine grape with a 2,4-D resistance gene isolated from a soil microorganism], development of improved soft red winter wheat varieties, identification of the most efficacious fungicide products for controlling Fusarium head blight in winter wheat, the development of improved weed management options by engineering safener response into dicot crops, the use of DNA markers to design more efficient and innovative marker-assisted breeding strategies for maize, coordination between Regional Integrated Pest Management Centers, the EPA Tribal Pesticide Program Council, the USDA Tribal Education Equity and Extension programs, and land grant institutions to develop culturally-sensitive Integrated Pest Management training materials, and the development of Bt-corn hybrids that are resistant to Western Corn Rootworm.

Conferences at which research was presented in 2010 included the National Entomology Meetings, the Society of Nematologists Annual Meeting, the Short Rotation Woody Crops Working Group, the American Phytopathological Society Meeting, the National Fusarium Head Blight Forum, the Illinois Corn and Soybean Classic Meeting Series, Illinois Agronomy Day, the multi-state AgMasters Conference, the 2010 Entomology Society of America Annual Meeting, the International Sweet Corn Development Association, and the Midwest Food Processors Association Annual Meeting.

Extension activities focused on both non-food horticulture crop production 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. 3,545 participants attended a series of 12 horticulture distance education programs titled **Four Seasons Gardening** offered at Extension offices throughout the state. Extension Master Gardeners gave countless hours providing horticulture information to the public. There are currently over 3,400 active

Master Gardeners in Illinois who made over 200,000 teaching contacts in 2009-10. This past year, 555 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 nutrients required for good health. Responsibilities assumed by the Master Gardeners this past year included conducting local public right-of-way ash tree inventories, hosting garden tours, providing educational experiences for at-risk youth, expanding the native plant area and conducting programs at the Chicago Museum of Science and Industry Smart Home Garden, and teaching workshops in 10 counties on how to construct environmentally friendly, low-cost rain barrels.

Two educational sessions were held for individuals involved in nursery production to teach integrated pest management, production practices and insurance procedures. One session targeted insurance adjustors and the second targeted growers. The plant clinic and Digital Diagnostic System provided extensive outreach to homeowners and commercial producers in diagnosing and providing solutions for samples of invasive and exotic species pests. In addition, 17 issues of the **Home Yard and Garden** newsletter were distributed.

2. Brief description of the target audience

The target audience included plant breeders and basic researchers focusing on insect-plant interactions, members of the scientific community focusing on transgenic plants, corn growers and their input suppliers, apple growers, agricultural producers, weed management professionals, soybean farmers and breeders, plant pathologists and crop scientists, the green industries of the Midwest [including members of the nursery and landscape industries as well as botanical gardens and arboreta], fertilizer industry professionals, wheat producers and breeders, local, state, and federal agencies, integrated pest management stakeholders, and the sweet corn seed and food processing industries. In addition, Extension targeted homeowners, Master Gardeners, and Master Naturalists.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	110381	204693	29836	0

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

Patent Applications Submitted

Year: 2010

Actual: 2

Patents listed

[1] Plant Derived Biofungicide; [2] A DNA Sequence That Confers Aphid Reistance In Soybean

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	1	46	47

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Research Projects

Year	Actual
2010	6

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Percentage Of Nitrogen Utilization By Wheat
2	More Careful Use Of Garden Chemicals [Pesticides, Fungicides, And Fertilizer] And Water
3	Changes In Application Of Recommended Pest Control Practices For Field Crops
4	More informed use of pesticides
5	Self-Reported Increased Use Of Transgenic Crops And Pest Resistant Crop Varieties
6	Increased Knowledge Of New Crop Management Techniques
7	Developing Knowledge About The Genetic Basis For Phenotypic Responses To Selection
8	Improving Nitrogen Utilization To Reduce Inputs Required And Greenhouse Gas Emissions Associated With Agriculture
9	Better Informing Weed Management Clientele In Treating Waterhemp
10	Improved Management Of Phytophthora Blight Of Cucurbits
11	Utilization Of Digital Communication Tools By American Farmers
12	Developing Wheat Varieties With Improved Resistance, Improved Stability Of Production, And Improved Grain Quality
13	Engineering Safeners For Use With Dicot Crops
14	Improved Management Of Western Corn Rootworm
15	Improving Soybean Production Through A Better Understanding Of Flavenoid Pathways
16	The Illinois Soybean Yield Challenge
17	Providing Management Information To Farmers With Regard To Managing Soybean Cyst Nematode Heteroda, Glycines

Outcome #1

1. **Outcome Measures**

Percentage Of Nitrogen Utilization By Wheat

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

More Careful Use Of Garden Chemicals [Pesticides, Fungicides, And 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**

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
2010	3000	148

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 550 new volunteers.

Results
Based on a retrospective evaluation conducted via an online survey in 2007 by the state coordinator of Master Gardeners to assess 12 gardening practices, 11 personal improvement skills, and Master Gardeners' experience in teaching horticulture topics, results suggest that an additional 148 [27%] of this year's 550 new Master Gardeners used pesticides only according to the directions after the training [65% before the training as compared to 92% after]. Likewise, an additional 303 [55%] Master Gardeners often used plant varieties that are known to be resistant to insects and diseases [83% after the training as compared to 28% before the training].

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

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

Increased Knowledge Of New Crop Management Techniques

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Developing Knowledge About The Genetic Basis For Phenotypic Responses To Selection

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This project's activities were associated with the continuation and further analysis of materials and information produced from the Illinois Long Term Selection Experiment for protein and oil concentration in corn grain. 2010 marks the 111th growing season for the project.

What has been done
An additional cycle of selection was conducted for the following 10 populations [cycle number]: Illinois High Oil [108], Illinois High Protein [108], Illinois Reverse High Protein [60], Illinois Reverse Low Protein [61], Illinois Reverse Low Oil [61], Illinois Reverse High Oil [58], Illinois Switchback High Oil [53], Illinois Reverse Low Protein Two [20], Illinois Reverse High Protein Two [7], and Illinois Reverse High Protein Three [8]. The project annually investigates and provides empirical data regarding the limits to genetic selection, sources of genetic variation, and methods for measuring cereal grain composition. The project also provides practical training in the genetic improvement of corn, including the development of germplasm resources with novel grain composition and related traits, such as N utilization and the relative growth of endosperm and embryo tissues within the cereal seed.

Results
The primary outcomes and impacts of the project are knowledge about the genetic basis for phenotypic responses to selection. Both commercial and academic research programs continue to request seeds and biological materials from the Illinois Long Term Selection Strains. The generation of molecular genetics resources such as DNAs isolated from individual plants can be used for studies of how selection has affected the structure and expression of the corn genome. Furthermore, it will allow more effective associations between genotype and phenotype, with utility in both discovery of gene functions and the genetic improvement of corn.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
206	Basic Plant Biology

Outcome #8

1. Outcome Measures

Improving Nitrogen Utilization To Reduce Inputs Required And Greenhouse Gas Emissions Associated With Agriculture

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The goal of this project was to investigate the physiological and molecular effects of nitrogen [N] on early kernel development.

What has been done
Our general approach was to grow maize in the field under conditions of N stress, use an in vitro kernel culture system to manipulate amino acid supply during the developmental window when N-stress often induces kernel abortion, and then assay both cultured kernels and kernels from field grown plants for changes in amino acid accumulation and gene expression. The first objective of the project was to assess N-responsive changes in growth and metabolism among developing kernels from genotypes that show extreme differences in kernel number and grain yield responses to supplemental N. The second objective was to obtain RNA expression profiles for the same tissue samples generated in the experiment described above.

Results
Results of this project are expected to reach and benefit a wide spectrum of audiences. Anticipated results will have considerable economic impact on crop breeding and productivity. Improving nitrogen use efficiency is becoming increasingly important to reducing the energy inputs and greenhouse gas emissions associated with agriculture. These gains must occur in the face of greater global demand for food, feed, and energy derived from maize production.

Reducing the N requirements for cereal grain production, this research addresses two major USDA goals: enhancing economic opportunities for agricultural producers and protecting the nation's natural resource base and environment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology

Outcome #9

1. Outcome Measures

Better Informing Weed Management Clientele In Treating Waterhemp

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{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 ALS-inhibiting herbicides, 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 has shown that amplification of the target-site

gene [EPSPS] plays a role in resistance. From this information we designed a molecular assay for EPSPS amplification.

Results
Results from rapid assays for herbicide resistance in waterhemp are being used to inform weed management clientele how to best manage waterhemp populations present in their 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 these herbicides will be of increasing importance.

4. Associated Knowledge Areas

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

Outcome #10

1. Outcome Measures

Improved Management Of Phytophthora Blight Of Cucurbits

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Illinois produces approximately 35,000 acres of cucurbit crops [cucumber, cantaloupe, gourd, pumpkin, squash, and watermelon] annually. More than 90% of the processing pumpkins produced in the U.S. are grown and processed in Illinois. Phytophthora blight, caused by Phytophthora capsici, is the most serious threat to production of cucurbits in Illinois, as well as

nationwide.

What has been done
Surveys conducted in 1999 and 2000 showed up to 100% crop losses in pumpkin fields in Illinois. Research was initiated in 1999 to develop a short-term solution and to establish a long-term strategy to manage Phytophthora blight of vegetables. The initial research focused on processing pumpkins and bell peppers, hosts most susceptible to P. capsici. The objective of this research was to develop effective control for Phytophthora blight and save the highly unique processing pumpkin industry, as well as other cucurbits and peppers. No variety of pumpkin, or other cucurbits, with measurable resistance to P. capsici was found. Intensive research was conducted in the laboratory, greenhouse, and field during 2000-2010 to determine effective fungicides for control of P. capsici. Among more than 50 fungicides with potential effects on Phytophthora, only six of them were found to be effective against foliar blight and fruit rot of cucurbits caused by P. capsici in Illinois. All of these fungicides received registration for use on cucurbits, to a good extent, based on the data generated in Illinois.

Results
A significant accomplishment in management of Phytophthora blight of cucurbits was development by seed treatment to control seedling death of plants caused by P. capsici during the early growth stages of the plants. Seed treated with Apron XL LS [mefenoxam], which effectively protects seedlings against P. capsici until about five weeks after sowing, was developed and is now widely used. The cost for this seed treatment is less than $0.10 per acre. By combining Apron seed treatment with applications of effective fungicides, yield losses in cucurbit fields were reduced from up to 100% to less than 10%. As a result, acreage of processing pumpkins increased by 133% from 1998 to 2011. Due to the devastating effect of Phytophthora blight on processing pumpkin yields, the processing pumpkin industry in Illinois was at risk of complete loss in 2000. Developing effective methods for control of the disease saved this high-value industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology
216	Integrated Pest Management Systems

Outcome #11

1. Outcome Measures

Utilization Of Digital Communication Tools By American Farmers

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A survey of Illinois and Wisconsin soybean producers and agronomists was undertaken to assist university groups to more effectively, efficiently, and economically serve farmers with outreach information and resources.

What has been done
A mail survey was designed and sent to 47,000 producers and agronomists in Illinois in July 2010. Through cooperation with Dr. Shawn Conley at the University of Wisconsin, there were another 10,000 simultaneously mailed to producers and agronomists in Wisconsin. Furthermore, another survey was designed using an on-line survey program. This on-line survey was advertised by mail postcards as well as newsletter and blog articles. There were 1,663 total direct-mail surveys and 203 on-line surveys completed. The direct-mail survey indicated that 85% of soybean growers use cell phones, 11% use cell phones with Internet, 70% use computers, 57% use high-speed Internet, 56% use email, and 3% use an iPod. In contrast, soybean growers that responded to the on-line survey all used cell phones [98%], computers [100%], email [99%] and high-speed Internet [97%] at greater frequency than television [83%], radio [88%], yield monitors [58%] and Global Positioning Satellite [GPS] guidance [58%].

Results
Key findings are: [1] All types of digital communications are playing important roles as information resources for American farmers and ranchers, and will play increasingly important roles in the future; [2] While digital may have become dominant in other B2B markets, agricultural magazines and newspapers continue to be the most important information resource, reaching and influencing the most farmers and ranchers, even among the younger age segment; [3] In addition to magazines and newspapers, ag dealers and retailers also are used mostly for informing and validating purchase decisions; [4] The role of different media changes through the purchase cycle, emphasizing the importance of integrated communications; [5] Continuity in marketing programs should be planned due to varying purchase cycle times; and [6] As measured by revenue, larger operators are more actively engaged with media channels, seeking information to run their businesses and inform decision making.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #12

1. Outcome Measures

Developing Wheat Varieties With Improved Resistance, Improved Stability Of Production, And Improved Grain Quality

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
An objective of the wheat breeding program is to evaluate experimental genotypes for agronomic performance and disease resistance.

What has been done
In the 2009-10 growing season, about 105 advanced experimental breeding lines were evaluated in replicated tests. About 312 preliminary breeding lines were evaluated. Selections were made based on yield, test weight, milling and baking quality, maturity, height, and resistance to Fusarium head blight [scab] and barley yellow dwarf virus. In addition, about 1,960 breeding lines were evaluated in single plots, and about 416 of these lines were selected for continued evaluation in 2011. About 28,000 F4 headrows were evaluated, and about 2,200 headrows were selected for further evaluation in 2011 based on height, maturity, disease resistance, and kernel morphology. All advanced and preliminary experimental breeding lines in the program were evaluated for Fusarium head blight resistance in a misted, inoculated field nursery. Preliminary increase blocks of three experimental breeding lines were grown in 2010 in preparation of possible release of these lines.

Results
Development of improved soft red winter wheat varieties has a significant economic impact and benefits wheat producers, processors, and consumers. Improved, disease resistant, adapted varieties reduce losses, improve stability of production, and improve the quality of the grain produced. The number of units of seed of breeding lines developed in this breeding program that were sold for commercial production increased compared to 2009 even though overall wheat acreage in the region decreased substantially due to late harvest, wet conditions at planting time and low price for wheat at planting time in the Fall of 2009.

4. Associated Knowledge Areas

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

Outcome #13

1. Outcome Measures

Engineering Safeners For Use With Dicot Crops

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The differential ability of plant species to metabolize a particular herbicide is widely exploited in modern agriculture by the use of selective herbicides that are safe to the crop but effectively control associated weeds. Safeners are a group of chemically diverse compounds with the unique ability to protect grass crops from herbicide injury without reducing herbicide activity in target weed species. Safener protection from herbicide injury is accomplished by increasing the expression of genes encoding herbicide-metabolizing enzymes such as the glutathione S-transferases [GSTs], cytochrome P450s, and several other enzymes. Safeners induce the expression of genes involved in plant defense and detoxification, such as GSTs and cytochrome P450s, yet they are not toxic to the plant and confer protection from herbicide injury. This suggests that safeners are tapping into an unidentified, pre-existing signaling pathway for detoxification of endogenous toxins or xenobiotics.

What has been done
A new hypothesis resulting from our recent research in wheat is that safeners may be utilizing an oxidized lipid [oxylipins] or cyclopentenone-mediated signaling pathway, which subsequently leads to the expression of GSTs and other proteins involved in detoxification and plant defense. Our research has utilized proteomic and targeted transcriptomic approaches to describe the molecular components of the herbicide detoxification pathway in wheat seedling tissues. A novel finding was that three 12-oxo-phytodienoic acid reductase [OPR] isoforms were highly induced by safener treatment and were differentially expressed in etiolated tissues of wheat [Triticum tauschii] seedlings. OPRs belong to a multigene family common to all plants that are well known

for their involvement in jasmonate biosynthesis and responses to numerous biotic and abiotic stimuli. For example, plant OPR genes are induced by a variety of stimuli including wounding, phytohormones, xenobiotics, and pathogen attack. Several OPR proteins and transcripts are strongly induced by safener treatment in Triticum tauschii seedling tissues. Consequently, it is possible that safeners may be tapping into an oxylipin-mediated signaling pathway via induction of OPR expression, which subsequently leads to the expression of GSTs and other proteins involved in herbicide detoxification and plant defense in a tissue-specific manner.

Results
Although safeners do not improve herbicide tolerance in dicot plants such as Arabidopsis, cotton, or soybeans, it may be possible to utilize the results of our research and biotechnology techniques to extend the safener response from monocot to dicot crops. Interestingly, dicots do not respond to safeners at the whole plant level despite significant increases in GST expression. If, however, the safener response could be engineered into dicot crops, then this would offer new weed management options by improving the margin of herbicide selectivity between dicot crops and target weed species, as well as providing new chemical control options for managing herbicide-resistant weeds. Additionally, knowledge of critical regulatory elements in the promoters or untranslated regions of genes encoding detoxification enzymes, or a comprehensive understanding of how gene expression is up-regulated by safeners, might lead to the precise manipulation of transgene expression in plants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
206	Basic Plant Biology
213	Weeds Affecting Plants

Outcome #14

1. Outcome Measures

Improved Management Of Western Corn Rootworm

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Western corn rootworm [WCR] is a significant pest of U.S. corn. Rootworm-resistant Bt-corn hybrids offer WCR control equal to insecticide with simplified planting operations and reduced chemical exposure. Use of Bt-hybrids requires establishment of non-Bt corn refuges [equal to 5-20 percent of Bt-planted area] to nurture modest populations of susceptible WCR adults intended to disperse and mate with more sparsely-distributed, potentially-resistant WCR adults that develop in Bt corn. Mating between WCR from refuge and transgenic corn will delay development of Bt resistance. An abundance of susceptible beetles entering transgenic corn reduces the likelihood that any two potentially-resistant WCR will mate; this slows the rate of resistance development.

What has been done
This study's goal is to measure the behaviors of WCR beetles as they move and mate in different configurations of refuge and transgenic corn. Emergence data showed that male and female adult production in transenic corn was 10.0 and 11.7 percent of that in refuge corn rows. Physical measurement of WCR indicates that males in refuge corn rows are larger than those from transgenic rows. The presence of WCR males bearing markers indicative of plot entry from another plot suggests that as many as 6.5 percent of males in a plot may have participated in interfield movement. Analyses of mating pairs and female WCR are ongoing. These data suggest that a seed blend may be superior to block refuges for moving and mixing mate-seeking WCR.

Results
An intention of this work is to go beyond the assumptions and measure what rootworms actually do under field conditions. Measuring outcomes that correct erroneous assumptions about pest biology is valuable to improving models of insect resistance and designs for refuge deployment in transgenic crops. The observations that WCR male movement from refuge to transgenic areas of fields is most likely during the vegetative period of corn phenology, mating is concentrated in and around refuge, and that mating females outside of refuge are older than mating females in transgenic corn [i.e. males are scarce so females wait longer to mate, leaving more time for a potentially-resistant male to locate a given female] illustrates some dramatic departures from assumptions that are generally given credence in current models. These changes in knowledge have been incorporated into a larger model of WCR resistance for seed blend/mixtures of transgenic corn submitted for publication. Because the model incorporating the measurements of male WCR abundance and movement patterns has also been submitted to the docket of an EPA Science Advisory Panel, there is a potential for these data to affect policy knowledge and decision-making rules about refuge configuration for transgenic pyramided hybrids included in seed blends.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #15

1. Outcome Measures

Improving Soybean Production Through A Better Understanding Of Flavenoid Pathways

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To understand gene expression networks leading to functional properties of the soybean seed, we have undertaken a detailed examination of soybean seed development during the stages of major accumulation of oils, proteins, and starches, as well as the desiccating and mature stages, using microarrays consisting of up to 27,000 soybean cDNAs.

What has been done
A subset of these genes on a highly-repetitive 70-mer oligonucleotide microarray was also used to support the results. It was discovered that genes related to cell growth and maintenance processes, as well as energy processes like photosynthesis, decreased in expression levels as the cotyledons approached the mature, dry stage. Genes involved with some storage proteins had their highest expression levels at the stage of highest fresh weight. However, genes encoding many transcription factors and DNA binding proteins showed higher expression levels in the desiccating and dry seeds than in most of the green stages. Of particular interest are the genes found to peak in expression at the desiccating and dry seed stages, such as those annotated as transcription factors, which may indicate the preparation of pathways that will be needed later in the early stages of imbibition and germination.

Results
These outputs contribute to the project goals of understanding the control of gene expression in soybean seed and seedling development. They will benefit the biotechnology industry and soybean producers and consumers by providing basic information on gene regulation in soybean, specifically of the nutritionally important flavonoid pathway and potentially in several important developmental pathways including the formation of cell walls, leaves, and trichomes. A better understanding of pathways involved in seed composition will enhance our ability to modify flavonoid, protein, and oil in the seed for improved nutritional and health value. Soybean products are of immense value to U.S. agriculture, annually contributing nearly $17 billion in unprocessed

crop value. Soybean has high protein [40%] and moderate oil [20%] content and is the main source of vegetable protein and oil in world markets.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
206	Basic Plant Biology

Outcome #16

1. Outcome Measures

The Illinois Soybean Yield Challenge

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	120

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In 2010, the Illinois Soybean Yield Challenge was established and over 250 Illinois soybean growers started the program. 120 finished the program with complete data submitted into an established on-line reporting system. This provided soybean production information on 120 side-by-side testing locations throughout the state where 'novel' yield enhancing practices were paired against 'standard' practices. In addition, soybean trials were established at four Illinois experiment station locations [DeKalb, Monmouth, Urbana, and Brownstown] to test crop production inputs to increase soybean yields.

What has been done
There were 45 treatments in total tested on two adapted varieties and replicated four times at each location. These treatments consisted of additional fertility above soil nutrient recommendations, fungicide, insecticide, biological, and hormone product applications. All locations were planted in May 2010 and harvested prior to October 2010. Additionally, a different set of soybean trials was established at six Illinois experiment stations [DeKalb, Monmouth,

Urbana, Perry, Brownstown, and Dixon Springs] to test the interactions of soybean planting date, seeding rate, and row spacing to investigate current agronomic recommendations. There were four planting dates [mid-April, early-May, late-May, early-June], three seeding rates [70,000, 120,000, 170,000], and two row widths [15" and 30"]. All trials were planted according to protocol and harvested in a timely manner.

Results
Participants of the 2010 Yield Challenge increased soybean yield by 5.2% for the 'novel' practices versus the 'standard' practices over all locations. Participants were asked in the final yield reporting forms if they learned from their 2010 experiences, and over half indicated they did learn and would apply new information to soybean production acres in 2011. Additionally, information disseminated from the 'novel' products screening trials and the agronomic recommendation screening trials allow farmers to view unbiased product information that enhances their ability to make better purchasing decisions. Furthermore, information from the agronomic studies showed that soybean seeding rates can be lower than what most growers currently plant. Information gathered at the 2010 and 2011 corn and soybean classics winter meetings suggests growers are reducing seeding rates, which translates to less soybean production costs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology

Outcome #17

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
2010	{No Data Entered}	3097

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, particularly in Illinois where over 83% of four million hectares of soybean are infested with yield-reducing population densities of the nematode. Soybean yields can be reduced from 5% to over 50% in individual fields. The primary means of managing H. glycines is through the use of resistant soybean cultivars. Farmers need to know two things in order to manage the nematode successfully: [1] The level of resistance in soybean cultivars labeled as resistant; and [2] The level of adaptation of the nematodes to resistant cultivars.

