2011 University of Illinois Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

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

Relatively modest budget reductions in FY 2012 allowed for more stable conditions to implement structural adjustments in ACES' units and subsidiaries, which had resulted from the compound effects of previous years' fiscal constraints. Serious challenges remain, as the University contemplates issues like pension reform and employee benefits, and as local, state, federal, and private partners cope with economic distress. The Illinois economy and the financial condition of the state government remain very uncertain. Nevertheless, the services provided for the citizens of Illinois by the multidimensional mission of the university must be appropriately valued if the land-grant idea is to remain viable in Illinois. No college has a greater stake in land-grant, mission-oriented activities than ACES.

In FY 2012, the Urbana-Champaign campus realized a 2.3% decrease in the state-appropriated education assistance fund, while the tuition income fund increased by 8.7%, widening the gap between direct state support and student support of the institution. Tuition revenue now more than doubles the revenue contribution from direct state appropriations to the campus. The state continues to operate in arrears for currently obligated funding to higher education, and the state's budget deficit has widened, despite revenues generated by recently enacted tax increases. The campus assessed a permanent base budget reduction of 0.55%, applied uniformly across academic and administrative units. In addition, the campus implemented a 3% salary increase program, and ACES differentially allocated tuition income to help cover the cost of the program. The reductions were much less severe than in the previous year, when budgets for state-funded functions were differentially reduced relative to tuition-earning activities.

The college's multidimensional mission requires capacity and functional programs in the areas of fundamental and applied research, education, and public engagement that are highly relevant to the needs of students, employers, communities, and families, and support robust food, agricultural, natural resource, and more recently, energy systems. In aggregate, expenditures by the College of ACES in FY 2011 declined 5.9% [-$9,697,401], mainly reflecting reallocations and reductions that were implemented for the state base budget. A significant share of the college's operation is not tuition-earning, so expenditures in University of Illinois Extension were down 10.8% [-$8,465,442], and the Illinois Agricultural Experiment Station expended 3.9% less [-$2,306,342] than in FY 2010. Most of the reduction in expenditures is attributable to waning staff and faculty resources.

University of Illinois Extension

At the end of the FY2011 the restructured University of Illinois Extension was in place with 27 multi-county units in operation as of July 1, 2011. This restructuring was precipitated primarily by a major decrease in state funding, further threatened by a large and growing state spending deficit.

Many challenges occupied staff and volunteers during this past year before the structure was in place. County directors were charged with meeting with funders and developing a multi-county budget and assisting in moving the application and selection process forward to reassign and/or hire all support positions. Educators were assigned to new geographic areas, took on new areas of expertise in some

cases, and now had county directors as their supervisors. Support staff remained uncertain of their employment status throughout the majority of the year. The final staffing positions totaled 27 county directors, 123 educators, and 354 support staff positions, representing an associated reduction of 116 academic professionals and 28 support staff positions. In addition, Extension campus faculty and staff appointments now number 19.24 FTE, a reduction of 4.28 FTE due to retirements or resignations that are not being refilled.

The most notable consequence of the staff reductions and challenges was a reduction in the scope and/or initiation of new programming as evidenced by direct contacts of 999,432 in FY11 as compared to 2,869,363 direct contacts in FY10. Reporting was not a priority for those with notices of non-reappointment and remaining staff struggled with picking up additional responsibilities and in maintaining programs. Vacancies in positions continued throughout the year due to inadequate pools of qualified applicants and additional resignations. In addition staff who left were often ones that could be relied on to collect impact data or conducted programs where impact was to be formally measured. Reviewers of this report may find this description helpful in interpreting the scope of the planned program reports. Few publications were also produced since our field staff, unlike other states are not a part of a tenure track system with high expectations for publishing. Our Extension faculty positions are often joint appointments in research with publications reflected in the report of research publications.

With respect to the Stewarding Excellence @ Illinois, a campus initiativeto identify cost-savings measures across campus that might relate to Extension's fiscal viability mentioned in last year's annual report, no action has been taken on the nine recommendations that might affect University of Illinois Extension.

Illinois Agricultural Experiment Station [Office of Research]

The IAES administers federal formula funding provided to Illinois through the USDA National Institute of Food and Agriculture. The combined research activities of IAES/ACES accounted for $59,138,830 [36% of the FY 2011 expenditures in ACES]. The college is doing more to advance science and scholarship, with less from traditional sources. External funding has grown, while the mix has changed -- away from state and USDA support and towards support from industry gifts and grants, a broader array of federal granting agencies, and significant involvement in multi-disciplinary centers and initiatives such as the **Institute for Genomic Biology**, the **Energy Biosciences Institute**, the **ADM Institute for the Prevention of Post-Harvest Loss**, the **Center for Agricultural, Biomedical, and Pharmaceutical Nanotechnology** [CABPN], and the **Abbott Laboratories Center for Nutrition, Learning and Memory**.

The research portfolio of the Illinois Agricultural Experiment Station includes mission-oriented research to support stakeholders in Illinois, in partnership with USDA and entities in the state. The level of mission-oriented research has been a factor in determining the permanent base budget reductions to the College of ACES, since the IAES is not considered a tuition-generating activity. As a result, a portion of the base budget reduction applied to the college and its departments in recent years is related to the proportion of investment in IAES mission-oriented activities. After FY 2009, the state ceased its direct contribution to mission-oriented research by failing to appropriate any funds for the **Council on Food and Agricultural Research** [C-FAR].

The research infrastructure maintained by the IAES and the College of ACES includes the statewide system of field research and education centers [RECs]. These centers, operated in several strategic locations around the state, provide essential capacity for field-scale research that takes advantage of various environmental conditions represented in Illinois. As new development occurs on the south campus, particularly related to expansion of the Research Park and to the needs of the Department of Intercollegiate Athletics, the college cooperates with other units to both accommodate development and maintain excellent research facilities.

Changes in Research FTE Allocations

Three significant factors drove changes in research FTE allocations across planned programs from the previous year. The first factor is a continuing decline in FTE's overall [just from the previous report to this one the number fell from 115 to 100]. The second factor is the termination of concluded projects and the initiation of new ones. The third factor is our desire to insure that the five planned programs requested by NIFA are well-populated [for Climate Change the FTE total doubled from two to four; for Global Food Security and Hunger the number tripled from five to fifteen].

The Planned Programs

Agricultural and Biological Engineering - Activities in 2011 included the continued improvement of the **Illinois Manure Management Plan** program, the development of algorithms for predicting biofilter media airflow performance, research that will decrease the cost of agricultural droplet size measuring instruments, ongoing collaborations with several chemical manufacturers to develop best management practices, work to better evaluate fan performance in agricultural buildings, certified livestock manure management online training, and workshops, pesticide applicator training, and programming on biomass energy.

Agricultural and Consumer Economics - Activities in 2011 included recent modifications to **MarketMaker**, analysis of U.S. and international biotechnology laws, ongoing improvements to **farmdoc**, econometric modeling focusing on producer decision making as it relates to specialty crops, research that impacted the nation's understanding of the effects of new technologies on agricultural production, a study of the patterns of consumer adoption of rain barrels in an urban setting, and Extension activities focused on farm financial trends, crop insurance and grain farm budgeting, risk management for small landowners, and consumer resource for teachers and financial professionals.

Animal Health and Production - Activities in 2011 included a study on the ambient conditions that finishing pigs experience during transport, research with the goal of developing a PRRSV virus as a potential vaccine vector, an improved understanding of the molecules on the porcine oviduct that bind sperm, characterizations of particulate matter from confinement livestock buildings, high-density single nucleotide polymorphism [SNP] discovery, validation, and characterization in swine, and continuation of Extension annual statewide programs that addressed animal production and health for swine, beef, dairy, sheep, poultry, and horses for owners, producers, and 4-H youth.

Childhood Obesity - Activities in 2011 included the development of the **Survey of Household Finances and Childhood Obesity**, ongoing work under the PONDER-G [**Prevent Obesity and Nutrition-related Diseases: Environmental Resources and Genomics**] program, several projects under the umbrella of the **STRONG Kids** program, research with the goal of improving our understanding of the mechanism of macronutrient effects on fat deposition and development of metabolic syndrome, and hands-on Extension activities with children and their parents regarding the MyPlate healthy food choice guide including snack choices, portion sizes, and the importance of physical activity.

Climate Change - Activities in 2011 included ongoing monitoring work through the **National Atmospheric Deposition Program**, a study of the factors affecting soil organic carbon, a study of how the ecology of ratsnakes is likely to be affected by climate change, work to improve our understanding of the physiological responses of fish to climate changes, research with the goal of turning residual waste products into a carbon sink, and Extension programs addressing carbon sequestration through soil management and forestry management, preventing the loss of trees by properly handling invasive pests, and training for natural resource volunteers on climate and the weather.

Community Resource Planning and Development - Activities in 2011 included the development and distribution of fact sheets for the southern Illinois region [which led to continuing support for the **Dixon Springs Agricultural Center** and other decisions to continue engagement in southern Illinois], a study on how Latino/a migrants in central Illinois were coping with the ongoing economic crisis, county official certification programs, and providing data gathering and process management assistance to communities for engaging residents in decision making and planning, customer service, and disaster education and preparedness.

Food Safety - Activities in 2011 included a study of the beneficial and adverse effects of natural, bioactive dietary chemicals on human health and food safety, efforts to reduce losses to the dairy industry due to mastitis, experiments to determine the water barrier properties of zein-oleic acid films, 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 fresh fruit and vegetable production and handling practices to prevent food contamination.

Global Food Security and Hunger - Activities in 2011 included work focusing on early childhood nutrition improvement in developing countries, research with the goal of developing higher-quality food products and associated materials, improved understanding of the flavor function of soy to reduce undesirable flavor/taste characteristics, a study with the goal of field testing effective fortification technologies, conferences, clinics, websites and field days addressing pesticide safety, crop management, local food production and distribution, and hunger mediation for limited resource families.

Human Development and Family Wellbeing - Activities in 2011 included revision of our work-life management curriculum for couples [already in use in eight states], the development of data that provide insights into family processes within low-income African-American families, a project that extends previous activities under the **More Fun With Brothers and Sisters Program**, continuation of the **Child Development Laboratory Research Database Project**, continued delivery of the work-life management curriculum, financial management for young adult and limited resource individuals, web-based parenting education resources, and workshops and resources addressing food choices and management of chronic diseases.

Natural Resources and the Environment - Activities in 2011 included utilization of field sites where tile flow is monitored to illustrate the response of the tile line to our nitrate reduction method, use of dredged sediment as a topsoil to reclaim brownfields into city parks, development of improved land management strategies to enhance native pollinators on urban agricultural sites, results that produced novel insights into the behavioral adjustments of an urban adapter species [woodchucks], research that will help to improve wetland assessment protocols, a variety of forestry-related education, a statewide series of tillage workshops and soil and water workshops, continued curriculum development and volunteer Master Naturalist training and project support, and stewardship activities for youth.

Plant Health, Systems and Production - Activities in 2011 included ongoing cultivar trials, research focusing on herbicide resistance in waterhemp, continuing calibration of the **Illinois Soil Nitrogen Test**, development and distribution to local farmers of a handbook on cover crops, efforts to improve our understanding of the pathways involved in soybean seed composition and of plant disease resistance, efforts to better reach young farmers through the use of tablet and smart phone technologies, training Master Gardeners to provide information on environmentally friendly plant production, digital diagnosis and recommendations for plant-related problems, and production and insurance management for plant nurseries.

Sustainable Energy - Activities in 2011 included a systematic study of particle size effects across different pretreatment technologies and feedstocks, the collection of data on the biomass productivity of switchgrass depending on management practices, utilization of glycerol as a biodiesel fuel additive or fuel

extender, a study with the goal of accelerating the process of screening Miscanthus biomass germplasm, a project in coordination with the University of Illinois Energy Biosciences Institute that seeks to identify yields, geographic adaptability, and agronomic requirements of sustainable lignocellulosic feedstocks, exploration and discussion of biomass conversion for heat and electricity, using energy more efficiently, and wind energy learning activities for youth.

4-H Youth Development - Activities in 2011 focused on increasing youth enrollment in sustained 4-H experiences, and volunteer training to ensure positive youth development. Educational content available through 4-H focused on: [1] learning employment skills using simulations and career exploration; [2] experiencing healthy relationships; [3] becoming physically; [4] thinking green by engaging youth in investigations of living things and their environment; and [5] engaging in science.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	185.0	0.0	115.0	0.0
Actual	129.8	0.0	99.7	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
- Combined External and Internal University External Non-University Panel
- Expert Peer Review
- Other (Extension Staff Program Teams)

2. Brief Explanation

Hatch proposals are submitted to their respective department for peer review and revisions are suggested [if warranted] by the review committee prior to approval for submission to NIFA. In the Department of Crop Sciences, the committee consists of at least two faculty members selected based on the research focus of the proposal. In the Department of Agricultural and Biological Engineering, two reviewers [one internal and one external] are selected [through consultation with faculty members in the department and other professional contacts, again based on the subject area of the proposal] to provide input and suggest areas of revision/improvement if needed. In the Department of Animal Sciences, a standing research committee is charged with the responsibility of reviewing proposals and making approval decisions. In the Department of Food Science and Human Nutrition, all proposals are reviewed by the department head.

Due to previously-discussed staffing changes in Extension, the long-established process for conducting county program reviews was suspended this past year. The major focus this year was on bringing academic professionals and support positions together to provide training on their

new responsibilities. Program leaders in family and consumer science, agricultural and natural resources, community and economic development, and 4-H youth development lead discussions with county directors, educators, and support staff on the importance of research-based programming, taking inventory of and prioritizing what programming should be continued, and encouraging the use of technology and employing other innovative ways to carry out Extension education. These discussions resulted in the identification of the need to update and create Extension educational resources [such as websites and curricula]. The new Extension multi-county structure shifted review of educator performance appraisal to the county director [along with a review of the educator's accomplishments by the appropriate program leader who provides comments to the county director]. University of Illinois Extension recognizes the need to explore additional program review processes that more formally involve external source input for future merit review of program content and delivery.

The vision of restructuring field staff into multi-county assignments included assigning responsibility for statewide Extension programs to campus faculty; this will be challenging due to retirements or resignations from positions that will not be filled, resulting in reductions in the expertise and capacity to deliver statewide programs.

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 traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional individuals

Brief explanation.

At the college level the Dean [Dr. Robert Hauser] and the Associate Deans of Research [Dr. Jozef Kokini] and Cooperative Extension [Dr. Robert Hoeft] play very significant roles in seeking out external stakeholder input. On the research side, a significant portion of Dr. Kokini's time is devoted to meeting with external stakeholders and seeking their input, local or national, public or private, academic or in industry. A key established formal source of stakeholder input is the College External Research Advisory Committee, which meets next in April. Organizations represented on this committee include the Illinois Farm Bureau, the Illinois Department of Agriculture, the Illinois Beef Association, the Illinois Pork Producers Association, Kraft Foods, William Wrigley, Jr. Company, Shawnee National Forest, the University of Missouri, the University of Minnesota, and the Illinois Department of Commerce and Economic Opportunity.

External advisory committees also play a significant role at the department level. In the Department of Food Science and Human Nutrition, input is provided by a fifteen-member committee where the members serve up to two three-year terms and are selected to provide representation from a wide variety of disciplines [such as food science, human nutrition, and hospitality management]. In the Department of Animal Sciences, the Departmental External Advisory Committee consists of twelve to fourteen members representing corporate, commodity group, and public interests.

At least as important as college-level and department-level efforts to seek out stakeholder input are the efforts made by individual faculty members and Extension educators. These efforts range from formal avenues, such as lectures, demonstrations, and other scheduled events, to one-on-one conversations that grow out of the relationships stakeholders have developed with individual investigators and educators.

County directors, although not officially in their new multi-county roles until last July, contacted various stakeholders to reassure them of continuing access to Extension programming and to seek their continued financial support. This was accomplished by the county director making proactive contacts through individual and group meetings and has been critical in preventing further reductions in staff.

Extension Councils were combined from single-county to multi-county councils and county directors were expected to seek their input. The scope of that input likely varied and focused on immediate needs related to budget, facility, and staffing concerns, with discussions to identify priority issues for educational programming constituting a small portion of that input. Educators whose new geographic assignment encompassed the county where they had been previously assigned continued their programming interactions with external groups and individuals in that county and began expanding relationships and interactions with groups and individuals in their new counties. A smaller number of educators accepted assignments in a new geographic multi-county unit and are beginning the process of interacting with traditional stakeholders.

Surveys have been developed as a more formal way to seek stakeholder input. The thirteen Extension educators who have assignments focusing on small farms and local foods have discussed how to reach these stakeholders. One educator developed a survey and list of individuals that have small farms and/or are interested in local food systems. The survey was distributed to collect information about their educational needs and interests. In addition, educators with community and economic development responsibilities often help officials develop surveys for their residents to complete. Examples of surveys distributed this past year include a survey of interest in additional flood-related information, which was distributed to local officials attending a FEMA project meeting, and a community energy assessment survey. Results from these surveys provided access to information on issues that Extension might address.

County directors were given the combined results from their multi-county respondents to the statewide online survey of educational needs conducted in March of 2009. This survey 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 the 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
- Open Listening Sessions
- Use Surveys

Brief explanation.

In the Department of Animal Sciences, faculty members are assigned as liaisons to commodity organizations such as the Illinois Beef Association, the Illinois Pork Producers Association, and the Illinois Milk Producers Association, and attend meetings of the boards of these organizations. Input is then shared with the department head and with other faculty members. The department is also in frequent communication with representatives of public and private partners with whom faculty members have collaborative research arrangements or who are providing sponsored research funding. Using the Department of Crop Sciences as a second example; the department meets annually with their State Advisory Committee, which then submits a report to the department providing suggestions on the direction and future of the department.

The college Office of News and Public Affairs also plays a crucial role in informing stakeholders and soliciting input. Each year NPA distributes approximately 400 news releases with over 2,000 placements in publications such as Reader's Digest, Prevention, Parents, Prairie Farmer, Corn and Soybean Digest, Farmweek, and Farm Journal. NPA stories also appear in the Chicago Tribune, New York Times, USA Today, St. Louis Post Dispatch, Boston Globe, and locally in the Champaign-Urbana News Gazette. NPA also produces publications to share research and Extension findings with the public and invite feedback. Our most recent publication as of this writing, **ACES@Illinois**, was inserted into FarmWeek where it reached approximately 80,000 landowners in Illinois. The publication can be found online at: http://aces.illinois.edu/system/files/acesillinoiswinter2012.pdf. NPA also produces approximately 200 radio feature stories per year that are distributed to 60 outlets representing over 1,500 stations nationwide [as well as being featured locally on Illinois Public Media WILL AM 580].

Multi-county Extension Advisory Council members and local Extension volunteers provided advice on who should be targeted for an invitation to a specific program or a particular input opportunity. In addition, Extension staff members rely on their involvement in meetings with community collaborators and key leaders, who were both targets for input or for identifying other representative stakeholders to contact regarding identifying program opportunities. Community planning and economic development Extension activities also by their very nature 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
- Survey of 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.

As mentioned previously, the Associate Dean of Research plays a significant role in collecting stakeholder input. Stakeholders the Associate Dean of Research met with in 2011 included [but were by no means limited to] legislators at both the state and federal levels, leaders representing a cross-section of federal agencies and private industry firms, fellow Experiment Station Directors, attendees of the Illinois Soybean Association Outreach Summitt, Illinois Agriculture Legislative Day, the Farm Progress Show, the National Coalition for Food and Agriculture Research, the Biennial Conference on the Management of the Illinois River System, the General Electric/University of Illinois Food and Energy Summitt, and the Illinois Agricultural Association Annual Meeting. Input is then shared with and received from deans, department heads, faculty members, and other college and campus leaders.

In the Department of Crop Sciences, input from their State Advisory Committee is augmented by input from commodity groups, industry, community colleges, and high schools. In the Department of Agricultural and Biological Engineering, regular outreach and engagement activities are conducted that include participation from a diverse cross-section of stakeholders. As mentioned above, the most important lines of communication our college has with our stakeholders are the ones between faculty members and Extension educators and their funding partners, students, professional colleagues, seminar and event participants, and interested and concerned citizens.

As mentioned in section III-1, the Extension process has been limited in scope due to changes in Extension staff responsibilities and location. The process most often used was conversations proactively initiated by professional staff with current funders, key community leaders, Extension Council members, and Extension volunteers. Use of surveys with traditional and new audiences was limited. End-of-meeting surveys seeking suggestions were used, but limited, due to the uncertainty of the continuation and leadership for a given program.

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.

In the Department of Agricultural and Biological Engineering, the department holds Monday lunch meetings, faculty/staff meetings, administrative committee meetings, and Future Committee and Council Meetings [among others] to discuss stakeholder input and develop plans of action. In the Department of Animal Sciences, stakeholder representatives are often included on search committees for faculty positions. Stakeholder input is also carefully considered by the department in identifying emerging areas of importance for research and educational programming. In the Department of Crop Sciences, stakeholder recommendations are considered in faculty meetings and Departmental Advisory Committee meetings. In the Department of Food Science and Human Nutrition, recommendations from the External Advisory Committee have resulted in changes being

made at the department level.

External funding continues 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.

Input last year was used primarily to develop the local budget, to evaluate staffing positions, and to make decisions regarding office facilities. Staff members were encouraged to select three to five priorities to be reflected in a FY 2012 multi-county plan of work, but will likely have a better understanding of program needs to be reflected in revised plans created for FY 2013 as they expand their knowledge of the needs of residents in their geographic area of assignment.

Brief Explanation of what you learned from your Stakeholders

Commodity groups [representing swine, beef, corn and soybean producers] are consulted throughout the year by the Associate Dean of Research. Members expressed a great deal of interest in translational research and were very interested in activities conducted at ACES research and education centers [seven are located throughout the state]. Specific research areas of interest to members included crop variety trials, research related to converting corn to ethanol [led by the **Center for Advanced Bioenergy Research** - CABER], the development of guidelines for better utilizing distillers dried grains [DDG's] as an animal feed, and economic information developed and disseminated through **farmdoc** [farmdoc provides crop and livestock producers with round-the-clock access to information and analysis to better manage their farm business] and through FAST [the **Farm Analysis Decision Tool** aids users in performing financial analysis, assessing investment decisions, and evaluating the impacts of various management decisions]. Members expressed an interest in the importance of continuing to develop research focusing on needs within the state of Illinois while at the same time collaborating with other states in the North Central Region.

At the request of stakeholders in the region, Illinois has been an active participant [along with six other universities and federal partners such as the Natural Resources Conservation Service] in developing initiatives focusing on sustainability for the Upper Mississippi region.

The College also joined with partner institutions in the region in support of a study performed by the Battelle Memorial Institute titled **Power and Promise: Agbioscience in the North Central United States**. The report found strong support from stakeholders throughout the region for the contributions land grant universities make in 'conducting fundamental and applied research that leads to innovations,' providing the 'testing, piloting, and scale-up infrastructure for bringing new technologies to market,' providing outreach activities that 'translate new knowledge, techniques, and tools into the field,' and in educating the 'scientists, engineers, and other skilled specialists required to sustain global leadership.' The full report can be found at: http://www.uwex.edu/ces/nccea/documents/battellefull2.pdf.

Stakeholders expressed to ACES Department Heads that they highly value their interactions with ACES scientists and educators, as this two-way communication allows them to educate us on the problems they face as well as giving them access to research that can significantly impact their work and their lives. They consider the development of interdisciplinary research teams to solve current, complex issues and the translation of research findings to application to be their top overall priorities.

Extension stakeholders who serve as Extension volunteers remain strong supporters of the **4-H Youth Development Program** and **Master Gardener Program** and of a local physical presence in each county allocating financial resources to sustain that presence. They continue to be pleased with the quality of the programs in which they participate.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
9438001	0	6805963	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	7111235	0	6710573	0
Actual Matching	7111235	0	6710573	0
Actual All Other	64278193	0	36364914	0
Total Actual Expended	78500663	0	49786060	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	5751351	0	5808533	0

V. Planned Program Table of Content

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

V(A). Planned Program (Summary)

Program # 1

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%		10%	
401	Structures, Facilities, and General Purpose Farm Supplies	45%		15%	
402	Engineering Systems and Equipment	15%		20%	
403	Waste Disposal, Recycling, and Reuse	0%		15%	
404	Instrumentation and Control Systems	10%		15%	
405	Drainage and Irrigation Systems and Facilities	0%		15%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	5.0	0.0
Actual Paid Professional	1.3	0.0	3.2	0.0
Actual Volunteer	0.0	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**
71112	0	393414	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
71112	0	393414	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
642782	0	841547	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2011 included the development of algorithms for predicting biofilter media airflow performance based on media particle size distribution and base material composition [these algorithms will make biofilter design more robust and reduce errors in matching ventilation fans to media-filled biofilter containers]; the development of a new measuring system that, if commercialized, would dramatically decrease the cost of agricultural droplet size-measuring instruments and would allow Extension specialists to have a measurement system to bring with them into the field; the development of methods to automate tasks in the specialty crop area [we have already developed a 1/4 scale robotic system that can remove blossoms from fruit trees]; ongoing collaborations with several chemical manufacturers to develop best management practices for the application of new herbicide formulations; research that provides a database for future regulations on animal feeding operation emissions [chemical characterization of particulate matter emanating from animal confinement buildings can provide essential information for receptor modeling-based PM source apportionment as well as health effects assessment]; and the finding that, similar to livestock housing, the use of the **Fan Assessment Numeration System** unit to characterize greenhouse fan performance is a useful tool, especially for Extension educators and industry groups.

Conference presentations in 2011 included the American Society of Agricultural and Biological Engineers Annual International Meeting, Illinois Pork Expo, Agmasters, University of Illinois Agronomy Day, and the Institute of Biological Engineering.

Extension activities related to this planned program are interdisciplinary in nature and relate to other planned programs featured in this report [such as Sustainable Energy and Animal Health & Production]. A significant amount of 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 passing an exam every three years. One hundred eighty-three [183] livestock producers attended one of eight workshops and five completed the online five-part quiz series to meet training requirements.

With limited Extension specialist FTE's, Extension has chosen to expand outreach activities primarily through online education. 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 users to customize the plan to meet their needs and can be updated annually. Currently, fifteen producers are using the website to store 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 [just under 20,000 page views]; [2] **Small Farms Manure Management** website for individuals with less than 300 animal units [4,000+ page views]; and [3] **EZregs** for users who have established accounts to store their questions and Extension's responses related to identifying environmental regulations that pertain to specific agricultural and horticultural operations and practices in Illinois [just over 35,000 page views].

Equipment education efforts included O**peration S.A.F.E. Fly-in**, which was conducted in Illinois as well as other states by an Extension pesticide safety education staff member to ensure aerial applications of fungicides to corn are made accurately and safely. In Illinois, Extension worked with the Illinois Agricultural Aviation Association to check the spray pattern and droplet size of aircraft and adjustments were made to the aircraft setup if needed. Extension faculty and staff with agricultural engineering expertise have also provided leadership in programming that addresses sustainable energy [see Sustainable Energy Planned Program] and soil drainage research findings [see Global Food Security and Hunger and Natural Resources and the Environment Planned Programs].