What has been done

Two important continuing studies are being conducted to provide soybean farmers with the information they need to manage H. glycines on their own farms: [1] Monitoring the levels of adaptation of the nematode to resistant cultivars statewide and in individual farms; and [2] Assessing the level of resistance in soybean cultivars labeled as resistant to the nematode. Unfortunately, over 95% of the resistant cultivars are derived from the same source, known as Plant Introduction [PI] 88788. 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 have shown that 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 2,500 H. glycines field populations confirmed that over 82% are adapted to PI 88788 at some level. On the host side, resistance is not a plus-or-minus trait in resistant cultivars, but occurs along a continuum from high to low resistance, measured as a comparison with a standard susceptible cultivar. Each year, we assess over 500 different soybean cultivars for their actual levels of resistance according to a standard protocol developed at the University of Illinois.

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 3,097 individuals in agribusinesses including farming, consulting, and supplying production materials were provided with this information during 2010. Surveys showed that awareness of the change in emphasis has increased to 65%. Second, our assessment program has had a profound effect on the marketing of resistant cultivars. In 2002, just over 50% of the cultivars labeled as resistant were actually resistant. By 2010, the percentage had increased to 87%. The assessments are provided to farmers electronically [the web site had nearly 5,000 unique hits in the past year] and through a printed booklet distributed to over 50,000 recipients, and has had an impact well beyond the state of Illinois.

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

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)

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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	30.0	0.0	3.5	0.0
Actual	33.2	0.0	2.1	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
1094181	0	65016	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1094181	0	65016	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
10160823	0	301364	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Extension activities include a wide variety of methods and focus on community participatory planning, organizational development, economic development, and community leadership development and education.

Illinois ResourceNet [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, through educational opportunities, and by working with experienced technical assistants to develop quality funding proposals. In partnership with the University of Illinois at Chicago and the Great Cities Institute, University of Illinois Extension staff members [employed through the University of Illinois at Urbana-Champaign] provided education and 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, 380 county officials are actively seeking certified status through participating in approved educational programs. 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 community and organizational leaders to make decisions using current, reliable, and relevant data and citizen engagement. CADS focuses on providing statewide Extension staff training in applied research methods to strengthen the University's outreach to businesses, organizations, and local governments. Online self-directed interactive training modules are being developed for statewide use and potential use by other states. Eight beginner modules and six advanced modules are at various stages of development. Completed module topics include: Introduction to Applied Research, Getting a Project Started, Logic Models, Data Management, Measuring Outcomes and Evaluation, Introduction to SPSS, and Using Excel.

Extension was also involved this past year in disaster preparedness activities. Working with Missouri, Kentucky, Tennessee, and Arkansas Extension, Illinois Extension staff members planned the third annual disaster conference held in August of 2010 in Paducah, Kentucky which was attended by 200 individuals. Recordings of some of the session were posted on West Kentucky Technical College's website. Illinois staff presented information on earthquake disaster preparedness at the eXtension Conference in St. Louis in October of 2009. Extension staff also facilitated finalization of county hazard mitigation plans. In addition, staff provided leadership for the completion of several additional community plans developed through a citizen participatory planning process.

Other Extension programs include **Customers 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], and leadership education including **Tomorrow's Leaders** high school curriculum [designed to develop citizens who care about and contribute to their communities].

Research activities in 2010 included research on positive youth development that led to an awarded grant proposal from the W.T. Grant Foundation, a study of the factors that influence the mental and physical health of poor rural mothers and their children, an investigation into how the recession affects the Latino community in their lives in Illinois as well as the impacts on families in their birth countries, research on newspaper coverage of social movements examining rural and urban social movement issues, work

focusing on creating youth report measures of engagement with challenge and strategic planning, which we believe will be of use to researchers focusing on youth development programs, observation of immigrant and second-generation youth to learn about their experiences with regard to political engagement, and a project that considered the role school factors such as racial segregation and poverty, as well as family circumstances, play in shaping student's educational trajectories during the elementary and secondary school years.

Conference presentations were made in 2010 to the National Conference on Family Relations, Cambio de Colores, the Society for Research on Adolescence, and the International Association for Feminist Economics Conference.

2. Brief description of the target audience

Members of the target audience include local child care practitioners, state and local policy makers, international scientific audiences, financial/economic/consumer educators [especially those focusing on the Latino community], immigrant and second-generation youth and their families, the academic fields of sociology, education, and psychology, federal policymakers, local school boards, and practitioners in education [school administrators/principals/teachers].

Community leaders, business leaders, agencies and organizations, and local government officials involved in community and economic development are key Extension target audiences that are large in scope. Other target audiences include youth and residents interested in starting small businesses.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	86199	105716	13452	0

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

Patent Applications Submitted

Year: 2010

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	0	2	2

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Research Projects

Year	Actual
2010	0

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	Examining The Causes Of Racial/Ethnic And Socioeconomic Gaps In Student Achievement
6	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
2010	500	423

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, more than 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.

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 Grant and Extension assistance in completing disaster plans. Three were completed in 2009. Pike County, with no pressing mitigation projects pending, began their planning process in January 2010.

Results
Pike County completed their disaster plan through engaged residents, of whom 160 completed surveys, 141 served on steering committees, 17 participated focus groups, and 58 attended public meetings. An additional 25 attended the final public meeting in Pike and another 23 participated in the final planning meeting in Mercer and Hancock Counties. Extension staff assisted communities by providing draft jurisdictional resolutions, and answering community questions. FEMA requires annual meetings to maintain the plans, and with Extension's assistance these plans will be monitored for progress on each project.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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 #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

Year	Quantitative Target	Actual
2010	100000	108029398

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] failure to understand the importance of collaborating with other organizations for funding; [3] lack of staffing resources and organizational capacity to prepare and manage grants; [4] lack of proposal writing skills; and [5] lack of knowledge about fundraising planning.

What has been done
In the third year of this initiative, Illinois ResourceNet [IRN] was operating at full capacity and refining its place-based approach to success. During this year, the project offered one statewide conference, one regional conference and 41 educational workshops that reached 1,628 participants. During the three years, the initiative has conducted 81 workshops that reached 2,536 individuals and five conferences reaching 925 individuals. During this year resource development tools have reached 673,166 individuals and organizations through conferences, newsletters, websites, and direct contacts. A total of 1,055,632 individuals and organizations have been reached during this three-year initiative. An evaluation of outcomes and process was also conducted.

Results
With IRN assistance, a total of 42 proposals for federal funding have been submitted this past year and 120 over the initiative period [three years]. In this past year, $78,925,407 in federal funds has been awarded in response to those proposals. Awards in federal grants to date is $83,064,028. In addition, $29,103,991 has been awarded in state funding with a total of $29,224,391 over three years. Interviews or surveys with the people responsible for preparing and submitting 119 of the 120 federal proposals indicated that the assistance they received in grant writing, finding a funding source, preparing a plan to develop the proposal, budget development, and finding partners met their expectations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Examining The Causes Of Racial/Ethnic And Socioeconomic Gaps In Student Achievement

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The main objective of this project is to examine the causes of racial/ethnic and socioeconomic gaps in student achievement and school-related behaviors and their implications for educational and occupational attainment. Specifically, this project has considered the role school factors, such as racial segregation and poverty, as well as family circumstances play in shaping student's educational trajectories during the elementary and secondary school years utilizing data from a national sample of students from the Department of Education.

What has been done
The overall goal of this study was to determine whether mobility impedes the learning progress and engagement of elementary school students. This study examined whether changing schools and/or residences during the first four years of school is associated with increased behavioral problems, fewer positive learning-related behaviors and slower achievement growth compared to students who did not change schools. Results were disseminated in both academic and public settings.

Results
The results of this project show that school and family factors affect student's behavioral, attitudinal and achievement trajectories. The most recent study on student mobility shows that changing schools early and later on during elementary school has a significant negative impact on reading gains over the first four years of elementary school. The results also provide important evidence that suggests that non-routine school and residential changes are associated with lower student engagement and learning behavior in the classroom and more internalizing and externalizing of behavioral problems during elementary school. This study finds no immediate or long-term educational benefit of changing schools at any point during the first four years of elementary school, either in terms of reading and mathematics achievement or student behavior. Rather, it finds that students who do experience school changes, especially coupled with residential changes, are at an increased risk of developing greater behavioral problems during elementary school.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services

Outcome #6

1. Outcome Measures

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
2010	{No Data Entered}	7

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, more than 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, began their planning process in January 2010.

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 through 1,040 completed surveys, 442 residents serving on steering committees, 137 participating in focus groups, and 146 attending public meetings. Tentative FEMA approval was received for Hancock, Henderson, and Mercer Counties in the spring of 2010. Participating jurisdictions then adopted a resolution to adopt the plan. Once FEMA received confirmation of jurisdictional adoption, final FEMA approval was given for the plans. All three counties received their official FEMA approval in September of 2010. Extension staff assisted communities by providing draft jurisdictional resolutions, answering community questions, etc. 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. Other plans completed by communities included Monroe County Strategic Plan, City of Rochester Community Plan, and City of Teutopolis Community Plan.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

We are still refining our indicators, but will be adopting a subset of those identified by the extension program leaders in community and economic development in the North Central States. Therefore, we added an indicator from that set and used ones previously identified that reflect our major areas of impact this past year. With reorganization nearly in place, the educators will be able to focus on a select group of indicators and the methods identified for collecting the impact evidence.

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

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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	25.0	0.0
Actual	11.5	0.0	27.7	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
377570	0	1132375	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
377570	0	1132375	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
3506200	0	11582734	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2010 included efforts to better understand the PRRSV-S. suis superinfection in an effort to develop better treatment and prevention of this serious disease in pigs and emerging disease in humans, a study of the effect of grooming devices on performance and behavior in feedlot cattle, a study to monitor environmental conditions on a swine transport trailer during journeys from the farm to the slaughter plant, research that developed the first metagenomics dataset, including phylogeny and functional capacity, of the canine gastrointestinal microbiome, a significant expansion of the base for teaching manure nutrient management plan development through the Illinois Manure Management Plan program, improved treatments for pig castration [with improved treatments, swine producers would realize significant decreases in their production costs while experiencing similar rates of average daily gain in the pigs], findings that have helped contribute to our understanding of the effects of two commonly used intra-articular drugs, sodium hayaluronate and triamcinolone, on joint metabolism, results that will be used to further delineate better isolation techniques for progenitor cells from tendon [the research will benefit clinical cases of tendon injury], a finding that the nutraceutical approach of providing natural or synthetic dietary receptor mimetics for protection against gastrointestinal virus infectious disease in all species is plausible, the discovery that expensive storage media is not necessary for improving fecal detection method but that the choice of extraction methods seems paramount, and the first survey and characterization of the prohormones in three main livestock species [cattle, chicken, and pig].

Additional research activities in 2010 included results that provide a foundation for understanding how sperm releases acrosome, the development of design constructs to improve the safety of the very effective Pinnacle IN vaccine in treating strangles in horses, the application of microfluidics to embryo production in vitro [which should alleviate some of the limits that traditional microdrop culture places on embryo development and research into gamete and embryo physiology], a project designed to develop a behavioral assay for neonatal piglets to assess learning and memory and determine the effects of acute viral infection on learning and memory, and the development of a DNA-based diagnostic test for neuropathic hydrocephalus that accurately determines an individual's genotype [over 80,000 animals have already been screened using this technique].

Conference presentations of research in 2010 included the Ceva Vector Vaccines Symposium, the American Association of Avian Pathologists/American Veterinary Medicine Association Western Poultry Disease Conference, the Waltham International Nutritional Sciences Symposium, the American Dairy Science Association Annual Meeting, the American Society for Animal Sciences, the National Institute of Biomedical Innovation, the Japanese Society of Developmental Biologists, the Third Pan Pacific Symposium on Stem Cell Research, the Society for the Study of Reproduction, the Gordon Conference on Fertilization and Activation of Development, the American Society for Cell Biology, the International Embryo Transfer Society Annual Meeting, the International Society on Stem Cell Research, the Society for the Study of Reproduction Meetings, and the Korean National Academy of Science Biotechnology Conference.

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 489,942 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. Data for Arkansas, Colorado, Florida, Louisiana, Pennsylvania, South Carolina, Washington, D.C., Texas, and Alabama are under development [see Agricultural Global Food Security and Hunger planned program]. **Illinois Horse Breeders Short Courses**, 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, 1,288 Illinois 4-H and FFA members completed the seven modules of the online **Quality Assurance and Ethics Certification** training and quiz for 2010 for beef, dairy, goats, horses, sheep and swine covering topics related to care and administration of medicine for livestock.

2. Brief description of the target audience

Members of the target audience include pig farmers and the swine industry, beef cattle producers, feedlot operators, cattle veterinarians, swine transport companies, the swine slaughter sector, the pet food industry, custom manure haulers, regulatory agency representatives, livestock commodity group representatives, equine veterinarians and horse owners, dairy scientists, the genetic dairy industry, dairy producers, basic and applied biomedical and agricultural researchers and livestock industries using genome-based selection tools, scientists focusing on animal reproduction issues, commercial egg producers and poultry nutritionists, and companies that produce veterinary biologics and researchers working on PRRS virus biology. Extension also targeted companion animal owners and youth.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	74903	31959	40394	0

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

Patent Applications Submitted

Year: 2010
Actual: 3

Patents listed
[1] Carbohydrate Binding Molecule With Affinity For Insoluble Xylan; [2] Microfluidic Systems And Methods; [3] Thermostable Enzymes For The Hydrolosis Of Mannan-Containing Polysaccharides

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	1	56	57

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Research Projects

Year	Actual
2010	11

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

Outcome #1

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Knowledge To Ensure Meat Is Safe For Consumption

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	3000	1288

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Humane care of animals helps develop social and emotional skills in young people.

What has been done
An online module and certification on ethical treatment of animals continues to be provided to 4-H members. In addition, face-to-face training is offered that combines ethics and basic livestock production training.

Results
Online module training records indicate that 1,288 youth were certified.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
307	Animal Management Systems

311	Animal Diseases
806	Youth Development

Outcome #3

1. Outcome Measures

Increased Knowledge Of Livestock Care And Management

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Improving On Current Methods Of Surgical Castration Of Swine

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Surgical castration is a practice chosen by most swine producers because it is relatively easy to perform and is an inexpensive and effective method to reduce boar odor in pork. It can also alleviate potential behavioral problems associated with raising intact males. This practice has come under major scrutiny in the past 20 years as animal welfare concerns are being raised regarding the pain associated with surgical removal of the testes.

What has been done
Boars were given a single injection of a time-released progestin, depot medroxyprogesterone acetate [DMPA], at ten weeks of age and monitored weekly and biweekly for serum testosterone and androstendione measurements as well as for testicular size, length and width as measured by calipers. Animals were sacrificed at 180 days of age and samples of subcutaneous fat and muscle as well as testes were collected for further analysis. The information currently gained from this project has been shared with large, integrated swine operations and veterinary practices as to its use and efficacy. Additionally, industry representatives have been consulted on the current research and modifications that need to be made for future experiments.

Results
With improved treatments, swine producers would realize significant decreases in their production costs while experiencing similar rates of average daily gain in the pigs. Not only would this result in a substantial reduction in labor costs, but losses due to mortality and costs of post-surgical castration complications such as swelling of the incision, anorexia, and infection would be reduced. Additionally, there would be less risk of employee injuries during surgical castration of piglets. This would improve employee and animal welfare.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
315	Animal Welfare/Well-Being and Protection

Outcome #5

1. Outcome Measures

Improved Cattle DNA Amplification And Sequencing Through Optimal Sampling

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In order to maximize the ability to amplify and sequence DNA from cattle, we have tested various collection and storage media.

What has been done
The cattle fecal samples were collected locally at the facilities of the University of Illinois, with minimal exposure of samples to the environment before collection. Samples were collected into one of three different media to test the success rate of DNA extraction and amplification for the three media: [1] A saturated salt/DMSO solution; [2] The commercially available RNAlater [Qiagen] storage medium; and [3] The commercially available SCSR fecal transport medium [Noninvasive Technologies], which is specifically designed to keep exfoliated cells alive during sampling. Two different commercially available kits were used to extract DNA from each of the cattle fecal samples collected in each of the different media. The DNA Stool Mini Kit [Qiagen] is

specifically designed to extract DNA from fecal samples, and to reduce the presence of PCR inhibitors in the resulting extracted DNA. A second commercially available kit not specifically designed for use with dung was also tested.

Results
The medium into which the fecal samples were collected did not appear to have a great effect on the ability to amplify DNA extracted from the samples. By contrast, the type of DNA extraction kit used had a major impact on the utility of the extract for PCR amplification. The kit designed for use with fecal DNA had a much higher success rate, presumably due to the use of an adsorption resin and a buffer optimized for removal of PCR inhibitors. The storage media were all found to be similarly effective in producing DNA of sufficient quality and quantity for downstream amplification. This suggests that expensive storage media is not necessary for improving fecal detection methods. However, the choice of extraction method seems paramount, as methods specifically designed for use with fecal DNA [by incorporating the use of resins and buffers to minimize the presence of downstream inhibitors] greatly improved the ability to amplify the DNA.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
305	Animal Physiological Processes
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection

Outcome #6

1. Outcome Measures

Establishing A New Model For Assessing The Effects Of Acute Viral Infections On Learning And Memory In Piglets

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Pigs are used in a myriad of research disciplines related to human health, but no studies have employed the piglet to directly assess cognitive function during the neonatal period or to assess how viral infection affects cognition. An objective was to develop a behavioral assay for neonatal piglets to assess learning and memory and determine the effects of acute viral infection on learning and memory.

What has been done
At two weeks of age, piglets were trained to locate a milk reward in an eight arm radial maze, using colored intra-maze cues. Cue colors were then reversed and pigs re-tested to assess learning and working memory. Piglets quickly learned the simple associative acquisition task, and proficiency greatly improved throughout reversal testing. To further assess the behavioral assay, piglets received an i.p. injection of saline or polyinosinic:polycytidylic acid [poly I:C; 5 mg/kg body weight] immediately preceding reversal testing. Poly I:C-treated piglets exhibited acute sickness behaviors, but observationally, were asymptomatic for twelve hours post-injection. Pro-inflammatory cytokine mRNA expression was elevated four hours post-injection in both peripheral and central compartments, and plasma cytokine protein levels were concurrently elevated. At 24, 48, and 72 hours post-injection, poly I:C-treated piglets committed more incorrect arm entries, required more time to complete the reversal task, and moved a greater distance in the maze compared with control piglets. Collectively, these data demonstrate that neonatal piglets are capable of being trained in traditional learning and memory tests, and peripheral immune activation elicits alterations in cognitive processing in the neonate.

Results
The present study established a new model for assessing the effects of acute viral infections on learning and memory. Viral infections are common in swine but how they impinge upon the brain to affect behavior and cognition is largely unknown. The brain is rapidly growing and developing in the postnatal period and infection at this time may have long-lasting programming effects on future behavior. Understanding how early-life infection affects brain and cognitive development will be relevant to animal health and well being. Further, the piglet may be an excellent preclinical translational model for studying the developmental origins of behavioral disorders.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #7

1. Outcome Measures

An Improved Diagnostic Test For Neuropathic Hydrocephalus In Pigs

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The expression pattern of bhmt and bhmt-2 genes in pigs is similar to humans and further supports the use of the pig as an appropriate animal model to study diseases and gene regulation associated with bhmt and bhmt-2 genes.

What has been done
Nonsynonymous SNPs recognized in this study are located in regions of the pTLR gene that are implicated either in binding microbial products or intracellular signaling. Thus, they could be significant in host responses to important swine diseases. In addition, the protein domain architecture of these three pTLRs was examined between human, mouse, cow, and pig, revealing 12 regions of conservation in the TLR variable leucine-rich-repeat patterning. Using the DNA sequence information that has been generated, a DNA-based diagnostic test has been developed for neuropathic hydrocephalus that accurately determines an individual's genotype.

Results
The genotype of an animal can be obtained through analysis of any DNA containing sample such as blood, semen, tissue or hair follicles. Internationally, more than 80,000 animals have been screened using this diagnostic.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals
305	Animal Physiological Processes
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #8

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
2010	{No Data Entered}	100

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] has been further developed. Discussions with the Illinois EPA regarding changes that need to be made to the website language and forms to maintain compliance with new CAFO/NPDES rules are ongoing. Illinois will see a dramatic increase in NPDES permits over the next couple of years and IMMP will be helpful to those new to the permit program.

IMMP is one of several products available, but is the only one that 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 this reporting and record keeping 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.

During the 2009-2010 workshop series "Certified Livestock Manager Training", we used anonymous polling at 8 workshops around the state to get answers to the question "My manure plan is: [1] in my head [13%]; [2] a work in progress [23%]; [3] written, but not updated regularly [20%]; or [4] written, updated annually and constantly used [45%]." 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 279 producers and consultants participated in 2010. Since each year in the three year cycle we have a different group, it has been encouraging to see the [4] responses slightly increase each year.

Results
Limited web usage data are available to IMMP site administrators. 64 new plans were created in 2010. 36 plans were modified in 2010, and the website had 18,550 total page views.

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 #9

1. Outcome Measures

Mitigating Impacts Associated With The Reuse Of Concentrated Animal Feeding Operations Wastewater

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Large volumes of manure-contaminated wastewater, wash water, and storm water runoff can be generated at concentrated animal feeding operations [CAFOs]. The reuse of CAFO wastewater on agricultural lands can decrease the amount of wastewater discharge into sensitive water bodies and use the nutrients in the discharge as fertilizers for irrigation applications. However, the wastewater from large confined-animal farms usually retains many contaminants such as excess amounts of nutrients, salts, pathogens, heavy metals, hormones and antibiotics, which could pose environmental and public health risks if the wastewater is widely applied for agricultural irrigation.

What has been done
This project addresses how wastewater reuse from dairy and beef farms contributes to the problem of animal hormones and veterinary antibiotics in the environment. The initial phase of the study focused on established robust analytical methods for extraction and detection of three free hormones [17a-estradiol, 17b-estradiol, and estrone], three hormone conjugates [17a-estradiol-3-sulfate, 17b-estradiol-3-sulfate, and estrone-3-sulfate], and two new veterinary antibiotics

[ceftiofur and tulathromycin] in water, manure contaminated wastewater, and soil matrices. To compensate for matrix effects observed in the analysis of environmental samples when using high performance liquid chromatography combined with tandem mass spectrometry [HPLC-MS/MS], we also utilized an isotope dilution method to provide more accurate analysis for those complex samples. All developed methods are applicable for the studies regarding fates and transport of these hormones and antibiotics as well as their monitoring in various environmental samples. We also investigated the transformation kinetics and mechanisms of three steroid hormones and two antibiotics in dairy lagoon water and beef recycled wastewater during the reporting period.

Results

We found a reversible transformation occurred among three hormones in the dairy lagoon water, which resulted in the hormone contaminant persistence in the environment. A biological degradation mechanism for cefitiofur in beef recycled wastewater was proposed through identifying its metabolites. Also, our initial results suggest that increasing the residence time of wastewater in a lagoon or using aerobic settling tanks may be economical, feasible, and efficient practices to degrade hormone and antibiotic contaminants and thus reduce their loads to the environment. These results will be useful for development of integrated management strategies to mitigate potential adverse impacts associated with the reuse of CAFO wastewater.

4. Associated Knowledge Areas

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

Outcome #10

1. Outcome Measures

Utilization Of Yeast-Based Mannan Oligosaccharide Products For Improved Growth Performance And Disease Resistance

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
We expect the results of our research to be of significant practical importance to the swine industry. There is widespread adoption in the industry of yeast-based mannan oligosaccharide [MOS] products, largely for improvement of growth performance but to some extent for increased disease resistance. However, the impacts on disease resistance are not well defined nor well understood.

What has been done
Our previous results suggested that MOS stimulates the immune system under normal conditions, but reduces inflammation during disease. Our present results suggest that it is important to define mannan products precisely, because a more refined product [Actigen] may have somewhat different impacts on the immune system. We must now confirm these results and then define more clearly the immune effects of the two related products. That will be necessary in order to use these products to greatest advantage. There is widespread interest in the use of physiologically active plant extracts in animal diets to improve productive performance and protect against disease. Our current data provides the clearest available evidence that some of these products can reduce diarrhea in disease-challenged animals.

Results
We expect the swine industry to consider the use of these plant extracts under certain conditions. Our demonstration of effects on intestinal morphology provides further support for beneficial effects. The anti-inflammatory effects that several plant extracts showed in our in vitro work may be important in management of diseased animals. Overall, our work this year has continued the process of clarifying which of the many candidate dietary factors will be useful in maintaining health of pigs, and how they may be used most effectively.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
305	Animal Physiological Processes
311	Animal Diseases

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)

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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	11.0	0.0	13.0	0.0
Actual	11.0	0.0	7.8	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
362159	0	565541	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
362159	0	565541	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
3363090	0	1842740	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2010 included work to refine and improve the design of pheromone traps, the development of new knowledge on the impact of pesticides on mosquito population dynamics and potential disease transmission, efforts to reduce nutrients in streamwaters to improve local conditions and decrease downstream loads, research to gain new knowledge on how forest soils change through time [investigating the impact of a variety of factors such as tree growth, acidic deposition, and climate change], study of tile drainage modifications to reduce nitrate losses in agricultural watersheds, the development of data that was used by USDA APHIS personnel to identify leafhoppers intercepted at ports of entry [to prevent delays in shipping and reduce the possibility of introduction of exotic agricultural pests], research resulting in better-developed forest harvest rules, and results that produced novel insights into the behavioral adjustments and real and perceived risks for an urban adapter species [adult woodchuck].

Additional research activities included research that will lead to the design of management systems that optimize biologically-mediated soil processes, informing management efforts against garlic mustard, purple loosestrife, and invasive species in Illinois in general, work to improve forest sustainability through the economic returns that can be generated from forest by-products such as pine slash and shredded Quercus stella, an improved understanding of short-term and long-term interactions among soil conditions, fertilization, residue management, cropping history and soil organic matter deposition, and the dissemination of publications designed to assist in the implementation of best management practices in tile-drained watershed for enhancing water quality while maintaining productivity.

Conference presentations in 2010 included the 70th Annual Midwest Fish and Wildlife Conference, the Illinois Sustainable Technology Center, the International Soil Science Meeting, the 13th International Symposium on Microbial Ecology, the Illinois Water Conservation Conference, the Emiquon Science Meeting, the International Symposium for Society and Resource Management, the American Society of Agronomy, the Crop Science Society of America, the Soil Science Society of America, the Wisconsin Crop Management Conference, and the Entomological Society of America.

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 sections.

The statewide **Illinois Tillage Seminar** attended by over 90 participants addressed various tillage topics, with 10% of those commenting on their intent to incorporate cover crops in their operation. Annual soil and water management seminars via audio conference were hosted at county Extension offices. Other programs addressing natural resource topics were also offered via audio-conferences, including one that addressed prairie restoration and one that addressed windbreaks and their installations. Sections of the statewide pesticide safety education program also cover practices related to preventing chemical contamination of our natural resources. **Regional Crop Management Conferences** also included a segment on water quality.

The majority of forestry-related education focused on forest landowner education and outreach that extends beyond management to include urban forestry, forest product marketing and utilization, and carbon sequestration. Sixteen presentations, seminars, workshops and field days reached 4,047 individuals, while email, telephone calls, walk-ins, and **Ask A Forester** resulted in another 325+ contacts. Examples include a two-day chainsaw safety course for women, a webinar hosted at 14 Extension offices on timber harvesting that reached approximately 95 forest landowners, and hands-on

activities for nearly 3,000 grade school students and 155 teachers during Stewardship Week. Now a 14-year tradition, Iowa State University Extension forestry and University of Illinois Extension forestry partnered to offer the **Tri-state Forest Stewardship Conference** held in Sinsinawa, Wisconsin attended by 400 paid registrants; topics offered by Illinois Extension staff addressed urban tree selection and maintenance and crop tree release. The Extension forestry website now allows for mobile linkage.

The **Illinois Master Naturalist [ILMN]** program completed a third year of statewide implementation, drawing on internal grant funds for this pilot initiative. Participation this year expanded to two new locations. A total of 627 individuals have participated in the program to experience nature and to develop knowledge of and respect for the environment. In addition, they are engaging in a wide variety of projects as environmental stewards. An internal website served 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 five sustainable agriculture tours with 99 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**, online courses for Certified Crop Advisers required continuing education units, a webinar series that included a session on prairie restoration techniques and windbreak installation, and **Stewardship Days** conducted for youth.

2. Brief description of the target audience

The target audiences included state and federal agency personnel who are working on nutrient criteria for agricultural streams and basins, crop producers and suppliers, biologists conducting research on leafhoppers, USDA Forest Service personnel, members of the general public who use forests for recreation, conservation managers, restoration ecologists, land owners, wildlife managers and local citizens, wetland researchers, Extension professionals, agricultural, biological, and ecological researchers, Illinois homeowner associations, forest land owners in pine barren areas, agronomic field professionals, agricultural retail professionals, forest managers focusing on forest soil carbon sequestration, watershed partners and citizens, landscape architects, land planners, and land owners who manage land near riparian areas. In addition, Extension targeted loggers, woodworkers, timber buyers, and youth.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	48293	15225	24145	0

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

Patent Applications Submitted

Year: 2010

Actual: 1

Patents listed
Hydrothermal Processing [HTP] Of Algae Grown In HTP Waste Streams

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	0	36	36

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2010	4

Output #2

Output Measure

- Continuing Education Units Awarded To Certified Crop Advisers Who Complete Online Natural Resource Management Courses

Year	Actual
2010	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
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] [Project Currently On Hold Due To Lack Of Funding Per Dr. Branham]
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 NADP Website
5	Application Of Pond Managment Recommended Practices
6	Determining The Effects Of Widespread Pesticide Use On The Dynamics Of Vector Borne Diseases
7	Examining The Impact Of Nutrient Runoff On Biotic Integrity
8	Studying The Impact Of Urbanization On Wildlife Species
9	Improved Management Of Garlic Mustard And Other Invasive Species
10	Preserving And Protecting Vegetated Riparian Buffers
11	Improved Assessment Of The Biotic And Abiotic Risks Imposed By Animal Operations
12	More Informed User of Pesticides
13	Increased Knowledge of Natural Resources, Science, and Environmental Stewardship

Outcome #1

1. **Outcome Measures**

Number Of Drainage Water Management System Acres

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Reduction Of Nitrate Levels In Lake Bloomington, Illinois, A Largely Agricultural Watershed [Assuming A 100% Baseline For 2008] [Project Currently On Hold Due To Lack Of Funding Per Dr. Branham]

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Application Of Reduced Tillage Or Soil And Water Management Practices

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

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

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Application Of Pond Managment Recommended Practices

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Determining The Effects Of Widespread Pesticide Use On The Dynamics Of Vector Borne Diseases

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The United States accounts for one-third of the total amount of pesticides used to control agricultural and public health pests around the world. This work will aid in determining the effects of widespread use of these chemicals on the dynamics of vector borne diseases.

What has been done
The PI has interacted with both graduate and undergraduate students to generate and analyze data on how the insecticide malathion and nitrogenous fertilizers interact with larval competition to alter adult mosquito traits. The research component has involved training and mentoring graduate and undergraduate students on how to conduct experiments, analyze data, prepare reports and present findings in conferences and journals. Many of these students have registered for their semester courses in the department of entomology and are using part of the data to accomplish the research components of their respective courses. This engagement has played a significant role in bridging the gap between research and curriculum.

Results
We have generated new knowledge on the impact of pesticides on mosquito population dynamics and potential for disease transmission. Our results so far demonstrate that pesticides can interact with other environmental factors such as larval competition, larval resource, and larval rearing temperature to alter the components of vectorial capacity including survival to adulthood, development time to adulthood, adult mosquito size and life span. Sublethal concentrations of insecticide malathion killed a fraction of the larvae and released the surviving larvae from competition so that they developed into large adults with a longer lifespan compared to the control treatments. Given that mosquito size and longevity are closely related to vector competence, our results suggest that pervasive use of pesticides in agriculture may have negative effects on mosquito-borne disease transmission.

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 #7

1. Outcome Measures

Examining The Impact Of Nutrient Runoff On Biotic Integrity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Agricultural fields in Illinois contribute nitrate and phosphorus to streams from both surface runoff and tile flow, which has led to degraded water quality. This project will examine how various concentrations and forms of these nutrients affect stream algal production, dissolved oxygen, and in-turn, biotic integrity.

What has been done
As Illinois discusses ways to reduce nutrients in streamwaters to improve local conditions and decrease downstream loads, results from this project have continued to influence the development of nutrient criteria in the state. The PI was again chosen to be a consultant to the EPA Science Advisory Board Ecological Processes and Effects Committee to review Nutrient Criteria Guidance for Florida. Sampling of several streams in central Illinois also continued during the past year, adding to our long-term temporal data sets of water quality.

Results
The outcomes from this worked influenced the State of Illinois in how it is proceeding with developing nutrient criteria. Our work on nitrate yields in the Mississippi River basin was important in showing that tile-drained agricultural fields in Illinois were a major source of nitrate.

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 #8

1. Outcome Measures

Studying The Impact Of Urbanization On Wildlife Species

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Urbanization is one of the main threats to wildlife species, even in agricultural landscapes already highly modified by humans. Our objectives were to compare movements, survival, and anti-predator behavior of adult woodchucks [Marmota monax] distributed across an urban-rural gradient within an agricultural landscape. Woodchucks are considered an urban adaptor species.

What has been done
Our results produced novel insights into behavioral adjustments and real and perceived risks for an urban adapter species. Home-range sizes of woodchucks in urban areas were approximately 10% of those living in rural areas. Despite lack of natural predators in urban areas, woodchucks were as vigilant against predators as those in rural areas. This result partially reflects the fact that woodchucks in urban areas are not strongly habituated to humans and still treat them as potential predators. Survival rates were related positively to urbanization, especially during the winter hibernation period. Mortality causes differed across the urbanization gradient with most urban mortalities related to vehicle collisions or unknown reasons, whereas most rural mortalities were due to predation or probable starvation during hibernation.

Results
The results from this study contributed to an awarded external research grant from the United States Fish and Wildlife Service to continue examining the ecology and management of urban

woodchucks. The new project will be conducted in Chicago in collaboration with scientists at the Urban Wildlife Institute located at the Lincoln Park Zoo.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #9

1. Outcome Measures

Improved Management Of Garlic Mustard And Other Invasive Species

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Collectively, the results of the demographic and allelopathic studies conducted between 2004 and 2010 have informed management efforts primarily against garlic mustard and purple loosestrife, but also on invasive species in Illinois in general.

What has been done
In the first study, soils collected from 15 invaded areas along a chronosequence of invasion history were used in a series of greenhouse experiments to determine if soil microbial communities with a longer history of garlic mustard invasion had altered community richness and structure, and whether they had developed increased resistance to the allelopathic impacts of the invader. In the second study, currently ongoing, a large scale field reciprocal transplant experiment was established to test whether three native understory plants have begun to show evolutionary adaptations to the presence of garlic mustard. In the first study, we found that garlic mustard genotypes that produce higher levels of allelopathic compounds have greater impacts on native soil communities, especially mycorrhizal fungi, and that over time, soil communities decline in richness [but in very old sites richness seems to recover]. We found that at least one of the three species displayed evidence of adaptation to garlic mustard. There is also evidence that the presence of garlic mustard may be interfering with the native's ability to adapt to local climates. However, these results are still preliminary and require further research.

Results
This information has been passed on to biocontrol scientists working on agents in quarantine, and to land managers in Illinois to enable better prioritization of management efforts. In addition, important Extension and outreach materials have been developed for translating the outputs into outcomes. We are currently collaborating on a citizen science project in which high school students around Illinois will perform experiments on their local population of garlic mustard. These results will then be combined to produce a greater understanding of the spatial and temporal variability in invasion processes and impacts across the state, which managers can use to prioritize their control and restoration efforts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
123	Management and Sustainability of Forest Resources

Outcome #10

1. Outcome Measures

Preserving And Protecting Vegetated Riparian Buffers

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Intensive management of riparian zones in the Midwestern United States has long involved clearing vegetation, straightening meandering streams, and lining earthen banks with stone or concrete. The findings from this body of work demonstrate the value to citizens, farmers, and the environment of a variety of landscape buffers along the waters edge.

What has been done
This body of work provides ample evidence for planners and policy-makers to take necessary steps to preserve or restore vegetated riparian buffers and meandering channels along Midwestern waterways. These natural alternatives to existing strategies are not only visually attractive and ecologically beneficial, they are also positive steps towards more sustainable

riparian management practices. The findings also suggest that implementing management strategies that include vegetation buffers in riparian zones will not only be tolerated by people in the Midwest, but will be highly preferred over prevailing management strategies that are devoid of vegetation. Vegetation buffers not only improve visual appearance, but also provide many ecological benefits valued by the public. These benefits include a reduction of soil erosion, filtration of pesticides from runoff, and creation of wildlife habitats.

Results
Taken together, the findings suggest that vegetation in riparian zones, particularly tree buffers, should be widely implemented.

4. Associated Knowledge Areas

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

Outcome #11

1. Outcome Measures

Improved Assessment Of The Biotic And Abiotic Risks Imposed By Animal Operations

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The use of antibiotics in livestock production is a ubiquitous practice. Swine, poultry and cattle production use antibiotics for treatment, prevention of animal diseases, and for growth promotion. As such, water bodies in close proximity to animal operations are often at risk of biotic and abiotic contamination. Groundwater constitutes 50% of the drinking water supply for the U.S. population, and over 97% of the drinking water sources for rural communities. It remains of high priority to maintain the quality of our water resources.

What has been done
The project examines the microbial communities, the antibiotic resistance genes and the mobile gene pools that are associated with swine production facilities, and evaluates if these contaminants will impose a potential adverse risk to nearby water bodies. To achieve this long term goal, this project aims to first establish the presence of biotic contaminants and the diversity of the mobile gene pool that are associated along a contamination gradient in a swine production environment. Subsequently, bacterial isolates will be isolated from soil samples obtained within the swine production facilities. The bacterial isolates will be well-characterized. Specifically, we aim to look for bacterial isolates that are resistant to tetracycline, and evaluate the genes that confer their tetracycline-resistant traits. We also aim to look for genotypic traits such as mobile genetic elements, and determine if the phenotypic traits encoded by the mobile genetic elements are transferrable to other bacterial isolates endemic to a non-contaminated water system, as well as the human and animal commensal microbiota.

Results
The knowledge gained from this work would enable regulatory bodies to better monitor and assess the biotic and abiotic risk imposed by animal operations. This work addresses a priority of USDA-NRI Program 26.0 to 'understand the sources, fate, the transport of pathogens, such as bacteria, protozoa and viruses in soil, surface and groundwater, and irrigation systems of agricultural and rural watersheds to reduce zoonotic pathogens in the environment'. Our work would help to enhance the long-range sustainability of U.S. agricultural systems by providing the data necessary for the proper assessment of microbial risk. This will subsequently allow for better design and implementation of informed management decisions about antibiotic usage in agriculture, treatment of animal waste, and the use of animal manure as fertilizer.

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 #12

1. Outcome Measures

More Informed User of Pesticides

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	397

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Use/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 integrated pest management, environmental protection, human protection, pesticide labels and characteristics, correct application procedures including equipment calibration, problems that may occur with the use of pesticides, and steps to take if a problem occurs with the use of a pesticide. To determine knowledge gained and teaching effectiveness of the instructors, participants at 14 Pesticide Safety Education Program training in Northwestern Illinois were given a pre-test and post-test of the same questions representing these various topics. Participants responded using the TurningPoint technology response card to 12 questions. Over 5,000 private pesticide applicators were trained statewide in 2009-2010.

Results
Approximately 70 percent [580] of the 808 individuals that attended the Northwest Illinois Pesticide Safety Education Program training responded to the pre-test and post-test questions. The percent of respondents correctly answering the 12 questions increased for post-test scores compared to the pre-test scores for 11 of the 12 questions, with over 80% of the respondents answering 5 of the 12 post-test questions correctly. [The number of participants who correctly identified the definition of pesticide tolerance actually decreased by 15% on the post-test]. The greatest increases in correct answers were noted for the environment question on preventing pesticide injury to bees [an additional 397 [55%] of the respondents knew the correct answer after the training]. A large increase in the number of participants' correct post-test answers regarding their knowledge of pesticide label requirements was also evident. An additional 144 respondents knew the correct answer after the training [21% increase].

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #13

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
2010	{No Data Entered}	54

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Protecting the environment was the broad issue area selected by the third largest number of respondents [85% of 9,439] who completed the 2009 Extension survey of the public's educational interests. Concerns encompass water quality, air quality, wildlife protection, and preservation of natural undeveloped land resources.

What has been done
The Illinois Master Naturalist program was developed to provide science-based educational opportunities that connect people with nature and help them become engaged environmental stewards. Special funding was allocated in 2007 to create and expand curriculum and experiences for training volunteers to promote best management practices and address critical natural resource issues in their communities. The curriculum consists of 20 topic chapters; eleven are in print, remaining chapters are near completion. Educational activities that enhance naturalist learning and skill building are a significant part of the curriculum and training. Various departments at the University of Illinois, the Illinois Natural History Survey, Illinois Department of Natural Resources, The Nature Conservancy, and the Environmental Education Association of Illinois have worked together in developing the content, promotion, and volunteer training. In addition, multiple organizations and agencies have provided placement and support for volunteers to apply their knowledge serving as Illinois environmental stewards. Educational materials are now being made available online and with use of iPod/iPad applications. Evaluation tools developed and in use include assessment of participant motivation to participate, assessment of each training instructor by participants, and retrospective post- then pre-evaluations to measure impact of training on participants.

Results
647 cumulative participants have completed or are currently enrolled in the Illinois Master Naturalist [ILMN] program within 20 counties, and 260 have become certified Illinois Master Naturalists. This number includes 35 participants from two new counties who were recruited to participate in 2009-2010. Total donated volunteer hours for 2009-10 was nearly 10,000.

Retrospective post- then pre-evaluations, using a 1-5 Likert scale [5 being high] for self-reports of knowledge level before and after training indicated an increase for all seven topics. The knowledge topics of greatest average gain reflected in mean scores were in: [1] local environmental issues [2.73 pre- vs. 3.86 post]; [2] ecosystem management [2.77 pre- vs. 3.79 post]; and [3] invasive species [2.91 pre- vs. 3.88 post]. Measurement of skill level gain showed an increase in all eleven areas. The topics of greatest average mean score gain were in: [1]

interpret nature 'read the landscape' [2.69 pre- vs. 3.77 post]; [2] conduct hands-on experiments in nature [2.45 pre- vs. 3.45 post]; and [3] identify native species [2.68 pre- vs. 3.63 post].

Retrospective post- then pre-evaluations, using a 1-5 Likert scale [5 being high] for self-reports of the value level before and after training indicated an increase for all fourteen topics. The value topics of greatest average gain were in: [1] local natural history [3.5 pre- vs. 4.65 post]; [2] citizen science/scientific monitoring [3.21 pre- vs. 4.32 post]; [3] prescribed burning [3.63 pre- vs. 4.63 post]; and [] habitat management [3.78 pre- vs. 4.7 post]. Measurement of behavior level gain showed an increase in all nine topics. The topics of greatest average gain in behavior were in: [1] gather data about nature with all of my senses; [2] think critically and communicate effectively about nature; [3] pay attention to my actions and their effect on others and the environment; and [4] consider alternatives and/or consequences before acting.

Reported examples of volunteer service given include helping scout troops to interpret nature, establishing a conservation site on an ILMN's farm, establishing a prairie garden at a local school, wetland restoration, prairie restoration, invasive species planned removal, water quality testing, educational program presentations, maintaining nature trails, planting trees, conducting bird and frog surveys, and providing planning input to administer prescribed fires. Volunteer project sites have included schools, forest preserves, park districts, nature centers, arboretums, and historic sites.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics
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

Brief Explanation

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

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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	33.0	0.0	7.0	0.0
Actual	25.0	0.0	5.9	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
824489	0	399863	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
824489	0	399863	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
7656395	0	2399898	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2010 included research to identify the lack of systemic activity from over-cooked broccoli or a broccoli supplement as compared to the activity of unheated whole broccoli [this will help consumers to know the best way to obtain the health benefits of broccoli], the generation of transgenic lines with increased innate resistance in soybeans [which will lead to the release of new improved soybean cultivars with increased and more durable resistance to pathogens], findings that begin to provide a mechanistic basis for the inhibition of RV infectivity induced by isoflavones in vitro [rotavirus infection is a primary cause of diarrheal diseases worldwide], a study of dietary soy genistein and its effects on the WNT signaling pathway in colon cancer cells [the WNT signaling pathway plays a critical role in both normal epithelial regeneration and tumorigenesis in the human colon], a study of the mechanisms of probiotic functionality, and the incorporation of herbicide resistance into maize to provide a model system we will use in the future for transgenic modification of the carotenoid and tocopherol biosynthetic pathways in maize kernels.