2. Brief description of the target audience

Members of the target audience included agricultural engineers, consultants, researchers in the livestock industry, animal scientists, livestock producers, Extension specialists, manufacturers of ventilation fans and other livestock facility equipment, university researchers, state, local, and federal agencies focusing on air and water quality, chemical companies, instrument manufacturers, commercial ground and aerial applicators, crop producers, and landowners.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2573	2495	509	0

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

Year: 2011
Actual: 2

Patents listed
Variable Orifice Nozzle [TF07007-CON], LED Vision Based Portable Particle Size Measurement System [TF10131-PRO]

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	23	23

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2011	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number Of Subsurface Bioreactor Acres In Illinois
2	Producer Reported Changes/Improvement In Manure Management And Application Method To Reduce Odor
3	Development And Use Of A Manure Management Plan
4	Applicator Equipment Selection For Improved Disease Treatment And Air Quality
5	Development Of Improved Airflow Systems To Reduce Air Pollution In Livestock Facilities

Outcome #1

1. Outcome Measures

Number Of Subsurface Bioreactor Acres In Illinois

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	500

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nutrient runoff from agricultural fields into water bodies is of particular concern in the Midwest, where increased nitrate leaching into the Mississippi River has been identified as a major contributor to growing hypoxia in the Gulf of Mexico. There is a strong correlation between improved drainage and elevated nutrient transport from cropped land. Scientists recommend implementing a variety of practices that lead to a reduction of both nitrogen and phosphorus fluxes.

What has been done
To reduce nutrient loading from subsurface drained fields, we have been developing and promoting the use of fixed-bed, in-field subsurface bioreactors. A subsurface bioreactor is a buried trench with woodchips, or some other carbon source, through which the tile water flows before entering a surface water body. Organisms from the soil colonize the woodchips. Some of them break down the woodchips into smaller organic particles. Other microorganisms use the carbon produced by the woodchips as an energy source, and reduce nitrate to nitrogen gas, which exits the bioreactor into the atmosphere. Through this mechanism, nitrate is removed from the tile water before it can enter surface waters.

Results
We have proposed a protocol for the sizing of subsurface bioreactors and have developed an interactive routine in which this protocol has been implemented. We proposed that bioreactor sizing be based on 10-year, 24-hour peak monthly drain flow, and are developing a database of county-level soil, rainfall, and temperature information to determine these peak flows for states in the Midwest. This database is fully populated for Illinois, and is at various levels of completion for other states. The routine is available in the online version of the Illinois Drainage Guide.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
402	Engineering Systems and Equipment
405	Drainage and Irrigation Systems and Facilities

Outcome #2

1. Outcome Measures

Producer Reported Changes/Improvement In Manure Management And Application Method To Reduce Odor

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Development And Use Of A Manure Management Plan

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	133

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: [1] specific technologies and [2] the overall impact of livestock production on the surroundings.

What has been done
To improve manure management planning in the state, we designed a Comprehensive Nutrient Management Plan [CNMP] writing course for Technical Service Providers [TSPs] who act as consultants for livestock producers wanting to make manure-management system improvements on farms. Operators who haul and apply manure to cropland for hire are not regulated in Illinois, but we collaborate with other Great Lakes states on a voluntary training and certification program.

For the last two years, we have provided training for custom haulers in a system in Western Illinois. The group of about 25 haulers, environmental managers, and their employees represents a manure management capacity of approximately 500 million gallons of liquid manure per year. We are confident that the training we provide has enabled the group to better understand Illinois regulations as well as best practices for environmental protection while managing animal manure.

Results
So far in the 2011-2012 training season [which is about half completed at this writing], we have responses from 190 producers; 35% claim to have 'active' manure management plans. Another 35% say they have plans written but not updated regularly. The sum of the two, 70%, is a slight increase over the last cycle [63%]. Our Extension manure management plans website, Illinois Manure Management Plans [IMMP], is a free service to producers and provides a barometer of the plan writing activity in the state. Limited web usage data are available to IMMP site administrators, but we know that 64 new plans were created in 2010, 36 plans were modified in 2010, and the website had 18,550 total page views. Fifty-one new accounts were created in 2011-2012 and there were 10,295 page views in 2011. Last fall in the new TSP training course we trained ten TSPs, each of whom writes several CNMPs per year; we are advertising the CNMP course again for 2012. In 2011 we trained 8 employees to Level 1 [basic environmental protection, safety, and emergency response], and 13 management-level operators to Level 2 [more advanced nutrient management planning and site management].

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
141	Air Resource Protection and Management
403	Waste Disposal, Recycling, and Reuse

Outcome #4

1. Outcome Measures

Applicator Equipment Selection For Improved Disease Treatment And Air Quality

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In order to help applicators select the proper equipment and use it correctly, research is needed to determine what droplet size is best suited for different types of applications, how the various factors impact droplet size, and how to best mitigate drift under these application scenarios. Applicators need guidance on how to properly set up sprayers for lower volume applications in order to maintain the correct balance between efficacy and drift. There has been some recent work focusing on efficacy instead of drift reduction. Several projects have examined making effective applications to control Asian soybean rust. All of this work, however, focused on ground applications, which will be less effective than aerial applications in covering many acres of soybeans in a short time period as will be required should a large outbreak of Asian soybean rust occur. While there has been research conducted to improve the efficacy of aerial applications, much of it has focused on crops other than corn and soybeans, which are the two most important crops in Illinois.

What has been done

We conducted ten aerial application fly-ins in seven different states where the latest information on nozzle setups was discussed with all pilots who participated. We worked with several chemical manufacturers on developing best management practices for the application of new herbicide formulations. We also coordinated development of a drift mitigation module for the 2011 Professional Aerial Applicators Support System program.

Results

Results of studies conducted in 2009 and 2010 were evaluated by a cooperating chemical company, and they have decided to move forward with updating their labels to allow applications that will treat diseases in a more timely manner. Results from a study conducted in 2011 were evaluated by another chemical company. They have decided to move forward with additional larger-scale testing in 2012. If these results confirm what was seen in 2011, they will be making changes to their label to recommend a new nozzle type be used when applying their products.

4. Associated Knowledge Areas

KA Code	Knowledge Area
141	Air Resource Protection and Management
402	Engineering Systems and Equipment
404	Instrumentation and Control Systems

Outcome #5

1. Outcome Measures

Development Of Improved Airflow Systems To Reduce Air Pollution In Livestock Facilities

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This multi-state project is a collective effort to identify and develop technologies to improve the indoor air quality in animal facilities and thus improve the health and wellbeing of animals and human workers. At the same time, temperature and humidity will be controlled to ensure maximum production. This effort is focused on poultry, swine, and dairy buildings in U.S. The objectives of this project are: [1] develop and improve sustainable systems to improve indoor air quality and reduce air pollution emissions from poultry and livestock buildings; [2] quantify animal response to thermal environments and develop improved methods for providing productive thermal environments without degrading air quality or sustainability; and [3] develop and improve methods of optimizing energy and resource utilization in poultry and livestock facilities to increase profitability without degrading air quality or animal wellbeing.

What has been done
We have evaluated measurement procedures for airborne pollutants in confinement animal buildings [include NH3, H2S, and odor] and dust emissions. Efforts in Illinois this year have focused on measurement techniques of an airflow field using volumetric particle tracking velocimetry [VPTV]. A real-time three-dimensional particle tracking system has been developed to quantify an airflow field using parallel computing and a graphic processing unit [GPU].

Results
The VPTV technology will add a unique capacity by enhancing fundamental fluid dynamics research in areas of national interest, including flow visualization, climate change mitigation, chemical and biological defense, sustainable building design, and aerospace engineering. The VPTV instrument will fill a current gap in flow instrumentation capability by enabling the measurement of much larger scale flows than the existing measurement technology, such as PIV and point measurement systems. The expected outcomes from this project in the coming year will include algorithms and computing procedures for real-time measurement for >500 flow markers at 250 frames per second, a multi-camera calibration module, and real-time streaming modules including image processing, flow marker detection, and temporal tracking in 3D space.

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
- 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)

Evaluation Results

We worked with several chemical manufacturers on developing best management practices for the application of new herbicide formulations. Results of studies conducted in 2009 and 2010 were evaluated by a cooperating chemical company, and they have decided to move forward based on these results to update their labels to allow applications that will treat diseases in a more timely manner. Results from a study conducted in 2011 were evaluated by another chemical company. They have decided to move forward with additional, larger-scale testing in 2012. If these results confirm what was seen in 2011, they will be making changes to their label to recommend that a new nozzle type be used when applying their products.

Key Items of Evaluation

Manure management planning is a key component of environmental protection in livestock production. During the last three-year training workshop cycle [2008/09-2010/11], producers responded to an anonymous polling question about their manure management plans: My manure plan is: [1] in my head [14%]; [2] a work in progress [24%]; [3] written, but not updated regularly [25%]; or [4] written, updated annually and constantly used [38%]. We recognize that NRCS pays producers to write, or have a consultant write for them, a manure management plan, but too often the plan sits on the shelf [answer [3] 'written, but not updated regularly']. The #4 choice, 'written, updated annually and constantly used' is the desirable situation, and if the anonymous responses are to be believed, 38% of the 1,074 producers polled, or about 408, had active manure management plans by the end of the last three-year training cycle. We also poll the producers about the size of their facilities, and while the size ranges are not precise, a good estimate of the mean would be 750 animal units per facility.

V(A). Planned Program (Summary)

Program # 2

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	80%		20%	
603	Market Economics	0%		20%	
605	Natural Resource and Environmental Economics	0%		10%	
607	Consumer Economics	10%		20%	
610	Domestic Policy Analysis	0%		15%	
801	Individual and Family Resource Management	0%		15%	
806	Youth Development	10%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	15.0	0.0	17.0	0.0
Actual Paid Professional	2.7	0.0	10.9	0.0
Actual Volunteer	0.0	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**
149336	0	438677	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
149336	0	438677	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1349842	0	2375823	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities included recent modifications to **MarketMaker** [a searchable, multi-state database of members across the food supply chain among the cooperating **MarketMaker** states], including the development of an expanded seafood database, development of a unique portal focusing on agritourism, and development of a mobile web-app; research focusing on social media use in agriculture that led to an awarded proposal from the USDA Beginning Farmers and Ranchers Program in FY 2011; continued research on international and U.S. biotechnology law focused on policy and regulatory measures; an analysis of the incentives for voluntary environmental management and its effectiveness; a study of the patterns of consumer adoption of rain barrels in an urban setting to reduce water demand and flooding; a modeling of the economic and environmental consequences of groundwater management policies in Nebraska; the use of econometric methods to analyze the impact of protected areas on deforestation rates in biodiverse areas; econometric modeling designed to better understand the macro and micro forces affecting producer's specialty grain production decisions; research that impacted the nation's understanding of the effects of new technology on agricultural production; research focused on the potential for reducing transaction costs and marketing losses in Africa through new market institutions; and work to improve our understanding of factors that impact decision-making on both the supply and demand sides of the agriculture and food industries through econometric analysis.

Conference presentations in 2011 included the National Agricultural Credit Committee, Agricultural and Applied Economics Association, American Association of Agricultural Economists, Chapman University School of Law, American Agricultural Law Association, Newcastle University School of Law, Northeastern University Law Journal Symposium, Hamline University School of Law, Berkeley Bioeconomy Conference, European Agricultural Economics Association, University of Illinois European Union Center, International Agricultural Trade Research Consortium, International Federation of Operations Research Societies, and the Association of Environmental Resource Economists.

Several **Illinois Farm Economics Summits** and three **FAST [Farm Analysis Solution Tools]** training workshops were held throughout the state. The latter one-day hands-on workshops attended by 32 individuals included demonstrations of the **Crop Insurance Decision Tool** and the **Grain Farm Budget and Projection Tool**. Agricultural economics topics were also covered in the annual regional Extension workshops focused on crop and dairy production. Risk management is a topic addressed in a number of programs including the **Central Illinois Farm Beginnings Program**.

An Extension faculty member provided oversight for the **Center for Economic & Financial Education**, offering integrated research and Extension education related to consumer economics through educational conferences, training, and resources for teachers and financial professionals. The center

partnered with the Council for Economic Education with funding from the United States Department of Education Office of Innovation and Improvement to support the **7th Annual Financial Fitness for Life Training Conference** that showcased the newly-revised **Financial Fitness for Life** curriculum. Guest speakers from the financial industry, state agencies, and area businesses discussed pressing financial issues. The center also promoted the **3rd Annual K-12 Teacher Conference on Financial Literacy** and **Jump$tart 5th Annual Financial Literacy Conference** for K-12 teachers and financial literacy practitioners**.** Revisions were also made to **Welcome to the Real World**, a simulation that gives students [age 12 through young adults] introductory-level instruction on money management.

2. Brief description of the target audience

Members of the target audience include all participants in the food supply chain, practicing lawyers and academic lawyers in the U.S. and abroad, retail distributers of natural and organic products, government regulatory agencies, water resource managers, and private firms with agricultural interests.

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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4598	1372	4598	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	42	42

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2011	1

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	Number Of Web Hits On The Varietal Information Program For Soybeans Website
4	Number Increased Knowledge Of The Costs Of Independent Living
5	Number of Actions Taken To Plan For Long-Term Care And Retirement
6	Number Applying Skills In Managing Limited Financial Resources
7	Number Making Decisions To Reduce Risk In Agriculture Production
8	Connecting Food Producers To Markets Through MarketMaker

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	Actual
2011	5400000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The goal of these tools is to provide farmers with expert advice on insurance product selection. These second-generation tools will be part of the iFARM collection of tools that is available in the crop insurance section of farmdoc [www.farmdoc.uiuc.edu]. The tools will include a yield analyzer, an insurance plan selector, and a marketing-crop insurance selector.

What has been done
A FAST Microsoft Excel spreadsheet entitled The Crop Insurance Decision Tool was modified to more accurately evaluate risk and returns associated with alternative crop insurance and marketing decisions. This spreadsheet is available for download from the FAST section of farmdoc. Most of the efforts in 2011 were associated with the addition of the Trend Adjusted Yield endorsement. Also, a Planting Decision Model spreadsheet was developed to evaluate late and prevented planting decisions.

Results
The Crop Insurance Decision Tool and Planting Decision Model were used by many decision makers in the Corn Belt. These two tools were downloaded over 2,200 times from the farmdoc website. Material related to the decision tool was also accessed through the crop insurance section of farmdoc. During 2011, many of the decisions centered on the introduction of the COMBO product and the new insurance plans contained within that policy.

4. Associated Knowledge Areas

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

603 Market Economics
605 Natural Resource and Environmental Economics

Outcome #2

1. Outcome Measures

Knowledge Of Practices That Affect Your Credit Rating

Not Reporting on this Outcome Measure

Outcome #3

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	Actual
2011	129872

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Varietal Information Program for Soybeans database annually provides Illinois soybean producers and agribusinesses with unbiased soybean variety production information for over 500 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 thirteen 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, Illinois soybean producers attending production meetings were asked to suggest varieties to be evaluated in the 2011 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 thirteen 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 thirteen possible trial locations. Scientists at both the University of Illinois and Southern Illinois University worked together to screen varieties for resistance to pest species relevant to Illinois soybean producers. 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 2011 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 2011 has been added to the VIPS website. This includes yield, protein, and oil content information for 510 varieties from 42 seed companies. 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, four biotypes of soybean cyst nematode, and sudden death syndrome.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Number 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	Actual

2011 209

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 independent adults.

What has been done
Annually, Extension field staff members in sixteen counties provide Welcome to the Real World training and curriculum materials for teachers and a simulation for their middle and high school students that allows 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 typically included in a family budget, such as housing, utilities, food, transportation, insurance, and child care. This year Youth Development and Consumer and Family Economics Extension Educators conducted 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 490 [70.4%] of the 689 student participants at five locations in the state. The evaluation was designed to identify increased knowledge of financial management.
The evaluation 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 students responding to the related questions indicated that they already knew how to complete the list of six tasks or skills. However, 198 [40.4%] reported learning how to balance income and expenses, 209 [42.6%] learned how to balance a checkbook, 170 [34.7%] learned how to write a check, 178 [36.3%] gained skill in keeping track of savings, 173 [35.3%] learned how to open a savings account, and 132 [26.9%] gained skill in exploring career possibilities.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Number of Actions Taken To Plan For Long-Term Care And Retirement

Not Reporting on this Outcome Measure

Outcome #6

1. **Outcome Measures**

Number Applying Skills In Managing Limited Financial Resources

Not Reporting on this Outcome Measure

Outcome #7

1. **Outcome Measures**

Number Making Decisions To Reduce Risk In Agriculture Production

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

Connecting Food Producers To Markets Through MarketMaker

2. **Associated Institution Types**

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	850000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The MarketMaker platform is a searchable, multi-state database of members across the food supply chain among the cooperating MarketMaker states. The data is geospatially referenced information that has been aggregated through a collaborative effort among the MarketMaker state partners. It is the largest searchable food marketing database of its kind and includes rich farmer/producer data that does not exist elsewhere.

What has been done

Recent activities include the development of an expanded seafood database, development of a unique portal focusing on agritourism that is currently being piloted in South Carolina, development of the Market Ready curriculum [at the University of Kentucky] to increase the number of farmers with the credentials to sell into complex markets, implementation of a train-the-trainer method to create a core of qualified Extension educators to bring the curriculum to farmers in each of the MarketMaker states, development of a mobile web-app, and the development of a widget that allows data to be shared and searched on other web sites and allows the data to be parsed out by geography, product interest, or product characteristics.

Results

In the past year, MarketMaker expanded into Alabama and Texas. Additionally, Wyoming MarketMaker is currently under development. The addition of Alabama and Texas gives MarketMaker a presence in 52% of the U.S. population. The database has grown to more than half a million businesses [including more than 2,500 farmers markets and nearly 1,000 agritourism businesses], as well as farmers, processors, wholesalers, buyers, and retailers. We have approximately 70,000 visitors to our site a month, with well over 1 million hits per month. MarketMaker has been recognized by Feeding America as a source of information to locate food for the hungry. A single food bank in Michigan sourced over 6.1 million pounds of produce in 2010. A single e-mail blast in western Michigan resulted in over 50,000 pounds of produce donations in September 2011. The MarketMaker platform will continue to serve as a resource for millions of pounds of food to feed the hungry in cooperation with Feeding America and their affiliated food banks.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

At the end of the **Welcome to the Real World** simulation, evaluation forms were completed and collected from 490 [70.4%] of the 689 student participants at five 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], students rated the simulation on four factors -- interest, useful information, helpful activities, and helpfulness for the future. The ratings results for each of these factors averaged 2.6 or higher for the students who completed the survey. The rating averages for the five locations varied and were likely related to the age/grade level or classroom exposure to the curriculum materials prior to the simulation.

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 students responding to the related questions indicated that they already knew how to complete the list of six tasks or skills. However,

- 198 [40.4%] reported learning how to balance income and expenses
- 209 [42.6%] learned how to balance a checkbook
- 170 [34.7%] learned how to write a check
- 178 [36.3%] gained skill in keeping track of savings
- 173 [35.3%] learned how to open a savings account
- 132 [26.9%] gained skill in exploring career possibilities.

A follow-up evaluation distributed two weeks after the simulation was completed by 125 students [50% of the participants at three locations]. Sixty-four [51.2%] indicated they had increased their knowledge about what it costs to maintain a household. When asked to provide an assessment of the importance of various factors, 70 students [56%] assigned increased importance to having a spending plan that included both needs and wants, 69 [53.2%] assigned increased importance to saving their money regularly, and 44 [35.2%] indicated they were likely to change their behavior by saving more regularly.

Key Items of Evaluation

Simulations help youth recognize the challenges of independent living. There is a need to determine the scope of the use of curriculum materials in the schools where the simulation was conducted.

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 FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	10.0	0.0	28.0	0.0
Actual Paid Professional	3.7	0.0	19.2	0.0
Actual Volunteer	0.0	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**
199115	0	1427096	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
199115	0	1427096	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1799789	0	7073402	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2011 included physical, chemical, and biological characterizations of particulate matter from confinement livestock buildings; high-density single nucleotide polymorphism [SNP] discovery, validation, and characterization in swine; the use of next-generation sequencing methods to explore the fine-grained structure of the microbial communities and functional gene content in the fiber-adherent microbiome of the bovine rumen; a horse manure composting program that has built stakeholder involvement; biofilter studies that are now better able to predict ammonia removal based on media moisture content and ammonia loading history; research that has allowed us to develop new tools for teaching biofilter design and management to producers, contractors, consultants, agencies, and other stakeholders; the finding that use of modified wet distillers' grains with solubles in diets for dairy cows could be increased by over four times the level of current practice if rations are prepared using the proprietary **Keenan MechFiber TMR** [total mixed ration] mixer technology; a study that established a new procedure for assessing brain growth and development in pigs; and an improved understanding of the molecules on the porcine oviduct that bind sperm [we have learned that binding to these sugars also affects sperm behavior, lifespan, and sperm maturation].

Additional research activities in 2011 included the finding that the problem of osteochondrosis in foals presents much earlier than initially thought; a study on the ambient conditions that finishing pigs experience during transport [an indication that the results of this research are being applied by the industry is illustrated by the levels of transport losses experienced by the production system in which these studies were carried out]; findings of the beneficial effects of dietary spray-dried plasma [SDP] on reproduction of stressed females that could lead to marked improvements in the reproductive performance of sows and other animals; advancement in the technologies for the practical use of cryopreserved boar sperm to improve opportunities for profitable pork production; research results that provide hope that small molecule natural products such as L-PUFA or CDPK inhibitors will be valuable for the development of new drugs that show broad efficacy for the treatment of apicomplexan parasitic diseases; results that will be useful for stakeholders as they develop integrated management strategies to mitigate potential adverse impacts associated with the reuse of concentrated animal feeding operation wastewater; and research with the goal of developing a PRRSV virus as a potential vaccine vector to deliver protective antigens for important pig diseases.

Conference presentations in 2011 included the American Society of Agricultural and Biological Engineers, National Science Foundation - National Science Council Summer Institute on Biosensing and Bioactivation, University of Illinois Cell and Molecular Biology Training Grant Symposium, American Society of Animal Science, American Dairy Science Association Discovery Conference on Milk Composition, Investigator Meeting of the Consortium for Functional Genomics, Gordon Conference on

Fertilization and Activation of Development, 44th Annual Meeting of the Society for the Study of Reproduction, Keystone Symposia on Molecular and Cellular Biology - Stem Cells in Development, Tissue Homeostasis and Disease, 2011 Midwest Swine Nutrition Conference, Pig International Congress, Poultry Science Association - American Association of Avian Pathologists Program, 2011 Naturally Illinois Exposition, International Society for Applied Ethology, Society for the Study of Reproduction, and the Specialized Cooperative Centers Program in Reproduction Research Women's Health Conference.

The use of technology is a growing delivery system for Extension programs addressing animal production and health. **The Illinois Livestock Trail** website is one source for information related to livestock production and manure management. A series of monthly swine production webinars reached 45 producers over the year with topics that addressed reproduction, industry issues and policies, facilities, grow-finish, and management delivered by seven campus specialists. The Extension educator with livestock responsibilities in southern Illinois organized a series of twelve weekly webinars in January, February, and March targeted to meet the needs of cattle, hair sheep, and goat producers. Thirty-five [35] participants interacted with various specialists who addressed topics that included animal behavior, genetic selection, predator control, animal health, nutritional problems, soil and forage, and marketing**. Illinois Horse Breeders Short Course, Illinois Dairy Days**, and **Pet Extravaganza** are examples of programs that were delivered by Extension staff to audiences at campus and off-campus sites.

A number of Extension campus faculty and staff members help conduct horse, poultry, dairy, meat, and livestock judging contests for 4-H members. Other 4-H activities included a youth swine seminar held at the state **Pork Expo**, the state **Dairy Quiz Bowl**, regional and state **Horse Bowl/Hippology**, and speech contests. The Extension faculty specialist in poultry taught teachers how to use the curriculum and incubators for the 4-H chick incubation and embryology project in 53 classrooms during the 2010-11 school year. In addition, Illinois 4-H and FFA members completed the seven modules of the online **Quality Assurance and Ethics Certification** training and quiz 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 animal scientists, farmers, livestock producers, consultants and researchers in the livestock industry, the scientific community, local, state and federal agencies [such as IEPA, USEPA, IDOA, and USDA], Extension educators, students, animal farm operators, conservationists, industry firms related to air quality control technologies, agricultural and environmental engineers, reproductive biologists, dairy farmers, nutrition consultants, technical employees of feed and nutrition companies, veterinarians, commercial egg producers and poultry nutritionists, researchers and vaccine developers focusing on porcine reproductive and respiratory syndrome virus, and diagnostic laboratories focusing on virus isolation.

Extension activities targeted livestock producers, custom manure haulers, regulatory agency representatives, livestock commodity group representatives, horse owners and breeders, the livestock feed industry, companion animal owners, community leaders, and youth.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3528	10972	24478	0

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

Patent Applications Submitted

Year: 2011

Actual: 3

Patents listed

Composition And Method For Facilitating The Internalization Of A Therapeutic Agent Into A Cell [TF08051-DIV], Carbohydrate Binding Molecule With Affinity For Insoluble Xylan [TF09087-US], Thermostable Enzyme Mix For Hydrolysis Of Mannan Containing Polysaccharides [TF10025-US]

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	1	74	75

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Research Projects

Year	Actual
2011	7

Output #2

Output Measure

- Number of Youth Completing Livestock Ethics Training

Year	Actual
2011	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased Knowledge Of Livestock Care And Management
2	Utilization Of Waste Management Tools Such As The Illinois Manure Management Plan Workbook And Website
3	Minimizing The Harmful Influences Of Particulate Matter Emitted From Confinement Feeding Animal Operations
4	Development Of An International Single Nucleotide Polymorphism Map For The Pig
5	Lowering Feed Costs Through Increased Use Of Modified Wet Distiller's Grains With Solubles
6	Improved Production And Tracking Of Individual Livestock Embryos In Vitro
7	Development Of A New Procedure For Assessing Brain Growth And Development In Pigs
8	Reduced Finishing Pig Transport Losses
9	Improved Reproductive Performance Of Sows Through The Use Of Spray-Dried Animal Plasma
10	Accurate Identification Of Angus Cattle Carriers Of Contractural Arachnodactyly
11	Development Of Improved Vaccines For Porcine Reproductive And Respiratory Syndrome Virus

Outcome #1

1. Outcome Measures

Increased Knowledge Of Livestock Care And Management

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1268

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Humane care of animals helps to 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 1,268 youth were certified.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection
806	Youth Development

Outcome #2

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Minimizing The Harmful Influences Of Particulate Matter Emitted From Confinement Feeding Animal Operations

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Particulate matter [PM] emitted from confinement animal feeding operations [CAFOs] contains harmful components that can have an adverse influence on human and animal health as well as the environment. State and federal air quality regulations are becoming increasingly stringent, including restrictions on particulate matter concentrations and emissions. These regulations and their application should be based on scientific research of particulate properties and their potential health effects, for which we have only a limited understanding. The long-term goal of our research is to establish a comprehensive database of PM properties emitted from CAFOs so that adverse health and environmental effects can be assessed and appropriate mitigation technologies can be developed and deployed.

What has been done
The outcomes generated from this project will greatly benefit U.S. agriculture and our society. Through a systematic investigation on 18 different livestock farms, valuable data have been obtained on the biological, chemical, and physical properties of particles from livestock facilities.