Conference presentation in 2010 included the Institute of Food Technologists Annual Meeting, the Soybean Board, the Illinois Soybean Program Operating Board, the American Chemical Association, and the Environmental Mutagen Society.

A significant investment of Extension's effort is focused on helping limited resource families and youth improve nutrition knowledge through the **Supplemental Nutrition Assistance Program Education [SNAP-Ed]** 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-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 [being revised and renamed **I on Diabetes** was taught as a four-part [2.5- 3 hours per part] Extension program that combined lecture, food demonstrations, activities, and samples of healthy foods. In addition, single session programs on diabetes awareness and management were provided for student groups and community groups. 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 and can be found at: http://www.urbanext.uiuc.edu/diabetes [over 65,000 English page views and over 87,000 Spanish page views recorded for this past year]. **Meals for a Healthy Heart** is a two-part series focused on increasing awareness of the risk factor of coronary heart disease, hypertension, high blood cholesterol, and other warning signs. Activity levels and weight management information, as well as food demonstrations, taste testing, and recipes, are provided at each session.

2. Brief description of the target audience

Members of the target audience included soybean producers, parents, physicians, the soy industry and infant formula manufacturers, persons with an interest in gastrointestinal function, members of the general public who have an interest in tomato products and prostate cancer, biochemists, food scientists, nutritional scientists who work on carotenoid metabolism and carotenoid production, the food, nutraceutical and animal feed industries, academic plant scientists, and consumers with limited resources, chronic diseases, and/or Spanish-speaking, and youth.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1191929	120108	408141	0

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

Patent Applications Submitted

Year: 2010

Actual: 1

Patents listed

Acetaminophen Co-Formulation For Preventing And Reducing The Risk Of Acetaminophen-Induced Liver Toxicity

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	0	16	16

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2010	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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**

Increased Knowledge Of Nutritional Food Preparation

2. **Associated Institution Types**

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	500	262

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 377 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 hands 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 377 youth participants in cooking schools who completed pre- and post-tests, 70% [262] perceived improvement in at least one of the six areas of focus. Of the remaining youth, 23% [87] 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 skills after the cooking school, findings indicated that 27% increased post-test skills related to following recipes; 27.6% increased measuring skills; 26% increased skill in handling a sharp knife; 20% increased kitchen tools/equipment use skills; and 29% increased skill in reading food labels. Food sanitation/hand washing skills perception increased for only 3% of the youth participants, but must be interpreted in light of pre-test responses that indicated that 95% of the youth felt they could easily do this before the cooking session began.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #4

1. Outcome Measures

Engineering Health-Promoting Value And Disease Resistance In Soybean

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Work continues in an effort to engineer disease resistance and health-promoting value in soybean.

What has been done

For the first time, the genetic biodiversity of several important phytochemicals was determined by simultaneous analyses of isoflavones, phytosterols, sphingolipids and saponins in different soybean genotypes that have high or low levels of protein and oil. Since soy-based protein products contain isoflavones and saponins as co-extracted during seed processing and the oil fraction contains sphingolipids and sterols, the information generated during this study could be valuable for application in breeding programs aimed at soy health added values.

Results
The information will also be useful for future testing of the target individual bioactive compounds and their combination for their health effects. Generation of transgenic lines with increased innate resistance in soybeans will lead in the future to the release of new improved soybean cultivars with increased and more durable resistance to pathogens. Soybean producers will ultimately benefit from the release of soybean cultivars with increased disease resistance that can stabilize soybean production in the presence of high disease levels.

4. Associated Knowledge Areas

KA Code	Knowledge Area
701	Nutrient Composition of Food
704	Nutrition and Hunger in the Population

Outcome #5

1. Outcome Measures

Studying Metabolic Products From The Tomato Carotenoids To Develop Antioxidants

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{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 from the tomato carotenoids such as lycopene, phytoene, and phytofluene, in mammalian tissues.

What has been done
Recently, two carotenoid cleavage enzymes, CMO-I and CMO-II, have been identified in many tissues of human, rat, mouse, and ferret, including the intestine and liver. Human CMO-I is

confirmed to cleave beta-carotene at the 15, 15' double bond to form vitamin A, but acyclic carotenoids such as lycopene are poor substrates for this enzyme. Human CMO-II cleaves beta-carotene at the 9', 10' double bond to form apo-10'-carotenoids, but the ability to cleave acyclic carotenoids such as lycopene is yet to be confirmed. Therefore, we proposed to study the cleavage activity of CMO-II to investigate the impact of this enzyme on the primary tomato carotenoid, lycopene.

Results

We enhanced the carotenoid extraction efficiency from tomato cell suspension culture in this project. We also established novel carotenoid-accumulating E. coli strains that will provide invaluable tools for researchers studying tomato carotenoids. In addition, our newly developed LCMS method detects lycopene metabolic products more efficiently. Importantly, the acyclic carotenoids with multiple conjugated double bonds in the CMO-II expressing tissues can serve as antioxidants, which are hypothesized to reduce the risk of cancer and cardiovascular disease.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
704	Nutrition and Hunger in the Population
723	Hazards to Human Health and Safety
724	Healthy Lifestyle

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

Extension retirements and reorganization prevented moving forward to update diabetes curriculum and create an evaluation of practice changes that could be used for statewide programming.

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

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 6

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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	18.0	0.0	20.0	0.0
Actual	18.3	0.0	13.0	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
601029	0	522719	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
601029	0	522719	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
5581298	0	2775764	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2010 included ongoing research on international and U.S. biotechnology law focused on regulatory measures, coexistence, and significant court decisions, a study that focused on property rights regimes for geologic carbon sequestration, regulation of carbon offset provisions for both voluntary and mandatory carbon regulation regimes and the regulation of ecosystem service payments to agricultural operations, a study of functional benefits transfer to forecast the economic impacts of contamination in Great Lakes Areas of Concern, the integration of a biophysical model that simulates the yields of bioenergy energy crops in the U.S. with an economic model to assess the biophysical and economic potential of biofuel production under alternative policy scenarios and analyzes the breakeven costs of biomass production, the development of an economic model that indicates that the quick germ/quick fiber process is an improvement on the conventional dry grind process and that it has an improved return on investment in all cases except when prices are low and interest rates are high, a project that is substantially improving scientific knowledge about risk modeling and evaluation for crop farms in Illinois and throughout the cornbelt, a study of the potential for reducing transaction costs and marketing losses in Africa through new market institutions, research designed to provide a better understanding of how identity preservation and segergation of genetically modified commodities will affect prices throughout the world's grain markets and food chain, and an investigation designed to identify how value is created in rural communities where broad acre commodity crops are being produced.

Research presentations in 2010 included the International Academy of Comparative Law, the American Agricultural Law Association, the Illinois State Bar Association, the Agricultural and Applied Economics Association, the International Agricultural Trade Research Consortium, the Norwegian Agricultural Economics Research Institute, the Fourth World Congress of Environmental and Resource Economists, the Fourteenth Annual Conference of the International Society for New Institutional Economics, the Alliance for Commodity Trade in Eastern and Southern Africa, and the International Food and Agribusiness Management Association.

Farm Land Ownership, an Extension program series held at county office locations as well as through an online course, encompassed information on leasing options, estimated costs of production, and what landowners should expect from the farmer who is leasing their land. Other educational activities related to agricultural economics included **Farm Analysis Solution Tool** [FAST] workshops that relate to the **FarmDoc** website, **Annie's Project** multi-session workshop focused on farm management for women, estate planning workshops, farmland leasing presentations, five regional **Illinois Farm Economics Summits** and **Illinois Tax Schools** dispersed throughout the state delivered by campus specialists, 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 & Hunger planned program]. Two additional online courses were developed this year: **U.S. Cooperative System** [grain marketing] and **Building a Business Plan.** Risk management is a topic addressed in a number of programs including the **Central Illinois Farm Beginnings** program. Agricultural economic topics were also covered in the annual regional Extension workshops focused on crop and dairy production.

All My Money, a hands-on, train-the-trainer curriculum designed for staff and volunteers in community agencies and social service organizations that work directly with limited-resource clientele was conducted in several locations. The lessons cover all the basics of money management and consumer skills. **Long Term Care: Talking, Deciding, and Taking Action,** a multidisciplinary Extension curriculum, targeted to help older adults in rural Illinois plan for long-term care needs was delivered through workshops in six locations.

The **Getting Through Tough Financial Times** program, initiated 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 - each of the twelve sheets offers ten practical tips to help consumers spend wisely or save money, and presentations on **Saving & Investing in Turbulent Times.**

Other consumer focused Extension programs included **Choosing a Financial Professional** group presentations on evaluating a financial adviser's experience and credentials, **Credit Card Smarts** and **Plan Well, Retire Well** websites [Spanish and English], and presentations including programs on retirement planning held for tax preparers in conjunction with the Illinois Tax Schools. A new electronic **Plan Well, Retire Well** newsletter was also initiated this past year to highlight retirement planning news articles as well as the blog posts. Subscribers to the e-newsletter grew to 1,288 by the end of the year. Revisions were made in **Welcome to the Real World**, a simulation that gives students [age 12 through young adults] a taste of future income and expenses.

2. Brief description of the target audience

Members of the target audience included 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, local citizens' groups, economists, conservation biologists, ecologists, conservation groups, and the dry grind ethanol industry. Extension-targeted audiences this past year included providers working with youth and limited resource audiences through non-profit organizations, community groups, government agencies, and families facing financial challenges.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	35192	13765	9570	0

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

Patent Applications Submitted

Year: 2010

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total

Actual	3	29	32

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2010	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Page File Requests Made To Farmdoc [Note That Projections Have Been Significantly Modified Per Request Of PI]
2	Knowledge Of Practices That Affect Your Credit Rating
3	Knowledge Of Planning For The Expenses Of Home Ownership
4	Aspiration To Compare Prices And Review Bills More Carefully
5	Number Of Web Hits On The Varietal Information Program For Soybeans Website
6	Increased Knowledge Of The Costs Of Independent Living
7	Actions Taken To Plan For Long-Term Care And Retirement
8	Identifying Policies And Estimating The Benefits of Environmental Improvement
9	Number Applying Skills In Managing Limited Financial Resources

Outcome #1

1. Outcome Measures

Page File Requests Made To Farmdoc [Note That Projections Have Been Significantly Modified Per Request Of PI]

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	5000000	4261672

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.

What has been done
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. 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 this project. Highly popular premium calculators that estimate the premiums of crop insurance products for corn, soybeans, wheat and grain sorghum in the North Central Region were made available for crop insurance decisions. The calculators included premiums for basic, optional and enterprise units. In addition, a decision-tool that computes payoffs and risk statistics for representative farms in each of the counties in Illinois, Indiana, Iowa, Minnesota, Missouri and Ohio was provided for crop insurance decisions.

Results

This project is substantially improving scientific knowledge about risk modeling and evaluation for crop farms in Illinois and throughout the cornbelt. The incorporation of this information into enhanced models provides farmers with an important tool to use in evaluating specific farm risk management strategies. 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. The farmdoc website [www.farmdoc.illinois.edu] where the tools are hosted received nearly a million unique visits in 2010. Many of the visitors used the crop insurance tools. By any standard, large numbers of producers, educators and agribusinesses found these tools of considerable value.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
603	Market Economics
610	Domestic Policy Analysis

Outcome #2

1. Outcome Measures

Knowledge Of Practices That Affect Your Credit Rating

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Knowledge Of Planning For The Expenses Of Home Ownership

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Aspiration To Compare Prices And Review Bills More Carefully

Not Reporting on this Outcome Measure

Outcome #5

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
2010	150000	102042

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The VIPS database annually provides Illinois soybean producers and agribusinesses with unbiased soybean variety production information for over 650 varieties. The VIPS database can be viewed at www.vipsoybeans.org. 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 homepage includes an interactive map showing the 13 trial locations, and each location is interactive. 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.

What has been done
In January, about 17,000 Illinois soybean producers were asked by postcard mailing to suggest varieties to be evaluated in the 2010 VIPS program, and over 200 varieties were identified for the trails. Seed companies submitted over 580 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 2010 data have been made available on the VIPS website, and over 6,000 copies of the VIPS booklet have been printed for distribution. VIPS usage is currently tracked by two

programs and the location of VIPS users can be reported. 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. The VIPS website includes outreach and education materials on pathogens, pests, and weed resistance. The VIPS database now includes variety information about herbicide resistance technology for each variety.

Results

Information on all soybean varieties grown in the University of Illinois Variety Trials during 2010 has been added to the VIPS website http://www.vipsoybeans.org]. This includes yield, protein, and oil content information for 656 varieties from 57 seed companies. These varieties were grown, according to maturity group and herbicide resistance system, at 13 locations across Illinois, and the number of entries collectively total 3,154 in the University of Illinois Variety Trials. Both location-specific and regional averages are available for yield, protein and oil data. Testing for protein and oil content was done at the University of Illinois. In addition, substantial information on disease and pest resistance was added to the 2010 database. Varieties, including approximately 200 producer-nominated varieties, were screened for resistance to the major yield-reducing diseases. University of Illinois and Southern Illinois University scientists evaluated varieties for resistance to aphids, green stem disorder, Phytophthora root rot, Sclerotinia white mold, soybean mosaic virus, and sudden death syndrome. University of Illinois nematologist Dr. Terry Niblack and Southern Illinois University nematologist Dr. Jason Bond provided data on SCN resistance ratings for four Illinois SCN population types for all participating companies. In addition, company-provided data about resistance to SCN and Phytophthora root rot also were added to the VIPS website. To help the VIPS users understand and use SCN Type data, the 'Question and Answer' section has links to explain the importance and utility of SCN types and variety resistance ratings to enable variety selection and variety rotation schemes that reduce the yield damage caused by SCN.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Increased Knowledge Of The Costs Of Independent Living

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	1000	105

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Older youth need knowledge and skills to assist them in selecting careers and managing income and expenses in order to live as an independent adult.

What has been done
Annually, Extension field staff members in 16 counties provide Welcome to the Real World training and curriculum materials for teachers and a simulation for their middle and high school students that allow them to explore careers and money management [balancing income and expenses] in adult life. The simulation allows students to start with a monthly income and visit various booths to spend their income on items typical in a family budget such as housing, utilities, food, transportation, insurance, and childcare. This year, Youth Development and Consumer and Family Economics Extension Educators updated the curriculum, created evaluations to be used statewide, and conducted statewide trainings for county staff to standardize the implementation of this statewide program.

Results
At the end of the Welcome to the Real World simulation, evaluation forms were completed and collected from 272 [70%] of the 386 student participants at three locations in the state. The evaluation was designed to identify increased knowledge of financial management. Using a scale of 1-4 [4=strongly agree, 1=strongly disagree], student rated the simulation on four factors: [1] interest; [2] useful information; [3] helpful activities; and [4] helpfulness for the future. The ratings results for each of these factors averaged 3.2 or higher for this group of 272 students who completed the survey. The evaluation also asked students to evaluate six money management skills choosing between 'learned how to do' or 'already knew how to do'. Over one-half of the 237 students responding to the related questions indicated that they already knew how to complete the tasks/skills. However, 105 [44%] learned how to balance income and expenses, 81 [34%] gained skill in exploring career possibilities, 80 [34%] learned how to open a savings account, 60 [25%] gained skill in keeping track of savings, 60 [25%] learned how to balance a checkbook, and 45 [19%] learned how to write a check. A follow-up study designed to further assess knowledge change is underway and data will be collected from additional sites in the current year.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Actions Taken To Plan For Long-Term Care And Retirement

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Identifying Policies And Estimating The Benefits of Environmental Improvement

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Part of this project applies both stated and revealed preference methods to estimate the benefits of environmental improvement. Other work on this project identifies policies and private actions that increase social welfare in the environmental arena. The applications emphasize environmental attributes of land, water bodies, and innovative products from crops.

What has been done
This year, work was completed on: [1] A study of functional benefits transfer to forecast the economic impacts of contamination on Great Lakes Areas of Concern; [2] Public policies designed to reduce storm water pollution; [3] the effects of biofuel policies on not only greenhouse gas emissions, but also on nitrogen use and pollution; [4] the role that conservation options and portfolio diversification can have in cost-effective conservation in the face of climate-change uncertainty; and [5] a study to evaluate the world's first forestry project designed to act as a Clean Development Mechanism in world climate-change policy.

Results
Research findings for the projects above included: [1] Based on Census data for median home values, approximately $5.2 billion [2005 dollars] have been lost in residential property values around 23 of the AOCs; [2] proposed policies for storm water pollution mitigation underestimate

the potential effects and economic benefits of low-impact alternatives for urban development; [3] Proposed carbon taxes would cause a significant increase in nitrogen use in association with a shift from petroleum to biofuels; [4] Conservation agents can benefit from using short-term conservation contracts and/or spatially diversified conservation portfolios; and [5] We quantified the successes of the first Clean-Development forest project, and highlighted those areas where it fell short of its objectives.

4. Associated Knowledge Areas

KA Code	Knowledge Area
603	Market Economics
605	Natural Resource and Environmental Economics
610	Domestic Policy Analysis

Outcome #9

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
2010	{No Data Entered}	316

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. A total of 411 individuals participated in the program that was offered in five

locations; 372 graduated from the program.

Results
Results of a 2008-2009 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 [complete study findings were shared in last year's annual report]. Using those specific findings and extrapolating them to participants for this reporting year, likely 279 [75%] of the 372 program graduates saved more, 316 [85%] changed their household budgeting practices, 141 [38%] opened a checking account for the first time, and 156 [42%] made a long-term investment such as home purchase or retirement savings.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

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

Evaluation Results

The purpose of this study was to evaluate the **Central Illinois Farm Beginnings** business planning seminar, one of four program components. The eight-session seminar has been the key component in enabling prospective and transitioning farmers to get a successful start in sustainable farming. Focus groups and individual feedback forms have been used to improve the content, materials, and delivery over the past five years. The business planning seminar has been quite successful in achieving its primary aim of enabling graduates to begin farming either immediately or within three years of completing the training. However, organizers wanted to better understand the needs of these start-up farmers, and to continue to develop the potential of the successful partnership between the Land Connection and University of Illinois Extension.

Results:

Demographic Overview of the Business Planning Seminar Participants

The seminar continues to serve a diverse group of participants,

87% had some experience with agricultural pursuits primarily through gardening,

Approximately half either owned or had access to land,

40% managed their own farms which included a variety of enterprises,

Acreage owned or farmed tended to be less than 5 acres,

Most were already following sustainable practices on their farms, although none were certified,

60% were female,

Age varied with 40% in the 26-35 age range.

Overall Assessment of the Business Planning Seminar

Participants rated their skill level in 'identifying and managing risk in a sustainable farm business' an average of 2.4 points higher [on a 4-point scale] at the end of the course over the beginning. Approximately 90% reported that they would recommend the course to others. Approximately 75% of the class said they were planning to start a farm business and planned to use their business plans in doing so. Participants also provided comments that indicated the seminar helped them recognize their strengths and weaknesses and the importance of a business plan.

Observations and Recommendations for the Business Planning Seminar

An Evaluation Consultant facilitated a one-day planning meeting with the three program organizers of this program representing the Land Connection and University of Illinois Extension. Recommendations that resulted included:

Have simplified worksheets to be completed and assembled into a business plan during the course,

Bring mentors in earlier--by Session 4 at the latest,

Arrange to connect participants in small groups with a farmer who has an similar enterprise,

Prepare an actual plan as part of the course rather than just learning about it,

Incorporate more active/experiential learning activities to increase understanding of the topics presented.

Clarification of Program Outcomes

The organizers discussed the need to expand investigation of the sizes and types of farm enterprises that are the expected outcomes of the program. They recognized the competing concepts of land: [1] ownership of an economically productive resource and [2] land as a home. Three major medium term outcomes/impacts of farmer education were identified by the organizers: [1] building relationships and connections with other people [a network of relationships]; [2] enabling participants to make use of available resources; and [3] developing local food systems. Another outcome to strengthen the sustainable agriculture community was also identified as important.

Key Items of Evaluation

A follow-up questionnaire with graduates of **Central Illinois Farm Beginnings** indicated that the business planning seminar continues to be a springboard to the establishment of new sustainable farm enterprises. However, five years into the program, most of these enterprises remain small. The majority of the graduates of the program indicate that their farm operations gross $5,000 per year or less, and provide less than 20% of their household's income. Further investigation is needed to determine if the small size relates to choice or barriers. Ongoing evaluation should also focus on outcomes with respect to strengthening of the agricultural community. Outcomes of the program have been measured in economic terms, and the social impact of increased sustainable farming on the participants and the community has not been assessed. It is recommended that the impact of the program on the community as a result of an increased number of farm enterprises be further explored in terms of networks of personal relationships and quality of life.

V(A). Planned Program (Summary)

Program # 7

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%		80%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		20%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	15.0	0.0	8.0	0.0
Actual	15.2	0.0	7.9	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
500858	0	327239	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
500858	0	327239	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
4651081	0	2122966	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2010 included a study that provides one of the most comprehensive

assessments, to date, of the mother-toddler attachment relationship during the third year of life, research with the goal of identifying 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, efforts to better understand the strengths and needs of non-metropolitan gay and lesbian parents, work to examine how young preschool children develop cognitive belief structures and expectations about different relationships through their daily interactions with caregivers, the development of a curriculum that will teach children a set of social and emotional competencies that have been found in previous research to be necessary for successful sibling interactions in middle childhood, dissemination of "Eat a Rainbow" materials at the Urbana Farmer's market resulting in preschool age children trying new fruits and vegetables, an expansion of work focusing on helping couples develop work-life management skills to focus more on Latino couples, development of prospective studies in the field of intimate partner violence, a study designed to better understand the place of both people and wildlife in an urban or semi-urban ecosystem, and work updating previous estimates on the success of the Uniform Interstate Family Support Act [UIFSA] on improving collection of child support in Illinois.

Conferences at which research was presented in 2010 included the National Council on Family Relations Annual Conference, the Biennial Meeting of the Society for Research in Child Development, the Child Care Center Directors of Champaign County, the Annual Head Start Conference, the International Making Cities Livable Conference on Planning Health and Child Friendly Communities, and the Illinois Student Council on Family Relations.