Results

The data derived from this project will fill the voids in existing literature, enhance our understanding of the science and implications of PM emissions from livestock facilities, and benefit the development of technologies for air pollution monitoring, prevention, and mitigation for typical confinement animal feeding operations [CAFOs]. This preliminary PM database provides critical background knowledge for future studies in dispersion modeling, source apportionment, and health effects evaluation, and produces useful data for the development of regulations and control strategies on PM exposures and emissions.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Development Of An International Single Nucleotide Polymorphism Map For The Pig

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The pig is the only major agricultural animal that does not have an international SNP Consortium or SNP map. This project unites many experts to focus on the identification of SNPs and the production of a publicly-available genotyping platform. The development of a SNP chip would permit genome scans for the identification of quantitative trait loci [QTL] and the elucidation of linkage disequilibrium within relevant commercial populations.

What has been done
Activities included: [1] creation of pooled libraries of relevant pig germplasm and the creation of reduced representation libraries to reduce the sequence complexity of libraries targeted for sequencing; [2] utilization of Solexa sequencing to select new SNPs with high minor allele frequencies [>0.05] uniformly distributed across the genome; [3] validation and characterization of

SNPs in relevant commercial populations; [4] construction of haplotypes and LD maps; and [5] development of a SNP RH map to correctly order SNPs and swine genome sequence assembly.

Results
The Illumina porcine SNP chip was developed, tested, and made available to the research community. Overall, the results of this study indicate the utility of using next-generation sequencing technologies to identify large numbers of reliable SNPs. In addition, the validation of the Porcine SNP60 Beadchip demonstrated that the assay is an excellent tool that will likely be used in a variety of future studies in pigs. Discussions are underway for additional smaller chips to be developed for studying specific target areas.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals
305	Animal Physiological Processes

Outcome #5

1. Outcome Measures

Lowering Feed Costs Through Increased Use Of Modified Wet Distiller's Grains With Solubles

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Use of distillers' grains with solubles [DGS] in diets for dairy cows is severely limited in the field by the concern about milk fat depression, which is a function of the residual oil content in DGS and its negative effects on rumen function. Typical inclusion rates for DGS would be only 5% to 7% of total ration dry matter [DM]. A novel on-farm ration preparation apparatus, the Keenan MechFiber TMR mixer, has been shown to optimize feed utilization in the rumen. Our hypothesis was that much larger amounts of modified wet DGS [MWDGS] could be fed to dairy cows if the rations were prepared with the Keenan system compared with the more common vertical auger mixer.

What has been done

We fed lactating Holstein cows diets containing 10%, 20%, or 30% of the total DM as MWDGS in rations that were mixed by either a Keenan MechFiber mixer or a Knight-Kuhn vertical mixer. As MWDGS content of the diet increased, cows fed with the vertical mixer experienced severe depression of milk fat production, which would be a major economic loss to dairy farmers. However, the same diets prepared in the Keenan mixer caused little change in milk composition. Furthermore, when rations containing greater amounts of MWDGS in the diet were mixed with the Keenan mixer, the content of several fatty acids that are believed to have positive effects on human health were increased in milk. The Keenan mixer produced rations that were more consistent and less variable. Our research also found several subtle changes in the rumen environment and in digestive processes that may help to explain the differences between mixer systems in the effects on milk composition.

Results

Economic analysis indicated that increased use of MWDGS lowered daily feed cost. For rations prepared in the Keenan mixer, income over feed cost was increased or maintained as MWDGS was increased but decreased with greater MWDGS when fed with the vertical mixer. Our results indicate that use of MWDGS in diets for dairy cows could be increased by over four times the level of current practice if rations are prepared using the proprietary Keenan technology.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Improved Production And Tracking Of Individual Livestock Embryos In Vitro

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Production and tracking of individual embryos in vitro would be a useful technique for many purposes. In vitro embryo production includes multiple steps, including oocyte in vitro maturation [IVM], in vitro fertilization [IVF], and in vitro embryo culture [IVC]. The objective of this study was to evaluate the effect of a novel microfluidic system in both a dynamic and static environment for individual oocyte IVM, on oocyte nuclear maturation, and on developmental competence after standard IVF/IVC.

What has been done

Microfluidic well inserts can mature a large number of oocytes individually and each oocyte can be tracked easily. Each insert is fabricated of polydimethylsiloxane and is composed of microwells. Each microwell is connected to adjacent microwells via microchannels underneath the surface of the inserts, allowing communication to occur between individual cumulus oocyte complexes. To create a dynamic culture environment, the culture dish was placed on a rocking platform inside the incubator with a speed of 10 rpm during maturation. Oocytes were matured in either the microfluidic well system or control conditions and in dynamic or static culture environments. For fertilization, gametes were co-incubated and then cultured for six days, when cleavage, blastocyst development, and blastocyst cell number were determined. Data were analyzed by ANOVA for balanced data with culture system [microfluidic well or control] and environment [dynamic or static] as fixed factors, and differences determined by a Bonferroni [All-Pairwise] Multiple Comparison Test. The percentage data was arcsin transformed. There were no significant differences among percentage of nuclear maturation, percentage of embryonic cleavage, or blastocyst total cell number between treatments. Blastocyst development was significantly decreased when oocytes were matured in this dynamic environment compared to a static environment. Importantly, the blastocyst development of oocytes matured in the microfluidic well system was equal to that of oocytes matured in standard control conditions.

Results

A dynamic environment during oocyte maturation in either standard or microfluidic well systems was detrimental to blastocyst formation. The microfluidic well system can successfully mature oocytes individually without compromising blastocyst formation after IVF/IVC. These results demonstrate that this microfluidic system provides an efficient way to successfully mature oocytes individually. Further work in optimizing this microfluidic system for individual egg fertilization and embryo culture will provide the opportunity to fully integrate each step of individual in vitro embryo production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
303	Genetic Improvement of Animals
315	Animal Welfare/Well-Being and Protection

Outcome #7

1. Outcome Measures

Development Of A New Procedure For Assessing Brain Growth And Development In Pigs

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Neonatal infection is a risk factor for aberrant behavior later in life. Mounting evidence indicates that inflammatory mediators produced by the immune system during infection affect brain development, reducing the ability to adapt successfully to acute stress or adversity later in life. Less resilient animals experience exaggerated or prolonged physiological and psychological responses to mild or innocuous stressors. Thus, the exaggerated stress response in less resilient animals adds to the allostatic load, creating wear-and-tear to the body and brain, and resulting in ill health. In pigs it negatively impacts animal well-being, reduces production efficiency, and leads to pre- and post-slaughter losses. The developmental origins of the loss of resilience owing to infection during pregnancy are poorly understood.

What has been done
Studies this year focused on developing a magnetic resonance imaging [MRI] protocol that can be used to investigate how PRRSV infection in neonatal piglets affects brain development. Anatomic MRI data [non-longitudinal] were acquired for six piglets each at two weeks and five weeks of age using a three-dimensional T1-weighted MPRAGE sequence on a MAGNETOM Trio 3T imager. Manual segmentation was performed for volume estimations of total brain, cortical, diencephalon, brainstem, cerebellar, and hippocampal regions. Hippocampal volumes were also estimated by postmortem histological analysis using the Cavalieri method with planimetric analysis. Strong correlations were found between the hippocampal volume estimates using MRI and the histological section estimates of hippocampal volume, indicating that accurate volumetric measurements can be obtained using this MRI protocol. In addition to developing and validating MRI methods for estimating brain volume, the present study also provides evidence of substantial brain growth during this early period. The results indicate that MRI can provide accurate estimates of brain region volume changes over time during the neonatal period in piglets. The ability to use MRI in longitudinal studies may be useful for understanding the effects of experimental factors on brain growth and development.

Results
The present study established a new procedure for assessing brain growth and development in pigs. In the postnatal period the pig's brain is malleable because it undergoes rapid growth and development. Mounting evidence indicates that inflammatory mediators produced by the immune system during infection may affect brain development, reducing an animal's ability to adapt successfully to acute stress or adversity later in life. This can negatively impact animal well-being, reduce production efficiency, and lead to pre- and post-slaughter losses. Infectious disease is common in commercial swine production. Understanding how viral infection affects brain development and behavior is important.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
305	Animal Physiological Processes
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #8

1. Outcome Measures

Reduced Finishing Pig Transport Losses

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There has been limited research carried out to date under typical U.S. climatic conditions to characterize the ambient conditions that finishing pigs experience during transport from the farm to the processing plant and on factors that could influence those conditions. To a large extent, this reflects the difficulty of obtaining appropriate and accurate measures of ambient conditions on a moving vehicle that is carrying a full load of animals. The research carried out as part of this project is some of the first to be undertaken in North America and, for the first time, gave detailed information on the ambient conditions during transport across the range of climatic conditions

experienced in that area of the world. There is strong evidence that the results of this research are already being applied by the swine industry to improve conditions for pigs during transport, with a consequent reduction in transport losses, which is positive from both animal welfare and economic perspectives.

What has been done

The research reported as part of this project was carried out in collaboration with two commercial companies. A swine production company provided access to pigs and to transportation vehicles and a major swine processor allowed access to facilities to monitor the pigs after arrival at the processing plant. Two studies were carried out over the duration of this project. The first study investigated the effects of floor space during transport [comparing floor spaces of between 0.396 and 0.520 m2/pig] and journey time from the farm to the processing plant [comparing journey times of <1 /hour compared to >3 hours] on ambient conditions on the trailer during the journey and on transport losses [dead and non-ambulatory animals] on arrival at the plant. The second study monitored environmental conditions on a typical swine transport trailer during journeys from the farm to the processing plant. This study was carried out to provide detailed measurements of the ambient conditions experienced by harvest weight pigs during the transportation process. Both studies were carried out in the Midwestern U.S. in all four seasons to allow data to be collected across the range of climatic conditions typical of this area of the world. These two studies generated data on conditions on swine trailers on typical journeys from the farm to the plant and on two factors [transport floor space and journey time] that can influence both the environment experienced by the pigs during the journey and, also, losses of animals on the trailer.

Results

Perhaps the most significant indication that the results of this research are being applied by the industry is illustrated by the levels of transport losses experienced by the production system in which these studies were carried out. In studies that were carried out prior to the initiation of this project, the level of transport losses [dead and non-ambulatory pigs] in harvest weight pigs in this production system during journeys from the farm to the plant averaged around 1.3% of pigs transported. In contrast, in the study of the effects of floor space on the trailer and journey time on transport losses carried out as part of this project, total transport losses average 0.24% of pigs transported. Arguably, this improvement occurred because of the adoption by the production company of improved transport management practices that were developed as a result of this research and other related studies.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Improved Reproductive Performance Of Sows Through The Use Of Spray-Dried Animal Plasma

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Our reading of the literature led us to hypothesize that inflammation would impair reproductive processes and reduce reproductive performance of pigs and other animals, and that feeding spray-dried animal plasma [SDP] would alleviate the inflammation and its detrimental effects. We conducted a series of studies using mice as an experimental model.

What has been done
Our approach was to feed diets with or without 8% SDP to pregnant mice for two weeks, then stimulate inflammation by injection of lipopolysaccharide [LPS]. We found, as expected, that LPS caused inflammation and that SDP alleviated it. The LPS caused a high rate of loss of pregnancy, but SDP did not alter that response. The more important response in this experiment was that the pregnancy rate of mice shipped from the supplier on the first day after mating for arrival at our laboratory two days later was very low if the mice were fed the control diet but dramatically increased in mice fed SDP. A further study confirmed this response and showed that levels of SDP as low as 1% of the diet produced the benefit. Levels of cytokines and an acute-phase protein indicated some degree of inflammation in the mice upon arrival at our laboratory, which decreased slightly in control animals and sharply in those fed SDP during subsequent days. Of particular note, pregnancy was improved dramatically by feeding SDP for only one day. We have identified impacts of porcine reproductive and respiratory syndrome [PRRS] on expression of several critical genes, using microarrays with confirmation by quantitative polymerase chain reaction [PCR]. Further, we have identified those genes on which the impacts of PRRS are modified by feeding Actigen, a yeast-based feed additive. We found that feeding specific plant extracts to pigs experimentally challenged with PRRS reduced markers of inflammation, consistent with our previous in vitro data. Some plant extracts reduced the amount of the PRRS virus in serum of pigs after challenge.

Results
Our findings of the beneficial effects of dietary spray-dried plasma [SDP] on reproduction of stressed females may well lead to marked improvements in reproductive performance of sows and other animals. The overall result would be increased efficiency of use of scarce resources for production of the food needed by the world's people. Our finding that SDP reduces inflammation of stressed animals directs attention to stressful conditions. Considerably more research will be needed to clarify the benefits and optimize the use of SDP, but it seems likely that sows in commercial pork production are often subject to various stressors and that feeding SDP may improve their reproductive performance under those conditions. For example, our results may explain the empirical data suggesting that feeding SDP to sows during the heat stress

experienced in summer increases farrowing rate. Future research may suggest other stressful situations in which SDP may be beneficial.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
315	Animal Welfare/Well-Being and Protection

Outcome #10

1. Outcome Measures

Accurate Identification Of Angus Cattle Carriers Of Contractural Arachnodactyly

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	50000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Contractural arachnodactyly [CA] is a genetic defect that has been reported in Angus cattle. Based on pedigree examination of affected calves, this genetic defect was determined to have an autosomal recessive mode of inheritance. Due to this recessive inheritance pattern, only calves that are homozygous for the mutation causing CA are affected with multiple abnormalities [most often with contractures or joint laxity]. The condition is semi-lethal in that most calves survive yet have significantly reduced performance. Some calves born under extensive management will succumb to environmental stressors and fail to survive. Classification of normal-appearing individuals is virtually impossible in the absence of planned breeding studies or test matings. The accurate identification and subsequent selection against carriers of the mutation is the only method that can be used to eliminate this genetic defect from the population without concurrent loss of germplasm due to culling based only on pedigree.

What has been done
The development of a method to accurately and efficiently determine the genotype status of an individual is dependent on understanding the molecular basis of the defect. The mutation causing

CA has been identified as a deletion of approximately 54,000 base pairs. This deletion encompasses the 3' end of the bovine ADAMTS-like 3 [ADAMTSL3] gene and the intergenic region between ADAMTSL3 and the elongation factor Tu GTP-binding domain containing 1 [EFTUD1] genes. This deletion removes the last four exons of bovine ADAMTSL3 and thus, a complete loss of function of ADAMTSL3 would be expected due to the absence of full-length protein when an animal is homozygous for the deletion-containing chromosome. Very little is known about the function of ADAMTSL3 in mammals, although it has been implicated in the control of human height. This role would be consistent with CA disease pathology, where affected calves are significantly taller than their normal siblings. Hypotrichosis or hairlessness can be found in several breeds of cattle. Previously, we have identified a mutation in the bovine keratin 71 [KRT71] gene that is responsible for recessive hypotrichosis in Hereford cattle. However, the condition has also been reported in Belted Galloway cattle with the same mode of inheritance. Although the pathology in Belted Galloway calves is remarkably similar to that of Hereford calves, Galloway calves do not share the same KRT71 mutation. A genome-wide association analysis was conducted and the locus causing hypotrichosis in Galloway cattle was mapped to chromosome 29. Resequencing of several candidate genes in the region has resulted in the identification of a mutation in the hephaestin-like protein 1 [HEPHL1] gene. The A-to-T transversion results in the conversion of a lysine codon to a termination codon resulting in premature truncation of the protein. Using the DNA sequence information that has been generated, a DNA-based diagnostic test has been developed that accurately determines an individual's genotype.

Results

Using the DNA sequence information that has been generated for contractural arachnodactyly [CA] and hypotrichosis [HYG], DNA-based diagnostic tests have been developed that accurately determine an individual's genotype. To date, more than 50,000 Angus and Angus-derivative cattle have been genotyped for the CA mutation. More than 500 Belted Galloway cattle have been genotyped for the HYG mutation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
303	Genetic Improvement of Animals
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

Outcome #11

1. Outcome Measures

Development Of Improved Vaccines For Porcine Reproductive And Respiratory Syndrome Virus

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
We expect this project to have a significant impact on the diagnosis as well as on the study of the biology of PRRS virus. The ZMAC cell line [a porcine alveolar macrophage cell line developed in our laboratory] represents a major technical advancement that has improved the technology used to study the biology of PRRS virus. The knowledge that will be gained by the use of this cell line will very likely have a direct impact on policies to deal with the disease caused by this virus.

What has been done
Porcine reproductive and respiratory syndrome virus [PRRSV] expresses proteins that circumvent the type I IFN response and other cellular processes, and to compensate the small coding capacity of PRRSV, these proteins are multifunctional. Our research suggests that PRRSV Nsp1-alpha and NSP11 are multifunctional nuclear proteins participating in the modulation of the host IFN system. Our research also suggests that PRRSV is inhibiting the ability of porcine macrophages to produce IFN-a in response to infection by interfering with the activation of the transcription factor IRF-3 but not NFkB. Our data firmly confirm the important notion that GP3 may be involved in inducing neutralizing antibodies.

Results
Collectively, our work aimed at deciphering the transcriptional and cytokine responses of cells as porcine alveolar macrophages to PRRSV infection will likely lead to the development of strategies to develop better vaccines against this costly disease.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- 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)

Evaluation Results

Research was conducted to gain detailed information on the ambient conditions pigs experience during transport. There is strong evidence that the results of this research are already being applied by the swine industry to improve conditions for pigs during transport, with a consequent reduction in transport losses, which is positive from both animal welfare and economic perspectives. Perhaps the most significant indication that the results of this research are being applied by the industry is illustrated by the levels of transport losses experienced by the production system in which these studies were carried out. In studies that were carried out prior to the initiation of this project, the level of transport losses [dead and non-ambulatory pigs] in harvest weight pigs in this production system during journeys from the farm to the plant averaged around 1.3% of pigs transported. In contrast, in the study of the effects of floor space on the trailer and journey time on transport losses carried out as part of this project, total transport losses average 0.24% of pigs transported. Arguably, this improvement occurred because of the adoption by the production company of improved transport management practices that were developed as a result of this research and other related studies.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

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 FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	30.0	0.0	3.0	0.0
Actual Paid Professional	6.6	0.0	3.6	0.0
Actual Volunteer	0.0	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
362673	0	441581	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
362673	0	441581	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
3278188	0	573172	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2011 included development of the **Survey of Household Finances and Childhood Obesity** [the first dataset to compile information on financial stress, childhood obesity, and financial management skills]; a half-day conference devoted to meal time assessments and discussion of future directions [topics included review of key constructs of family meal times, an overview of the effects of frequency of meal times on health and wellbeing, and emotion regulation as an explanatory construct]; a project poised to enhance our understanding of mechanisms of healthy foods in chronic disease prevention and provide new knowledge for understanding how nutrition early in life shapes physiology and susceptibility to childhood obesity; ongoing work under the PONDER-G **[Prevent Obesity and Nutrition-Related Diseases: Environmental Resources and Genomics**] program focusing on understanding how individual genetic material interacts with the environment to promote or delay metabolic effects that result in excessive weight gain or related diseases; and several projects under the umbrella of the **STRONG Kids Program** [focusing on children's media exposure and nutritional knowledge, the impact of food marketing and promotion on food choices, the role of child care providers in promoting healthy eating, parent-child relationships as potential moderators of health practices, families' health literacy as it relates to weight management and body image, and the interaction of genetic, social, and behavioral risk factors]. Research under the **STRONG Kids** program has led to funded grant proposals from the USDA [$4.5 million for the proposal **Illinois Transdisciplinary Approach to Obesity Prevention**], from the UIC Cancer Center [$50,000 for the proposal **Obesity and Mealtime Behaviors in a Diverse Sample of Low-Income Families**], and from the National Institutes of Health [$48,018 for the **Illinois Childhood Activity Program** [I-CAP]].

Additional research activities included the finding that while families participating in WIC and SNAP had children at greater risk for energy-dense food consumption, when practicing regular meal time routines [such as planning ahead, assigning roles, and eating regularly together] they were less likely to eat energy-dense foods and more likely to eat fresh fruits and vegetables; efforts to better understand how food insecurity and stress affect childhood obesity in the United States; and research with the goal of better understanding the mechanism of macronutrient effects on fat deposition and development of metabolic syndrome [this will contribute to improving dietary recommendations for weight maintenance and to producing healthier products by the agricultural and food industries].

Conference Presentations in 2011 included the Agricultural and Applied Economics Association, Association for Public Policy and Management, International Prediabetes Meeting, Experimental Biology 2011, American Society for Nutrition, Feeding America BackPack Laboratory Meeting, Transdisciplinary Approaches to Childhood Obesity Workshop, American Psychological Association, Society for Research in Child Development, and Illinois Spring Into Action.

Most Extension activities that address healthy food choices for youth were delivered by **Expanded Food and Nutrition Education Program [EFNEP]** and **Supplemental Nutrition Assistance Program Education [SNAP-Ed**] staff who conducted hands-on activities with children and their parents in low-income families. Nearly 585,000 youth were taught healthy eating choices by **SNAP-Ed** Extension staff members. Education regarding **MyPlate** and the importance of physical activity was delivered in preschool, school classrooms, and summer cooking schools [which were reduced in number due to staffing uncertainties this year]. **OrganWise Guys** materials were purchased this past year for use in teaching **SNAP-Ed** program youth participants.

Under the leadership of 4-H Youth Development staff members, the **Wisercise** program was implemented by training fifth-grade peer-teachers to conduct physical activity in third-grade classrooms. In

addition, the **Health Jam** program was conducted for fifth-graders and offered support-related exercise, wellness, nutrition, and health career information using an experiential learning approach. Additional information about the programs and their impact is included in the outcome section of this planned program.

Healthy Hopping, a website focused on increasing the physical activity of youth as well as providing recipes for healthy snacks, had more than 63,500 page views during the year. The site also includes jump rope stunts and rhymes and games for children to use. **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.

2. Brief description of the target audience

Members of the target audience included parents, child care providers, policy makers, health professionals, researchers focusing on the impact financial stressors have on childhood obesity, epidemiologists, agencies focusing on health and food products, product developers who are interested in properties and processing technologies of high protein snack foods, elementary school staff and administrators, food banks, pantries, agencies working with food-insecure clients, physicians, infant formula manufacturers, and youth.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	30733	28708	64024	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	16	16

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Research Projects

Year	Actual
2011	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Knowledge Of Food That Is Low In Fat And High In Fiber And/Or The Importance Of Increasing Physical Activity Levels
2	Increased Consumption Of Foods Low In Fat And High In Fiber And/Or Increased Physical Activity Levels
3	Reduction In Children's Body Mass Index [BMI]
4	Improved Understanding Of How Nutrition Early In Life Shapes Physiology And Susceptibility To Childhood Obesity
5	Investigating The Role Of Macronutrient Composition In The Prevention Of Obesity

Outcome #1

1. Outcome Measures

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	Actual
2011	1478

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 interactive 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
4-H youth development staff implemented Wisercise as the basic curriculum to be used by fifth-grade youth in leading daily physical activities in third-grade classrooms. Approximately 1,180 elementary school youth participated in Wisercise across the state this past year. University of Illinois Extension 4-H staff also conducted the Health Jam program with 329 fifth-grade youth from eight counties participating 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 body functions and their measures.

Results
Results from a questionnaire given at the beginning of the Wisercise program were disappointing. The third-graders checked that they were already doing everything [such as eating five servings of fruits and vegetables every day], but may have done so because they felt they were expected to rather than answering honestly. Youth did complete the daily classroom exercise, but no systematic attempt has been made to determine if that activity is continuing. A pre- and post-test evaluation format consisting of 25 questions tailored to the health activity topics taught at each Health Jam delivery site was used to identify knowledge increases. All but two of the 296 youth

participants who completed the pre- and post-tests were able to correctly answer at least one question on the post-test that was incorrectly answered on the pre-test. By working together, 100 percent of the youth achieved that goal and walked the equivalent of the length of Illinois.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
802	Human Development and Family Well-Being
805	Community Institutions, Health, and Social Services
806	Youth Development

Outcome #2

1. Outcome Measures

Increased Consumption Of Foods Low In Fat And High In Fiber And/Or Increased Physical Activity Levels

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Reduction In Children's Body Mass Index [BMI]

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Improved Understanding Of How Nutrition Early In Life Shapes Physiology And Susceptibility To Childhood Obesity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The consumption of a nutritious diet is important for maintaining long-term health and decreasing the risk for chronic disease. This project is poised to enhance our understanding of mechanisms of healthy foods in chronic disease prevention and provide new knowledge for understanding how nutrition early in life shapes physiology and susceptibility to childhood obesity. Results will provide information on the practical application of daily food consumption for healthier living.

What has been done
Nutrient partitioning during gestation between maternal and fetal tissues is extremely important for determining pregnancy success and the future growth of the fetus. The objective of this project is to determine the role of fat compositions during early life [gestation, suckling, and weaning periods] on childhood obesity development in a rat model, with emphasis on the effects of total fat levels and essential fatty acid composition on adipose tissue development. The present study tested the hypothesis that a high maternal fat diet leads to a decreased antioxidant defense capacity and causes cellular senescence in the liver of adult offspring rats, which might increase the risk of developing chronic liver disease.

Results
Our studies so far have demonstrated that WNT signaling is directly involved in the excessive accumulation of fat within the placenta when the mother is obese, a pathophysiology that may have dire consequences for placental efficiency, nutrient transport, and fetal development.

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
806	Youth Development

Outcome #5

1. Outcome Measures

Investigating The Role Of Macronutrient Composition In The Prevention Of Obesity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
It is unclear to what extent macronutrient composition can contribute to prevention/development of obesity. In animal models, high-fat and marginally protein-deficient diets increase adiposity, while high fructose diets cause several of the hallmark symptoms of metabolic syndrome, including hyperlipidemia and hypertension.

What has been done
A total of four experiments were completed using rats as a model animal to assess the effects of macronutrient composition and fructose on development of obesity and metabolic syndrome. The following effects were tested: high fructose, interactions between high fat and low protein, and interactions between high protein and high fructose. Baseline and final body composition were measured by dual energy X-ray absorptiometry. Final blood pressure was measured by a tail-cuff method. Gene expression and tissue glycogen in liver and skeletal muscle were analyzed.

Results
The key findings of the project were as follows: [1] fructose had profound effects on gene expression in the liver by inducing genes for its metabolism; [2] fructose-mediated increase in blood pressure is independent of development of obesity; [3] both low protein and high fructose attenuated part of the insulin signaling pathway; [4] dietary fat may have a nitrogen sparing effect in marginal protein deficiency; and [5] gene regulation by fructose was mediated by transcription factors SREBP1c, FOXO1 and ChREBP. This line of research to understand the mechanism of macronutrient effects on fat deposition and development of metabolic syndrome will contribute to improving dietary recommendations for weight maintenance for consumers and to producing healthier products by the agricultural and food industries.

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

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)

Evaluation Results

In-depth interviews with school personnel administering a weekend feeding program revealed several predominant themes: [1] a need for additional food resources due to the recent recession; [2] overall disruptions in the family home that can lead to food insecurity [such as domestic violence and relationship instability]; [3] difficulties managing household finances as a symptom of food insecurity; [4] emotional, physical, and academic consequences to children who experience hunger as directly observed by school personnel; [5] flexibility of weekend feeding programs to serve a variety of children beyond income-based programs; [6] the creation of an 'ethos of care' in schools that participate in weekend feeding programs; and [7] a social responsibility to feed all children.

Results from a questionnaire given at the beginning of the **Wisercise** program were disappointing. The third graders checked they were already doing everything [such as eating five servings of fruits and vegetables every day], but may have done so because they felt that this was the expected answer. Youth [1,182] did complete the daily classroom exercise, but no systematic attempt has been made to determine if that activity is continuing. However, when asked to provide evaluative comments, teachers shared observations that revealed another notable impact regarding the important relationships that were created between the third and fifth graders--building confidence and self-esteem in the fifth-grade peer-teachers who served as role models to the third graders.

A pre- and post-test evaluation format consisting of 25 questions tailored to the health activity topics taught at each **Health Jam** delivery site was used to identify knowledge increases. All but two of the 296 youth participants who completed the pre- and post-tests were able to correctly answer at least one question on the post-test that was incorrectly answered on the pre-test. For example, more than a third of the youth at one site could identify the healthier of several food choices. At another site, 30% of the youth identified the amount of fruits and vegetables that should be eaten. At a third site, more than half of the group learned about calories burned through exercise. 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.

Key Items of Evaluation

An evaluation study more appropriate for third graders is being further explored to identify knowledge and practice changes after this pilot year of implementing **Wisercise**. However, based on teacher observation and anecdotal comments, the use of older youth to lead activities for younger youth appears to bring about positive growth and development in the youth leaders. **Health Jam** is a mature program that continually evidences knowledge gained, but program management requires time devoted to ensuring the pre- and post-test questions address important and key items that are part of the various health instructors activity content.

V(A). Planned Program (Summary)

Program # 5

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 FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	2.0	0.0
Actual Paid Professional	0.1	0.0	3.7	0.0
Actual Volunteer	0.0	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**
7111	0	236933	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
7111	0	236933	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
64278	0	408994	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2011 focused on monitoring work through the **National Atmospheric Deposition Program,** including the recent establishment of the **Ammonia Monitoring Network** [ammonia is causing great concern among scientists studying agriculture and air pollution]; a study of the factors affecting soil organic carbon [such as land use, management history, soil type, climate, and soil landscape processes]; a comparison of the ecology of ratsnakes across the complete range of this species to assess how the snakes' ecology is likely to be affected by climate change; a project with the goal of providing statisticians, modelers, managers, and policy makers with knowledge regarding forest carbon; work to improve our understanding of the physiological responses of fish to temperature and how land use and climate stressors can dictate the response of fish to stressors; research with the goal of eventually turning residual waste products that currently cause significant greenhouse gas emissions into a carbon sink sufficient in size to offset all the other emissions of an agricultural enterprise; oilseed research that has focused on the responses of soybeans to growth under elevated ozone and carbon dioxide; and a project that quantifies the carbon sequestration potential and, thus, opportunities for participation in carbon trading markets of Midwestern organic grain production systems.

Conference presentations in 2011 included the Soil Science Society of America, Workshop on Uncertainty in Estimates of Forest Change [U.S. Forest Service and U.S. Geological Survey], CarboForest Conference, Association of Agricultural and Biological Engineers, American Society of Agronomy - Crop Science Society of America - Soil Science Society of America Annual Meeting, and the Institute of Food Technologists.

Climate is one of the twenty chapters in the **Illinois Master Naturalist** curriculum for volunteers who advance environmental stewardship. Extension campus and field staff conducted activities to prevent the loss of shade trees that remove and sequester carbon from the atmosphere.

2. Brief description of the target audience

Members of the target audience include scientists, policymakers, educators, students, and others with an interest in atmospheric deposition trends, statisticians, modelers, managers and policy makers focusing on forest carbon, restoration ecologists, land owners, biologists, soybean industry businesses and growers, scientists studying the impact of altered atmospheric gas concentrations on plant life and food production, and nutritionists and food scientists. Extension has focused efforts on including climate education in **Master Naturalists** training and in working with tree care professionals, municipal officials, park distric personnel, and homeowners.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	372	0	0	0

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

Patent Applications Submitted

Year: 2011
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	23	23

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2011	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Dissemination Of Air Quality And Atmospheric Data Through Web Hits On The National Atmospheric Deposition Program Website
2	Identifying Ways Greenhouse Gases Can Be Removed From the Atmosphere
3	Factors Affecting The Dynamics Of Soil Organic Carbon
4	Improved Understanding On The Impact Of Climate Change On The Ecology Of Ratsnakes
5	Predicting Climate Change Through Improved Carbon Modeling
6	Improved Understanding Of How Fish Populations Respond To Stressors Associated With Climate Change
7	Conversion Of Residual Waste Products Into A Carbon Sink Designed To Offset Other Emissions
8	Number Of Municipal And Agency Personnel Who Increase Knowledge Of The Control Of Pests That Threaten The Extensive Loss Of Trees

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	Actual
2011	1597281

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The National Atmospheric Deposition Program precipitation chemistry network began operations in 1978 with the goal of providing data on the amounts, trends, and geographic distributions of acids, nutrients, and base cations in precipitation. A second network, the Atmospheric Integrated Research Monitoring Network [AIRMoN] joined the NADP in 1992 and currently has seven sites. A third network, the Mercury Deposition Network [MDN] joined the NADP in 1996, and currently has over 100 sites in the United States and Canada. The Atmospheric Mercury Network [AMNet] joined NADP in 2009. This network measures atmospheric mercury fractions, which contribute to dry and total mercury deposition.

What has been done
The NADP recently established its fifth network with agricultural scientists in mind -- the Ammonia Monitoring Network. Ammonia is causing great concern among scientists studying agriculture and air pollution. The network is currently operating with 52 sites and a large inventory of atmospheric measurements. The NADP continues to convert our precipitation gauges to an all-digital network, originating with a 2006 membership decision. Collaboration continues with the USDA Cereal Disease Laboratory to measure soybean rust spores in NTN samples. With support from the Agricultural Research Service, weekly samples from 80 eastern U.S. NTN sites were selected and are undergoing study. Additionally, a new wheat rust investigation, also with the CDL, began in November 2010.

Results
Our principal output is the collection and analysis of precipitation chemistry samples. Our second most important output is making these data available to all for continued research. Scientists, policy makers, educators, students, and others are encouraged to access data at no charge from the NADP [nadp.isws.illinois.edu]. This site offers online retrieval of individual data points,

seasonal and annual averages, trends, concentration and deposition maps, reports, and other information. Web statistics show that we are reaching our expected audience: federal and state agencies [30%], universities [30%], K-to-12 schools [20%], and others. Annual maps of atmospheric pollutants, concentrations, and depositions constitute one major network product [nadp.isws.illinois.edu/data/annualiso.aspx]. Individual maps are compiled into annual Map Summary reports and distributed. Every year, a scientific meeting is held that showcases the latest deposition research.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
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

Identifying Ways Greenhouse Gases Can Be Removed From the Atmosphere

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Factors Affecting The Dynamics Of Soil Organic Carbon

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The dynamics of soil organic carbon [SOC] are affected by many factors, including land use, management history, soil type, climate, and soil landscape processes.

What has been done
The objective of this research is to compare the storage of SOC on sloping woodland and cropland landscapes of northwestern Illinois. The cropland area was cultivated using a moldboard plow system for 125 years, and then the primary tillage was changed to chisel plow for the last 25 years. The woodland area was never cleared or cultivated. The SOC concentrations of various soil layers, to a depth of 0.5 m, were measured. The woodland landscape had significantly higher SOC in the surface layers on all landscape segments than at the cultivated site. For both land uses, the subsurface layers had similar SOC levels.

Results
Results suggest that the cropland landscape retained 52% of the total SOC on a volumetric basis during the last 150 years of cultivation, soil erosion, and agricultural use. The other 48% of the SOC was either deposited in the water or released to the atmosphere. Results suggest that if the mesic-frigid temperature line moved north because of climate change, then the current uncultivated forest soils would be used for cropland and additional SOC would be released to either the stream or atmosphere and not maintained in soil even with a no-till system.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
125	Agroforestry
132	Weather and Climate
133	Pollution Prevention and Mitigation

Outcome #4

1. Outcome Measures

Improved Understanding On The Impact Of Climate Change On The Ecology Of Ratsnakes

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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. Study sites are in eastern Ontario, southern Illinois, and central Texas. After harmonizing data across the three populations, data analysis was completed and a publication submitted.

What has been done
Data collection is continuing, both to document changes in populations and to focus specifically on the extent of nocturnal activity in each population and the temperature thresholds that trigger the switch between diurnal and nocturnal activity, using automated telemetry. 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. Analyses are also underway using data from ratsnakes and racers in Illinois to assess how these ecologically-different species respond to common weather-related challenges.

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 temperature 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 [find prey] as effectively at night as during the day.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
136	Conservation of Biological Diversity

Outcome #5

1. Outcome Measures

Predicting Climate Change Through Improved Carbon Modeling

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As significant carbon sinks, forests play a critical role in the regional and global carbon cycle dynamics and the mitigation of the greenhouse effect. However, there are considerable uncertainties on estimates and spatial distribution of forest carbon because of landscape complexities, inaccurate data, incorrect models, and knowledge gaps. There is thus a strong need to develop a methodology to improve the quality of data and products of forest carbon needed for climate change research at global and regional scales. This project intends to overcome current significant gaps in the generation and assessment of the data and products of forest carbon dynamics.

What has been done
This year we developed the theoretical and methodological framework for accounting for a variety of measurement, sampling, modeling, and classification uncertainties in the estimates of above-ground forest carbon based on ground measurements and remote sensing. A number of monitoring systems are being assessed with these uncertain methods.

Results
This project will provide statisticians, modelers, managers, and policy makers looking at forest carbon with knowledge, methods, and guidelines to reduce uncertainties and improve decision making. The developed 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
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
125	Agroforestry
132	Weather and Climate
133	Pollution Prevention and Mitigation

Outcome #6

1. Outcome Measures

Improved Understanding Of How Fish Populations Respond To Stressors Associated With Climate Change

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Expanding human populations are altering aquatic communities and threatening fish populations across the United States. Restoration of fish populations cannot succeed unless the mechanisms for population declines are identified and the habitat requirements of fish are clearly described. This research will document how biotic and abiotic stressors associated with changes to terrestrial land-use patterns and forest habitats can impact the ecology, physiology, and behavior of freshwater fish across Illinois. In addition, it will provide crucial information on guidelines for aquatic habitat restoration that can assist rehabilitation efforts.

What has been done
Outcomes included: [1] improved understanding of the physiological responses of fish to temperature; [2] improved understanding of how land use and climate stressors can dictate the response of fish to stressors; [3] training and improved skills of two graduate students using novel laboratory and field techniques; and [4] improved ability to predict how broad stressors such as climate change and land use alterations can impact fish.

Results
This project will provide us with a physiological, mechanistic understanding of how fish populations respond to stressors associated with land-use changes and climate change

scenarios. Knowledge of how ecosystems respond to these different stressors will improve our ability to predict how aquatic ecosystems will respond to future conditions resulting from climate change, and will also provide managers and restoration biologists with definitive guidelines for the habitat requirements of fish species.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
132	Weather and Climate
133	Pollution Prevention and Mitigation
136	Conservation of Biological Diversity

Outcome #7

1. Outcome Measures

Conversion Of Residual Waste Products Into A Carbon Sink Designed To Offset Other Emissions

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The central hypothesis is that, by integrating hydrothermal liquefaction processes and algae-based biological treatment [HTL-ABT] in novel residual management systems, the residual carbon can be captured into various valuable products rather than allowing it to be converted into GHGs and released into the atmosphere. Furthermore, these alternative approaches can also capture the nutrient content of agricultural residuals and leverage it to grow new algal biomass. Because the algae grow photosynthetically, it increases the net amount of carbon captured and the quantity of valuable products generated. In fact, it will be shown later that a fully-developed version of the proposed treatment system can internally recycle most of the nutrient content and grow multiple cycles of algae biomass on the nutrients in agricultural residuals.

What has been done

The objectives of this project are: [1] Demonstrate integrated algal production systems that treat agricultural residuals. We will investigate and optimize the performance of mixed algal treatment systems that provide water quality improvements and new biomass feedstocks derived from agricultural residuals and atmospheric carbon. The carbon capturing capabilities and efficiencies will be determined during this process. [2] Investigate mechanisms of hydrothermal liquefaction [HTL] processes to produce valuable products. Bench and pilot-scale reactors will be used to investigate the novel treatment systems and to develop and quantify key process performance criteria including feedstock recipe, operating conditions, reaction rates, water usage, water quality improvements, yield of valuable products, and greenhouse gas reductions that can be used for scale-up in industrial applications.

Results
Through this project, we are introducing a potential paradigm shift in the climate change impacts of agricultural activities by turning the residual waste products that currently cause significant GHG emissions into a carbon sink sufficient in size to offset all the other emissions of the agricultural enterprise. We will significantly increase our knowledge base on hydrothermal liquefaction and direct pyrolysis of specific high-impact agricultural residuals as well as for algae, which we are using to recycle waste nutrients from agricultural residuals into useful products. As a result, we will also improve the knowledge base for culturing fast-growing algae in wastewater treatment situations and the cleaning of these wastewaters provided by the algae.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
132	Weather and Climate
133	Pollution Prevention and Mitigation
136	Conservation of Biological Diversity

Outcome #8

1. Outcome Measures

Number Of Municipal And Agency Personnel Who Increase Knowledge Of The Control Of Pests That Threaten The Extensive Loss Of Trees

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual

2011 350

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Emerald ash borer [EAB] was discovered in Illinois in 2006. The insect affects several species of ash trees that comprise up to 20 percent of urban forests [parks, street trees, and residential shade trees]. The spread of emerald ash borer is expected to affect nearly 17 million urban trees located in the northeastern United States and is estimated to cost billions of dollars in removing, replacing, and protecting these trees with insecticides during this ten-year period. In addition, the loss of this valuable resource can have a noticeable effect on the urban climate through the reduction in plants that remove carbon from the atmosphere as well as release of the carbon contained in the trees when they die.

What has been done

A team of Extension staff working with Illinois Department of Agriculture and Illinois Department of Natural Resources staff members has been involved in efforts to educate homeowners, municipal officials, park district personnel, and tree care professionals regarding the spread and control of this exotic pest over the past three years. In addition, development of community action plans and cost estimates for future municipal tree removal and planting were emphasized. In 2010-11, additional programs reached more than 200 individuals, including programs held in southern and western Illinois as the insect spread to those parts of the state. Three programs were scheduled specifically for state park managers and workers; approximately 150 people attended. Quick identification of the pest was available through Extension's Digital Distance Diagnostic system and 45 kiosks featuring literature and an enlarged model of the insect were placed in rest stops throughout the state.

Results

The use of Turning Point technology provided the vehicle to ask fifteen questions at the beginning and again at the end of the one-day program. Results indicated an 85% increase in the number of individuals who correctly answered the questions after the program as compared to before. Similar questions modified for three training sessions targeted toward approximately 150 state park managers and workers in northern and southern Illinois evidenced roughly a 92% increase in those who correctly answered post-test versus pre-test questions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
124	Urban Forestry
132	Weather and Climate

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)

Evaluation Results

The use of Turning Point technology at the emerald ash borer programs provided the vehicle to ask fifteen questions at the beginning and end of the one-day programs. Results indicated an 85% increase in the number of individuals who correctly answered the questions after the program as compared to before. Similar questions modified for three training sessions targeted toward approximately 150 state park managers and workers in northern and southern Illinois evidenced roughly a 92% increase in those who correctly answered post-test versus pre-test questions related primarily to control options and legal issues such as the best chemical control currently for emerald ash borer, the size of trees where chemical control is most effective, and restrictions on movement of firewood throughout the state. In addition, discussions were held that led to the formulation of an Illinois Department of Natural Resources EAB action plan.

Extension Master Gardeners and Masters Naturalists have conducted ten tree inventories for various municipal entities using GPS technology. Data collected are used to compare strategies dependent on tree size in estimating treatment and replacement costs. Officials can then use the diameter of the trees to determine replacement costs of removing a tree, grinding the stump, purchasing, planting, staking, and mulching the new tree [$300 average], as well as estimating the treatment costs.

Key Items of Evaluation

Individuals in leadership positions to control the spread of emerald ash borer and the destruction of an important urban forest tree population increased their knowledge of control options and legal issues such as the best chemical control currently for emerald ash borer, the size of trees where chemical control is most effective, and restriction on movement of firewood throughout the state of Illinois. In addition, they discovered an online calculator to help them explore costs for control options for this invasive pest. Follow-up is needed with respect to decisions made that were based on the application of knowledge gained.

V(A). Planned Program (Summary)

Program # 6

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 FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	20.0	0.0	2.0	0.0
Actual Paid Professional	17.1	0.0	2.8	0.0
Actual Volunteer	0.0	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**
938683	0	164777	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
938683	0	164777	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
8484721	0	649771	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2011 included research examining youth participation and engagement in large youth forums and conferences; a project examining the multiple factors and contexts that influence the mental and physical health statuses of poor rural mothers and their children; work focusing on the processes whereby high-school-aged adolescents develop initiative and the role of youth programs in facilitating this development [preliminary findings from this study led to a $640,000 grant award from the William T. Grant Foundation]; modeling of the effects of school-level characteristics including racial and poverty composition alongside family socioeconomic factors on student's educational trajectories during the elementary and secondary school years; the organization of data and research findings into fact sheets for the Southern Illinois region [a change in condition occurred as a result of this project as the state has continued to fund the **Dixon Springs Research and Education Center** and the University of Illinois has dedicated resources to summer internships at the center and has also made other fiscal decisions to continue engagement in Southern Illinois]; and a study exploring how Latina/o migrants in Central Illinois were coping with the local effects of the global economic crisis of the late 2000s [findings suggest that the economic crisis has affected the ability of migrants to meet their families basic needs and that the strategies for coping with the economic crisis included cutting back on remittances, turning to self-employment, and tapping into support programs for the first time].

Conference presentations in 2011 included the Critical Ethnic Studies Conference, American Anthropological Association, National Council on Family Relations, and the Society for Research on Adolescence.

Extension activities included a wide variety of methods and focused on community participatory planning, organizational development, community economic development, and community leadership development and education. Key programming for the year included: [1] the completion of **On the Front Line: Skills for Excellent Customer Service in Your Community** presentation modules; [2] **Tomorrow's Leaders,** a high school curriculum [designed to develop citizens who care about and contribute to their communities] was updated for loading on a website that will be accessible to teachers; and [3] **Data for Decision Makers** two-page sheets comparing 2000-2010 census data developed for each Illinois county and delivered to appropriate local offices for distribution to county officials and residents.

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, 381 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 the courses offered each year; others are designed to address current issues.

This past year Extension was involved in several disaster education activities. The 2011 flooding along the Wabash and Ohio Rivers and their tributaries affected a wide area of southern Illinois. Extension responded by taking an active role in staffing the local resource centers and working closely with county emergency managers in distributing more than 3,500 copies of **First Steps to Flood Recovery** and **Plan Today for Tomorrow's Flood -- A Flood Response Plan for Agricultural Retailers**. Local emergency management officials were extremely grateful to have the information aggregated from multiple fact sheets into these two publications. Reports indicated that adoption of the best practices outlined in the materials helped victims more speedily and safely recover from flood damage and avoid unscrupulous contractors. Flood-related presentations were also delivered by Extension at an **All Hazards Conference** in Paducah, Kentucky and at a sustainability exposition in southern Illinois. Extension educators with expertise in community participatory planning and natural resources also partnered with the Illinois State

Water Survey in piloting the new **Federal Emergency Management Agency [FEMA] Risk MAP Program** at meetings held in three watersheds.

Extension staff also facilitated finalization of county hazard mitigation plans. Staff provided leadership for the completion of several community plans developed through a citizen participatory planning process. **Community Matters** is a program that aims to enhance the ability of community and organizational leaders to make decisions using current, reliable, and relevant data and citizen engagement.

Online self-directed interactive training modules have been developed for statewide use and potential use by other states. Eight beginner modules and six advanced modules including Introduction to Applied Research, Getting a Project Started, Logic Models, Data Management, Measuring Outcomes & Evaluation, Introduction to SPSS, and Using Excel will be available online along with an evaluation process designed to collect data on knowledge change.

Extension educators continued educational outreach focused on fostering entrepreneurship, and continued helping communities develop supportive environments for the development of businesses, including entrepreneurial businesses.

2. Brief description of the target audience

Members of the target audience included investigators and educators in the fields of sociology, education, and psychology; federal and state policymakers; local school boards; practitioners in education such as school administrators, principals, and teachers; low-income rural mothers in Illinois; financial, economic, and consumer educators; regional stakeholders; and Latina and Latino audiences. Communitiy 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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	26729	45787	7336	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	1	0	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Research Projects

Year	Actual
2011	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number Of Individuals Who Worked On/Gave Leadership To Specific Community Issues
2	Community Leaders Who Used Information And Data In Making Decisions That Improved Local Communities Or Organizations
3	Number of Plans Developed/Adopted/Adjusted by Communities Through Citizen Engagement
4	Dollar Value Of Grants And Resources Leveraged/Generated [Includes Gifts, Grants, Private Investments, Equipment, Workforce Training, Budget Allocations, Etc.]
5	An Examination Of The Causes Of Racial/Ethnic And Socioeconomic Gaps In Student Achievement
6	Improved Understanding Of How Immigrant Families Make Intrafamily Decisions With Regard To Discretionary Income

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	Actual
2011	229

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Individuals and communities face serious challenges in recovering from damage that occurs from natural disasters such as floods, high winds and tornadoes, and fires. Illinois has experienced several flood events over the past three years, including the greater Chicago area in 2010 and 2011, areas along the Mississippi River in 2009, 2010, and 2011, and areas along the Wabash and Ohio Rivers and their tributaries in 2010 and 2011. With proper planning before disaster strikes and a comprehensive management plan in place to guide decisions and actions during and after disasters, lives and dollars can be saved.

What has been done
University of Illinois Extension educators with expertise in community participatory planning and natural resources were invited to partner with the Illinois State Water Survey in piloting the new Federal Emergency Management Agency [FEMA] Risk MAP program. The first phase of the project involved inviting community officials from targeted watersheds to review and provide additional information to develop maps that accurately reflect flood hazard data. Extension county directors invited officials and professionals with responsibilities associated with preventing and handling floods to participate. Nine meetings in three watersheds were facilitated by Extension educators to update maps that will be made available to communities within the watersheds for use in planning and flood mitigation actions.

Results
Participants from the Lower Fox, Upper Sangamon, and Middle/Lower Wabash watersheds were provided with an evaluation questionnaire seeking their feedback on Flood Risk Mapping Discovery meetings at the end of those meetings. A total of 149 of 229 attendees completed and submitted the evaluation at the end of the meetings. Ninety-eight [98] of the respondents [66%] had never attended a flood mapping meeting. Attendees responses indicated an increased knowledge of where flooding occurs in their communities, the reason for that flooding, mitigation

opportunities, and appreciation for seeking their input to develop and provide them with accurate maps. In addition, attendees shared feedback on the value of other map products and ways to communicate information reflected on the new maps with community officials and the community at large.

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

Number of Plans Developed/Adopted/Adjusted by Communities Through Citizen Engagement

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.]

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The goal of this project was 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. Central to this project was the modeling of the effects of school-level characteristics, including racial and poverty composition, alongside family socioeconomic factors on 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
Our results show that school and family factors affect student's behavioral, attitudinal, and achievement trajectories. There are several significant findings from this project. We found that African-American, Hispanic, and low-income students are more likely to be placed in lower groups for instruction early in elementary school and this placement has a negative impact on multiple educational outcomes. More specifically, we found that grouping practices have a dual impact on educational inequality during the earliest years of schooling by delaying the reading skills of racial minority and low-income students and by imbuing lower-grouped students with negative school-related attitudes and behaviors. These effects persist regardless of the racial and poverty composition of the school. We also found that parent involvement can make a difference and may help to explain some of the behavioral differences between students from lower socioeconomic backgrounds and middle-class families. Specifically, students whose parents volunteer in school, informally talk with teachers and other parents, and create a better learning environment in the home have fewer behavioral problems and improved work habits over time compared to similar students whose parents do not engage in these activities. Our research also indicates that changing schools has a significant negative impact on reading gains over the first four years of elementary school.

Results
The results suggest that students who experience school changes, especially coupled with residential changes, are at an increased risk of developing greater behavioral problems during elementary school. Overall, this work highlights the importance of school processes, above and beyond family influences, in shaping early reading skills and behavioral trajectories. This research has shown that understanding the determinants of early differences in skills and behaviors is important to the micro-processes involved in later educational stratification.

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 #6

1. Outcome Measures

Improved Understanding Of How Immigrant Families Make Intrafamily Decisions With Regard To Discretionary Income

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Immigrants are increasingly settling in non-metro communities in the U.S. Although it is known that they send substantial remittances to their birth countries, relatively little is known about how intrafamily decisions are made for the transfers or other uses of discretionary income. This is especially the case for non-metro communities in the Midwest. This project focuses on the influences on immigrant use of discretionary income in the host community and for remittances to the country of origin.

What has been done
Our focus was to explore how Latina/o migrants in Central Illinois were coping with the local effects of the global economic crisis of the late 2000s. Twenty participants, ten women and ten men, were interviewed between the months of July 2009 and March 2010. In addition, informal interviews were conducted with key stakeholders in the community. Drawing on a case study approach, we focused on the capabilities of migrants to have control over their environment through employment and entrepreneurship, as well as in use of their income.

Results
Findings suggest that the economic crisis has affected the ability of migrants to meet their families' basic needs. The strategies for coping with the economic crisis included cutting back on remittances, turning to self-employment, and tapping into support programs for the first time. It appears that some of these coping strategies have a gender dimension that make them more challenging for male migrants.

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

University of Illinois Extension educators with expertise in community participatory planning and natural resources partnered with the Illinois State Water Survey in piloting the new Federal Emergency Management Agency [FEMA] Risk MAP program. The first phase of the project involved inviting community officials from four targeted watersheds to review and provide additional information to develop maps that accurately reflect flood hazard data. Participants from the Lower Fox, Upper Sangamon, and Middle/Lower Wabash watersheds were provided with an evaluation questionnaire seeking their feedback on Flood Risk Mapping Discovery meetings at the end of those meetings. A total of 149 of 229 attendees completed and submitted the evaluation at the end of the meetings. The evaluation was designed to determine flood knowledge gained by the participants and participants' understanding of the new flood risk mapping outreach effort. In addition, information was gathered regarding the format and content of the meetings, ways to communicate information developed through this project with community officials and the community at large, and additional educational needs related to flood risk management.

Key Items of Evaluation

Attendee responses indicated an increased knowledge of where flooding occurs in their communities, the reason for that flooding, mitigation opportunities, and an appreciation for seeking their input to develop and provide them with accurate maps. With respect to the meetings' impact on respondent's knowledge, 116 of 145 of the respondents [80%] indicated that they 'strongly agreed' [26] or 'somewhat agreed' [90] that they increased their knowledge of where flooding occurs in their communities. Seventy-six percent [110 of 145] indicated that they 'strongly agreed' [52] or 'somewhat agreed' [58] that they increased their knowledge of the reasons for that flooding. An even larger percentage of the respondents indicated an increase in knowledge regarding mitigation opportunities. Nearly 96% [138 of 146] of the respondents checked 'strongly agree' [7] or 'somewhat agree' [81] for this particular question. Eighty-seven percent [128 of 147] of respondents 'strongly agreed' [7] or 'somewhat agreed' [71] that the Discovery MAP was helpful in increasing their knowledge of flood risk in the community.