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 [and also includes newsletters and brochures]. The site is organized by age of children, and includes: [1] research-based articles; [2] links to breaking news on child development, parenting, and family life; [3] links to recommended websites; and [4] 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: [1] 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.

Long-Term Care: Talking, Deciding, Taking Action is an educational series and website that includes both family life and financial management topics for helping individuals and families plan effectively for their needs as aging adults. Other programs focus on helping caregivers of adults or professionals who work with those caregivers discover tools for self-care through interactive sessions, discussions, and brainstorming.

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, **Parenting Again** topic-based discussion guides for grandparents raising grandchildren, a **Latino Childcare** Video/DVD, a **Nurturing Creativity** DVD and lesson guide for childcare providers, and **Just in Time Parenting**, a multi-state effort offering two national interactive internet resources on parenting. Additional programs include the **Intentional Harmony: Managing Work and Life** curriculum and web-based self-study, and the **Breaking the Code** bullying simulation.

2. Brief description of the target audience

Members of the target audience included parents, psychologists, child development professionals, early care providers, parents of preschool age children, families experiencing food insecurity, school personnel administering weekend feeding programs, low income families, ethnic minority families, racial minority families, families living in small urban and rural environments, mothers coparenting after separation, family court judges, family law attorneys, parent educators, health care providers, older adults, and urban forestry program advocates. In addition, Extension is targeting grandparents, caregivers of adults, and working couples.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	39866	16433	115232	0

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

Patent Applications Submitted

Year: 2010

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	0	11	11

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2010	5

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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
2010	20	23

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, two standardized assessment tools commonly used with young children were used as the focus for 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 used 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 again implemented 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.

Results
The primary beneficiaries of this project during the current reporting period have been the 23 teams of 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. A wide variety of disciplines were represented in the studies undertaken during the current reporting period.

Other beneficiaries of the project during the reporting period have been the 12 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
2010	100	160

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
A total of 851 participants were enrolled in the Partners in Parenting program as of September 30, 2010. The Parenting 24/7 website, Just in Time Parenting monthly age-paced newsletters, and Your Young Child parenting programs and brochures provided information designed to help

parents feel confident and empowered during children's developmental stages, to manage their stress, to understand normal child behavior, to have realistic expectations, and to develop positive workable parenting strategies. Participation in the face-to-face parenting programs by those enrolled in the Partners in Parenting program was limited but not unexpected. Rather, this lack of participation in workshops reflects conditions that were part of the original rationale for using a direct delivery method [age-paced newsletters] as a major component of the Illinois program. Community collaborations established in the previous years of the three-year project were maintained and expanded by project staff and included 60 agencies and organizations that offered or supported efforts to reach parents of at-risk newborns. An evaluation was conducted using a survey of knowledge, attitudes, and practice changes attributable to age-paced newsletters that was completed by parents of the at-risk newborns.

Results

In both Year 1 and Year 2, parents reported via the evaluation survey that the monthly newsletter helped them to gain knowledge about child development and parenting. Evaluations were distributed to 727 participants [287 in 2008, 316 in 2009, and 124 in 2010] who had received one year of newsletters through the Partners in Parenting program with 238 respondents [81 in 2008, 112 in 2009, and 45 in 2010]. In addition, of the 593 participants who received the second year of newsletters, 183 completed and returned the evaluation sent to them. With respect to knowledge gained, over 90% of the respondents '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 [96% in Year 1, 95% in Year 2]; [2] understand that some annoying things my baby does are normal for that age [92%, 96%] ; [3] notice my baby's clues [92%, 95%]; [] have more ideas about ways I can play with my baby to help him/her learn [95%, 97%]; [5] have more ideas about disciplining my child without spanking or slapping [86%, 93%]; and [6] understand that my baby is not trying to be bad or to make me mad on purpose [94%, 92%]. In addition, a large majority of the participants who completed the evaluations in 2009-2010 [169] 'agreed' or 'strongly agreed' that they felt more confident in their skills as a parent from reading the newsletter [89% in Year 1, 95% in Year 2]. Moreover, participants also claimed that the newsletter helped them feel more comfortable talking with their doctor when they had a question or concern [85% in Year 1, 91% in Year 2].

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

Increased Confidence And Competence In Functioning As A Parent

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Increased Parenting Practices That Promote Nurturing Relationships

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	100	120

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 childcare, 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
A total of 851 participants were enrolled in the Partners in Parenting program as of September 30, 2010. The Parenting 24/7 website, Just in Time Parenting monthly age-paced newsletters, and Your Young Child parenting programs and brochures provided information designed to help parents feel confident and empowered during children's developmental stages, to manage their stress, to understand normal child behavior, to have realistic expectations, and to develop positive workable parenting strategies. Participation in the face-to-face parenting programs by those enrolled in the Partners in Parenting program was limited but not unexpected. Rather, this lack of participation in workshops reflects conditions that were part of the original rationale for

using a direct delivery method [age-paced newsletters] as a major component of the Illinois program. Community collaborations established in the previous years of the three-year project were maintained and expanded by project staff and included 60 agencies and organizations that offered or supported efforts to reach parents of at-risk newborns. An evaluation was conducted using a survey of knowledge, attitudes, and practice changes attributable to age-paced newsletters that was completed by parents of the at-risk newborns.

Results
Evaluations were distributed to 727 [287 in 2008, 316 in 2009, and 124 in 2010] participants who have received one year of newsletters through the Partners in Parenting program with 238 respondents [81 in 2008, 112 in 2009, and 45 in 2010]. When asked how much impact reading the newsletter had on using specific parenting practices at Year 1, parents [124] who completed the survey in 2009-2010 said it helped them to do the following things 'quite a bit more' or 'a lot more' than what they would have done without the newsletter: [1] provide opportunities for my baby to explore and learn [63%]; [2] feed my baby safe and healthy food [62%]; [3] talk and listen to my baby [64%]; [4] try different ways to calm my baby and help my baby stop crying [60%]; [5] have patience when my baby is fussy or does something annoying [60%]; [6] protect my baby from accidental injuries [60%]; [7] be less angry when my baby is difficult [54%]; [8] show my baby books and pictures [55%]; and [9] take care of myself [50%]. In Year 2 , over 90% of the 45 participant respondents 'agreed' or 'strongly agreed' that the newsletters helped them 'try different ways to handle feeling angry or frustrated'.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Toward A Better Understanding Of Children's Peer Relationships

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Because patterns of problematic interactions with peers begin to emerge during the preschool years and have implications for children's subsequent adjustment, it is important to pinpoint risk factors and the underlying processes that may contribute to children's peer difficulties. This project examines how children's early attachment relationships may foster or hinder their ability to manage conflict and negative emotions with friends.

What has been done

This research project has resulted in several findings that have clear relevance for fostering optimal social and emotional development among young children. First, the findings underscore the joint contributions of parental emotion socialization practices, child temperament, and child gender to the prediction of early behavior problems at age three. In short, the main findings indicate that parental reactions that minimize or punish children's expression of negative emotions were more likely to be associated with greater internalization of problems at age three, especially for boys who exhibit high levels of negative emotionality. Second, controlling for child gender, child language, child proneness to anger, and maternal sensitivity, results indicate that great toddler-mother attachment security was related to greater child responsiveness across play and snack contexts, more complex social play between mothers and children, more synchronous mother-child interaction across play and snack contexts, and more psychological proximity-seeking in a disappointing situation. Moreover, in certain instances, associations between child-mother attachment security and child behavior were moderated by child characteristics. Greater attachment security was related to more self-assertiveness during play and snack and more committed compliance toward maternal requests during clean-up and waiting tasks, but only when child anger proneness is high. Greater attachment security was also related to more help-seeking in play and snack contexts, but only when anger proneness or language ability was low, and more physical proximity-seeking in a disappointing situation, but only when language ability was low.

Results

In sum, this study provides one of the most comprehensive assessments, to date, of the mother-toddler attachment relationship during the third year of life. The research also provides a window into children's early peer relationships. Understanding the factors that predict children's ability to get along with unfamiliar peers and develop positive patterns of interaction is critical in light of the fact that so many young children enter out-of-home care arrangements during the first five years of life. This research takes a relationships perspective by examining how characteristics of both children in the peer dyad contribute to the quality of their interaction. Child temperament, social understanding, and language ability, as well as child-mother attachment security, are examined in this line of inquiry. Results underscore the importance of considering both children in the peer dyad, such that the characteristics of the two children have multiplicative rather than additive effects.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Better Understanding The Stressors Affecting The Lives Of Low-Income 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
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The goal of this 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 organizational characteristics of impoverished inner-city communities undermine family functioning.

What has been done
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 unconventional value systems. In contrast, our research examined how families overcame the adversity of living in low-resource, high risk neighborhoods. The research was informed by a family resilience framework. This approach focuses on family strengths and assets. Methodologically, an interpretive framework characterized the qualitative data collection: We sought to describe the daily lived experiences of participants and to understand the meanings that they 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.

Results

Key findings have emerged concerning family coping strategies: extended kinship relationships are a major factor affecting low-income, African American families' coping abilities. 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 their members. Well-functioning families were able to manage local dangers through a range of protective strategies: Adult members restricted social relations with troublesome residents, instead limiting much of their social life to kin-based activities. They confined their activities to 'safe' neighborhood locations. With respect to young children, mothers found local resources that benefitted their children's development, including Head Start. Mothers also 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 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. We added new insights on child physical activity. Mothers used several strategies [neighborhood appraisal, chaperonage, collective monitoring, and local- and extra-local resource brokering] to promote their children's physical activity. These findings have implications for child health across the life cycle. Extended kin were relevant for members' nutritional health: Resilient families pooled monetary resources to enlarge families' food budgets and assisted mothers with feeding young children. Mothers also used a range of nutritional management strategies to enhance the nutrition of their children, such as selective food purchases and restricted access to unhealthy foods.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #8

1. Outcome Measures

Examining How Preschool Children Develop Cognitive Belief Structures

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{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 to obtain the data. For example, we conduct classroom observations of children interacting with their peers, we interview parents and children, and we collect self-report data from parents and teachers. This research is also longitudinal, which requires following families over time. Data to date have been collected on 70 families and 300 preschool-age children. The participants in this research include three to four year old children who attend the University-affiliated Child Development Laboratory and their primary caregivers. The children participate in a laboratory procedure in which they are interviewed regarding their attachment representations as well as their 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, which has been shown to be important in the development of emotional dispositions and responses. Observational data are also obtained in the preschool setting. These data include how often children express positive and negative affect 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.

Results
Our data analysis thus far has revealed important relations between hemispheric processing of emotion and observations of children's affect in the classroom setting. In particular, we have shown that children who have a right posterior bias in perceptually processing emotions are significantly more likely to express negative affect while interacting with peers than children who don't have this processing bias. 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 designed to examine the neurobiological correlates of attachment. Additional data from home and laboratory procedures are currently being transcribed and coded. Longitudinal classroom data have revealed that preschool social competence can be conceptualized as a higher order, multi-dimensional construct that remains quite stable over the preschool years.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Studying Coparenting Relationships Following Intimate Partner Violence

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The overarching goal of this prospective exploratory study is to investigate pathways and outcomes associated with mothers' post-separation coparenting relationships, with a particular focus on experiences of intimate partner violence.

What has been done
The specific aims are to: [1] delineate trajectories of coparenting relationships among mothers with and without a history of marital violence and [among those who experienced violence] explore variations based on type of violence; [2] identify potential predictors [risk and protective factors] of differences in coparenting relationships after separation; and [3] examine the effects of differences in coparenting relationships on mothers' and their children's physical and psychological health over time.

Results
Prospective studies are lacking in the intimate partner violence field. Violence and divorce researchers call specifically for longitudinal research that teases out the complexities of separating in the context of violence versus no prior history of violence and that explores the potential role of different types of violence. Also, findings can inform the development of divorce and health care policies and programs that target the unique needs of women and children who are vulnerable to ongoing violence and negative health outcomes.

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

- Economy
- 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)

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 8

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%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	50.0	0.0	0.0	0.0
Actual	54.4	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
1787677	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1787677	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
16600783	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. A variety of educational delivery systems are built on this research base to help youth develop into adults who contribute in positive ways to

their families and communities. Delivery included community clubs, after-school programs, conferences, and camps. The priorities focused on [1] learning employment skills; [2] experiencing healthy relationships; [3] becoming physically fit; [4] thinking green; and [5] engaging in science. The current curriculum also addresses the three national areas of focus--science, engineering, and technology [SET], healthy lifestyles, and youth leadership. Examples follow. A total of 265,596 youth were enrolled in 4-H this past year.

A variety of activities occurred this year related to club participation in national and quarterly state science experiments and SET robotics projects [2,273 enrolled youth] and robotics team competitions. Cook County continued to offer youth science classes through its Mobile Science Laboratory. **Science Siesta** and **Advanced Science Siesta** 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. Twelve new groups were formed to master video production, a new 4-H project introduced this past year. Statewide enrollment in the project totaled 483 youth. **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 as well as hands-on workshops on potential careers in SET or leadership development training. A grant-funded national applied research project, **4-H Tech Wizards**, designed to establish mentoring programs for at-risk, underserved youth in an after-school setting, was also initiated.

Health Jam involved over 250 youth from eight counties in two-day camps that allowed them to explore health careers and to learn about pursuing a healthy lifestyle and keeping their bodies fit [also see Childhood Obesity planned program]. **Welcome to the Real World,** a multi-disciplinary curriculum and simulation that allows youth from 12-18 to explore careers and money management [balancing income and expenses] in adult life, was revised by Youth Development and Family and Consumer Economics Extension Educators this past year [also see Agricultural and Consumer Economics planned program].

Volunteer Training. Volunteers are key in delivering 4-H Youth Development programs and are instrumental as caring adults who create an environment that is critical to positive youth development. This past year 29,131 volunteers gave time and talents to the 4-H Youth Development program in Illinois. Volunteer training included 19 workshops across Illinois to help volunteers address the key elements needed to ensure positive youth development--belonging, independence, generosity, and mastery [BIG-M] and 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, and parental involvement, experiential learning, and public presentations. Leaders also had instant access to a new series of online tips **Leaders on the Go** written in a question and answer format. In addition, the State 4-H Office promoted the national **Everyone Ready** online professional development modules focused on working with volunteers; 205 Illinois Extension staff participated.

2. Brief description of the target audience

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

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	396937	0	266972	190116

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

Patent Applications Submitted

Year: 2010

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- New Extension Program Curricula Developed

Year	Actual
2010	0

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 Science, Engineering, And Technology
4	Increased Knowledge Of Social And Physical Skills

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
2010	200	364

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Reports of college degrees awarded, media reports, and business and industry leaders' expressed concerns about the declining interest of youth in science, engineering, and technology have identified this decline as a situation that may undermine the country's standard of living and global position of leadership. 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. Research findings suggest that girls generally do not pursue science careers because they believe them to be too difficult and not fun. Further, they have rare opportunities to see women in the workforce performing in these jobs.

What has been done
University of Illinois Extension initiated the Science Siesta program in 2002. Now in its ninth year, Science Siesta provides girls in grades 4-6 with the opportunity to meet and interact with female scientists, conduct fun hands-on science activities in a lab setting, and participate in activities in stimulating science-centered environments. It is conducted annually at the Discovery Center Children's Museum and Burpee Museum of Natural History. This past year 203 girls participated in the event. University of Illinois Extension 4-H also received a $50,000 Healthy Living grant from a private foundation to support the Health Jam program. Over 250 fifth-grade students from eight counties participated in two-day camps and an eight-week Walk Across Illinois. During the camps, the youth learned how to keep their bodies healthy and fit and explored health professions.

Results
Of the 195 participants who completed the evaluation at the end of Science Siesta, 190 [98%] indicated that they 'agree' or 'strongly agree' that they are more aware of the variety of science-

related careers, and 178 [92%] increased their interest in science-related careers. In addition, 180 [93%] learned science techniques they didn't know before attending Science Siesta, and 171 [88%] increased their confidence in their ability to study science. Using a pre- and post-test evaluation format, 169 Health Jam participants [66% of the 250 youth] were able to list at least one additional health profession on the post-test after participating in the day-camp 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

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Increased Knowledge Of Science, Engineering, And Technology

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	3117

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Reports of college degrees awarded, media reports, and business and industry leaders' expressed concerns about the declining interest of youth in science, engineering, and technology have identified this decline as a situation that may undermine the country's standard of living and global position of leadership. In addition, 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.

What has been done

Illinois recently launched a robotics 4-H project and purchased robotics kits to loan to counties for use in training volunteers and youth. A state 4-H Robotics Challenge was held on campus for a second year with 17 teams participating. In 2009-10, 841 Illinois youth were enrolled in the 4-H Robotics project. The goal of this educational program was to develop skills in robotics and team work, which would then influence confidence in the use of technology and interest in science and technology related science careers. An in-depth evaluation was developed this past year to: [1] assess indicators of quality; [2] program components deemed critical to the program goals; and [3] program outcomes associated with robotic teams. The evaluation was then conducted in one county that had received a three-year grant to support eight robotics teams that met weekly or twice a week in the fall to prepare with their adult coach and technical advisors for a regional LEGO League competition in mid-December.

Science experiments were designed and supporting materials were developed for 4-H clubs and groups at the national and state level. Participation was promoted at the county level for the national water quality-related experiment and two Illinois experiments: Wind Your Way Around Your Own DNA and Shake Rattle and Roll: Soil - Its' Composition and Structure. In October, youth throughout Illinois were involved in completing a three-tiered science experiment to learn how heightened levels of carbon dioxide can impact water quality and climate change. This experiment taught young people how increased amounts of carbon dioxide can affect aquatic animals, plants and other living organisms in lakes, streams, rivers and oceans. Using workbooks and online guides, the nationwide experiment was designed to help youth relate their 4-H National Youth Science Day experiences back to their own lives by teaching them how to measure a carbon footprint and how to estimate energy savings by looking at gas and electric bills. The Illinois science experiment 'Shake, Rattle, and Roll: Soil - Its' Composition and Structure' gave middle school youth an opportunity to 'shake things up' in order to learn what makes up soil, how soil keeps them alive, and how they can keep from losing this resource. The 'Wind Your Way Around Your Own DNA' science experiment is part of Illinois' Science Excited series and gave 4-H youth throughout the state of Illinois the opportunity to explore their own DNA. Engineering and technology abilities, including observation and comparing/contrasting, were used by the youth involved in this experiment.

Results

Robotics Teams: The evaluation program quality items related to the dimensions of learning engagement, supportive adults, and belonging. Another set of items was designed to assess program components of practice and peer interaction. Both sets of items incorporated the same 4-point strongly disagree-to-strongly agree Likert scale. The third section of the evaluation included items related to robotics interest and skill development outcomes using a retrospective pre- and post-test format with a 10-point scale [1=low and 10=high]. Questionnaires were mailed to each program participant about four to six weeks after the end of the program. Twenty-six youth completed the questionnaire. Youth reported that as a result of the program they built their confidence in technology and learned to value helping other teams succeed. On average, the 26 respondents also reported a 2-3 point average increase [on a 10 point scale] in their interest in robots and robot competitions. There were also positive changes in interest in alternative energies, engineering, computers, and science but to a lesser degree, since interest in computers and science was already at a high level before participating in the robotic team experience. The program also had a very positive effect on the development of six specific robotic skills with youth reporting a change of 3-5 points on the 10-point scale. Using an average team size of seven youth, the results of this evaluation suggest that an estimated 119 youth [17 teams in the state competition x 7 members] increased their confidence in using technology and interest in science and technology.

Science Experiments: Sixty-one clubs/groups with over 3,000 members participated in completing the national water quality experiment. In response to questions asked of the youth participants at the end of the experiment, 79% of the groups indicated they would like to learn more about water quality, 100% would like to learn more about other science topics, and 95% would like to learn more about technology in science. Twelve groups that included over 900 youth conducted the soil experiment. In response to questions asked of the youth participants at the end of this experiment, 92% of the groups could identify different particle layers in their bottle demonstrating science skills in observation, comparing, and contrasting, and 67% could: [1] explain what the three primary mineral components of soil are; [2] explain how soil is formed [the process of weatherization]; and [3] felt more confident when comparing and contrasting different soil particles and layers. In addition, 83% of the groups would like to do more activities like this in the future. Ten clubs/groups that included over 300 youth conducted the DNA experiment. In response to questions asked of the youth participants at the end of this experiment, 90% of the groups: [1] stated that they could explain where DNA is found; [2] could name one way biotechnology is used to help humans; [3] could name one way biotechnology is used in agriculture; and [4] would like to do more activities like this in the future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #4

1. Outcome Measures

Increased Knowledge Of Social And Physical Skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	45

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Opportunities need to be expanded for youth to experience a feeling of belonging, independence, generosity, and mastery. Research indicates that youth development is enhanced in a positive manner when learning experiences are designed to address these four elements and to create a safe and structured environment.

What has been done
Overnight camping is one of the longtime 4-H youth development delivery methods that allow youth to test their wings of independence, try new activities not available in their normal home routines, and closely interact with new peers and adult counselors. During the past year, 2,308 young people attended residential camps in Illinois. A study was conducted this year through a survey of parents of campers who attended the 4-H camp in Northern Illinois to determine how effective the camp was in meeting its objectives.

Results
Fifty families [49%] of the 103 who received a mailed questionnaire completed and returned their responses. Of those parent respondents, all 'agreed' or 'strongly agreed' that 4-H Camp provided their children with an opportunity to make friends with others who have similar interests, 49 [98%] experienced unique opportunities to try new things; 45 [90%] developed new social skills; and 40 [88%] developed new physical abilities. When asked about changes that they noticed because of what was learned at 4-H Camp, 40 [88%] 'agreed' or 'strongly agreed' that their children's self-confidence, social skills, and interest in outdoor adventure increased. Thirty-nine [78%] noticed an increase in domestic skills such as keeping their room or area clean, setting the table, taking out the trash, or caring for athletic equipment.

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
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

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

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Agricultural and Biological Engineering

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management	20%		10%	
141	Air Resource Protection and Management	10%		5%	
401	Structures, Facilities, and General Purpose Farm Supplies	45%		20%	
402	Engineering Systems and Equipment	15%		20%	
403	Waste Disposal, Recycling, and Reuse	0%		20%	
404	Instrumentation and Control Systems	10%		15%	
405	Drainage and Irrigation Systems and Facilities	0%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	3.5	0.0	6.0	0.0
Actual	1.8	0.0	4.4	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**
61644	0	197146	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
61644	0	197146	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
572441	0	1427954	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2010 included the development of an in-situ moisture sensing system for biofilters [the only one that has a stable, usable output over such a wide range of moistures], the establishment of a preliminary database of particle size distributions for concentrated animal feeding operations and a protocol to evaluate the performance of PM samplers used in agricultural operations, efforts to lower agricultural chemical input costs and reduce environmental impact through the use of improved methods of chemical equipment [nozzles] and application [both air and ground], the development of new analytical methods that greatly reduce the analytical costs of bench-scale GAC treatability studies using natural waters spiked with pharmaceuticals and pesticides, project outcomes that are providing dry grind processors with information to cause them to consider other benefits and possibilities provided by filtration, such as increased water recycle and nutrient recovery for improved value of coproducts from ethanol, the development of a formal understanding of a small class of positive feedback-based engineered gene circuits and their behavior over long periods of time [this information will be useful in developing the next generation of biotechnology and has been used by students of this program in their own scientific careers], and a project with the goal of producing a sampling technique and procedure suitable for PM measurement in agricultural operations, with a near 100% sampling efficiency that is superior to the existing sampling instrumentation.