Participants also expressed appreciation for seeking their input prior to preparing the final maps. Sixty-six percent [98 of 149] of participant comments evidenced the value of the experience, commenting that the meetings were an excellent educational opportunity and dealt with a subject that inevitably impacts the livelihoods of many thousands of people and that the maps could prove to be very useful.

V(A). Planned Program (Summary)

Program # 7

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 FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	8.0	0.0
Actual Paid Professional	0.7	0.0	5.9	0.0
Actual Volunteer	0.0	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**
35556	0	457966	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
35556	0	457966	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
321391	0	2264896	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2011 included work to determine the etiology, biology, and epidemiology of the bacterial spot to develop effective management strategies for the disease [since there is very little known about this bacterial spot disease, this investigation is essential to assure that the pumpkin industry will continue to be a significant component of the Illinois agricultural economy]; a study of the beneficial and adverse effects of natural, bioactive dietary chemicals on human health and food safety; efforts to reduce losses to the dairy industry caused by mastitis through the study of micro-RNA expression data from mammary tissue; development of a laboratory-scale continuous flow manothermosonication [MTS] system [an enabling system that can be used in maximized microbial inactivation as well as enzyme inactivation tests to ensure food quality]; and experiments to determine the water barrier properties of zein-oleic acid films.

Conference presentations in 2011 included the American Society for Biochemistry and Molecular Biology, American Society for Nutrition, Experimental Biology, and the American Chemical Society.

Food safety training for employees and volunteers that prepare or serve food to the public was delivered at a significantly reduced level this year while searches were launched to fill Extension educator positions. Approximately 100 individuals were trained primarily through the first of the following three programs: [1] the Illinois Department of Public Health five-hour **Refresher Course for Food Handlers** designed for food service sanitation managers who must maintain their certification every three years; [2] a fifteen-hour **Food Services Sanitation Manager's Certification Course** for those seeking initial certification; and [3] **Serve it Safely**, a food class for volunteers who serve food for fundraisers, community organizations, and family events. A major effort was made to develop and expand evaluation tools for completion by those participating in food safety training. A follow-up survey was modified to address the 2008 Illinois Food Service Sanitation Code changes and is described in more detail in the outcomes and evaluation sections.

The **Supplemental Nutrition Assistance Program-Education [SNAP-Ed]** staff has emphasized teaching proper hand-washing to youth as well as cleanliness habits when preparing food. Participation in youth cooking schools that incorporate hand-washing activities was not tracked this past year. The scope was reduced because staff members with responsibility for delivering **SNAP-Ed** programs were experiencing uncertainty regarding funding and staff relocations. Both areas of uncertainty are now resolved.

During this past year, Extension educators focusing on small farms and local foods met to explore opportunities and plan educational delivery responses as a part of their new role. A team of these

educators conducted five one-day programs in northern Illinois during the winter and early spring of 2011 to address safe food production and handling in order to ensure that fresh produce is free from contamination by microorganisms that cause foodborne illnesses. Fifty-eight participated in these **Enhancing Specialty Food Safety** programs and shared information through end-of-meeting and follow-up evaluations designed to gather information on program improvement, knowledge gained, and practices applied. Findings are described in the outcomes and evaluation sections.

2. Brief description of the target audience

Members of the target audience included the general public, farmers, the produce industry, policy makers at the local, state, and federal levels, artisanal chocolate manufacturers, research personnel in academia, government, and the food industry, and Extension educators. Extension programs target youth, certified food handlers, and volunteers who serve food to the public [such as 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.

3. How was eXtension used?

Seeking answers and resources related to food safety.

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	814	665	429	0

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

Patent Applications Submitted

Year: 2011
Actual: 2

Patents listed

Enhanced Fermentation Of Cellodextrins And B-D-Glucose [TF10182-PRO], Biopolymer Microfluidic Devices And Methods Of Manufacture [TF11068-PRO]

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	15	15

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2011	3

Output #2

Output Measure

- Number of Individuals Completing Food Safety Certification Required Training

Year	Actual
2011	100

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Monitor Proper Temperatures Of Food Served To The Public To Prevent Food-Borne Illnesses
2	Increase Knowledge of Personal Cleanliness Habits That Prevent the Spread of Disease Through Food
3	Effective Management Of Bacterial Spot Affecting Pumpkin Production [The Most Valuable Vegetable Industry In Illinois]
4	Evaluating Storage Impact Of Quality Characteristics Of Dark Chocolate
5	Developing A Food Safety Intervention To Pasteurize Fruit And Vegetable Juices
6	Improved Serviceability Of Zein Films By Improving Their Water Resistance And Barrier Properties
7	Number Of Fresh Food Producers Adopting Practices That Prevent Foodborne Illness Contamination During The Production And Distribution Of Fresh Produce

Outcome #1

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	Actual
2011	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As of 1999, the Food Service Sanitation Code required Illinois-certified food service sanitation managers to attend food safety training with a minimum of five hours or to complete a re-certification exam to be eligible for re-certification every five years.

What has been done
Workshops on food safety have been conducted statewide by Extension educators who focus on nutrition and wellness. Adjustments in the content were initiated to incorporate the 2008 updates in the Illinois Food Sanitation Service code. Due to staff reductions, only about ten workshops involving about 100 participants were held. The majority participated in the 5-Hour Refresher Course for Food Handlers for recertification of those serving food to the public. Serve it Safely was offered to volunteers and interested individuals that do not require certification status. This year, evaluation tools were updated for Serve it Safely and the 5-Hour Refresher Course for Food Handlers. A follow-up survey of practice changes was developed and mailed to a random sample of the 367 individuals who participated in the classes between June 1, 2009 and May 31, 2010 [the first year of training that incorporated the Code updates].

Results
Surveys were collected from 74 [56.9% response rate] of the 134 participants. Nearly 65% [48 of the 74 respondents] reported adoption of one or more of the eleven safety handling practices as a result of the training with half of the respondents reporting changes in practices related to monitoring the temperature of the food they served as a result of the training. Most frequently mentioned were: [1] checking the thermometer regularly for accuracy and recalibrating when needed; [2] reheating food rapidly to 165 degrees for 15 seconds and holding at 135 degrees or higher; and [3] cooking and reheating micro-waved protein foods 25 degrees higher than the conventional temperature. Additional information on this survey is provided in the evaluation section.

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

Increase Knowledge of Personal Cleanliness Habits That Prevent the Spread of Disease Through Food

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Effective Management Of Bacterial Spot Affecting Pumpkin Production [The Most Valuable Vegetable Industry In Illinois]

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Illinois is the leading state in pumpkin production in the United States. In 2011, approximately 11,000 acres of jack-o-lantern pumpkins and 14,000 acres of processing pumpkins were produced in Illinois. More than 90% of processing pumpkins produced in the U.S. are grown and processed in Illinois. Since 2005, bacterial spot, caused by Xanthomonas cucurbitae, has been a serious disease of pumpkins in Illinois and other Midwestern states, causing more than 50% fruit rot in some fields. Incidence and severity of the disease increased every year.

What has been done
In 2010, bacterial spot was observed in 40 of 50 commercial jack-o-lantern pumpkin fields in Illinois, with 34% of the fruit overall showing the bacterial spot. In 2011, 64 and 46 pumpkin fields

were surveyed in Illinois and other Midwestern states, respectively, to assess the occurrence of the bacterial spot disease. The fields surveyed in Illinois included 53 jack-o-lantern and 11 processing pumpkin fields. The fields outside Illinois include 7, 8, 5, 6, 5, 9, and 6 jack-o-lantern pumpkin fields in Indiana, Iowa, Kansas, Missouri, Nebraska, Ohio, and Wisconsin, respectively. All of the fields were surveyed at harvest time. Bacterial spot was observed in all eight states surveyed. Incidence of the disease [percent fruits with the bacterial spots] was 89%, 82%, and 83% in jack-o-lantern pumpkin fields in Illinois, processing pumpkin fields in Illinois, and jack-o-lantern pumpkin fields in other Midwestern states.

Results
The pumpkin industry is the most valuable vegetable industry in Illinois and several other Midwestern states. Determining etiology, biology, and epidemiology of the bacterial spot will help to develop effective management strategies for the disease. Since there is very little known about this bacterial spot disease, this investigation is essential to assure that the pumpkin industry will continue to be a significant component of the Illinois agricultural economy.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Evaluating Storage Impact Of Quality Characteristics Of Dark Chocolate

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Experiments were conducted addressing the overall hypothesis that changes occur during storage of chocolate that impact lipid polymorph structure and ultimately lead to bloom formation, leading to a significant detrimental change in texture and flavor as indicated by instrumental and human sensory analyses.

What has been done
We have made significant progress on determining storage impact on quality characteristics of dark chocolate and the role of lipid polymporph transition in chocolate quality. We have also made significant progress in the evaluation of the impact of different emulsifiers and their role in polymorph stability in chocolate during storage. We have also conducted two Summer Chocolate Education Programs for high school students.

Results
Specific details from sensory and instrumental analyses will lead to a better understanding of the impact of storage and of different emulsifiers on physical, chemical, and structural properties in dark chocolate, allowing for optimization of quality during storage. This will provide insight into emulsifier selection for chocolate manufacturing. Artisanal chocolate manufacturers who are not easily able to conduct this research have been expressing a desire for more of this information.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Developing A Food Safety Intervention To Pasteurize Fruit And Vegetable Juices

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The long-term goal of the proposed research is to develop a novel and practical food safety intervention, manothermosonication [MTS], with maximized cavitation activity, to pasteurize fruit and vegetable juices to achieve a 5-log reduction and at the same time to maintain product

quality.

What has been done
Acoustic cavitation and reducing treatment time with a sonication, pressure, and mild heat combined treatment for maximized microbial inactivation has been proposed as a feasible approach to facilitate ultrasound-assisted liquid food processing operations. We successfully developed a MTS system with stable temperature in both batch and continuous operation modes and applied it to the inactivation of microorganisms. A double-jacketed sonoreactor was designed and fabricated in the MTS system. The temperature in the reactor was controlled by circulating water through a water jacket.

Results
A laboratory-scale continuous flow manothermosonication [MTS] system was developed in this project. It is an enabling system that can be used in maximized microbial inactivation as well as enzyme inactivation tests to ensure food quality. The microbial inactivation tests conducted with the MTS unit prove that ultrasound technology as a new food processing modality may provide a promising alternative to traditional thermal food preservation methods, especially those dealing with liquid food processing.

4. Associated Knowledge Areas

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

Outcome #6

1. Outcome Measures

Improved Serviceability Of Zein Films By Improving Their Water Resistance And Barrier Properties

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The goal of the proposed research is to increase the serviceability of zein films by improving their water resistance and barrier properties. This work considers the use of drying oils as hydrophobic protective coatings for zein films. Current coating technology relies on the use of toxic heavy metals as catalysts for in situ oil curing. We are proposing the application of ionizing radiation and the use of nanocomposites for safe and effective film treatments that will increase water resistance of films.

What has been done
Activities related to this project include conducting experiments on determination of water barrier properties of zein-oleic acid films and analyzing collected data. A second output was the mentoring of three graduate students. Services related to this project include consulting work with industry groups on methods to increase water resistance of paper and other biobased agricultural and packaging films. Products as outcomes of this project include technology development to increase water and grease resistance of biobased films by formulating bionanocomposite coatings containing nanoclays. Prototypes of bionanocomposite coatings were prepared and showed to industry groups. Dissemination activities included hosting visits and holding conferences with industry groups including paper, polymer, and biopolymer manufacturers to promote the use of biobased materials for agricultural and packaging applications.

Results
Changes in knowledge as a result of this project include gaining new fundamental knowledge on the application of Fourier-transform infrared spectra to monitor polymerization of drying oils treated by irradiation. Changes in action include an increase in production of biobased polymers resulting from the development of novel and enhanced applications. Changes in conditions include a new awareness among the research and industrial communities of the potential of bionanocomposites to improve performance of biobased films for agriculture and packaging applications.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Number Of Fresh Food Producers Adopting Practices That Prevent Foodborne Illness Contamination During The Production And Distribution Of Fresh Produce

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	14

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In recent times, the safety of fresh produce has become a growing concern to consumers and the horticulture industry. Contamination of produce by microorganisms that cause foodborne illness outbreaks result in significant associated health costs. In addition, these outbreaks have financial consequences for a given producer as well as other producers in the same industry who incur losses when the public refuses to buy any product associated with a given foodborne illness outbreak. With FDA plans to introduce new rules to regulate the production and handling practices for fresh produce, it is imperative that stakeholders in the food industry become proactive regarding both Good Agricultural Practices [GAPs] and Good Handling Practices [GHPs].

What has been done
In response, five one-day Extension educational programs were conducted in Northern Illinois in the winter and early spring of 2011 on safe food production and handling in order to ensure that fresh produce is free from contamination by microorganisms that cause foodborne illnesses. Specific topics addressed in these programs included water usage and water testing, worker health and hygiene, facilities and equipment sanitation, manure handling and field application, and record keeping. More than fifty individuals participated in the conferences, representing specialty crop producers and retailers; including farmers' market managers and vendors, as well as local health officials.

Results
An end-of-meeting evaluation form was distributed and collected from 38 of the participants. A second evaluation was also mailed in January of 2012 to all attendees in the five programs who provided an address [52] to identify any of 37 different practice changes resulting from their participation that were implemented during the growing season. Fourteen of the 27 respondents [53%] identified practice changes implemented. Twelve [44%] of the respondents indicated implementing practice changes related to worker health and hygiene. Ten [37%] of the respondents indicated implementing practice changes related to facilities and equipment sanitation. Six [22%] of the respondents indicated implementing practice changes related to water usage. Four [15%] implemented changes in their record keeping. Five [18%] initiated a safety audit and six [2%] created a written food safety plan for their food production enterprise. Extension has received over $80,000 of additional funding to expand the number of program delivery sites and support costs of food safety audits of the fresh produce producers'operations in the coming three years.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

A. Enhancing Specialty Food Safety Program Results

An end-of-meeting evaluation form consisting of seven questions was distributed and collected from 26 of the participants in five one-day **Enhancing Specialty Food Safety** programs. An evaluation was also mailed in January of 2012 to all attendees in the five programs who provided an address [52] to identify any of 37 practice changes resulting from their participation that were implemented during the growing season. A stamped return envelope was provided to each and a second reminder letter and evaluation copy was sent out two weeks after the original mailing. Respondents to the follow-up survey included a total of 27 of 52 attendees that included specialty crop producers and retailers, including farmers' market managers and vendors, as well as local health officials.

Practice changes implemented

Five questions encompassed 37 potential practice changes that were addressed in the programs. The focus areas of the five questions included: [1] water usage and water quality testing; [2] worker hygiene and health; [3] facilities and equipment sanitation; [4] manure handling and application; and [5] record keeping. Respondents were presented with five options for each practice that included 'Did Prior', 'Do as a Result', 'Plan to Do', 'Do Not Plan to Do', and 'Does Not Apply.'

A large number of the practices were checked 'Does Not Apply.' Most [60-80%] of the respondents checked this response in relation to manure handling and application practices. None of the respondents checked that they had initiated any of the nine practices

related to manure handling and application. Two-thirds of the respondents do not have employees and would have no need to implement changes related to worker health and hygiene or record keeping. However, 14 of the 27 respondents [52%] identified practice changes implemented.

- Six [22%] implemented practice changes related to water usage and water quality
- Twelve [44%] implemented practice changes related to worker health and hygiene
- Ten [37%] implemented practice changes related to facilities and equipment sanitation
- Four [15%] implemented practice changes related to record keeping.

Specific practices most frequently marked as changes by the respondents included: [Number of individuals making the change is indicated following the practice].

- Provide training to help workers understand the importance of personal hygiene [9]
- Prohibit eating or smoking in produce packing houses and provide a separate space [6]
- Cover clean storage bins when not in use [6]
- Clean harvesting bin/aids daily [5]
- Prior to harvest, clean and sanitize all storage facilities [4]
- Test well water twice a year for microbiological quality [4]
- Properly monitor cooling bath temperature [3]
- Emphasize proper hand-washing [3]
- Record dates and results of all water quality tests [3]
- Record worker training dates and content of training [3]
- Monitor produce wash water temperature [2]
- Provide convenient, clean, well-serviced toilet facilities in the field and packing house [2]
- Encourage proper use of disposable gloves on packing lines [2]
- Reassign sick employees to prevent contact with produce [2]
- Remove field soil from harvesting containers/bins prior to moving them into packing areas [2]
- Wash, rinse, and sanitize the packing area, equipment, and floor at the end of each day [2]
- Clean and sanitize trucks and other transportation vehicles before loading [2]
- Monitor the level of chlorine in sanitizing solutions. [2]

An additional six [6] practices have been implemented by at least one respondent. Respondents also described additional practice changes that included re-evaluating pets in the field, keeping plants in fenced-in areas, and improving the wash area layout. Only three practices plus the nine related to manure handling and application were not checked by any respondent.

In addition, 21 of 27 [78%] of the respondents indicated that they planned to implement at least one additional practice change. However, all of the 37 practices were checked as 'Plan to Do' by at least one and as many as nine respondents.

With respect to their involvement in an audit of their operation regarding risk management practices, four indicated that they conducted a self-audit and one engaged a third party in conducting the audit. Six respondents [22%] also indicated that they had created a written food safety plan for their food production enterprise.

B. Refresher Course for Food Handlers

In February of 2012, a questionnaire was mailed to collect data verifying whether or not the five-hour Refresher Course for Food Handlers helped participants improve food handling within their establishments. Subjects were selected through list sampling from recertification class rosters for those held between June 1, 2009 and May 31, 2010 [the period encompassing the first year of training that incorporated information related to the 2008 revisions in the Illinois Food Service Sanitation Code]. A total of 134 workshop participants were randomly sampled from a list of 367. Respondents were asked to remain anonymous. A second mailing of the questionnaire was sent to all respondents three weeks following the first letter to remind them to return the questionnaire. Four questionnaires were returned as undeliverable. A total of 74 [56.9%] of those who actually received surveys returned a questionnaire.

Between 30 and 40% of the participants **who found the question applicable** indicated that as a result of the Refresher Course for Food Handlers training that they now:

- Use double strength sanitizing solutions in spray bottles [37.7% of 61 responding]
- Check thermometers regularly for accuracy and recalibrate [31.4% of 70]
- Chill ingredients for mixed food before combining. [31.1% of 61]

In addition, between 20 and 30% of participants **who found the question applicable** indicated that they now practice the following as a result of the training:

- Reheat food rapidly to 165 degrees and hold at 135 degrees or higher [28.3% of 60]
- Cook micro-waved protein foods 25 degrees higher than conventional temp [27.1% of 59]
- Use test strips to check the strength of sanitizing solutions daily [26.6% of 64]
- Wear only a plain wedding band or medic alert bracelet during food preparation. [25.8% of 62]

How many improved on one or more practice?

Two-thirds [48 of 74] of the respondents reported adoption of one or more improved food safety handling practices as a result of the training. Of that number, one-half [37 of 74] of the respondents reported adoption of one or more improved food safety practices related to monitoring proper food temperatures. Respondents reported adopting on average between two and three food safety practice behaviors [2.42 practices].

To what extent did participants share what they had learned with others?

Sixty-six or 90% of the respondents indicated they shared what they learned with others. Three out of four times, this was with co-workers. One out of two times, it was with friends or family or volunteers who helped them.

Key Items of Evaluation

A. Enhancing Specialty Food Safety Key Findings

Approximately half of the end-of-program evaluation respondents indicated they had learned a great deal about enhancing specialty food safety pertaining to preparing for an

audit of implementation of safety practices, keeping appropriate records related to these practices, and manure handling and application. A follow-up evaluation gave evidence that food safety practice changes had been implemented by half of the respondents [primarily with respect to providing training for workers on personal hygiene and facilities and equipment sanitation, such as cleaning procedures for storage and harvesting bins]. One-fourth of the respondents initiated an audit of their safety practices and one-fourth created a written food safety plan for their food production enterprise that will reduce their risk of food contamination by microorganisms that cause food borne illnesses. These actions will position the program participants to be in compliance with rules and policies the Food and Drug Administration plans to introduce to regulate the production and handling practices for fresh produce. Extension training is bringing about practice changes to prevent the spread of food contamination, and thus, reducing the risk of consumer foodborne illnesses and their associated health costs. In addition, these safe practices substantially reduce the financial risk to a given producer as well as other producers in the same industry who incur losses when the public refuses to buy any product associated with a given foodborne illness outbreak.

B. Refresher Course for Food Handlers

The results of a random follow-up survey with participants in the University of Illinois Extension food safety recertification workshop indicate that this program does more than meet the continuing education requirements for food handlers to remain certified. Two-thirds of the respondents reported improving their actual food handling with between two and three improved behaviors being reported on average. One-half reported improving food temperature monitoring practices and more than one-fourth [26.8%] took steps to reduce cross-contamination. Using conservative estimates based on the number of meals participants reported serving daily [100] and the annual number of food handlers trained on average per year [350], we believe that Extension training has helped to ensure that an estimated 35,000 meals per day are free of contaminants that can cause foodborne illnesses. Based on a March 2010 study funded by the Pew Charitable Trust indicating that the average cost each time someone gets sick from food is about $1,850, this could represent a very significant contribution toward reducing health care costs.

V(A). Planned Program (Summary)

Program # 8

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 FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	23.0	0.0	5.0	0.0
Actual Paid Professional	12.0	0.0	15.3	0.0
Actual Volunteer	0.0	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**
654234	0	974528	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
654234	0	974528	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
5913594	0	7306052	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities have included work in Nicaragua focusing on early childhood nutrition improvement through cooperation with a local NGO, the Nicaraguan Department of Health, and industry partners [similar efforts for early childhood nutrition improvement, school feeding, and nutrition education programs have taken place in Guatemala, Kenya, Botswana, Rwanda, Haiti, Indonesia, Bangladesh and India]; research with the goal of developing higher-quality food products and associated materials [such as ingredients and packaging materials] by evaluating flavor-related quality indices for product development/improvement and shelf-life estimation; research on the frequency and distribution of soybean aphid biotypes [which will enable plant breeders, soybean seed companies, university Extension scientists, and soybean producers to intelligently deploy aphid-resistant soybean cultivars where they would be most effective]; the development of knowledge that will allow us to better understand the flavor function of soy in different food systems and how to best present soy to consumers globally [this research has the potential to have a significant impact on promoting the sales of soy foods by providing the means to reduce undesirable taste/flavor characteristics]; a study with the overall goal of developing and field testing effective fortification technologies that are low-cost, easy to use, and that do not change feeding habits among children in developing countries; and the discovery of the mechanism of haloacetic acid toxicity in drinking water [this will play a significant role in identifying which chemical disinfection byproducts pose the greatest health and environmental risks].

Conference presentations in 2011 included the Institute of Food Technologists, American Chemical Society Symposium Series, American Oil Chemists Society, Western Extension and Research Activities Committee on Agribusiness, Agricultural and Applied Economics Association, Illinois Wheat Association Summer Wheat Forum, American Seed Trade Association Corn and Sorghum Seed Research Conference, American Society for Biochemistry and Molecular Biology, and the American Society for Nutrition.

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 [seven regional-based meetings] that featured eight faculty presentations on the latest research concerning weed management, fertility, stewardship, and pest management reached 1,080 producers and agricultural consultants. The multi-state **AGMasters Conference** was held on campus and two-day **Regional Crop Management Conferences** were held in four locations in 2011. 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. Eight annual research farm field days were held in the summer to

showcase research plots to producers.

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 current agricultural conditions with advice on pest management. We diagnosed 3,888 plant samples through the **University of Illinois Plant Clinic;** collected 1,860 soybean leaflets from Illinois sentinel plots for the purpose of monitoring soybean rust and other foliar diseases of soybean; and analyzed 966 field crop samples to perform disease analysis required for growers to obtain a phytosanitary certificate allowing export. Efforts to certify strawberry disease-free stock resulted in an Illinois strawberry producer being able to establish a new market for export to Jamaica.

Statewide Extension Conferences related to produce production included several multi-state conferences, including the **Illiana Vegetable Growers School**, the **Southern and Southwestern Tree Fruit Schools**, and the **Southern Illinois Commercial Vegetable School.** Additional Illinois state or regional conferences focused specifically on growing horseradish, small fruit, and strawberries. Extension also provided leadership for the **Specialty, Agritourism and Organic Conference** and distributed 22 issues of **Fruit and Vegetable News.**

In November of 2010, the **Season Extension and High Tunnel Webinar Series** sponsored by the Great Lakes Vegetable Working Group with funding from the North Central Region Sustainable Agriculture Research and Education Program was offered. The five-session multi-state series focused on pest management and soil, water, and nutrient management information related to high tunnels.

Twenty-five Illinois residents registered for the series. Illinois hosted the final two sessions with 89 and 66 participants.

Pesticide safety education was conducted using presentations at numerous locations with 8,072 teaching contacts through commercial training and 1,364 through private pesticide training. 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]** 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 using food pantries. Just under 639,000 individuals including 279,411 youth participated in the **SNAP-Ed** program.

For the second year, Southern Region Extension staff members implemented **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 created by youth who were mentored by adults. Produce harvested from gardens in 27 participating counties was shared with food pantries, sold at Farmers' Markets, and enjoyed by participants' families.

2. Brief description of the target audience

Members of the target audience included undernourished populations in Latin America, Africa, and Southeast Asia; commercial seed companies; food producers and processors; Extension educators; the consumer meat industry and those making recommendations to consumers; the scientific community involved in genetic crop improvement; the water research community; and drinking water utilities. Extension targeted producers of feedstuffs for livestock, producers of fruit and vegetable crops, limited-resource audiences that are food stamp eligible, and youth.

3. How was eXtension used?

Data was not gathered to respond to this question.

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	30716	29423	19100	0

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

Patent Applications Submitted

Year: 2011
Actual: 2

Patents listed
Method Of Selecting Soybeans With Enhanced Bioactivity And Composition For Reducing Cancer Cell Viability [TF09040-US], Methods Of Flavor Encapsulation And Matrix-Assisted Concentration Of Aqueous Foods And Products Produced Therefrom [TF10116-US]

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	65	65

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Research Projects

Year	Actual
2011	8

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number Increasing Knowledge Of New Corn And Soybean Crop Management Techniques
2	Number Changing Application Of Recommended Pest Control Practices For Corn And Soybean Production
3	Dollars Saved Through Safe And Effective Pesticide Application
4	Reducing Aflatoxin In Corn
5	Managing Soybean Aphids For Improved Production
6	Improved Understanding Of The Flavor Function Of Soy To Improve Consumer Acceptibility
7	Strategic Improvement In Maize Through Genetic Analysis
8	An Improved Soybean Cyst Nematode Control Strategy
9	Pounds Of Fresh Produce Donated For Consumption By Vulnerable Populations

Outcome #1

1. **Outcome Measures**

Number Increasing Knowledge Of New Corn And Soybean Crop Management Techniques

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Number Changing Application Of Recommended Pest Control Practices For Corn And Soybean Production

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Dollars Saved Through Safe And Effective Pesticide Application

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Reducing Aflatoxin In Corn

2. **Associated Institution Types**

- 1862 Research

3a. **Outcome Type:**

Change in Condition Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2011	0

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

Issue (Who cares and Why)

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

What has been done
This research clearly demonstrated the usefulness of marker-assisted selection to incorporate resistance into commercially-usable inbred lines. The results have paved the way for commercial companies to incorporate resistance into their inbred lines and hybrids without having to be concerned with yield drag and without the laborious task of evaluating for toxin during each cycle of breeding for resistance.

Results
Monsanto is crossing resistance into some of their inbreds for use in the southern United States. Other seed companies will likely also begin this process.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
704	Nutrition and Hunger in the Population

Outcome #5

1. Outcome Measures

Managing Soybean Aphids For Improved Production

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Soybean is second only to maize in importance in commodity crop production in the North Central region. One of the most important insect pests of soybean is the soybean aphid. Since arriving in the region from Asia in 2000, it has become firmly established. Severe outbreaks have occurred in the North Central region approximately every other year. In 2003, several million acres of soybean in the region were invaded, suffering estimated production losses in the millions of dollars. In addition, producers spent several million dollars spraying their fields to control the aphids. Host plant resistance is a major component of an integrated pest management program for a crop such as soybean, which includes chemical control, biological control, and plant culture management practices. Resistance can significantly reduce the need to apply insecticides, reducing the cost of production for producers and the impact of soybean production on the environment. Our research group identified the first useful sources of resistance to the soybean aphid.

What has been done
Results of this project confirmed the recessive inheritance of virulence on Rag1 in soybean aphid biotype 2 and suggested that a single recessive virulence gene was involved. This is the first evidence that virulence on a soybean aphid resistance gene is probably primarily controlled by a nuclear gene in the soybean aphid and is in agreement with results found with other phytophagous insect pests such as the Hessian fly. The presence of different virulence genes in soybean aphid biotypes explains their differential ability to colonize plants with different resistance genes. The F2 population produced in this project will be further used to map the location of the virulence gene in biotype 2 with DNA markers, leveraging another project funded by the United Soybean Board. Completion of these projects will lead to the development of technology to monitor and determine the distribution of soybean aphid biotypes in soybean production areas.

Results
Information on the frequency and distribution of soybean aphid biotypes will enable plant breeders, soybean seed companies, university Extension scientists, and soybean producers to intelligently deploy soybean aphid-resistant soybean cultivars where they would be most effective in an integrated management program that would reduce the need for environmentally-unfriendly control measures.

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
704	Nutrition and Hunger in the Population

Outcome #6

1. Outcome Measures

Improved Understanding Of The Flavor Function Of Soy To Improve Consumer Acceptibility

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In order to successfully develop and market soy-derived foods, we need to identify the drivers of consumer liking and disliking of soy foods for different food systems. 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.

What has been done
From the findings of our high-protein soy snack food research, we concluded that different strategies should be utilized when developing products for different global markets to cater to their specific inclinations. Despite the fact that soy foods have been previously shown to face challenges in consumer acceptance, this research described a food product that delivers a high level of soy ingredients in a form shown to be acceptable to consumers.

Results
The knowledge gained from our research will allow us to better understand the flavor function of soy in different food systems and how to best present soy to consumers globally. The outcome of our study has the potential to have a significant impact on promoting the sale of soy foods by providing the means to reduce undesirable taste/flavor characteristics.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
704	Nutrition and Hunger in the Population

Outcome #7

1. Outcome Measures

Strategic Improvement In Maize Through Genetic Analysis

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
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 yield 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.

What has been done
The germplasm being evaluated also contributes to the impact of the analysis being conducted. 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. This project lays the groundwork for strategic improvement through a more in-depth genetic analysis to locate chromosomal regions in maize that are associated with large grit yield.

Results
Kellogg's is acutely interested in the results of this project as a producer of a number of food stuffs from large corn grits. Bunge North America, 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)
701	Nutrient Composition of Food
704	Nutrition and Hunger in the Population

Outcome #8

1. Outcome Measures

An Improved Soybean Cyst Nematode Control Strategy

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Identification of genes involved in SCN 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 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 because it suggests that horizontal gene transfer [HGT] is more common in plant nematodes than originally thought. Several examples of HGT have been hypothesized to have occurred in plant parasitic nematodes, but none for an entire functional metabolic pathway.

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. If a nematicide were developed to inhibit this pathway, 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 to show that 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
704	Nutrition and Hunger in the Population

Outcome #9

1. Outcome Measures

Pounds Of Fresh Produce Donated For Consumption By Vulnerable Populations

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	180000

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
Master Gardeners assisted in helping others grow gardens and promote the donation of excess produce to places that furnished food for hunger people. The second year of the Southern Regional initiative that supported the youth and adult partnership of the Growing Illinois Food Together [GIFT] gardens continued to provide unique experiences and links between plants, gardening, food, and health within the 27 Southern Illinois Counties. An Extension educator who was trained to bring MarketReady, a curriculum designed to increase the number of farmers with credentials to sell into complex markets, was used to deliver a pre-conference associated with the Illinois Specialty Crops, Agritourism, & Organic Conference and through a presentation to the Southern Illinois Economic Development Council. Awareness was also created regarding a multi-state web-based market system for locating businesses and markets for agriculture products, but also proven effective in linking with food banks.

Results
Master Gardeners in Illinois reported estimated fresh produce donations that aggregated to 180,000 pounds. The GIFT gardens generated 4780 pounds of produce that was donated to food pantries.

4. Associated Knowledge Areas

KA Code	Knowledge Area

204	Plant Product Quality and Utility (Preharvest)
604	Marketing and Distribution Practices
704	Nutrition and Hunger in the Population

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)

Evaluation Results

The statewide **Pesticide Safety Education Program** [PSEP] survey found that 80% of the private applicator audience attended pesticide safety training once every three years. The training is focused on personal safety, environmental protection, integrated pest management, and proper use of application equipment. Private applicators were asked to indicate the level of influence that the PSEP training had in the four areas of focus encompassed in the training using a scale of 1-5. The survey found that pesticide safety education programming had influenced the decision making of applicators.

Key Items of Evaluation

While the reported impact of pesticide safety education upon **Integrated Pest Management** [IPM] adoption was less impressive than on the other areas of the training's focus, one-third of the farmers [304 or 33.4%] surveyed said it had influenced their adoption of IPM. Analysis and interpretation of the data is still in process; however, preliminary findings indicate that knowledge and application of actions that comprise integrated pest management are lacking.

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Human Development and Family Wellbeing

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

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

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	13.0	0.0	6.0	0.0
Actual Paid Professional	28.8	0.0	5.2	0.0
Actual Volunteer	0.0	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
1578694	0	249818	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1578694	0	249818	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
14269759	0	1447201	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2011 included the revision of our work-life management curriculum for couples, which has already been used in 8 states, reaching more than 1,000 couples per year since 2003; a collaboration that led to the development of **The Role of Commitment and Communication in Healthy Relationships** for the Ohio State University Family Life Electronics Seminar on Relationship and Marital

Enrichment Education; the development of findings that suggest that children high on anger proneness may especially benefit from interventions aimed at increasing the quality of the parent-child attachment relationship [intervention efforts among families of anger-prone toddlers are especially important given that trajectories of child behavioral problems are often rooted in coercive cycles of parent-child interaction that begin in toddlerhood and among families with highly-impulsive, volatile children]; the development of data that provide insights on family processes within low-income, African-American families; a project that extends a line of action-oriented research on effective methods for improving sibling relationships among children aged 8 to 12 years by developing and testing a new preventive intervention program [the **Even More Fun With Sisters and Brothers Program**]; and continuation of the **Child Development Laboratory Research Database Project**.

Conference presentations in 2011 included the International Conference on Infant Studies, Society for Research in Child Development, National Council on Family Relations, Environmental Design Research Association, Nature by Design [Canada], National Recreation and Parks Association, and the Illinois Council on Family Relations.

An introductory webinar for county directors and community professionals provided an overview of Extension programs and resources that addressed Human Development and Family Wellbeing and invited local agencies to partner with Extension in marketing these programs. In exchange for partnering with Extension, local agencies received a flash drive that included marketing materials for family life, nutrition, and consumer economics resources of use to families. Programs marketed by Extension staff included resources focused on nurturing children, supporting adults, and developing a healthy lifestyle.

Parenting 24/7 is a one-stop source for research-based information on the web that includes articles, breaking news and commentary, links to other resources, and video clips of real parents of children from birth through the teen years and focuses on challenges and solutions [total page views were 487,210]. **Just in Time Parenting** is an age-paced electronic newsletter that is a product of the national **eXtension** network of parenting and child development experts who provide online support to parents and professionals and is distributed every month for the child's first year and then every two months until the child is five. Access was also provided to **Your Young Child**, a research-based curriculum and set of customized brochures that help parents of infants and toddlers manage seven difficult stages and behaviors that are linked to child abuse and neglect, and **Parenting Again** topic-based discussion guides for grandparents raising grandchildren.

State-level partnerships were also established to address issues related to retirement that included brain health, motivation, stress reduction, and family relationships. The major activity encompassed 100 statewide workshops on memory improvement with nearly 4,000 Illinois Municipal Retirement Fund participants. Resources related to aging and retirement were also made available through **Long-term Care: Talking, Deciding, and Taking Action,** 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 and **Plan Well, Retire Well**, a comprehensive website, blog, e-news letter, and monthly news articles. Additionally, all Extension educators [nutrition and wellness, family life, and consumer economics] reached out to all counties statewide by offering similar older adult-focused 'healthy living' programs. An interdisciplinary series of programs were delivered at senior centers in the west suburban area of Chicago to help participants develop skills in health, nutrition, food safety, consumer and money management, and horticulture skills to reduce stress and promote better mental and physical health. A total of 54 programs were held with attendance totaling more than 500 seniors. The **Intentional Harmony: Managing Work and Life** curriculum and web-based self-study focusing on nurturing relationships continued to be offered.

A number of programs and educational resources successfully addressed developing a healthy lifestyle. The University of Illinois Extension **Financial Wellness** program targets young adults to help them make informed financial decisions. Efforts have continued to train college Peer Educators, who

made presentations to young adults on budgeting and using credit wisely, and through informal and one-on-one counseling. Students also connected with the **Financial Wellness** program through social media with over 800 subscribing to the electronic newsletters as well as accessing budgeting and tracking spending worksheets and checking their credit online. Another activity initiated this year was a workshop designed to increase knowledge of rules for taking distributions from tax-deferred retirement plans.

Extension programs also focused on chronic diseases, including heart disease and diabetes. **I on Diabetes** was taught as a four-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. Several websites also make information available to the public. The first, **Diabetes Lifelines**, is a bi-monthly newsletter that provides information in both English and Spanish to clientele on a variety of diabetes-related topics and is located at: http://www.urbanext.uiuc.edu/diabetes [over 62,000 English page views and over 80,000 Spanish page views were recorded for this past year]. **Your Guide to Diet and Diabetes** and **Diabetes Recipes** logged over 230,000 English page views and over 213,000 Spanish page views. **Meals for a Healthy Heart** is a two-part series focused on increasing participant awareness of the risk factors 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 were provided at each session. Extension is especially focused on helping limited-resource families and youth improve knowledge of nutrition practices through **Supplemental Nutrition Assistance Program Education [SNAP-Ed]**.

All My Money, a hands-on, train-the-trainer curriculum designed for staff and volunteers that work directly with limited-resource clientele, was conducted in several locations. The lessons cover all the basics of money management and consumer skills. 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.

2. Brief description of the target audience

Members of the target audience included families with children aged 8 to 12 years, educators and practitioners who work with families, dual-earner couples, mothers who co-parent after separation, professionals working with mothers in the process of divorce [including parent educators, family law attorneys, family court judges, victim advocates, and health care providers], policy makers and service providers concerned with building strong communities and families, and practitioners and policy makers focused on environmental design, including landscape designers, landscape architects, mayors, arborists, and urban foresters. In addition, Extension targeted caregivers of adults and working couples.

3. How was eXtension used?

Family life Extension staff promote access to information regarding parenting.

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	987748	81455	147045	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	4	4

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2011	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number Of Research Projects Utilizing The Child Development Laboratory Research Database
2	Increased Knowledge Of Children's Behavior At A Given Stage Of Development And Parenting Practices To Foster That Behavior
3	Reduction In Physical And Emotional Strain In Handling The Challenges Of Work And Family
4	Increased Confidence And Competence In Functioning As A Parent
5	Increased Parenting Practices That Promote Nurturing Relationships
6	Couples Utilizing The Intentional Harmony Work-Life Curriculum
7	Impacts Of Residential Vegetation On Older Adults
8	Improving Children's Relationships With Their Siblings
9	Investigating The Pathways And Outcomes Associated With Mothers' Postseperation Co-Parenting Relationships
10	Improved Understanding Of How Young Children Develop Expectations About Relationships

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	Actual
2011	24

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Implementation of the Child Development Laboratory [CDL] Research Database Project allows the CDL program to maintain an interdisciplinary, longitudinal, and programmatic research agenda in the areas of child development and parent-child relationships. By maintaining this programmatic research agenda, the CDL program will continue to add to the scholarly environment at the University of Illinois at Urbana/Champaign in several ways. First, the nature of the overarching research themes of the project reflect critical issues that need to be addressed regarding developmental outcomes for children. Second, implementation of the CDL Research Database Project allows for the use of systematic procedures to create unique databases of information on children's behavior in a variety of developmental domains.

What has been done
The purpose of this project is the ongoing implementation of the Child Development Laboratory [CDL] Research Database Project. This project is designed to facilitate an interdisciplinary, longitudinal, and programmatic research agenda at the CDL. During the current reporting period, the procedures developed during the previous year for conducting baseline assessments of children enrolled in the CDL program were continued. These procedures included using the BINS and DENVER II developmental screening tools for baseline data collection, training procedures for classroom teachers and research teams gathering data at the CDL, mechanisms for the reciprocal exchange of data across projects being implemented at the CDL, and standardized data compilation procedures. Information from the research database was then made available to researchers collecting data with CDL children and staff for research projects.

Results
There are three beneficiaries of this project. First, the systematic procedures used to create this unique database of information on children's behavior across multiple developmental domains

allows researchers to use these data for both historical and projective analyses that focus on child development and outcomes resulting from interactions in high-quality early childhood environments. Second, the continuation of the CDL Research Database Project facilitates long-term, interdepartmental, and cross-departmental faculty and student collaborations that provide opportunities for creative investigations of children's development. 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. A total of 24 research projects were conducted at the CDL during the current reporting period. Twenty-one of the 24 studies accessed information from the CDL Research Database project as part of their data collection. These 24 projects represent a diverse array of disciplines, all focused on various aspects of children's growth and development.

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	Actual
2011	925

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 and 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

Just in Time Parenting age-paced newsletters were made available through the Parenting 24/7 website via email subscription or downloading. There were approximately 95,000 unique visitors to the newsletter section and 300,000 page views. A total of 3,215 subscribers received either the monthly first-year newsletter or the bi-monthly newsletter for parents for children up to five years of age during the past year. Extension family life specialists and educators distributed marketing materials to agencies and to county directors to create awareness of these web resources. The newsletters cover 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. The evaluation was conducted using a survey of knowledge, attitudes, and practice changes attributable to age-paced newsletters that was completed by parents of 'at-risk' newborns.

Results

Based on the findings from past evaluations collected from parents who received the newsletter and applied to the 3,215 subscribers who received all the issues this past year, an assumption can be made that these parents also gained knowledge about child development and parenting. Projected response rates regarding specific knowledge gained suggest that 925 [90% of the respondents] would 'agree' or 'strongly agree' that the newsletters helped them learn to: [1] know what to expect my baby to be able to do at each age; [2] understand that some annoying things my baby does are normal for that age; [3] notice my baby's clues; [4] have more ideas about ways I can play with my baby to help him/her learn; [5] have more ideas about disciplining my child without spanking or slapping; and [6] understand that my baby is not trying to be bad or to make me mad on purpose. Based on previous evaluation data, Just in Time newsletters 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.

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	915

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
Just in Time Parenting age-paced newsletters were made available through the Parenting 24/7 website via email subscription or downloading. There were approximately 95,000 unique visitors to the newsletter section and 300,000 page views. A total of 3,215 subscribers received either the monthly first year newsletter or the bi-monthly newsletter for parents with children up to five years old during the past year. Extension family life specialists and educators distributed marketing materials to agencies and to county directors to create awareness of these web resources. The newsletters cover 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. An extensive evaluation of the value and impact of the newsletters was part of a three-year grant that ended the previous year. The 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
Based on the findings from past evaluations collected from parents who received the newsletter and applied to the 3,215 subscribers who received all the issues this past year, an assumption can be made that these parents also gained knowledge about child development and parenting. Using percentages documented in from a three year study, an assumption can be made by applying the study's 32% response rate that 1,028 of the 3,215 subscribers would complete the survey. Using those previous findings, an assumption can be made that 915 [89%] of the newsletter subscribers would 'agree' or 'strongly agree' that they felt more confident in their skills as a parent from reading the newsletter and 874 [85%] would feel more comfortable talking with their doctor when they had a question or concern.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Increased Parenting Practices That Promote Nurturing Relationships

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Couples Utilizing The Intentional Harmony Work-Life Curriculum

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
We have developed an evidence-based program, Intentional Harmony: Managing Work and Your Couple Relationship, to educate working couples about managing the stresses of work while maintaining their intimate relationship. This curriculum now must be evaluated for effectiveness. The proposed project involves a full-scale evaluation project, including recruitment and assignment, program delivery and follow-up, and collection of outcome data over a one-year period.

What has been done
The work-life management curriculum for couples has been revised as a result of the formative evaluation and has been used in eight states, reaching more than 1,000 couples per year since 2003. Another output was the development of The Role of Commitment and Communication in

Healthy Relationships [with Wallace Goddard] for the Ohio State University Family Life Electronics Seminar on Relationship and Marital Enrichment Education. The PI of this project is a founding member of NERMEN, the National Extension Relationship and Marriage Education Network. It is a 20 member, 14 state working group that provides information on healthy relationships and marriage education resources across the Extension system. NERMEN strives to support Extension educators and professional partners who are working with youth and adults in relationship and marriage enrichment programming.

Results

Overall, MWC improved work-life management as expected. It did not significantly impact relationship satisfaction. MWC was most effective for females, particularly in relation to work-life management. The project contributes to our understanding of techniques that are most effective in supporting dual-earner couples in managing the stress of their jobs while protecting their couple relationship. Our findings reveal that the program does, in fact, improve strategies that participants use to manage work-life balance. The most dramatic changes were among females who participated in the intervention. Specifically, significant changes for females occurred in the areas of behavioral conflict and spillover, partner practices, and physical and emotional strain. Their behavioral conflict and spillover and physical and emotional strain significantly decreased while their strategies to improve their daily interactions with their partner significantly increased. Unfortunately, the changes in men were not as profound, and these findings add further weight to the argument that we must consider gender when developing and delivering educational programming for couples.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Impacts Of Residential Vegetation On Older Adults

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This program of research centers around two major questions, both pertaining to the impacts of residential vegetation on older adults: First, does the presence of street trees, grass, flowers, gardens, and neighborhood parks encourage walking among older adults? And second, does walking in 'green' settings particularly increase older adults' vitality and capacity to live active, independent lives?

What has been done
The Sustainable Sites Initiative is an effort to design LEED [Leadership in Energy and Environmental Design]-type guidelines for designing and managing landscapes sustainably; the guidelines are now in pilot phase and have already been adopted by the federal government's Council on Environmental Quality to guide the development of all federally-owned and managed landscapes. In addition, the results have been incorporated into a monograph on the human health impacts of green spaces commissioned by the National Recreation and Parks Association.

Results
The Sustainable Sites Initiative's guidelines have already been adopted by the federal government; the document is entitled Guidance for Federal Agencies on Sustainable Practices for Designed Landscapes. The guidance is to be used by federal agencies for landscape practices when constructing new or rehabilitating existing facilities, or when landscaping improvements are otherwise planned. As the federal government controls or owns more than 41 million acres of land, landscaping practices by federal agencies can have significant impacts on the environment. Decisions regarding the development and maintenance of federal landscaped property provide an opportunity to promote the sustainable use of water and land, conserve soils and vegetation, support natural ecosystem functions, conserve materials, promote human health and well-being, and ensure accessibility for all users, including those with disabilities.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Improving Children's Relationships With Their Siblings

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Longitudinal research has revealed that without intervention, the quality of sibling interactions tends to be relatively consistent over the course of childhood and adolescence, thereby leaving siblings with poor quality relationships at a disadvantage. Thus, a key challenge is to help siblings develop positive relationships so that they can more fully reap the advantages of sibling support. Meeting such a challenge requires a clear understanding of the factors that promote supportive sibling relationships as well as knowledge of evidence-based strategies that have strong potential for enhancing sibling relationships during middle childhood. Few techniques are currently available to help children achieve these goals. Siblings in middle childhood may be particularly disadvantaged if they have not had the opportunity to develop the social and emotional competencies that set the stage for prosocial and supportive relationships. Therefore, the current investigation will extend a successful, evidence-based approach for strengthening prosocial sibling relationships by developing and testing a developmentally-appropriate curriculum for children in middle childhood, the Even More Fun with Sisters and Brothers program. This research will contribute to our understanding of the qualities of sibling relationships in middle childhood while providing a tool that is expected to help families.

What has been done
Evidence-based strategies for how to help children develop positive relationships with siblings are rare. The current project extends a line of action-oriented research on effective methods for improving sibling relationships among children aged 8 to 12 years by developing and testing a new preventive intervention program, the Even More Fun With Sisters and Brothers Program [EM-FWSB], that will be made available to families in community settings. The EM-FWSB program aims to increase prosocial sibling relationships by directly teaching children a set of social and emotional competencies that previous research has found to be necessary for successful sibling interactions in middle childhood. The first year of this project was devoted to curriculum development. The four-session curriculum focuses on teaching key social and emotional competencies of perspective-taking, emotion regulation, conflict management, prevention of bullying, bossiness, relational aggression, power differentials, peer-related concerns, and responses to unfair parental differential treatment.

Results
The implementation and evaluation of the EM-FWSB program will enhance the ability of parents, educators, and practitioners to support positive interaction among siblings, which in turn will strengthen family well-being. Evaluation findings will inform the continued development of the program, advance our theoretical understanding of children's sibling relationships in middle childhood, and direct the dissemination of the curriculum to broader audiences in need.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Investigating The Pathways And Outcomes Associated With Mothers' Postseperation Co-Parenting Relationships

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The goal of this study is to investigate pathways and outcomes associated with mothers' post-separation coparenting relationships, with a particular focus on experiences of intimate partner violence. The specific aims are to: [1] delineate trajectories of co-parenting 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 co-parenting 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.

What has been done
In 2011, we began recruitment and data collection that includes five assessment points with a targeted sample of 120 divorcing mothers. At the time of this report, we have completed 91 Time 1, 68 Time 2, 59 Time 3, 40 Time 4, and 7 Time 5 interviews. Preliminary empirical results were disseminated through four presentations at both state [Illinois Council on Family Relations] and national [National Council on Family Relations] professional conferences and a workshop delivered to a state-based agency that works with victims of domestic violence. A newsletter summarizing the results was also distributed to family law attorneys, family court judges, and the circuit clerk's office in Champaign, Illinois.

Results
This study contributes to existing empirical knowledge by teasing out the complexities of separating in the context of violence versus no prior history of violence. The study also adds to our knowledge regarding the role of different types of violence in different post-divorce coparenting experiences. The study makes theoretical contributions by integrating the disparate bodies of literature on intimate partner violence and co-parenting after divorce. Findings also

inform the development of divorce and health care policies and programs that target women and children who are vulnerable to violence after separation and negative health outcomes.

4. Associated Knowledge Areas

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

Outcome #10

1. Outcome Measures

Improved Understanding Of How Young Children Develop Expectations About Relationships

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This project was designed to examine how preschool children develop cognitive belief structures and expectations about different relationships through their daily interactions with caregivers in a variety of contexts. To examine these relations, we have used different methodological approaches to obtain the data. For example, we conducted classroom observations of children interacting with their peers, we interviewed parents and children, and we collected self-report data from parents and teachers. Additionally, we conducted laboratory observations of parent-child interactions during structured tasks.

What has been done
Our data analysis thus far has revealed important relationships 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 do not 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. They have also been used to leverage funds for an interdisciplinary research program that examines children's emotion regulation and food consumption. 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. In addition, frequency of positive affect is significantly associated with broad social competence measures.

Results
This project has generated longitudinal data that are valuable because they inform the development and implementation of evidence-based educational materials that may increase family resiliency. These research-based educational materials can be distributed to child care professionals, parents, and community programs that focus on family services. The findings from this research are important for theory building, methodology development, and for policy formation. For example, these data help us to understand the specific mechanisms through which family experiences and parent-child interactions influence the social and emotional outcomes of children. In addition, child care providers receive evidence-based materials that directly address the most pressing issues faced by teachers and parents.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

An evaluation study that used a randomized control trial with a pretest/posttest design was undertaken to measure the effectiveness of the **Intentional Harmony: Managing Work and Your Couple Relationship** [MWC] workshop. We examined the impact of MWC on individuals' work-life management and relationship satisfaction. By comparing the control [n = 50] and intervention groups [n = 50], we also examined impacts of the workshop by gender. Overall, MWC improved work-life management as expected. It did not significantly impact relationship satisfaction. MWC was most effective for females, particularly in relation to work-life management. The project contributes to our

understanding of techniques that are most effective in supporting dual-earner couples in managing the stresses of their jobs while protecting their couple relationship. Our findings reveal that the program does, in fact, improve strategies that participants use to manage work-life balance. The most dramatic changes were among females who participated in the intervention. Specifically, significant changes for females occurred in the areas of behavioral conflict and spillover, partner practices, and physical and emotional strain. Unfortunately, the changes in men were not as profound, and these findings add further weight to the argument that we must consider gender when developing and delivering educational programming for couples.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 10

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	20%		5%	
806	Youth Development	0%		5%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	9.0	0.0	12.0	0.0
Actual Paid Professional	7.7	0.0	9.2	0.0
Actual Volunteer	0.0	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**
426674	0	586590	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
426674	0	586590	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
3856692	0	1981315	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2011 included the collection of data that have provided fundamental knowledge regarding how biodiversity is responding to grassland restoration efforts in the Chihuahuan Desert and the sharing of that data with the Las Cruces Bureau of Land Management for use in future land-use decisions; the utilization of field sites on farms in a watershed where tile flow is monitored and nutrient concentrations determined to illustrate the response of the tile line to our nitrate reduction method; work with dredged sediment that has shown it to be a viable topsoil substitute [two city parks, one in East Peoria and another in Chicago, utilized Illinois River dredged sediment as topsoil to reclaim brownfields into city parks]; results that show the importance of fall nitrogen fertilization in affecting nitrate losses from agricultural watersheds in central Illinois [results such as these have led to the agricultural industry in the state proposing to move slowly away from fall fertilization, hoping to move to spring and side-dressed fertilization]; and improved land management strategies that growers can implement on their property to enhance native pollinators and pollination services on urban agricultural sites.

Additional research activities in 2011 included the discovery that, for forest landowners that minimize costs rather than maximizing net present values, long term sustainability is likely to decrease; results that produced novel insights into behavioral adjustments and real and perceived risks for an urban adapter species [woodchucks] and contributed to obtaining an external research grant from the United States Fish and Wildlife Service/Illinois Department of Natural Resources to continue examining the ecology and management of urban woodchucks; the development of predictive modeling tools for activated carbon filters that are very powerful and require a low amount of calibration data; experiments that clearly demonstrate a strong association of methylmercury with a non-volatile, non-distillable substance in natural waters that we believe to be sulfidic nanoparticles coated with natural organic matter [this will ultimately have an impact on our understanding of the fate of methylmercury in the environment and its bioaccumulation in freshwater fish]; an investigation of the factors [including land use] that may contribute to or regulate interactions between native freshwater bivalves and an exotic species; research that will help to improve wetland assessment protocols to include below-ground processes that affect water quality; and a study focusing on predicting the occurrence of Batrachochytrium dendrobatidis at landscape scales based on spatial variation in biotic and abiotic variables [Batrachochytrium dendrobatidis is a leading cause of amphibian extinctions in North America and worldwide].