Conference presentations of research in 2010 included the National Agricultural Aviation Association Conference, the Annual Meeting of the American Society of Agricultural and Biological Engineers, the 2010 Algae Biomass Organization Summit, and the Annual Meeting of the Institute of Biological Engineers.

Extension activities related to this planned program are interdisciplinary in nature and relate to other planned programs featured in this report [Sustainable Energy and Animal Health & 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. Two hundred seventy-nine livestock producers attended one of eight workshops and 23 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]** 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, 15 producers are using the website to hold and modify their plans. Other websites 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; [2] The **Small Farms Manure Management** website for individuals with less than 300 animal units; and [3] **EZregs** for 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. Extension faculty and staff have also provided leadership in programming that addresses sustainable energy. [See Sustainable Energy planned program.]

2. Brief description of the target audience

Members of the target audience included commercial exhaust equipment manufacturers and commercial farms, government regulatory agencies related to air quality near animal facilities and industry firms related to air quality control technologies, pesticide manufacturers and aerial and ground pesticide applicators, agricultural engineers, livestock producers, corn ethanol and biofuel producers, commodity and producer groups, and university and government researchers.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3634	1293	1202	0

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

Patent Applications Submitted

Year: 2010
Actual: 1

Patents listed
Method For Facilitating Fermentation Of High Solids Compositions

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	0	18	18

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2010	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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
2010	350	450

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 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 450 acres served by bioreactors. The relationship between contributing area and bioreactor performance in 2010 was consistent with the relationship in previous years.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Not Reporting on this Outcome Measure

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 And Use Of A Manure Management Plan

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	100	184

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 8 workshops attended by 279 participants were conducted across Illinois with a certification exam administered following the workshop. Content

for 2009-2010 training workshops addressed winter application of manure, carcass pits, safety [grain bins, confined spaces, equipment on and off the road], and innovative technologies for manure processing and odor/gas emission control. 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 responses from 2007-2008 workshop participants, one might expect similar finding for the producers who were seeking recertification in 2009-2010. The 2007-2008 findings would suggest that an additional 75 [27% of 279] have a manure management plan that was 'written, but not updated regularly' and 109 [39% of 279] have a plan that is 'written, updated annually, and constantly used'.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
404	Instrumentation and Control Systems

Outcome #5

1. Outcome Measures

Educating Dry Grind Processors On The Benefits Of Filtration

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Permeate from microfiltration has heat transfer fouling tendencies that are much lower than original thin stillage from the dry grind process. Because of their reduced heat transfer fouling characteristics, it may be possible to concentrate microfiltration permeate efficiently in stillage

evaporators, while sending retentate streams to the DDGS dryer.

What has been done
Permeate streams may allow increased water recycling within the dry grind process. Microfiltration followed by filtration with smaller pore size membranes, such as certain types of ultrafiltration or nanofiltration, may remove compounds that limit recycling of water in the dry grind process. Retentates have total solids contents that are nearly equal to solids contents of condensed distillers solubles. It may be possible to mix the retentate stream directly with the wet grains stream, reducing the need for evaporator capacity at an ethanol production facility. The interaction between membrane filtration and heat transfer fouling characteristics was further illustrated by this research. This resulted in unique training opportunities for our graduate students working on research projects that used both membrane filtration and heat transfer fouling equipment. Membrane filtration is typically viewed as a preconcentration step prior to conventional evaporation.

Results
The outcomes of this project are providing dry grind processors with information to cause them to consider other benefits and possibilities provided by filtration, such as increased water recycle and nutrient recovery for improved value of coproducts from ethanol production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
141	Air Resource Protection and Management
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse

Outcome #6

1. Outcome Measures

The Development Of Improved Particulate Matter Measurement Technologies

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The expected outcome from this project will provide a sampling technique and procedure suitable for PM measurement in agricultural operations, with a near 100% sampling efficiency that is superior to the existing sampling instrumentation. This new sampling technique will substantially improve the data quality in agricultural air emission studies. We have developed an automatic isokinetic airborne particle sampler for indoor air quality.

What has been done

The development of high efficiency particle sampling systems has been a major area of research in the past few decades. Airborne particle sampling should be conducted isokinetically, which ensures the representation of the particle concentration and size distribution. Sampling probes designed to obtain isokinetic sampling of non-changing airflows, such as in ducts, have been developed successfully and are widely used in practice. On the other hand, no current design of an isokinetic sampling head, which adjusts itself automatically to a variable airflow, exists. This study presents a prototype of an automatic isokinetic sampler for variable flow velocities.

Results

This sampler is capable of automatically adjusting its sampling velocities at the sampling inlet so isokinetic-sampling conditions can be satisfied in real-time and in-situ. The performance of the sampler prototype is evaluated in comparison with isokinetic samplers in a wind tunnel. The authors hypothesize that isokinetic sampling will be the most representative method of air sampling in comparison with existing methods and samplers in use.

4. Associated Knowledge Areas

KA Code	Knowledge Area
141	Air Resource Protection and Management
401	Structures, Facilities, and General Purpose Farm Supplies
402	Engineering Systems and Equipment
404	Instrumentation and Control Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

Indicator regarding radon is not being measured as the grant supporting this program has been fulfilled.

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

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Climate Change

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	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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Actual	0.2	0.0	2.3	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**
7706	0	165492	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
7706	0	165492	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
71555	0	305256	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2010 included ongoing data collection by the National Trends Network [the NTN provides the only long-term nationwide record of wet deposition in the U.S.], the development of thermal ecology data that indicate that the ability of ratsnakes to switch between diurnal and nocturnal activity is a critical adaptation for dealing with climate variation and will therefore also be critical in allowing these snakes to respond to climate warming, research results that continue to be part of a national program that improves our understanding of atmospheric inputs of nutrients and is needed to develop appropriate polices [for example, data from sites throughout the Mississippi River basin were used to show the relative importance of various inputs of nitrogen to the basin, including atmospheric deposition, fertilizer nitrogen, and biological fixation of nitrogen], continuing work at the SoyFACE [Soybean Free Air Concentration Enrichment] facility addressing questions such as [1] What yield and quality changes will result with rising CO2, temperature, drought stress and ozone?; [2] What genotypes and genes may be exploited to increase yield and maintain quality under the changed atmospheric conditions?; and [3] What system changes will increase yields and maintain quality under the changed atmosphere?, research that is synthesizing five years of findings related to the human dimensions of environmental change and implications for landscapes and cultural services, and a project that will provide modelers, managers and policy makers focusing on forest carbon with knowledge, methods, and guidelines to reduce uncertainties and improve decision-making.

Research presentations in 2010 included the National Atmospheric Deposition Program Annual Meeting, the Community on Ecosystem Services Conference, the IUFRO World Congress, the American Society for Photogrammetry and Remote Sensing ASPRS Annual Conference, and the Illinois Geographic Information System Association Conference.

Extension activities included a presentation at the 2010 Illinois Water Conference on water pricing as an adaptive climate change policy in Northeastern Illinois by an Illinois Sea Grant economist. Weather and Climate is one of the twenty chapters comprising the new nearly complete Illinois Master Naturalist curriculum for volunteers who advance environmental stewardship. Over 3,000 4-H youth throughout Illinois were involved in completing a three-tiered science experiment to learn how heightened levels of carbon dioxide can impact water quality and climate change. This **4-H National Youth Science Day** experience taught them how to measure a carbon footprint and how to estimate energy savings by looking at gas and electric bills.

2. Brief description of the target audience

Members of the target audience included federal environmental agencies, state and local governments, universities, producers of energy crops, local conservation groups, crop consultants, farm input suppliers, regional and national agriculture industries, youth, and local decision makers.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	210	0	3000	0

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

Patent Applications Submitted

Year: 2010

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	0	14	14

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2010	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

Outcome #1

1. Outcome Measures

Dissemination Of Air Quality And Atmospheric 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
2010	{No Data Entered}	1505814

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 federal and state 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 245 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 13,075 samples, which were delivered to the National Atmospheric Deposition Program database. These include approximately 130,000 different analyte concentration measurements. 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 1,060 samples, which were delivered to the NADP database [ongoing]. The Mercury Deposition Network has 116 sites [http://nadp.isws.illinois.edu/mdn/] and offers the only regional measuremtns of mercury [Hg] in North American precipitation. For the year, the MDN coordinated and analyzed approximately 7,200 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 ~ 1.50 million "hits" and 89,100 unique visitors in the past 12 months, and has almost 40,000 registered users. More importantly, users retrieved 26,938 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/]. Annual maps of atmospheric pollutants, concentrations, and depositions were developed for 2009 measurements. These maps are used widely and constitute one of the major network products. Maps are available by network, year, and constituent and are compiled into annual reports and animation sequences [http://nadp.isws.illinois.edu/data]. The 2009 Map Summary is available at our website, and by request from the Program Office [http://nadp.isws.illinois.edu/lib/dataReports.aspx]. During the 2010 Calendar year, 141 journals and reports were generated using the NADP data in some form.

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
806	Youth Development

Outcome #2

1. Outcome Measures

Continuing Study Of The Ecology Of Ratsnakes To Assess The Impact Of Climate Change

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The ecology of ratsnakes is being compared across the complete range of this species to assess how the snakes' ecology is likely to be affected by climate change.

What has been done
Study sites are in eastern Ontario, southern Illinois, and central Texas. Progress was made in harmonizing data analysis across the three populations. Those analyses are now being completed. Although further data collection continues, the specific focus of the research now is to use data collected using automated telemetry to determine the extent of nocturnal activity in each population and the temperature thresholds that trigger the switch between diurnal and nocturnal activity. Thermal ecology data indicate that the ability of these snakes to switch between diurnal and nocturnal activity is a critical adaptation for dealing with climate variation, and will therefore also be critical in allowing these snakes to respond to climate warming.

Results
Several important results have emerged from the comparisons of the three ratsnake populations that have been completed so far. Despite the populations spanning a north-south distance of more than 1,500 km, some aspects of their biology are surprisingly similar. Although the duration of annual activity increases from north to south, the profile of the main period of activity is highly conserved across populations. In addition, snakes in all three populations expend similar effort overall to regulate body temperatures through selective use of habitat. The principal mechanism the snakes use for dealing with climate differences across their range is to adjust when they thermoregulate and when they are active. In particular, the ability to shift to nocturnal activity in hot weather appears to be a critical adaptation for dealing with climate variation. Identification of these patterns has substantially altered the direction of this research program. To understand how these snakes will respond to climate warming, and thus to predict the ecological consequences of climate warming on these snakes and their ecological communities, it will be necessary to understand what triggers the snakes to alter when they are active and to determine whether the snakes are able to function equally effectively at night as during the day.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
133	Pollution Prevention and Mitigation
136	Conservation of Biological Diversity

Outcome #3

1. Outcome Measures

Improving Management Practices For Sustainable Biomass Feedstock Production

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The goal of this research is to determine and develop management practices for sustainable biomass feedstock production.

What has been done
During 2010, research activities were focused on feedstock harvest for switchgrass establishment and nitrogen management trials established during 2009. For the switchgrass establishment study, biomass was harvested after a killing frost in November and the effect of corn seeding rate on the second year switchgrass biomass yield was determined. The replicated field trial was planted again during 2010 for environmental replication. Planting method and treatments were the same as 2009. Switchgrass stand counts were measured using a frequency grid method and corn grain yield was measured. Two nitrogen management studies were initiated during 2009. The first study was conducted in the field of an existing switchgrass stand in Urbana, Illinois. The second study was initiated at six locations across an east-to-west and north-to-south gradient in Illinois.

Results
Since this project is dealing with perennial energy crops, the field research was focusing on stand establishment and the first biomass harvest for future research during this crop year. However, the collected first year establishment data, such as seed germination, stand count, and biomass yield of the seeded year, will be very useful for local producers who are looking for switchgrass as an alternative energy crop for their cropping system. The switchgrass and corn companion cropping trial demonstrated the potential benefits of corn as a nursery crop during switchgrass establishment. This companion cropping research also provided an optimum nitrogen fertilization and corn seeding rate for both corn grain yield and switchgrass establishment. To verify the first year data, the same trial was planted again in 2010. The switchgrass nitrogen study showed the importance of nitrogen fertilization on switchgrass biomass production. The switchgrass biomass responses to nitrogen fertilization were highly correlated with soil fertility levels and previous cropping history. A continuous nitrogen fertilization study in multiple locations in conjunction with harvest timing will be necessary for future biomass feedstock production of switchgrass. Producers and commercial industries attended field day events throughout the state. They were able to hear about new information and provide feedback, which generated interest in bioenergy crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area

102	Soil, Plant, Water, Nutrient Relationships
132	Weather and Climate
133	Pollution Prevention and Mitigation

Outcome #4

1. Outcome Measures

Utilizing Carbon Modeling To Improve Decision Making And Improve Predictions Of Climate Change

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Research continues on the systematic quality enhancement of data needed for above-ground forest carbon dynamics modeling.

What has been done
This year we developed a theoretical and methodological framework for up-scaling and uncertainty analysis of data and map products for regional forest carbon dynamics by integrating a process model and multi-sensor images. This framework included a method to spatially and temporally scale up data and their uncertainties from smaller supports to larger map units and then to study areas for long-term predictions, as well as a method to make spatial and temporal uncertainty and error budgets for modeling, mapping, and up-scaling of forest carbon budgets.

Results
This project will provide the modelers, managers and policy makers of forest carbon with knowledge, methods, and guidelines to reduce uncertainties and improve decision-making. The obtained methods can be applied to other regional and global programs of carbon modeling and management and the results will serve as general suggestions applicable to the programs. The knowledge, methods, results, and guidelines will serve to improve prediction of climate changes through the procedure of carbon budgets at global and regional scales.

4. Associated Knowledge Areas

KA Code	Knowledge Area

102	Soil, Plant, Water, Nutrient Relationships
125	Agroforestry
132	Weather and Climate
133	Pollution Prevention and Mitigation

Outcome #5

1. Outcome Measures

Knowledge Of Ways Greenhouse Gases Can Be Removed From The Atmosphere

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	3000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Scientists are not sure by how much climate will change, at what rate it will change, or what the exact effects will be. Adults and youth lack knowledge of how to reduce the release of greenhouse gases and their removal from the atmosphere

What has been done
In October, 4-H youth throughout Illinois were involved in completing a three-tiered science experiment to learn how heightened levels of carbon dioxide can impact water quality and climate change. This experiment taught young people how increased amounts of carbon dioxide can affect aquatic animals, plants and other living organisms in lakes, streams, rivers and oceans. Using workbooks and online guides, the nationwide experiment was designed to help youth relate their 4-H National Youth Science Day experiences back to their own lives by teaching them how to measure a carbon footprint and how to estimate energy savings by looking at gas and electric bills.

Results
Sixty-one clubs/groups with over 3,000 members participated in completing the national water quality experiment. In response to questions asked of the youth participants at the end of the experiment, 79% of the groups indicated they would like to learn more about water quality, 100% would like to learn more about other science topics, and 95% would like to learn more about technology in science.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
132	Weather and Climate
133	Pollution Prevention and Mitigation

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)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 11

1. Name of the Planned Program

Childhood Obesity

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Actual	10.3	0.0	2.1	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
339042	0	135881	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
339042	0	135881	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
3148424	0	558167	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2010 included the development of a body of knowledge that will serve to guide the development of self-efficacy based nutrition and physical activity teaching materials for a course that will be offered to undergraduates, a study that was the first to show that without gestational complications, a maternal high fat diet is enough to cause an increase in fetal glucose, the use of a holistic approach to better understand the global problem of obesity by focusing on both the social and biological sources of the problem, a study of the role of macronutrient composition in the development of obesity, efforts to understand how food insecurity and stress affect childhood obesity, and research designed to develop a better understanding of 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 the consumers]. Other research activities include 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], involvement of Latino families with children (K-5) in an afterschool program (Abriendo Caminos) to study culturally sensitive activities that promote healthy eating, positive family interactions and active living, and evaluation of the impact of the Backpack Program, distribution of child friendly easy-to-prepare food for children at risk for hunger.

Research conference presentations in 2010 included the Experimental Biology Conference, the National Heart, Lung and Blood Institute Physician Scientists Training Conference, The Obesity Society [TOS], and the American Society of Nutrition Annual Meeting.

Most Extension activities that address healthy food choices are delivered by **Expanded Food and Nutrition Education Program [EFNEP]** staff and **Supplemental Nutrition Assistance Program Education [SNAP-Ed]** 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 conducted in 27 schools. **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. **Healthy Moves for Healthy Children** involves a number of activities for use with children to increase their physical activity level. **The HOT Project: Healthy Outcomes for Teens** is a diabetes prevention series of five online modules for middle school youth. **Health Jam**, a program targeted at rural elementary school children offers support related to exercise, wellness, nutrition, and health careers information using an experiential learning approach.

2. Brief description of the target audience

Members of the target audience included nutrition and health educators, researchers, epidemiologists, and other agencies concerned about health and food products, families, children, child care providers, policy makers, health professionals, adults and children with diabetes, and product developers who are interested in the properties and processing technologies of high protein snack foods. Extension targeted preschool and elementary youth and their parents.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	528973	56307	197385	0

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

Patent Applications Submitted

Year: 2010

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	5	7	12

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Completed Hatch Projects

Year	Actual
2010	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Developing A Sustainable Dietary Intervention Strategy To Reduce Obesity And Diabetes
2	A Holistic Approach Toward Understanding Obesity
3	Characterization Of High-Protein Soy Foods Targeted At Alleviation Of Obesity
4	Increased Knowledge Of Food That Is Low In Fat And High In Fiber And/Or The Importance Of Increasing Physical Activity Levels

Outcome #1

1. Outcome Measures

Developing A Sustainable Dietary Intervention Strategy To Reduce Obesity And Diabetes

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Maternal obesity has been associated with a multitude of maternal morbidities, and epidemiological studies show that children of obese mothers are at higher risk for obesity, diabetes, hypertension, and heart disease. The long-term goal of this project is to develop a sustainable, functional dietary intervention strategy to reduce obesity and other related diseases such as insulin resistance and diabetes.

What has been done
The current recommendation is that eating healthy foods can help people have a healthy baby. In the present study, our aim is to demonstrate that as early as day zero of life, gestational high-fat diet-caused histone modifications are present that correspond to changes in gene expression, and we show that these changes are also accompanied by physiological consequences [as shown by our fetal glucose data]. During the fourth year of this project, we are conducting animal studies to investigate how maternal high fat diet may negatively affect the offspring's disease risk related to insulin resistance.

Results
Our study reported here is the first to show that without gestational complications, a maternal high fat diet is enough to cause increase of fetal glucose and hepatic gluconeogenic pathway.

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

A Holistic Approach Toward Understanding Obesity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Obesity is the second most preventable cause of death in the United States today. It is clear that the growing epidemic of obesity is not caused by an increase in the obesity genes, but by poor diet and lack of exercise. However, not all individuals respond in the same way to a dietary or exercise intervention. That is where the earliest identification of the most appropriate intervention will produce benefits in the long term well-being of the individual, their family, and our community.

What has been done
The aim of the PONDER-G [Prevent Obesity and Nutrition-related Diseases: Environmental Resources and Genomics] project is to integrate the observed [phenotype] characteristics with the genetic information and build a large cohort of data in our community. We are interested in understanding how the individual genetic material interacts with the environment to promote or delay metabolic effects that result in excessive weight gain or related diseases. The PONDER-G project envisions that in this genomic era it is possible to establish and recognize the basis of predictive, preventive, and personalized interventions to achieve healthy individuals and communities.

Results
In order to understand the global problem of obesity we need to have a holistic examination of both the social and biological sources of the problem. We aim to integrate the observed [phenotype] characteristics with the genetic information and build a large cohort of data in our community. We aim to understand how individual genetic material interacts with the environment to promote or delay metabolic effects that result in excessive weight gain or related diseases. The PONDER-G project envisions that in this genomic era it is possible to establish and recognize the basis of predictive, preventive and personalized interventions that result in healthy individuals and communities. Our outcome with the study will have a significant impact on promoting wellness by identifying factors amenable for of intervention.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle

Outcome #3

1. Outcome Measures

Characterization Of High-Protein Soy Foods Targeted At Alleviation Of Obesity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The long-term goal is 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 the consumers. The long-term goal of the study will be achieved by identification and characterization of soy ingredients in various ratios of macronutrients and processing conditions. The specific objective of this period was to identify the effect of macronutrient ratio and source on the product properties of high protein snacks.

What has been done
Both protein amount and protein type had significant effects on selected properties by instrumental measurements. In general, characteristics related to the degree of expansion seen in the snack were shown to increase with lower protein levels and higher amounts of soy protein. Increase in protein level showed significant correlations to multiple hunter color values, lower water hydration capacity and lower firmness for texture analysis. Increases in soy protein in relation to whey protein showed correlations to lower a* hunter color values [red tone], lower bulk density, larger diameter and lower values for texture analysis. The products with more soy protein expanded significantly more than products with more whey protein.

Results

The results will be used to develop high protein snack products that meet expectations of and are accepted by consumers, which in turn will increase soy foods consumption. Based on the findings about the changes in physico-chemical properties of extruded snacks by variations in the macromolecules [macronutrients such as protein, carbohydrate, and fat] ratios, specific soy snacks will be developed for different target consumer populations. High protein snack foods could be a huge asset in satiating consumers trying to lose or manage their weight. Utilizing soy in these snacks and showing the effects the protein amount and type have on their characteristics can greatly help in developing a product to be commercialized.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
802	Human Development and Family Well-Being

Outcome #4

1. Outcome Measures

Increased Knowledge Of Food That Is Low In Fat And High In Fiber And/Or The Importance Of Increasing Physical Activity Levels

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	254

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Obesity among children in the United States has become a national public health concern. According to the 2008-2009 Healthy Smiles, Healthy Growth data from the Illinois Department of Public Health, [38%] of Illinois' third grade students are at risk of being overweight [17.6%] or are overweight/obese [20.4%]. Lack of proper nutrition and inadequate physical exercise are two of many interacting factors that lead to childhood obesity. 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

University of Illinois Extension 4-H received a $50,000 Healthy Living grant from a private foundation to support the Health Jam program. Over 250 fifth grade students from eight counties participated in two-day camps and an eight-week Walk Across Illinois. During the camps, the youth learned how to keep their bodies healthy and fit and explored health professions. Educational activities focused on healthy eating behaviors, physical activity, disease prevention, dealing with health emergencies, and bodily functions and their measures.