Conference presentations included the New Mexico Fish and Game Agency, Illinois Mosquito and Vector Control Association, American Society of Agronomy, International Symposium for Society and Resource Management, Aldo Leopold Wilderness Research Institute, American Society of Agricultural and Biological Engineers**,** Midwest-Great Lakes Chapter Society for Ecological Restoration, North American

Benthological Society, Entomological Society of America, International Symposium on Erosion and Landscape Evolution, and the 32nd Annual Crown Gall Conference.

Extension activities encompassed a variety of delivery methods to provide education regarding soil and water management, forestry, and environmental stewardship. Other natural resource-related efforts are described in the Sustainable Energy and Climate Change planned programs sections.

The statewide **Illinois Tillage Seminars** held in three locations were attended by 240 participants and addressed nutrient management, use of cover crops, and economics in relation to conservation tillage with 10% of those commenting on their intent to incorporate cover crops into 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 soil erosion. quality. A **Soil and Water Management** webinar was hosted at local Extension offices across the state in February of 2011. Topics covered included corn residue/tillage and nutrients, research updates on erosion and sedimentation control and groundwater quality research, flood risk management, and how El Nino and La Nina affects weather and crops in the Midwest.

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. Fifteen presentations, seminars, workshops, and field days reached 2,079 individuals, while email, telephone calls, walk-ins, and **Ask A Foreste**r web questions resulted in another 975 contacts. The Extension Forestry website received 328,375 hits [up by 41.6 % over the previous year]. Now a 14-year tradition, Iowa State University Extension forestry and University of Illinois Extension forestry partner to offer the **Tri-state Extension Forest Stewardship Conference**. The conference included a presentation on herbicides by the Illinois Extension specialist who also worked with a local conservation partner to organize a successful invasive plant species workshop in Southern Illinois.

The **Illinois Master Naturalist [ILMN]** program completed a fourth year of statewide implementation. Participation this year expanded to two new locations. A total of thirteen Extension multi-county units with more than 700 individuals 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; two modules are still in progress. A web-based reporting site is near completion for use in collecting information on all Master Gardeners' training, volunteer hours, and projects.

2. Brief description of the target audience

Members of the target audience included forest landowners, wildlife managers, local citizens, Extension educators, USDA Forest Service personnel, soil scientists, agricultural engineers, environmental engineers, public officials, commercial interests, citizens interested in remediation and restoration of old industrial sites, policy makers focusing on storm water management, the fertilizer industry, soil and water conservation district personnel, the Illinois Department of Natural Resources, livestock producers, municipal water and wastewater utilities, the fish-consuming population of the United States, agricultural, biological, and ecological researchers, wetland researchers, and natural resource managers. Extension activities specifically targeted forest landowners, students [college and elementary], woodworkers, timber

buyers, loggers, and foresters.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	13158	5888	15699	0

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

Patent Applications Submitted

Year: 2011
Actual: 1

Patents listed
Phytochemical Composition And Anti-Inflammatory Properties Of Marqui Berry Juices Fermented With Yeasts [TF10096-PRO]

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	1	28	29

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2011	5

Output #2

Output Measure

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

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number Of Drainage Water Management System Acres
2	Application Of Reduced Tillage Or Soil And Water Management Practices
3	Application Of Pond Managment Recommended Practices
4	Optimizing The Utility Of The Soil Resource
5	Utilization Of The Online Interactive Key To Species Of Empoasca
6	Utilization Of Watershed-Scale Water Quality Models For Improved Total Maximum Daily Load Planning
7	Number Increased Knowledge Of Natural Resources, Science, And Environmental Stewardship
8	Number Of Pesticide Applicators Making Decisions To Avoid Harming The Environment

Outcome #1

1. **Outcome Measures**

Number Of Drainage Water Management System Acres

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Application Of Reduced Tillage Or Soil And Water Management Practices

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Application Of Pond Managment Recommended Practices

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Optimizing The Utility Of The Soil Resource

2. **Associated Institution Types**

- 1862 Extension
- 1862 Research

3a. **Outcome Type:**

Change in Condition Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2011	0

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

Issue (Who cares and Why)
There is a need to optimize utility of the soil resource for maximum benefit to society and to individual landowners. Large areas of Illinois have been altered by use and misuse of soils due to compaction, contamination, and other problems related to urbanization, industrial, or other high-impact activities. Included in these areas are brownfields, which are abandoned industrial sites, and surface mines that have not been properly reclaimed, as well as large tracts of suburbanized land.

What has been done
Work under the Illinois River Dredged Sediment Subproject revisited the sediment as topsoil substitute plots at Banner Marsh and measured the shrinkage of the sediment in our large and small containment vessels. This is an important measure that allows conversion of initial, fresh-dredged sediment volume to actual topsoil volume after dewatering. The Mud to Parks research and demonstration area was revisited to assess soil changes since initial sediment placement. The area has been proposed for extensive development, utilizing Illinois River dredged sediment as the much-needed topsoil to enhance the desirability of the property. Work under the Mississippi River Overbank Sediment Subproject included the collection of one hundred soil samples from overbank deposits resulting from the destruction of the Mississippi River levee downstream from Cairo, Illinois. These samples are now being processed in the NRES Pedology Lab.

Results
Our work with dredged sediment has shown it to be a viable topsoil substitute [two city parks, one in East Peoria and another in Chicago, utilized Illinois River dredged sediment as topsoil to reclaim brownfields into city parks].

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
605	Natural Resource and Environmental Economics

Outcome #5

1. Outcome Measures

Utilization Of The Online Interactive Key To Species Of Empoasca

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	15810

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Empoasca is one of the most economically-important genera of leafhoppers, with the potato leafhopper and other polyphagous species causing substantial damage to field and horticultural crops annually. The current lack of reliable identification aids and doubts about the identities of numerous previously-described species hinders the ability of economic entomologists and quarantine officers to manage these potential pests and prevent accidental introductions of invasive species. Because few specialists are available to do routine identifications [there are only three full-time leafhopper taxonomists in North America], user-friendly identification tools that can be used by non-specialists are urgently needed. Because they require only a computer with Internet connection and basic knowledge of insect morphology, online interactive keys provide the means for non-specialists to identify insects quickly and efficiently.

What has been done

The online interactive key to species of Empoasca now includes 486 valid species and 138 morphological characteristics. New outputs during the reporting period include the addition of 8,571 images illustrating various morphological structures to the online database. These images have been linked to the appropriate species pages and may now be used to compare homologous structures among multiple species using the 'compare' and 'images' functions in the 3i interactive key web interface.

Results

The project website received 15,810 unique visitors from 201 countries during the reporting period, an increase of 13% over the previous reporting period. This suggests that the interactive keys are being accessed by a wide variety of users. As a result of a seminar and informal training workshop conducted during the reporting period, entomology students at Northwest Agriculture and Forestry University, Yangling, China, are now compiling morphological data for Chinese Empoasca species to be included in the online database and keys.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

Outcome #6

1. Outcome Measures

Utilization Of Watershed-Scale Water Quality Models For Improved Total Maximum Daily Load Planning

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This study will evaluate watershed-scale water quality models for total maximum daily load planning. Specifically, the components to be examined are tile flow, direct runoff, and base flow. The relative proportions of these components will then be related to environmental variables such as previous rainfall, climate, land-use, tile density, and soil properties. Once algorithms have been examined and incorporated with existing models and evaluated, efforts will focus on estimating nitrogen and pesticide loads carried by these flow components.

What has been done
In the past, extensive field work on the effects of subsurface drainage on water quality was conducted in Illinois -- the Little Vermilion River [LVR] watershed, the Lake Decatur watershed, and the Upper Embarras River [UER] watershed. In 2011, we obtained significant modeling results on microbial pathogen transport. We also started collecting data on soil erosion and sediment transport. From the LVR watershed, we have more than 12 years of data on tile flow, surface runoff, nutrient concentration and mass flow, pesticide concentration and mass flow, and climatic data. These data are being used in several models. Recently, the project investigator has partnered with other researchers from the Civil and Environmental Engineering Departments at the University of Illinois, Purdue University, and the University of Iowa. We are conducting a diagnostic analysis of the effects of climate-landscape interactions on water balance variability and interactions between hydrologic and biogeochemical processes in the LVR watershed. From the data collected from the UER and Lake Decatur projects, models are being developed and modified for use on watersheds.

Results
Data are being used for model development and verification. The model development work continued in 2011 for nutrients and microbial pathogen transport. The relative proportions of

hydrologic components are related to environmental variables such as previous rainfall, climate, land-use, tile density, and soil properties. We are also working on a diagnostic analysis of the effects of climate-landscape interactions on the water balance variability and interactions between hydrologic and biogeochemical processes in the LVR watershed. These results have been presented to watershed groups. Microbial pathogen modeling results are being used to develop guidelines for best management practices. Several publications are in progress, which will help researchers and policy makers in implementing best management practices in tile-drained watersheds for enhancing water quality while maintaining productivity.

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
605	Natural Resource and Environmental Economics

Outcome #7

1. Outcome Measures

Number Increased Knowledge Of Natural Resources, Science, And Environmental Stewardship

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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 topics. The East Central Illinois Master Naturalists was one of the first training sites scheduled in 2006 and has trained 165 [111 remain active] residents from a multi-county area including 22 additional individuals this past year. Members of this group have joined forces to give volunteer hours to battle invasive plants and insects.

Results

East Central Illinois Master Naturalists have accomplished the following during 2011: [1] eradicated 2,740 pounds of garlic mustard, an exotic invasive plant that has spread throughout North America; [2] developed and distributed a document identifying invasive plants found in East Central Illinois and offered recommendations for action to prevent further spread; [3] sent information to 33 garden centers reminding them of which plants and cultivars are illegal to grow and sell in Illinois and suggested alternatives that could be sold instead; [4] presented an 'Eco-conscious Gardening and Landscaping' program and follow-up survey that documented knowledge as well as practice changes by the participants; [5] participated in a national Public Lands Day to remove invasive plants and collect prairie plant seeds to be used to restore local natural areas; and [6] completed nine ash tree inventory reports to help village officials determine actions needed with respect to the emerald ash borer invasive pest.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
123	Management and Sustainability of Forest Resources
605	Natural Resource and Environmental Economics

Outcome #8

1. Outcome Measures

Number Of Pesticide Applicators Making Decisions To Avoid Harming The Environment

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	501

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Application of pesticides has potential adverse impacts on the environment, crops grown, and the pesticide applicator.

What has been done
Pesticide training sessions focused on issues related to Integrated Pest Management, environmental stewardship, personal safety, and resistance management. Private applicator training sessions were greatly reduced in number due to staffing reductions and a smaller number of applicators due for re-certification. Extension staff taught 1,364 individuals in fourteen settings across the state that reached agricultural producers, agriculture and horticulture sales associates, and Extension master volunteers. Following the training, Illinois Department of Agriculture staff administered a certification test. In 2011, a local Extension unit conducted a massive statewide survey of private applicators with a random sample of the 16,935 private applicators registered in the state of Illinois as of December, 2010. Two thousand [2,000] surveys were mailed and 911 responses were secured [a response rate of 45.5%] via return mail.

Results
The statewide Pesticide Safety Education Program [PSEP] survey found that 80% of the private applicator audience attended pesticide safety training once every three years. Private applicators were asked to indicate the level of influence that the PSEP training had in the four areas of focus encompassed in the training using a scale of 1-5. The survey found that pesticide safety education programming had reportedly influenced the decision-making of applicators. Specifically, applicator vigilance in the area of pesticide safety had reportedly improved as a direct result of training, evidenced by 566 respondents [63.6%] selecting a 4 or 5 rating. Vigilance in the area of awareness of environmental issues was reportedly improved with 501 respondents [56.2%] selecting a 4 or 5 rating. While the reported impact of pesticide safety education upon Integrated Pest Management [IPM] adoption was less impressive, one-third of the farmers [304 or 33.4%] surveyed said it had influenced their adoption of IPM. The findings with respect to the influence of training on calibration of equipment were similar; 303 ratings of 4 or 5 [34.2%].

4. Associated Knowledge Areas

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

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)

Evaluation Results

An evaluation distributed and collected from 116 0f 240 attendees at the three 2011 **Illinois Tillage Seminars** asked the 72 who had attended in previous years to indicated changes in their farming/tillage system. One-fifth reported changing or increasing strip-tillage or no tillage and one-fifth reported adopting variable rate fertilizer application. Ten percent indicated they plan to start or increase strip-til. Ten percent also had investigated or had begun carbon trading. More than 92 percent of those who completed the evaluation the use of research and demonstration data as 'useful' or 'very useful'. More than 95 percent also rated the overall value of the program as 'useful' or 'very useful'.

Key Items of Evaluation

This year's annual evaluation using the same form suggests that attendance continues to include individuals who have never attended before [nearly one-fifth], warranting continuation of the seminars. Although one-fifth of the attendees indicated they have used no-till or strip-till, the evaluation results indicate that additional individuals plan to increase or initiate these methods. The evaluation findings also indicate strong interest in drainage and cover crops recommendations

V(A). Planned Program (Summary)

Program # 11

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%		15%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		10%	
202	Plant Genetic Resources	0%		10%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		10%	
205	Plant Management Systems	35%		10%	
206	Basic Plant Biology	10%		10%	
211	Insects, Mites, and Other Arthropods Affecting Plants	10%		5%	
212	Pathogens and Nematodes Affecting Plants	10%		10%	
213	Weeds Affecting Plants	5%		10%	
216	Integrated Pest Management Systems	30%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	15.0	0.0	20.0	0.0
Actual Paid Professional	12.2	0.0	14.9	0.0
Actual Volunteer	0.0	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**
668456	0	927597	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
668456	0	927597	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
6042150	0	8082110	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2011 included ongoing cultivar trials focusing on the agronomic performance of corn, soybean, winter wheat, alfalfa, and forage grass cultivars [results of these trials, either through direct use by farmers or through use by seed companies, affect crop production on 9,490,000 hectares in Illinois]; an increase in knowledge about herbicide resistance in waterhemp [a primary impact of this research is that it enables farmers to select the most efficacious herbicides for their fields, which can reduce wasteful applications of less effective herbicides]; a project with the goal of determining if the use of cover crops in a corn:soybean rotation is effective for reducing disease severity levels in soybean [managing diseases, weed problems, and increasing soil health through the use of cover crops will increase the sustainability of the corn:soybean rotation system and increase the profitability of soybean production by reducing yield losses resulting from disease]; research testing the feasibility of late-planted corn as a trap crop to concentrate western corn rootworm egg laying into small areas that allowed management action to be focused on a small area [focusing soil insecticide or transgenic cultivar use on at-risk areas reduces inputs, improves safety, reduces pesticide use, and promotes sustainable use of Bt corn hybrids by providing a refuge for Bt susceptibility]; ongoing calibration of the **Illinois Soil Nitrogen Test** [ISNT] for optimizing nitrogen fertilization of corn; a project to improve our understanding of the function of key flowering genes and their interactions that led to a USDA-NIFA grant award in 2011; and findings that will result in the development of allele-specific DNA markers located in regulatory regions of the maize genome [these DNA markers will allow more efficient and innovative marker-assisted breeding strategies to be designed].

Additional research activities in 2011 included coordinated efforts to improve marketing and increase consumer demand for locally-produced fruits and vegetables; development and distribution to local farmers of a handbook on short cycle cover crops; findings that are being used to educate clientele about the importance of using the right nitrogen rate, timing, source, and method of application to improve corn production and improve nitrogen use efficiency; ongoing development of improved soft red winter wheat varieties [which have had a significant economic impact while reducing losses, improving stability of production, and improving the quality of the grain produced]; efforts to improve our understanding of the pathways involved in soybean seed composition and of plant disease resistance [soybean products are of immense value to U.S. agriculture, annually contributing nearly $17 billion in unprocessed crop value]; foliar fungicide trials conducted on winter wheat with the goal of identifying the most efficacious fungicide products for control of Fusarium head blight, the associated mycotoxin deoxynivalenol, leaf rust, and Stagonospora leaf blight [results of these trials are being used to develop fungicide guidelines for growers, crop consultants, Extension personnel, and industry personnel]; the development of a reliable non-field

screening method, such as the new cut stem method, to facilitate soybean resistance evaluation [field screening of soybean for charcoal rot resistance has had variable and inconsistent results]; and efforts to better reach young farmers with information about plant-parasitic nematodes through the use of tablet technology and smart phone applications.

Conference presentations in 2011 included the American Geophysical Union Annual Meeting, Asilomar Legume Genetics Meeting, Cambridge Healthtech Next Generation Genomics Meeting, 23rd Annual Integrated Crop Management Conference, American Society of Plant Biology, University of Illinois Agronomy Day, Entomological Society of America Annual Meeting, American Society of Agronomy, Crop Science Society of America, Soil Science Society of America, University of Illinois Energy Farm Field Day, Association of Applied Biologists, Illinois Migrant Council, Illinois Specialty Growers Association, American Society of Horticultural Sciences, Weed Science Society of America, First South American Congress of Entomology, Fluid Fertilizer Foundation Symposium, Illinois Corn and Soybean Classic Meeting Series, National Fusarium Head Blight Forum, DOE Genomic Science Meeting IX - Systems Biology for Energy and Environment, Soil and Water Conservation Society Annual Meeting, and the International Sweet Corn Breeders Association.

Extension activities focused on both non-food horticulture crops and pests. The **Ask Extension -- Hort Corner** contains 77 website topics, of which seventeen are in Spanish, and which had more than 9,500,000 page views during the past year. The site allows visitors to ask a question of a University of Illinois Extension Educator or review the questions asked and answered previously. A series of twelve horticulture distance education programs titled **Four Seasons Gardening** were offered at Extension offices throughout the state during the spring and fall and were attended by 919 participants. Topics included small fruit, spring and summer bulb forcing, summer vegetable gardening, rain barrels, and invasive trees and shrubs.

Extension **Master Gardeners** spent countless hours providing horticulture information to the public. There are currently over 3,400 active Master Gardeners in Illinois. This past year, 683 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 creating and maintaining native plants and rain garden demonstrations, conducting local public right-of-way ash tree inventories, hosting garden tours, providing educational experiences for at-risk youth, and conducting **Four Seasons Gardening** webinars on constructing environmentally-friendly, low cost rain barrels.

Four training programs on integrated pest management, production practices, and insurance procedures for nursery production were attended by growers. Materials summarizing important points growers need to know about nursery crop insurance coverage were developed and shared with the growers to help them better assist their clientele. A session was also held for 100 growers at the 2011 fall Landscape Show in Orlando and an additional estimated 500 were reached during the trade show.

The **University of Illinois Plant Clinic** had a total of 7,040 client contacts [submitted samples, telephone inquiries, email request, and walk-in consultations] in 2011 and diagnosed 3,888 plant samples. Clinic staff members also prepared news releases, articles for newsletters, news columns and podcasts, developed a new website, created a facebook page, and developed a blog. In addition, the Extension **Digital Diagnostic System** provided extensive outreach to homeowners and commercial producers in diagnosing and providing solutions for 1,217 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

Members of the target audience include farmers, consumers, Extension educators, plant, crop and ecological scientists, seed companies and crop breeders, graduate and undergraduate students, nutritionists in animal feed companies, swine producers, soybean breeders, climate change scientists, nematologists, soybean growers, crop consultants, weed management professionals, crop biotechnology companies, the apple industry and apple grower organizations, the chemical and formulations industries, Corn Belt soybean and corn producers, homeowners who experience difficulty with periodic infestations of overwintering ladybird beetles and Japanese beetles, fruit and vegetable producers [including seasonal workers], farmers' market managers, produce aggregators, food banks, scientists and agricultural professionals familiar with crop physiology, plant breeding, and fertilizer use [specifically those trying to improve nitrogen use efficiency in corn], and the green industries of the midwest [the nursery and landscape industries, greenhouse managers, botanical gardens, and arboreta]. Extension audiences also included Master Gardeners and Master Naturalists.

3. How was eXtension used?

eXtension is used by staff and volunteers to access information to respond to homeowner inquiries. The Coordinator of Master Gardeners for Illinois Extension contributes content to the site.

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	26413	2787870	181	0

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

Patent Applications Submitted

Year: 2011

Actual: 3

Patents listed

Soybean Genes For Resistance To Aphis Glycines [TF04048-DIV], Soybean Genes For Resistance To Aphis Glycines [TF06124-DIV], Transmission Raman Spectroscopy Analysis Of Soybean Composition [TF10087-PRO]

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	1	67	68

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Research Projects

Year	Actual
2011	9

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 Informed User Of Pesticides
3	Providing Management Information To Farmers With Regard To Managing Soybean Cyst Nematode Heteroda, Glycines
4	Dollars Saved Through Safe And Effective Pesticide Application
5	Choosing Plant Varieties That Are Known To Be Resistant to Insects And Diseases
6	Farm Hectacres Impacted By Agronomic Performance Trials Of Corn, Soybean, Winter Wheat, Alfalfa, And Forage Grass Cultivars
7	Testing Of Waterhemp Samples To Better Inform Weed Management Clientele
8	Improved Management Of Weedy Species That Have Evolved Herbicide Resistance
9	Improving Crop Productivity Through Artificial Selection On Regulatory Sequence Variants
10	Development Of Unique Germplasm Resources
11	Informing Farmers On Research Conducted On Short-Cycle Cover Crops
12	Educating Farmers On The Importance Of Using The Correct Nitrogen Rate, Timing, Source, And Application Method
13	Educating Farmers On Weed Management For Vegetable Crops
14	Educating Farmers On The Importance Of Soils In Providing Needed Nitrogen For Corn
15	Further Improvement Of The Illinois Soil Nitrogen Test With The Goal Of Reducing Nitrogen Inputs Without Decreasing Yield
16	Educating Illinois Soybean Growers And Consultants On Optimal Seeding Rates

Outcome #1

1. Outcome Measures

Percentage Of Nitrogen Utilization By Wheat

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

More Informed User Of Pesticides

Not Reporting on this Outcome Measure

Outcome #3

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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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 by 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 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 had 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 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

Outcome #4

1. Outcome Measures

Dollars Saved Through Safe And Effective Pesticide Application

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Choosing Plant Varieties That Are Known To Be Resistant to Insects And Diseases

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	184

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 were completed by 683 new volunteers.

Results
Pre- and post-tests completed by 183 of the new Master Gardeners evidenced a 26.8% increase in scores from pre-test to post-test. Based on a retrospective evaluation conducted via an online survey in 2007 by the state Coordinator of Master Gardeners to assess twelve gardening practices, eleven personal improvement skills, and Master Gardeners' experience in teaching horticulture topics, results suggest that an additional 184 [27%] of this year's 683 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 375 [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
206	Basic Plant Biology
216	Integrated Pest Management Systems

Outcome #6

1. Outcome Measures

Farm Hectacres Impacted By Agronomic Performance Trials Of Corn, Soybean, Winter Wheat, Alfalfa, And Forage Grass Cultivars

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	9490000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The agronomic performance of corn, soybean, winter wheat, alfalfa, and forage grass cultivars available to farmers in Illinois were compared. Companies that sell seed in Illinois enter cultivars into these trials on a voluntary basis by providing seed and paying a fixed fee. Standard crop cultivar testing procedures are used to measure the performance of each cultivar. Comparative results are made available for general usage.

What has been done
Commercial corn hybrids and publicly and privately developed forage, soybean, and winter wheat varieties were evaluated for yield and agronomic performance. A number of publicly-developed advanced experimental lines were also included in the soybean and wheat tests. The evaluations were conducted at twelve locations for corn, thirteen locations for soybean, six locations for wheat, and one location for forages. The soybean evaluation trials at one location included a row spacing variable; corn evaluation trials at three locations included a corn-following-corn variable. In four locations of corn and thirteen locations of soybean trials, harvested grain was tested for protein and oil content. Forage evaluation trials included grass species at one location. Soybean varieties are evaluated for their resistance levels to several diseases of economic importance. Protein and oil levels of soybean varieties at all locations were determined. This information is compiled at the VIPS [Variety Information Program for Soybeans] website. The yield data generated by the Soybean Variety Testing Program coupled with the disease resistance and grain quality data provided through the VIPS Program provide producers with a very comprehensive source of information. The results were published as an insert in a widely-distributed farm newspaper and were distributed through Extension offices. Results for all crops are available at http://vt.cropsci.illinois.edu/.

Results

The results provided unbiased data useful to crop producers choosing cultivars of these crops to be grown in different agronomic zones of Illinois. Companies who enter cultivars also used this information widely. The results of these trials, either through direct use by farmers or through use by seed companies, affect crop production on 9,490,000 hectares of five crops in Illinois. Reports issued by this program are regarded as the premier source of unbiased performance information on current cultivars. These reports guide cultivar selection in Illinois and surrounding states to ensure producers are growing the best cultivar for their farming operation.

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Testing Of Waterhemp Samples To Better Inform Weed Management Clientele

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	500

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

Past and current research has resulted in the development of molecular-based rapid assays for herbicide resistance in waterhemp [Amaranthus tuberculatus]. Specifically, we now have assays for resistance to three herbicides or herbicide groups: inhibitors of acetolactate synthase [ALS], inhibitors of protoporphyrinogen oxidase [PPO], and glyphosate. Information obtained from the assays was then used to fine-tune weed management programs. We also pooled the data to obtain a regional picture of the extent of herbicide resistance in waterhemp. Such information was disseminated to weed management clientele via various Extension meetings and Extension newsletter articles. Through basic research, we also increased our understanding of the herbicide resistance mechanisms in waterhemp. Specifically, we obtained data on the preponderance of the specific resistance mechanisms for which the molecular assays are designed. This information allows us to more accurately interpret the results of the assays. Additionally, new information was obtained on waterhemp pollen biology and dissemination. This information will aid efforts to predict how herbicide resistance will move among populations.

Results

From previous research, we have identified the molecular basis of these resistance traits. This information was then used to develop rapid, DNA-based assays to detect these resistance traits in waterhemp samples. Crop producers and other weed management clientele submit to us waterhemp samples that they suspect have herbicide resistance for testing. In 2011, we tested over 500 waterhemp samples. 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. Pooling data from multiple submissions enables us to determine and track where herbicide resistant waterhemp is present in Illinois. A primary impact of this research is that it enables farmers to select the most efficacious herbicides for their fields, which can reduce wasteful applications of less effective herbicides. Knowledge of waterhemp pollen biology and dissemination is being used to develop models that will enable us to better predict the spread of herbicide resistance in waterhemp.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Improved Management Of Weedy Species That Have Evolved Herbicide Resistance

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Populations of weedy species that have evolved resistance to various herbicide site-of-action families are perhaps the most critical weed management issue facing producers of agronomic crops in many areas of the United States. In Illinois, we have documented that our most troublesome broadleaf weed species [waterhemp] has now evolved resistance to five herbicide site-of-action families.