Results

A pre- and post-test evaluation format consisting of between 21 and 25 questions tailored to the health activity topics taught at each delivery site was used to identify knowledge increases. All but one of the 255 youth participants were able to correctly answer at least one question on the post-test that was incorrectly answered on the pre-test. For example, over half of the youth at one site learned that being overweight is a factor causing the development of Type 2 Diabetes. At another site, over half of the youth learned about calories burned for various types of exercise. At the third site, nearly one fourth of the youth learned where to find a pulse and the number of servings of dairy products to consume each day. For the walk, youth supported each other to complete 30 minutes of daily physical activity and to track the number of miles they walked. By working together, 100 percent of the youth achieved that goal and 'walked' the equivalent of the length of Illinois [448 miles].

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
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)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 12

1. Name of the Planned Program

Global Food Security and Hunger

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
111	Conservation and Efficient Use of Water	0%		10%	
123	Management and Sustainability of Forest Resources	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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Actual	29.0	0.0	8.3	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**
955483	0	526643	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
955483	0	526643	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
8872832	0	5356295	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2010 included projects that focused on creating marketable products from corn and soybean ranging from increasing oil content in soybean to influencing the agricultural biotechnology regulatory process in countries that are deemed potential importers of corn and soybeans with biotechnology traits, work with soy dairy and soy applications in baking in Vietnam and Honduras that has continued to grow as microenterprises employ local women in the production and creation of over 40 different soy dairy and soy enhanced baked products for the marketplace as well as donation to the local school feeding programs, the development of a rapid and sensitive inverse gas chromatographic [IGC] method for the quantitative measurement of interactions between volatile flavor compounds and solid food matrices, studies which show that Refractance Window technology has potential as an alternative to spray drying for production of flavor powders [the flavor industry is always on the lookout for new/emerging technologies for improved flavor encapsulation], efforts to reduce charcoal rot of soybean [charcoal rot of soybean has become one of the most important soybean yield-limiting factors in recent years], work to develop microfluidic devices and biosensors which are valuable biodegradable alternatives, and efforts to improve our understanding of the evolution of molecular systems for improved genetic engineering of crop plants.

Additional research activities included the further development and evaluation of maize germplasm for use in functional genomics approaches to gene discovery for nitrogen [N] use efficiency, work to determine the potential of improving maize for food processing quality and yield [in cooperation with industry partners such as Kellogg's and Bunge North America], work at the National Soybean Research Laboratory with a local, Kenyan NGO that has resulted in the development of a school lunch program using soy protein in the meals for schools in the Masai Mara along with outreach to the students, teachers, parents and community leadership on the importance of nutrition, research demonstrating the usefulness of marker assisted selection to incorporate resistance into commercially usable inbred lines [aflatoxin is even a more serious problem in most of Africa where people are forced to eat poor quality corn], and the discovery that disease resistant apple cultivars have marketing and nutritional qualities comperable to commercially popular cultivars.

Conference presentations in 2010 included the National Meeting of the Entomological Society of America, the Annual Meeting of the Institute of Food Technologists, the American Chemical Society Symposium, the 12th International Workshop on Fire Blight, the 52nd Annual Maize Genomics Conference, the Annual Meeting of the Society of Nematologists, the National Corn Growers Association Corn Utilization and Technology Conference, the American Society of Agronomy, the Society of Toxicology, the American Association of Veterinary Laboratory Diagnosticians, and the Society of

Toxicologic Pathology.

State and regional Extension conferences/clinics and field days reach large numbers of corn and soybean producers with information on fertility and pest management. **Corn and Soybean Classics** meetings [six regional-based meetings] that address the latest research concerning weed management, fertility, stewardship, and pest management reached 998 producers and agricultural consultants. The multi-state **AGMasters Conference** held on campus and two-day **Regional Crop Management Conferences** were held in four locations in 2010. The primary audience was certified crop advisers. 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. The electronic **Pest Management and Crop Development Bulletin** series was prepared biweekly during the growing season by entomologists, agronomists, and plant pathologists to report on the current agricultural conditions with advice on pest management. The Plant Clinic diagnosed 2,346 plant samples in 2010 that included 489 soybean rust sentinel plot samples.

Statewide Extension Conferences related to produce production included several multi-state conferences: **Iowa/Illinois Fruit & Vegetable Growers Symposium, Iliana Vegetable Growers School, and the Illinois/Wisconsin Fruit & Vegetable Conference.** Additional Illinois state or regional conferences focused specifically on growing horseradish, vegetables, tree fruit, or small fruit and strawberries. Extension also provided leadership for the **Specialty, Agritourism and Organic Conference** and distributed 24 issues of **Fruit and Vegetable News.**

Pesticide safety education was conducted using presentations at numerous locations with teaching contacts numbering 8,768 through commercial training and 5,161 through private pesticide training. **Operation S.A.F.E. Fly-in** was conducted in seven locations 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 68 aircraft and adjustments were made to the aircraft setup if needed. The plant clinic and Digital Diagnostic System provided extensive outreach through 3,972 contacts seeking diagnosis and solutions for samples of invasive and exotic species pests. Information is also disseminated electronically via a quarterly multi-state newsletter focused on integrated pest management successes and activities.

Extension activities that addressed hunger within Illinois are delivered by **Expanded Food and Nutrition Education Program [EFNEP]** staff and **Supplemental Nutrition Assistance Program Education [SNAP-Ed]** staff members 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.

The Southern Region Extension staff members implemented a regional initiative **Healthy and Safe Food** partnering with volunteers and local agencies to plan and create **GIFT [Growing Illinois Food Together] Gardens**. Many of the gardens were the creation of youth who were mentored by adults. Over 5,400 pounds of produce were harvested from 16 participating counties and shared with food pantries, sold at Farmers' Markets, and enjoyed by participants' families.

Other Extension initiatives receiving attention focused on an interactive web-based multi-state market system [**MarketMaker**], small tract farming **[Living on the Land]**, and local food systems through workshops, conferences, and demonstrations. Other programs related to food production and consumption are encompassed in the Animal Health & Production planned program.

2. Brief description of the target audience

Members of the target audience included U.S. consumers of food and fuel, consumers in developing

countries that may become new purchasers of U.S. produced GM corn and soybean, U.S. seed companies and international regulators of agricultural biotechnology crop imports, lower income communities in Latin America, Southeast Asia, and Africa, members of the soybean breeding research community, the U.S. Environmental Protection Agency, corn seed companies, corn farmers, and populations in underdeveloped countries. Extension targeted producers of feedstuffs for livestock, producers of fruit and vegetable crops, limited resource audiences that are food stamp eligible, and youth.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	116471	35935	31819	0

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

Patent Applications Submitted

Year: 2010

Actual: 1

Patents listed

Methods For Producing Fertile Crosses Between Wild And Domestic Soybean Species

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	2	54	56

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2010	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

Outcome #1

1. Outcome Measures

Improving Soy Products For Better Consumer Acceptance

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The long-term goal of this study is to develop successful soy foods targeted for mainstream food products in the U.S and globally, to provide better nutritional options for the consumers, and to eventually change consumer perception of soy foods. The project objective is to determine the drivers of liking and disliking among different matrices of dairy-analogue soy foods to investigate the food matrix effect on soy flavor.

What has been done
In order to successfully develop and market soy-derived foods, we need to identify the drivers of consumer liking and disliking of soy foods across various food matrices. Although many researchers have studied potential ways to deliver soy in novel forms, little is known about specific sensory attributes associated with soy snacks, or how those attributes drive liking for consumers. Results indicate that consumers generally accept samples characterized by attributes such as crunchy, cumin, curry, salty and umami, but dislike samples with wheat, rough or porous attributes.

Results
Indian consumers differed from the U.S. consumers in that their preferences were more varied, and they tended to be more tolerant of wheat and porous attributes. Therefore, different strategies should be utilized when developing products for these groups to cater to their specific inclinations. The knowledge gained from this study will allow us to better understand the flavor function of soy in different food systems and how to best present soy to the consumers globally. The outcome of this study will have a significant impact on promoting the sales of soy foods by providing means to reduce the undesirable taste/flavor characteristics.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
701	Nutrient Composition of Food
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #2

1. Outcome Measures

Improved Treatment Of Charcoal Rot In Soybean

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Charcoal rot of soybean has become one of the most important soybean yield-limiting factors in recent years. Because the pathogen is a generalist and a facultative necrotroph, complete resistance is unlikely to be found in the soybean gene pool or in any soybean allies. However, partially resistant soybean genotypes have been identified that can limit the impact of the disease on soybean yield. Field screening of soybean for charcoal rot resistance has had variable and inconsistent results, mainly due to strong genotype x environment interaction and lack of standardization of testing methods. Development of non-field screening methods with standard and quantified inoculation can help control the g x e interaction and produce more accurate and consistent measurements of Mp colonization in soybean genotypes.

What has been done
We have developed and have begun putting into practice two methods, a pipette tip inoculation method and a qPCR method, to evaluate Mp colonization. Similarly, we developed a qPCR method to evaluate Pp colonization to enable more accurate measurements of incomplete and partial resistance to soybean rust. Soybean breeders seeking to identify and incorporate more durable rust resistance than the seven known complete rust resistance genes, which have proven ineffective after relatively short duration in soybean production, will increasingly apply the qPCR screening method in their rust resistance breeding programs. If the cloned putative resistance gene is confirmed as Rag2, this gene will be applied to further studies on the molecular basis of

soybean aphid resistance and may be directly transferred through transformation to new soybean genotypes. Rag2 is already being stacked with Rag1 and other resistance genes through backcrossing and marker-assisted selection techniques to increase the spectrum of resistance against aphid biotypes.

Results
Cloning of Rag2 with transformation will significantly facilitate resistance gene stacking. Our identification of soybean aphid biotype 3, which readily colonized plants with the Rag2 and other known aphid resistance genes, indicated that high variability in virulence towards soybean resistance genes is already present in soybean aphid populations, even before resistance genes are deployed into soybean production. This finding will encourage research into improving integrated management of the pest with other control methods such as application of insecticides and biological controls, and to developing methods to monitor soybean aphid virulence to enable intelligent deployment of resistance genes. Currently, there is a lack of effective control practices to manage SDS other than deployment of partial resistance. Soybean breeders will stack the new putative QTL for resistance to SDS, identified in PI 507531, from analysis Golden Gate Assay results of genomic DNA, with other SDS resistance genes to improve SDS resistance.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
216	Integrated Pest Management Systems

Outcome #3

1. Outcome Measures

Developing Soybean Varieties With Improved Resistance To Soybean Cyst Nematode

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Soybean cyst nematode remains one of the most important soybean diseases in Illinois and

across the United States

What has been done
During 2010, the soybean breeding program developed new experimental lines and tested lines for yield, agronomic traits and disease and pest resistance. The most advanced lines were evaluated in regional tests that resulted in the evaluation of the lines across several locations in many states. Those lines with the greatest yield and resistance were selected in these tests and five new varieties were released from the program.

Results
The released varieties are LD06-16721, LD06-30504Ra, LD06-30505Ra, LD04-11056H, and LD04-13265. All five varieties have resistance to soybean cyst nematode. LD06-16721 is a conventional maturity group II variety that combines high yield with the aphid resistance gene Rag1. LD06-30504Ra and LD06-30505Ra are both MG II varieties that have the Roundup Ready herbicide resistance gene combined with high yield and the soybean aphid resistance gene Rag1. LD04-11056H and LD04-13265 are MG III varieties that were released because they combine high yield with SCN resistance. These varieties were licensed to a commercial company which will market them to soybean producers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
216	Integrated Pest Management Systems
604	Marketing and Distribution Practices

Outcome #4

1. Outcome Measures

Improving Maize For Better Food Processing Qualities

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
We have conducted field trials in the summers of 2009 and 2010 under high and low nitrogen to determine the potential of improving maize for food processing quality and yield.

What has been done
Data on 66 hybrids derived from all combinations of 12 inbreds representing key heterotic subgroups relevant to U.S. commercial corn germplasm have been collected on a myriad of agronomic characteristics including yield, yield components [e.g. kernel size, weight, and number per ear], grain moisture at harvest, standability, flowering, barrenness, and seedling vigor, to name a few. Furthermore, a protocol for dry milling of small grain samples has been developed to facilitate evaluation of yields of large grits. With input from key stakeholders [Kellogg's and Bunge North America] we have identified a number of important factors contributing to milling yields and quality and data are being collected on these characteristics as well.

Results
The development of a dry milling protocol based upon a 1-kilogram sample of grain is important because it opens the door for selection based on dry milling yields in plant breeding and cultivar improvement. Without the ability to generate data from small plot field samples on a fairly sizeable population of various lines, milling quality and yields cannot be considered in selecting among various genotypes, nor can data related to agronomics be factored into the overall assessment of yield of large grits on a per acre basis. This work provides a first insight into the inheritance of processing traits in corn and the extent to which these traits are influenced by the environment and cultural practices. The germplasm also contributes to the impact of the analysis. Using the Elite Maize Association Mapping Panel, results will apply to a broad base of U.S. commercial corn germplasm. Methods for indirect selection for dry milling yields are anticipated as well, which will minimize the need for laborious efforts to collect massive amounts of dry milling yield data in the future. Kellogg's is acutely interested in the results of this project as a producer of a number of food stuffs from large corn grits [eg. corn flakes]. Bunge North America, as a corn dry miller, has interest in the findings to improve efficiency in the dry milling process. Whereas currently, corn grits are processed from commodity corn, this work may indicate potential prospects for an identity-preserved value chain for seed products created for enhanced dry milling yield and quality.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
604	Marketing and Distribution Practices
701	Nutrient Composition of Food
704	Nutrition and Hunger in the Population

Outcome #5

1. Outcome Measures

Utilizing Soy Products To Improve Nutrition In Developing Countries

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The protein gap around the world is a growing challenge for developing nations and the National Soybean Research Laboratory works to develop soy-based solutions to this challenge through partnership with local governments, universities, and local and international Non-Governmental Organizations utilizing knowledge transfer, training, and product development.

What has been done
The work in Haiti, Kenya, India and Guatemala has focused on a broad range of soy protein applications such as soy enhanced porridge. The use of soy granules in local dishes for school lunches took place in the Caribbean, Africa, Asia, and Central America.

Results
The NSRL work with a local, Kenyan NGO has resulted in the development of a school lunch program using soy protein in the meals for schools in the Masai Mara along with outreach to the students, teachers, parents and community leadership on the importance of nutrition. The community has adopted the program and leveraged their community funds with other outside funds to continue the lunch program. The work with school feeding also extends to efforts in Haiti to pair a healthy school meal with a strong nutrition education program for students, their parents and teachers, as well as a similar effort with school meals in Guatemala and a unique opportunity to begin introducing soy protein extruded snacks for use by a large local NGO providing over a million school meals a day for children in India.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices

701	Nutrient Composition of Food
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #6

1. Outcome Measures

Better Food Security Through Improved Nitrogen Utilization Of Corn

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Continued demand for corn grain to feed and fuel a growing world population will require further gains in genetic improvement for yield and agronomic input efficiency traits. Improvement of corn N use efficiency [NUE], in particular, will benefit from a thorough understanding of how past genetic improvement has shaped current N use parameters.

What has been done
We characterized 21 hybrids released in different years ranging from 1967 - 2006 for grain yield and N use traits. These hybrids were grown under three different levels of N availability in an N responsive evaluation nursery. Several traits were evaluated including plant biomass and N content, grain yield, yield components, NUE and its components, and measures of grain quality. Our hypothesis was that continued selection for grain yield under high levels of N fertilizer has resulted in modern hybrids with a larger response to fertilizer N than hybrids from earlier eras. Contrary to our hypothesis, the results of this study show that the response of grain yield to fertilizer N has remained relatively constant over the past 30 years, and it is an improvement in check plot yield that is associated with higher yield of modern hybrids. This finding has important ramifications in developing breeding programs and in devising crop management strategies for better use of fertilizer N.

Results
These results suggest that continued selection for grain yield has also improved the biofuel potential of corn by favoring increased grain starch concentration. Current criticism of expanded corn production for biofuel production uses the assumption that the crop requires increasing

levels of inputs for high yield. Our work suggests that past and current genetic improvement has not only increased grain yield, but also increased the potential efficiency of corn production by reducing the N required.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)

Outcome #7

1. Outcome Measures

Developing A Sustainable Method Of Soybean Cyst Nematode Control

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Identification of genes involved in soybean cyst nematode parasitism in the long term will lead to better understanding of SCN/soybean interactions and, potentially, the development of targeted and environmentally sustainable approaches to limit nematode damage to crops.

What has been done
The new SCN metabolic pathways discovered in this project are a first step in the process of developing a sustainable method of SCN control. Any nematode protein that is special or unique in a parasitic nematode may be a useful target for developing a nematode control strategy. These new putative metabolic pathways are a very significant discovery since it seems to suggest that HGT is more common in plant nematodes than originally thought, thus many HGT target genes may be in SCN. Several examples of HGT have been hypothesized to have occurred in plant parasitic nematodes, but none for an entire functional metabolic pathways.

Results
A plant-nematode specific metabolic pathway is a valuable target for disruption via chemical inhibitors [nematicides] or via genetically engineered plants, since only the parasitic nematode would be affected. That is, if a nematicide were developed to inhibit this pathway[s] it would harm

only parasitic nematodes, not beneficial nematodes, and would not be toxic to humans. Further analysis of these new nematode-specific metabolic pathways will be needed to confirm their function and show they are essential for the life of this nematode.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
216	Integrated Pest Management Systems

Outcome #8

1. Outcome Measures

Increased Knowledge Of Small Acreage Land Management Practices

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Communities are experiencing growth at the rural/urban fringes. Subdivision of agricultural properties into smaller, one to 50+ acre parcels is encouraging more urban clientele to move to rural areas. The small scale acreage owner may have purchased the property for many reasons, from retirement, to a desire to farm, to seeking an alternative income, or for change in lifestyle. This growing audience of small acreage owners is often not well versed in land management practices or entrepreneurial skills. A consistent message across the state on the best management recommendations for small acreages is needed to help landowners make wise, informed decisions while minimizing environmental impact.

What has been done
Living on the Land, a 13-week program series developed in Nevada, was adopted and modified to include information on best land management practices for Illinois conditions and laws. The course includes sessions on goal-setting, soils, wells and septic systems, local laws and regulations, water quality, streams and ponds, lawn management, pastures and managed grazing systems, animal husbandry, wildlife conservation and concerns, marketing and economics, and

sustainability. The program includes a trainer manual and participant notebooks as well as PowerPoint slides covering eight module topics. Resource lists were also created for each of the module topics to include Illinois resources. In addition, resource materials were placed on Extension's Small Farms website. Twenty-two educators from Extension, Soil and Water Conservation Districts, and The Land Connection participated in a two-day training on implementing the program using the various materials in five locations in the state. A retrospective pre-post evaluation was distributed at the end of the program series to gather input on improving future training programs. A follow-up evaluation will be conducted to collect data on practice adoption.

Results

The Living on the Land program was advertised in seven locations in the state. Attendance at the pilot program offered in the late fall of 2009 included 18 participants. A second program accommodated twelve participants representing seven land properties. Enrollment response at the five other sites was inadequate resulting in the cancellation of the program, partially as a result of uncertainty related to reorganization and staff reductions in University of Illinois Extension as well as the challenges of distributing program registration information to those who are likely not familiar with Extension.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
216	Integrated Pest Management Systems
604	Marketing and Distribution Practices

Outcome #9

1. Outcome Measures

Expansion/Adoption/Development Of Outreach Programs For Small Farmers And Ranchers

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	80

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Small farmers and ranchers are increasing in number, may lack resources, and may be newly engaged in food production, thus 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 stakeholders 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 a pre-conference short course, 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
All registrants were invited to complete a post-conference online survey two weeks after the conference ended. A total of 264 [45%] of the 583 conference attendees responded to the online survey. A third evaluation stage involving a six-month post-conference follow-up was completed this year using a slightly modified version of the post-conference online evaluation to assess the impact of the conference participants work with small-scale farmer and ranchers. A total of 165 [28%] of the participants completed the 6-month follow-up.

Participants reporting taking one or more of six actions was between 30% and 60% of the number that planned to take such actions as reported two weeks after the conference. The results from the 6-month follow-up suggest that while the respondents' enthusiasm led them to overstate what they could realistically accomplish, there was a respectable level of accomplishment in every category. Results of respondents actual reported actions include the following: [1] 80 [14%] of the 583 conference attendees extended an existing program to better meet the needs of small scale farmers; [2] 77 [13%] were now partnering or collaborating with someone identified at the conference; [3] 57 [10%] adapted an existing program to better meet the needs of small scale farmers; [4] 44 [8%] completed a funding request for a new or existing program; [5] 28 [5%] designed and implemented a new education or outreach program; and [6] 25 [4%] adapted an existing program to target an underserved populations.

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

Outcome #10

1. Outcome Measures

Increased Access Among Food-Related Enterprises

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{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 489,942 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. Arkansas, Colorado, Florida, Louisiana, Pennsylvania, South Carolina, Washington DC, and Texas and Alabama are under development. The database can be searched by type of facilities, offerings and activities, and shopping. 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 sixteen major national and/or state enterprises.

Working groups were created to design new business registration templates to be captured within the MarketMaker database. A training program was created to prepare farmers to become more commercial or retail ready. The materials developed in conjunction with the University of Kentucky include best practices and a readiness checklist that helps them align production, food safety, and marketing practices with what is expected and desired by supply chain decision makers beyond the farm gate. Templates were also constructed for nonfarm food businesses across all sectors of the food industry to capture the kinds of information that help supply chain players identify potential likeminded collaborators through the MarketMaker database.

Results

Five states have adopted the use of the retail/commercial ready curriculum and three of those states have reported that approximately 175 farmers have completed the training. The 59 new profile designs have enabled expansion of profiles across all sectors and at each step of the food supply chain that now includes 16,958 unique user profiles. The site now also features over 1,000 businesses with agri-tourism profiles. In addition, the introduction of the fish and seafood industries into the MarketMaker system coincided with the Gulf Oil Spill and played an active role in economic recovery activity. Thirty-four educators and practitioners were trained to work with the Gulf seafood industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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)

Evaluation Results

A survey of practice changes was distributed for completion prior to beginning private applicator training sessions this year. The 452 completed surveys represent approximately 9% 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 sessions, I have made the following practice changes' respondents could check up to 15 practice changes. Results follow:

86.2% [370] read and follow label directions for proper pesticide application methods and rates,
84.4% [362] take precautions to minimize spray drift when making pesticide applications,
84.1% [361] understand how pesticides can cause contamination and take steps to prevent it,
81.1% [348] determine proper identification of pests before determining if control is needed,

77.9% [334] mix and load pesticides in a well-lit open-air area to minimize exposure,
76.0% [328] know how to respond to pesticide exposures if they should occur,
72.5% [311] store pesticides in a secure location separate from any feed stuffs,
69.7% [299] use recommended personal protective equipment when working with pesticides,
68.5% [294] refer to treatment thresholds to decide if a pest needs to be controlled,
68.3% [293] calibrate their sprayer regularly to ensure accurate application rates,
67.8% [291] inform family, friends, employees of the safety precautions to follow,
58.5% [251] thoroughly examine my fields to determine the distribution of a pest population,
57.1% [245] have adopted IPM practices in managing pests in my farming operation,
56.6% [243] adjust cultural practices whenever practical to control/mange pest populations,
56.6% [243] select the safest pesticides possible to control/manage pest populations,
35.4% [152] have their pesticide storage areas prominently labeled and secured.

One hundred sixty-seven 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 $2,455,620 which averages to slightly over $14,700 per operation. The 349 respondents who provided information on acres treated with pesticides reported application to 298,831 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.

V(A). Planned Program (Summary)

Program # 13

1. Name of the Planned Program

Food Safety

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	6.0	0.0
Actual	1.9	0.0	2.7	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
61644	0	135049	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
61644	0	135049	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
572441	0	1182176	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2010 included a project focusing on developing a tool for the food industry providing practical guidelines on how to choose ingredients in food formulation in order to obtain a target product on a predictive basis [this will speed up ingredient replacement strategies and increase the utilization of alternative agricultural ingredients in novel food products with new and improved functionalities], research designed to guide the food industry on how to control microstructure and cell wall material properties through ingredients, processing and storage strategies in order to obtain food products that consumer like, the utilization of ultrasound in combination with moderate pressure and/or mild heat to ensure the food safety and quality of juice products, results that provide industry with information to make informed decisions regarding the efficacy of various antioxidants in ground beef and pork stored in the raw, frozen state or in the cooked, refrigerated state, research focused on the chemistry of lipids in chocolate as affected by storage conditions and the translation of these results into the impact on human perception of chocolate texture and flavor release, the study of moisture sorption isotherms that are useful for a variety of processing and product stability applications [newly developed automated water sorption instruments are more accurate, flexible, and convenient than the traditional saturated salt slurry method], and the utilization of zein to develop films for coating and protecting foods from degradation.

Conference presentations in 2010 included the Institute of Food Technologists Annual Meeting, the American Society of Mechanical Engineers International Conference, the First International Congress on Food Technology, and the Twentieth International Congress on Acoustics.

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 435 participants maintain their Illinois Food Services Sanitation Managers Certification in 2009; [2] a fifteen-hour **Food Services Sanitation Manager's Certification Course** in selected areas of Illinois; [3] **Serve it Safely** food class 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 2,400 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. Safe handling of food is also taught at multi-state and regional commercial fruit and vegetable production conferences and programs targeted at producers and distributors of local foods.

2. Brief description of the target audience

Members of the target audience included ingredient manufacturers in particular and the food industry in general, food product designers, chocolate manufacturers, research personnel in academia, government, and the food industry, and product and packaging development professionals in industry and academia. 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 number as a priority audience.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	5778	4243	2526	0

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

Patent Applications Submitted

Year: 2010

Actual: 1

Patents listed

Continuous-Flow Bacterial Disinfection Of Fresh Cut Produce And Leafy Greens Using High-Intensity Ultrasound

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	0	17	17

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2010	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	350	435

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Monitor Proper Temperatures Of Food Served To The Public To Prevent Food-Borne Illnesses

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	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 an exam to be eligible for re-certification every five years.

What has been done
Workshops on food safety have been conducted statewide by Extension Educators. Classroom presentations have been presented by professionals and hourly staff to youth. The Refresher Course for Food Handlers training was conducted for 435 individuals who serve food to the public during the 2009-10 federal year. This year a food vendor training in English/Spanish targeted specific problems observed during a local Chicago community festival. Photographs taken during the previous year's festival were shared and discussed during the training, including how to use a food thermometer for accurate temperature during food holding, calibration of an instant-read food thermometer using the ice point method, practice of proper hand washing techniques, and review of Chicago Department of Food, Drugs, and Dairies food code laws. Refrigerator/freezer thermometers were distributed at the training session.

Results
Based on data from a follow-up study with a 61.5% return rate from participants in the Refresher Course for Food Handlers conducted two years ago, 195 [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 160 participants likely changed practices related to monitoring the temperature of the food they served. Those monitoring practices included 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 recalibrate when needed.

A walking observation of food vendors at a Chicago neighborhood festival this year revealed that 100% of the 26 who participated in the Extension training were wearing hair restraints when only 75% of the vendors were in compliance at the previous year's festival. Likewise, 100% of the vendors had thermometers in place during the review during the Chicago Food Sanitarian inspection.

4. Associated Knowledge Areas

KA Code	Knowledge Area

712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #3

1. Outcome Measures

Reduction In The Population Of Pathogenic Microorganism Count In Juice Products

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The U.S. Food and Drug Administration requires a 5-log reduction in the population of pathogenic microorganism count in juice products. As an alternative to conventional pasteurization, ultrasound in combination with moderate pressure and/or mild heat has been proposed to ensure the food safety and quality of final products.

What has been done
The study investigated the responses of Escherichia coli to thermosonication [TS], manosonication [MS], and manothermosonication [MTS] treatments in apple cider, and examined the effects of ultrasonication on product quality. E. coli K12 cells suspended in apple cider were treated by MTS [400 kPa/59C], TS [100 kPa/59C], and MS [400 kPa/55C] for up to 4 minutes, plated on tryptic soy agar, and incubated at 37C for 24 hours. Quality changes in treated apple cider were monitored for 21 days at 4C. The thermal treatment was conducted by a cider mill. Raw apple cider was used as the control. A 5-log reduction was achieved in 1.4 minutes by MTS, 3.8 minutes by TS, and 2.5 minutes by MS.

Results
MTS may be used as a promising alternative to pasteurization for apple cider. The non-linear kinetic models may help to determine the treatment times needed for ultrasound treatments to achieve a 5-log reduction in pathogenic microbial counts in juice products.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies

502	New and Improved Food Products
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)

Evaluation Results

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 14

1. Name of the Planned Program

Sustainable Energy

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	20%		0%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		40%	
206	Basic Plant Biology	0%		20%	
402	Engineering Systems and Equipment	60%		25%	
601	Economics of Agricultural Production and Farm Management	0%		15%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	20%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

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

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	0.5	0.0	3.0	0.0
Actual	2.1	0.0	7.7	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
69350	0	369105	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
69350	0	369105	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
643996	0	2738878	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Activities in 2010 included research to assess management effects on soil carbon loss and soil productivity including the impacts of cover crops and corn residue removal on crop yields, soil organic carbon [SOC] levels and soil erosion, improvement of methods such as near-infrared reflectance spectroscopy for enabling a rapid measurement of factors such as protein, fat, neutral detergent fiber, acid detergent fiber, and residual starch in distiller's dried grains, results that support previous suppositions that herbicides used in corn are safe to use on M. x giganteus and may provide potential herbicide options that growers can use when establishing M. x giganteus, work focusing on the characterization of the properties of biofuels and their impact on combustion and emissions [the resulting property prediction methods have been integrated into detailed three-dimensional combustion models used both at the University of Illinois and other universities], development of a systems informatics infrastructure to allow people involved in biomass feedstock production to be able to access and exchange data, discovery of a never described ploidy cytotype, a hexaploid [finding this ploidy level has resulted in new germplasm to evaluate for increased biomass production and may help elucidate how prairie cordgrass has evolved], a study of the use of GSHE in the dry grind process [which could eventually eliminate the high-temperature cooking and liquefaction steps required in the conventional process, can save energy, and can simplify the dry grind process], research into digestibility when using distillers dried grains with solubles as a pig feed, and development of a method of glycerol utilization that could be used as a biodiesel fuel additive or fuel extender [for every three moles of fatty acid esters produced during biodiesel production, one mole of glycerol remains as an underutilized coproduct, equivalent to ~10% of the total biodiesel volume].

Conference presentations in 2010 included the American Society of Agricultural and Biological Engineers Annual International Meeting, the American Society of Agronomy, the Crop Science Society of America, the Soil Science Society of America, the 2010 Gateway Green Industry Conference and Trade Show, the 2010 Nebraska Turfgrass Field Day Program, the Central States Section Meeting of the Combustion Institute, Deere & Company, Caterpillar, and Navistar.

The most significant statewide Extension activities focused on wind energy and biofuels, particularly perennial grasses. Five additional workshops were held this past year around the central and northern parts of the state to educate 170 landowners about the economic and fiscal implications of wind farm development in Illinois. Webinars have also been offered this past year on solar and wind energy. A total of 1,147 youth enrolled in the 4-H Wind Energy project for the 2009-10 4-H year.

The **Dudley Smith Initiative** provides financial support to bring together area landowners, Extension field staff and University of Illinois specialists to conduct research and demonstrate practical solutions for growing miscanthus and switch grass, and more recently, tropical maize. Pellets formed from miscanthus are used to fuel the furnace in the local Extension office. A display focused on this project was featured at the **Farm Progress Show**. The local Extension educator has conducted presentations, tours, and demonstrations for producers, students, power suppliers, researchers from other institutions and states, and government officials, as well as supporting hands-on experiences for college and high school classes, and has been involved, along with Extension engineers, in exploring these options for providing green energy for the campus. An online biomass energy course has been developed that offers certified crop advisor credits.

The annual **Bioenergy Feedstocks Symposium**, sponsored by the Energy Biosciences Institute on campus, was attended by farmers, researchers, academics and industry professionals, and government officials who learned more about ongoing research and the use of perennial grasses as a potential renewable energy source and profitable alternative crop. Speakers addressed the science behind

feedstock improvement and taking it from farm use to commercial sales and the biomass crop assistance program as it relates to farmers. Most notably, a team of campus and field professionals, along with representatives from other universities, power suppliers and state agencies planned a **Biomass Conversion for Heat and Electricity Workshop** to benchmark the existing solid biomass for fuel technologies and supply chain components and to discover the bottlenecks, challenges, and opportunities for research and commercialization of biomass-based energy.

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 supplies, actively promoted their website as a source of information to increase energy efficiency: www.energyedcouncil.org.

2. Brief description of the target audience

Members of the target audience included researchers in the fields of economics, ecology, crop sciences and environmental sciences who are working on modeling bioenergy systems and crops and their economic and environmental impacts, policy makers focusing on the impact of crop residue removal for biofuels on soils, soil erosion and crop yields, nutritionists in feed companies, ingredient supplier companies, pork producers, members of the biodiesel and bioenergy industry, and those individuals and researchers interested in biodiesel research. Extension targeted agriculture producers and landowners with respect to producing alternative energy sources and ways to reduce energy used in producing agriculture commodities, as well as other businesses, individuals, families, and youth who wish to reduce energy consumption and expenses.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	5987	1326	239	0

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

Patent Applications Submitted

Year: 2010

Actual: 1

Patents listed

Method And System For Corn Fractionation

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Actual	1	31	32

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2010	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
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	Increase Knowledge Of Research Findings Realted To Biofuel Production
5	Evaluation Of Miscanthus X Giganteus As A Bioenergy Feedstock
6	Development Of A Systems Informatics Infrastructure For The Biomass Feedstock Industry
7	Utilizing Nucleotype Selection To Improve Yields For Biomass Crops
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
2010	9	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 the development of alternative and renewable energy sources are increasingly being driven by economics, national security and environmental concerns [in particular greenhouse gas emissions].

What has been done
Considerable effort has been directed toward solving the deconstruction of plant cell walls to produce hydrolysates that can be efficiently utilized for the production of liquid fuels. Recent reports suggest that there has been limited feedstock-dependent success along these lines. Demonstration scale up of biomass conversion technologies has taken place, but not at a sufficient scale to suggest that commercialization is economical or viable. Much of the delay continues to be the development of economical enzymes and microbes that are able to utilize both five and six carbon sugars. There have been recent reports by industry and academia on the development of strains of yeast that are able to utilize the sugars produced from the breakdown of biomass. Whether these newly developed strains will function under commercial conditions has yet to be determined.

Results
Efforts by industry and academia have resulted in improvements in processing of biomass for production of liquid fuels. However, these improvements only represent portions of the biomass to biofuel value chain. The developed technologies will need to be "bundled" together in order to have significant impact on the outcome for efficient and economical production of biofuels. This will likely occur over the next year as a result of industry consolidation and mergers.

4. Associated Knowledge Areas

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

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	60	52

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Meeting the revised National Renewable Fuel Standard [RFS2] established by the U.S. EPA in 2010 requires a substantial increase in biofuels production over the next 12 years. Biofuels such as ethanol, biobutanol and biodiesel are identified as candidates for meeting greenhouse gas emissions reduction requirements. The compatibility of these fuels with existing engines and their impact on regulated emissions has not been fully researched.

What has been done
Detailed measurements of key fuel properties impacting combustion and emissions show important differences relative to petroleum-based fuels. Fuel blends of biobutanol, biodiesel and diesel fuel may be formulated so that the properties fall within the required ASTM standards thereby ensuring compatibility with existing engines. A preliminary study of the properties of biodiesel produced from micro-algae has also been carried out.

Results
The fuel blending properties selected from ASTM standards that are critical to evaluating the suitability of a fuel for use in a diesel engine include handling and safety, cold flow, blend stability, material compatibility, wear prevention, and combustion. For biodiesel fuel, the kinematic viscosity, cloud point, pour point, cetane number, and boiling point all tend to be higher than for diesel fuel, while the alcohols tend to be lower. Blending of biodiesel with alcohols should be

beneficial in being able to balance the properties of these fuels. The energy content of a fuel blend containing any oxygenated biofuel will typically be lower than that of petroleum diesel fuel. In addition, outside of materials compatibility, corrosiveness, and lubricity, biobutanol appears to be a more favorable fuel when compared to ethanol. The properties of biobutanol show it is more closely aligned to diesel fuel than ethanol. The fatty acid composition of biodiesel made from micro-algae will have a strong impact on fuel properties. Algal oils typically contain higher quantities of polyunsaturated fatty acids that are more prone to oxidation and will have a shorter shelf life. It should be possible to select algae strains with fatty acid profiles that lead to optimum combustion characteristics as well as better oxidative stability.

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

Increase Knowledge Of Research Findings Realted To Biofuel Production

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	50	80

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To realize the economic potential of biomass energy in communities and industry requires parallel development of the end-use production [biorefinery] and energy conversion [heat and electricity]

technologies, and the supply chain needed to feed them. Some candidate energy conversion technologies exist now, but are not being fully supplied by renewable materials.

What has been done
A team of campus and field professionals, along with representatives from other universities, power suppliers and state agencies planned a Biomass Conversion for Heat and Electricity Workshop to benchmark the existing solid biomass for fuel technologies and supply chain components and to discover the bottlenecks, challenges, and opportunities for research and commercialization of biomass-based energy. The committee assembled over 80 key individuals from the industry segments, representing technologies and market models, who have the know-how to supply biomass markets for three existing energy end-users: pellet stoves for heating of homes and light commercials buildings, medium- and large-scale co-firing of coal boilers for heat and power, and gasification of solid biomass fuels for heat and power. These attendees included industry and/or biomass end-users, agricultural producers, Midwest landowners, government agencies, not-for-profit organizations, and university faculty/staff and community college staff from Illinois, Iowa, Indiana, Missouri, and Ohio. The format was a workshop style meeting, including keynote presentations, breakout sessions, discussion groups, and an industry mini-trade show with table exhibits. Speakers were invited from around the Midwest. They represented successful biomass energy projects around the country, including utility scale systems and industry hardware and systems experts for the best advice about individual components and how to match them up. A two-page evaluation form was distributed at the end of the two-day workshop.

Results
Evaluations were completed by 31 of the participants who were asked to rank the components of the workshop as 'very useful', 'somewhat useful', 'not sure', and 'not at all useful'. Keynote presentations, panel sessions, and breakouts were liked about equally, with 90% of the responses either 'very useful' or 'somewhat useful'. The opportunities for informal networking were clearly valued by all. Participants were pleased with the breadth of the workshop content, but are hungry for more information. Topics listed most were system economics, financial assistance for projects, and specific regulations. Overall the evaluations were very favorable and indicated that two of the planning committee's goals for the workshop [networking and identifying future biomass energy 'champions'] were met. Most notably, one main recommendation, the formation of a Biomass Working Group, has been achieved, and there have been a number of meetings of that group since last March.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Evaluation Of Miscanthus X Giganteus As A Bioenergy Feedstock

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
High-yielding perennial grasses have been touted as ideal candidates for widespread commercial bioenergy production due to the combination of high productivity and low inputs. Miscanthus x giganteus is a perennial rhizomatous C4 grass being evaluated in the United States as a potential bioenergy feedstock.

What has been done
Recent research on Miscanthus x giganteus has shown it to be a particularly attractive option for biomass production in the Midwest; however, no previous research has been done on optimizing the establishment of Miscanthus x giganteus under the growing environment within the Midwest. In side-by-side replicated field experiments, the optimal rhizome size and planting depth of Miscanthus x giganteus rhizomes was determined. In a glasshouse study, the effect of cold storage over time was determined on Miscanthus x giganteus rhizomes. Results of this study suggest that to maximize above-ground biomass production of Miscanthus x giganteus in the establishment year, rhizomes should be 60-75 g, planted to a depth of 10 cm and kept in cold storage for as little time as possible. These results provide necessary data for maximizing the likelihood of establishing commercially viable Miscanthus x giganteus production from rhizome propagation in an area that is projected to be a major contributor to renewable energy goals in the U.S.

Results
Results from the field experiments generally confirmed those from the greenhouse experiments. Pre-herbicides and herbicides with broadleaf-specific activity generally did not produce significant injury or reduce above-ground biomass while herbicides with grass activity tended to cause injury ranging from 22 to 25% and/or reduce biomass by 69 to 78%. With some exceptions, results support prior suppositions that herbicides used in corn are safe to use on Miscanthus x giganteus and may provide potential herbicide options that growers can use when establishing Miscanthus x giganteus.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
206	Basic Plant Biology
402	Engineering Systems and Equipment

601 Economics of Agricultural Production and Farm Management

Outcome #6

1. Outcome Measures

Development Of A Systems Informatics Infrastructure For The Biomass Feedstock Industry

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Biomass feedstock production is an integral element of bioenergy production. The amount of useful information distributed among various stages of biomass feedstock production is large while there is increased complexity in the relationship between the generated data. A systems informatics infrastructure is therefore considered necessary in order for the people involved in biomass feedstock production to be able to access the generated data.

What has been done
A database to that effect has been prepared previously. The ultimate goal of this infrastructure is the provision of effective procedures for decision making in a concurrent way. Specifically, all the stages of biomass feedstock production should be able to handle data simultaneously. Furthermore, any knowledge associated with the infrastructure must be managed efficiently and this can be achieved by the use of the appropriate software engineering techniques. The use of such techniques allows the identification of the requirements for the biomass feedstock production supply chains and the design of an efficient informatics platform based on these requirements.

Results
An application programming interface [API] that is the core element providing access to the informatics infrastructure developed for biomass feedstock production has been developed. The API is connected to a database containing data related to each stage of biomass feedstock production. The API provides a number of capabilities to its users, such as the access to and visualization of both existing data and simulation results for analysis purposes, the provision of a metadata-based database search engine, the identification of hidden relationships between data through the use of data clustering algorithms, and the identification of the strength of these relationships through the use of rule-based techniques. Furthermore, the capabilities of the API

will expand to the field of artificial intelligence and especially artificial neural networks and genetic algorithms for the realization of predictions and optimization. Regression analysis is another technique that will be provided by the API to facilitate the exploration of optimal values of data which affect other data related to biomass feedstock production to be explored.

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 #7

1. Outcome Measures

Utilizing Nucleotype Selection To Improve Yields For Biomass Crops

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The overall goal of the proposed research is to develop plant lines with increased biomass. By adding nucleotype selection with other known selections for increased biomass, plant breeders will have another tool at their disposal to use to breed lines with increased biomass. Having these lines will allow farmers to use lines that will be high yielding for both food and fuel.

What has been done
Flow cytometric techniques were modified for the determination of ploidy level in prairie cordgrass. Using this technique, the ploidy level of various native populations of prairie cordgrass were obtained. Techniques were modified for the purpose of obtaining chromosome counts in both prairie cordgrass and Miscanthus x Giganteus. Information with regard to the ploidy level of prairie cordgrass has been disseminated to various scientific groups as well as farmers and farm groups.

Results

A change in knowledge occurred when ploidy levels were determined in native Illinois populations of prairie cordgrass. A never described ploidy cytotype, a hexaploid was found. Previously, the only ploidy levels know in prairie cordgrass were tetraploid and hexaploid individuals. Finding this ploidy level has resulted in new germplasm to evaluate for increased biomass production and may help elucidate how prairie cordgrass has evolved. Ploidy evaluation of native populations of prairie cordgrass across the U.S. has resulted in the ability to predict which populations have the highest biomass potential in specific regions of the U.S.

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
2010	{No Data Entered}	85

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.

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 for the Illinois Wind Working Group], and an attorney to deliver Wind Energy 101: From a Landowner's Perspective at an additional five locations in the state that attracted 170 participants [six separate program locations served as delivery sites last year.] Two of the sessions were targeted at absentee landowners in the Chicago area, most of whom owned land in counties further south and west of the area and also attracted participants form the wind development community.

Topics included: [1] introduction to wind energy basics which covered 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. Extension staff members are currently working on converting the content of this program for web delivery, specifically short narrated PowerPoint pieces designed to answer specific questions.

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 170 participants, 90 [53%] completed the evaluation. Eighty-two percent [74] of the respondents rated the 'usefulness of the handouts' 4 or 5 on a scale of Poor=1 to 5=Excellent; 78 [87%] rated the 'relevance of topics to my needs' 4 or 5; and 85 [94%] rated 'amount of useful information' 4 or 5.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm 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)

Evaluation Results

Key Items of Evaluation