What has been done
Most recently, a waterhemp population from McLean County, Illinois was confirmed resistant to HPPD-inhibiting herbicides. We continued our greenhouse and field research experiments to characterize the response of this population [designated MCR] to HPPD-inhibiting herbicides. A greenhouse dose-response experiment was performed to determine the magnitude of resistance of MCR to foliar-applied HPPD inhibitors. Two other waterhemp populations [designated WCS and ACR] known to be sensitive to HPPD inhibitors were included in the experiment for comparison. The results from this research project will be used by Extension weed scientists to formulate recommendations that will be presented to weed management practitioners across Illinois.

Results
These results further support other data generated in controlled greenhouse conditions that indicate MCR has evolved resistance to foliar-applied HPPD inhibitors. In field experiments, we determined waterhemp density thirty days after treatment [DAT] with various soil-applied herbicides. Isoxaflutole and mesotrione, HPPD inhibitors used in corn, both significantly reduced waterhemp density compared with the untreated control; however, waterhemp density in these treatments was significantly higher compared with acteochlor. Other soil-applied herbicides, including sulfentrazone, flumioxazin, metribuzin, alachlor, and pyroxasulfone, significantly reduced waterhemp density compared with an untreated control.

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
213 Weeds Affecting Plants

Outcome #9

1. Outcome Measures

Improving Crop Productivity Through Artificial Selection On Regulatory Sequence Variants

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This project is based on the hypothesis that artificial selection on regulatory sequence variants could aid plant breeding efforts to improve crop productivity. Screening for allele-specific gene expression would seem to be a logical first step. Recent technological advances in high-throughput DNA sequencing and the availability of the complete maize genome provide the means to deeply sequence transcriptomes and to digitally count the number of transcripts. The overall objective of this project is to identify DNA sequence variants in regulatory regions of the maize genome.

What has been done
For this experiment, the homozygous inbreds LH1, LH123HT, PHG39, and PHG84 were used. Inbreds LH1 and PHG39 belong to the Stiff Stalk heterotic group, whereas inbreds LH123 and PHG84 belong to different lineages in the non-Stiff Stalk heterotic group. All were formerly parents of commercially-distributed maize hybrids, and plant variety protection and/or utility patents of each have recently expired. The four parental inbreds, the six F1 hybrids derived out of their crosses using a half diallel design, the six F2 populations obtained by selfing each F1 hybrid, and the twelve backcross [BC1] populations derived by crossing each F1 hybrid with its two parental inbreds were developed in the 2007 and 2008 summer nurseries and increased in our 2008/2009 winter nursery. All genotypes were grown in a designed experiment consisting of 28 entries in Urbana, Illinois in the summer seasons 2009 and 2010 and evaluated for a comprehensive set of plant life history characteristics and agronomically-important traits with a specific focus on the ear shoot. Ear tissue from all 28 genotypes grown in three replications [total number of samples N = 84] was sampled four days after anthesis. The extraction of total RNA from pooled ear shoot base samples obtained from a single plot was completed in 2011. The statistical analysis showed that genotypic variation in kernels per row was highly correlated with

cob length, cob weight, grain fill, ear weight, and grain weight per ear. Only non-additive sources of variation were significant genetic components of these traits. Inter-correlations of genotypic variation among the traits were quite high, with the first principal component of the correlation matrix accounting for 90% of the variation among traits. Trait weights on the first principal component vector were nearly equal.

Results
The knowledge gained in this project will be used to develop allele-specific DNA markers located in regulatory regions of the maize genome. Together with the new insights into the molecular basis of dominance, epistasis, and heterosis, these DNA markers will enable us to design more efficient and innovative marker-assisted breeding strategies. We also envision that isolation and modification of the found regulatory DNA sequences will open the door to pioneering biotechnology approaches for increasing crop productivity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
206	Basic Plant Biology

Outcome #10

1. Outcome Measures

Development Of Unique Germplasm Resources

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The important 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, with four

new requests during 2011 from Galilee Seeds in Israel, Michigan State University, Purdue University, and the University of Minnesota. The generation of molecular genetics resources 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 function and the genetic improvement of corn.

What has been done

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. 2011 marks the 112th growing season for the project. An additional cycle of selection was conducted for the following six populations [cycle number]: Illinois High Protein [109], Illinois Reverse High Protein [60], Illinois Reverse Low Protein [62], Illinois Reverse Low Protein2 [20], Illinois Reverse High Protein2 [8], and Illinois Reverse High Protein3 [9]. Included as reference genotypes in the experiment to aid in assessing genetic gain were inbred lines derived from each of Illinois High Protein, Illinois Low Protein, Illinois Reverse High Protein, and Illinois Reverse Low Protein. Also grown for reference were individuals from the most recent cycle of selection of each of the other strains: Illinois High Oil [108], Illinois Low Oil [86], Illinois Reverse High Oil [58], Illinois Reverse Low Oil [61], and Illinois Switchback High Oil [101]. Selection for the other strains was discontinued due to the apparent lack of recent response to selection. However, individuals from each of these recent selection cycles were self-pollinated to initiate the development of reference inbred lines for each population. All populations were grown in adjacent plots in the summer nursery, with 60 kg/ha supplemental N fertilizer. For each population, the 12 selected ears from the previous selection cycle were divided into two groups of six ears, 25 seeds from the six ears bulked, and 15 seeds from each bulk planted per row in 10 sets of rows that alternated the two groups of six selected ears. Fifty ears from each of the two groups within the population were pollinated by a single male plant from the other group, with each plant being used as either a male or female parent only once. Sixty well-filled ears were randomly chosen for compositional analysis.

Results

The primary outputs from this project are the unique germplasm resources and the opportunities it offers for educating students and the general public about plant breeding. The project annually investigates and provides empirical data regarding the limits of 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.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
206	Basic Plant Biology

Outcome #11

1. Outcome Measures

Informing Farmers On Research Conducted On Short-Cycle Cover Crops

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Pumpkins and cucumbers are key vegetable crops that are plagued by soil-borne weeds, insects, and diseases. Mustard and buckwheat, short-cycle cover crops, could suppress these key pests. This project develops integrated pest management strategies for sustainable pumpkin and pickle cropping systems and ensures their adoption by farmers.

What has been done
We evaluated crucifers and buckwheat as short-cycle cover crops before pumpkins and cucumbers. In Illinois, buckwheat killing method, planting time, kill time, and length of time between killing buckwheat and planting cucumbers were varied and their effect on weed populations and cucumber growth and yield determined. All experiments with incorporated buckwheat reduced cucumber growth and yield. This was possibly due to heavier soil and higher organic matter of the soils along with poor weather conditions. In New York State, mustard cover crops inhibited growth of direct seeded cucumbers. In Illinois, this inhibition did not occur [possibly because of the use of transplant cucumber, due to rodent feeding, and the difference in soil types]. Illinois has heavy Drummer series soils while New York state has a lighter, sandy soil. Studies in Illinois and New York helped to define the cropping system. In Illinois, for example, an overwintering study found that Pacific Gold reduced weed biomass more in mid-March than Florida Broadleaf but by late March, the reduction in weed biomass was similar for the two varieties. Pumpkin growth in the mid-March killing time was best for Pacific Gold. In a spring planting study, the highest levels of cover crop biomass occurred in the first planting time for Florida Broadleaf and the second planting time for Ida Gold and Pacific Gold. Late planting of mustard covers results in lower biomass and more weed growth, but still less than on bare ground. Weed control in cover plots tended to be better than in bare plots after incorporating mustard covers. Early planted mustard cover crops are effective at controlling early, cool season weeds, an effect that continues after incorporation, possibly giving a competitive advantage to the

following crop during early growth stages. Pumpkin yields trended lower when grown after mustard cover crops, regardless of plant time or mustard variety. Despite higher weed biomass in the bare ground plots, pumpkins had higher yield, indicating that mustard residue in the soil inhibited plant growth. Plant time did not have an impact on pumpkin yield. The results suggest that selection of an appropriate cover crop is very crop- and site-specific.

Results
We developed a book for farmers on research conducted on short cycle cover crops. A total of fifty copies were distributed. A scientific audience was addressed through presentations and a poster at both the Weed Science Society of America and the American Society for Horticultural Science.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

Outcome #12

1. Outcome Measures

Educating Farmers On The Importance Of Using The Correct Nitrogen Rate, Timing, Source, And Application Method

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The information generated through this study is being used to educate clientele about the importance of using the right nitrogen rate, timing, source, and method of application to improve

corn production and improve nitrogen use efficiency [NUE].

What has been done
Corn yields are tightly related to nitrogen uptake. Varying environmental conditions can make it difficult to use one approach to nitrogen management to fit all conditions and years. Understanding how different environmental and management factors impact NUE is important. Both under- and over-application of N fertilizers can have negative impacts on the environment as well as the sustainability of a farming operation. While nitrogen rate can impact both the environment and profitability, there are additional factors that must be considered. In our work we are measuring nitrous oxide emissions of different N sources [urea, ESN [which is a polymer-coated urea fertilizer], anhydrous ammonia with and without a nitrification inhibitor [N-Serve], and UAN]. Finally, we are quantifying the effect of timing and method of application of different nitrogen sources on corn yield.

Results
Our results have shown that spring conditions are most important in influencing the availability of nitrogen fertilizers applied in the fall or at early pre-plant. We have also observed that applications closer to planting time can sometimes improve corn yields. However, we have observed that lack of nitrogen availability early in the season, when applications are delayed until sidedress time, can result in substantial yield loss and leftover nitrogen after the growing season. These results are helping corn growers understand the importance of weather conditions along with factors such as nitrogen rate, source, timing, and application method to manage the corn crop properly. The data are illustrating the importance of approaching nitrogen nutrition not as an application, but as a system.

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 #13

1. Outcome Measures

Educating Farmers On Weed Management For Vegetable Crops

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
We focused on developing replacements for atrazine herbicide and providing the latest information to sustainable and organic farmers on weed management. Atrazine is the most widely-used herbicide in sweet corn and there are environmental and health concerns related to its use that necessitate development of replacements or methods to lower atrazine application rates. The atrazine replacement study focused on using linuron alone or in combination with low rates of atrazine, halosulfuron, mesotrione, or nicosulfuron.

What has been done
Halosulfron, mesotrione, and nicosulfuron are used at low rates and are environmentally safe but must be combined with atrazine. Linuron alone, combined with reduced amounts of atrazine or with halosulfuron, mesotrione, or nicosulfuron did not injure the sweet corn and provided weed control similar to atrazine. This suggests that atrazine use could be reduced, although at the present time the cost of alternative herbicides could require increases in sweet corn costs to the consumer. A second study worked with sustainable farmers to incorporate cover crops in their current fallow instead of allowing weeds to grow. The on-farm study found that fall [cereal rye, winter wheat, or hairy vetch] and summer cover crops [such as sudangrass or buckwheat] were effective methods to replace weedy fallow on sustainable farms. The cover crops are inexpensive, reduce weed growth, and improve the soil compared to weedy fallow. The third study used survey and case study approaches to determine how an organic farmer gets information about and decides the approaches to use for weed management. The farmers trusted other farmers and field days the most for weed management information. The research findings will allow educators to target outreach in a manner that increases adoption of information and improves technologies. The consumer will benefit from increased availability and lower costs for sustainable and organic vegetables.

Results
Printed materials, presentations at grower and scientific meetings, and field days were used to disseminate outcomes. We made presentations on weed management in vegetable crops at two Extension meetings for a total of approximately 100 farmers. Eight farmers participated in our on-farm evaluation of cover crops to improve the current weedy fallows often used on sustainable and organic vegetable farms. A survey and case study served as a tool to receive feedback from approximately 250 farmers [surveys] and six farmers [case studies]. This information will allow us to better target our educational activities aimed at organic growers. We developed a book for farmers on research that we and others conducted for fruit and vegetable farmers. Fifty copies were distributed.

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
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

Outcome #14

1. Outcome Measures

Educating Farmers On The Importance Of Soils In Providing Needed Nitrogen For Corn

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	5000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The information generated through this study was used to educate clientele about the importance of soils in providing a portion of the needed nitrogen for a corn crop. Corn yields are tightly related to nitrogen uptake. Typically, application of nitrogen fertilizers is done to supply corn nitrogen needs. However, there is a substantial pool of native soil nitrogen that can become available to corn during the growing season. Presently, the factors influencing the release of indigenous soil nitrogen to the corn crop have not been quantified in detail. Understanding how different factors regulate native soil nitrogen availability to a corn crop can help improve nitrogen fertilizer management.

What has been done
Both under- and over-application of N fertilizers can have negative impacts on the environment as well as the sustainability of a farming operation. Thus, determining how much additional nitrogen is needed beyond the amount of nitrogen that the soil can provide to a growing crop can help protect the environment by reducing unnecessary nitrogen fertilization and improve the economic return on the nitrogen fertilizer investment to the producer. Our results have shown that ammoniated phosphates are a good source of nitrogen, but nitrogen applied early is less likely to be available. Early spring conditions are most important in influencing the availability of applied inorganic ammoniated fertilizers, while later growing season conditions are most important in determining the amount of nitrogen mineralized from soil organic matter. In years when substantial loss of nitrogen from the fertilizer was observed in the early season but later season

conditions were conducive to mineralization of nitrogen from the soil supply, little or no corn yield reduction was observed.

Results
The research findings were shared during three types of presentations: with Extension educators during their Annual Crops Team Meeting, with farmers at several field days, and with crop advisors, industry representatives, and farmers at local and regional meetings. Various portions of the data being produced were shared with an estimated 5,000 people in approximately 25 different meetings during the entire project time. These results are helping corn growers understand the importance of applying nitrogen close to the time of crop uptake to minimize potential nitrogen losses and to understand that good growing season conditions, which typically enhance corn growth, also enhance the capacity of the soil to provide nitrogen from its organic pool.

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 #15

1. Outcome Measures

Further Improvement Of The Illinois Soil Nitrogen Test With The Goal Of Reducing Nitrogen Inputs Without Decreasing Yield

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nitrogen is the most critical nutrient for growing corn and accounts for the largest fertilizer investment in modern agriculture. Since the 1970s, this investment has been viewed as a form of insurance against yield loss from N limitation, and there has been widespread reliance on yield-

based N recommendations. In these recommendations, an expected yield goal is multiplied by 1.2 and the product is then corrected, if appropriate, by applying estimated credits for a previous legume or the use of manure for the current growing season. The usual result is overfertilization beyond what the crop needs, which not only reduces profitability for the farmer but also leads to air and water pollution and even degrades the soil itself. Clearly, the use of N fertilizers should be matched to crop N requirements, but in a humid region such as Illinois, this becomes feasible only if there is some means to estimate the soil's N-supplying power. The Illinois Soil Nitrogen Test [ISNT] was developed for precisely this purpose, and has been used successfully in several field trials to predict yield response by corn to N fertilization.

What has been done

A multi-factor calibration of the Illinois Soil Nitrogen Test [ISNT] is being carried out in conjunction with nitrogen response studies under continuous corn and a corn-soybean rotation, in which plot-specific yield data were collected for plant populations that varied from 20,000 to 40,000 plants/acre. Plot-specific soil samples collected from two depths [0-12 and 12-24 inches] have been analyzed for total nitrogen and organic and mineralizable carbon, as well as by the ISNT. The resulting database is being utilized to develop and evaluate different models for prediction of optimum nitrogen rate, which will quantify the interacting effects of soil nitrogen supplying power [ISNT level], plant population, and organic carbon availability. In contrast to the ISNT, a positive effect is expected for both of the latter factors, as crop nitrogen need is enhanced by a higher planting rate and the heterotrophic immobilization of nitrogen by soil microbes. Modeling efforts now underway will enable plot-specific estimation of optimum nitrogen rate and yield response.

Results

The extensive use of nitrogen fertilizers for corn production has major implications not only for the profitability of producers and agribusinesses, but also for the sustainability of cropping and management practices and their impact on soil, air, and water resources. Since the 1970s, these fertilizers have been used without adequately accounting for soil nitrogen reserves that in fact serve as the main source for crop uptake. The ISNT was designed to quantify soil nitrogen-supplying power as a means of improving the accuracy of nitrogen fertilizer recommendations and implementing site-specific nitrogen management. Our previous work has provided ample evidence that numerous soil and plant factors affect the interpretive value of the ISNT for predicting crop nitrogen response. By utilizing the ISNT in conjunction with a multi-factor calibration, a 30 to 40 percent reduction should be readily attainable in nitrogen inputs with no yield penalty. At current fertilizer prices, such a reduction would cut the annual cost of Illinois corn production by more than 300 million dollars.

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 #16

1. Outcome Measures

Educating Illinois Soybean Growers And Consultants On Optimal Seeding Rates

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	3000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The goal of this program is to evaluate inputs and practices to increase soybean yields, to evaluate agronomic management decisions to develop informed production recommendations, and to evaluate double-crop soybean systems to increase year-long crop system productivity.

What has been done
Field trials were conducted throughout the state in 2010 and 2011. Six field-research trials were conducted to evaluate the interactions between row spacing, seeding rate, and planting date and their impact on soybean growth and yield parameters. Those trials were conducted at the DeKalb, Monmouth, Urbana, Perry, Brownstown, and Dixon Springs Research and Education Centers to reach a wide variety of soil and climate conditions. Additionally, there were four research experiments conducted at the DeKalb, Monmouth, Urbana, and Brownstown locations that evaluated many management inputs for their ability to improve yield through methods including increased nutrition, pest management, and plant growth enhancement.

Results
Results of the trials listed above were analyzed, summarized, and distributed to Illinois soybean growers and consultants in a variety of ways. Trial results were presented to over 3,000 people that attended meetings throughout the state including the Illinois Corn and Soybean Classic meeting series held in DeKalb, Moline, Champaign, Bloomington, Springfield, Quincy, and Mt. Vernon; Crop Management workshops held in Mt. Vernon, Bloomington, Champaign, and DeKalb; and summer field days held at DeKalb, Monmouth, Urbana, Perry, Brownstown, and Dixon Springs. Because of the results of these findings, many growers reported they were reducing seeding rates, and several seed companies were designing research trials to also validate our findings [which has resulted in many of them also reducing seeding rate recommendations]. The reduction of these seeding rates make Illinois soybean growers more

profitable and competitive in the global marketplace while maximizing their inputs and sustainability.

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

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)

Evaluation Results

We conducted a mail survey of Midwestern organic farmers to understand how social factors affected their decision making on weed control. We sent out 500 surveys and had approximately a 45% response rate. We were able to cluster farmers based on their tolerance to weeds -- intolerant, accepting, and feel weeds are indicators/provide environmental services. We also found that farmers rely on other farmers and field days for much of their information.

Key Items of Evaluation

The primary impact of a mail survey of Midwestern organic farmers was that we are better able to understand decision making by organic farmers and better able to target outreach efforts [for example, by working with farmer groups to co-sponsor field days].

V(A). Planned Program (Summary)

Program # 12

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	55%		25%	
601	Economics of Agricultural Production and Farm Management	0%		15%	
801	Individual and Family Resource Management	5%		0%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	20%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	7.0	0.0
Actual Paid Professional	2.1	0.0	5.8	0.0
Actual Volunteer	0.0	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**
113780	0	411596	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
113780	0	411596	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1028451	0	3360631	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities in 2011 included a more systematic study of particle size effects across different pretreatment technologies and feedstocks as a requisite for optimizing the feedstock supply system for cellulosic ethanol production; utilization of a single-nucleotide resolution analysis of the C. beijerinckii 8052 transcriptome using high-throughput RNA-sequencing technology to discover 20 previously non-annotated regions with significant transcriptional activities and 15 genes whose translation start codons were likely mis-annotated [significantly enhancing the accuracy of the existing genome annotation]; the collection of data on the biomass productivity of switchgrass depending on management practices, including seeding rate, cultivars, and soil fertility [these data will be very useful for local producers who are looking for switchgrass as an alternative energy crop for their cropping system]; the use of sympatric populations of Prairie Cordgrass [PCG] differing in chromosome number to begin to dissect the best chromosome complement for biomass production in Illinois; measurement of the yield and storability of high-moisture harvested corn for ethanol use; utilization of glycerol 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]; a study that indicated that response surface methodology is a useful approach for optimizing operational conditions for butanol production and that tropical maize, with a high yield of biomass and stalk sugars, is a promising biofuel crop; research that will help the swine and feed industries to formulate diets for pigs more accurately and at a reduced cost utilizing biofuel co-products; a study with the goal of accelerating the process of screening Miscanthus biomass germplasm for desirable end use in various biofuels processes; and a project in coordination with the **University of Illinois Energy Biosciences Institute** that seeks to identify yields, geographic adaptability, and agronomic requirements of sustainable lignocellulosic feedstocks. The project will facilitate sustainable systems for the production of biofuels and continues collaborations with university colleagues in Illinois, Georgia, Kentucky, Louisianna, Michigan, Mississippi, New Jersey, South Dakota, Oklahoma, and Wisconsin in the United States and Ontario in Canada to determine the survival and annual growth and yields of Miscanthus x giganteus and switchgrass.

Conference presentations included the Society for Industrial Microbiology [SIM], American Society for Microbiology, iBio, Bioenergy Research Conference [Dalian, China], American Society of Agricultural and Biological Engineers, American Oil Chemists' Society, First Symposium on Biomass Conversion [University of Illinois], University of Illinois Agronomy Day, American Society of Agronomy, Crop Science Society of America, Soil Science Society of America, University of Illinois Energy Farm Field Day, Association of Applied Biologists, Seventh International Starch Technology Conference, American Institute of Chemical Engineers, and the American Association of Cereal Chemists.

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The annual **Bioenergy Feedstocks Symposium**, sponsored by the Energy Biosciences Institute [EBI] on campus, was attended by farmers, researchers, academics, 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, the ecological sustainability and cost effectiveness of growing feedstocks for biofuel, and their use in providing heat and power. The **Biomass Energy Crops IV** conference provided attendees from around the world the opportunity to engage in three days of presentations about the latest in biomass and energy crop research throughout the United States and Europe and to tour EBI's Energy Farm on the University of Illinois campus.

An update on the research being conducted by the Center for Advanced Bioenergy Research was presented by an Extension campus specialist at the Extension Soil and Water workshop held at different locations across the state, as was a presentation on the biomass production research at the Dudley Smith Farm. 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 switchgrass and, more recently, tropical maize. Pellets formed from miscanthus are used to fuel the furnace in the local Extension office. A display focused on a gasification test unit that operates on corn crop field residue was demonstrated at the Farm Progress Show. The local Extension educator has continued to conduct presentations, tours, and field demonstrations for producers, students, power suppliers, researchers from other institutions, and government officials, as well as supporting hands-on experiences for college and high school classes. A series of webinars was piloted to offer consumer-based programming in dealing with local-to-global energy challenges.

The **Biomass Working Group** that includes a team of campus and field professionals, along with representatives from industry, entrepreneurs, and agency representatives formed last year and continues to meet quarterly to build better networks toward innovative bioenergy systems. Their activates included a research field-day featuring tropical maize as a bioenergy crop, exploring biomass production as a community development effort in a small Southern Illinois county, and cross-listing activities with the Indiana Bioenergy Working Group based at Purdue.

Multi-county unit consumer science educators have also presented programs that cover both large and small changes that individuals can make in daily routines to save energy usage in bathrooms, kitchens and appliances, as well as lawns and gardens. 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 that includes presentations, videos, games, and links. The site can be found at: www.energyedcouncil.org. Youth have also experienced opportunities to learn about energy, with a total of 76 youth enrolled in the 4-H wind energy project for the 2010-2011 4-H year and 1,983 participated in the **Wired for Wind** science experiment.

2. Brief description of the target audience

Members of the target audience included the producers of energy crops and local conservation groups, crop consultants, farm input suppliers, regional and national agriculture industries, state and national governmental agencies, companies constructing cellulosic ethanol plants, the food oil and biodiesel industries, nutritionists in feed companies and ingredient supply companies, pork producers, plant genetics companies, industries involved in producing biomass plants and seeds, manufacturers of biomass planting and harvesting equipment, and developers of pest control products for biomass production. Extension will also target individuals and families who wish to reduce energy consumption and expenses and youth.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2035	3391	164	1938

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

Patent Applications Submitted

Year: 2011
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	3	30	33

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number Of Completed Hatch Projects

Year	Actual
2011	1

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 4-5%]
2	Percent Reduction In NOx Emissions From Biodiesel
3	Increase Knowledge Of Research Findings Realted To Biofuel Production
4	Increased Knowledge Of Current And Future Energy Source Options
5	Number Implementing Recommended Practices To Reduce Energy Use
6	Eliminating The Food Versus Fuel Choice By Utilizing Marginal Land For Biomass Production

Outcome #1

1. Outcome Measures

Proportion Of The Use Of Biomass Relative To Total Energy [Currently At 4-5%]

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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
Currently, biomass energy is being used primarily for heating [for example, Eastern Illinois University has converted from using coal to using biomass]. Many feel that cellulosic biofuels are disappointing in that commercialization has been slow. However, the arguments in favor of alternative energy sources remain valid: [1] independence from foreign oil; [2] the finite nature of oil reserves; and [3] climate change associated with the use of petroleum-based products.

Results
Efforts by industry and academia have resulted in improvements in processing of biomass for production of liquid fuels. However, these improvements represent only portions of the biomass-to-biofuel value chain. The developed technologies will need to be 'bundled' together in order to have a significant impact on the efficient and economical production of biofuels. Future trends seem to be research working toward the goal of making lignocellulosic biofuels a commercial reality and progress toward bringing major commercial plants into operation.

4. Associated Knowledge Areas

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

601 Economics of Agricultural Production and Farm Management

Outcome #2

1. Outcome Measures

Percent Reduction In NOx Emissions From Biodiesel

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Increase Knowledge Of Research Findings Realted To Biofuel Production

Not Reporting on this Outcome Measure

Outcome #4

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	Actual
2011	1983

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As the world demand for clean energy sources increases, so has the interest in wind power. The United States consumes 22% of the world's electricity yet represents only 4.5% of the world's population. Most of the energy we use today comes from nonrenewable sources. The United States produces most of its electricity [almost 50%] from coal.

What has been done
With a goal of increasing youth interest in science, University of Illinois Extension staff and

volunteers conducted the Wired for Wind experiment with 74 different groups reaching 1,983 youth. The experiment developed by the University of Nebraska provided youth with opportunities to design and build two types of wind turbines and test them to determine the most effective type in harnessing wind energy. Youth expanded their learning as they experimented with different blade pitch angles and whether or not blade pitch would affect rotor speed and performance. In the final phase, youth used data, maps, and social and environmental considerations that real scientists use when determining the best location for wind farms in Illinois. A corporate partner with a sustainability focus on alternative energy also provided retail space in 25 stores for 4-H youth to conduct this 4-H science experiment on National 4-H Science Day.

Results
Youth participants [1,983] gained knowledge about how wind energy is captured through wind turbine blades. Of the 74 groups participating in the Wired for Wind experiment, 95% indicated they liked science and felt they were good at doing science, 99% felt that science is useful in solving everyday problems and only 4% felt that science was boring.

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
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #5

1. Outcome Measures

Number Implementing Recommended Practices To Reduce Energy Use

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Eliminating The Food Versus Fuel Choice By Utilizing Marginal Land For Biomass Production

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Modern agriculture practices have resulted in one of the most efficient production systems ever seen. In 1960, food, feed, and fiber production in the U.S. was 252 million tons. By 1990, this production had more than doubled to over 596 million tons. Making this feat more amazing is the fact that this gain occurred while 25 million fewer acres were in production in 1990 and the percentage of the population involved in farming declined from about 5% in 1970 to less than 2% in 2000. Recently, agriculture has been asked to take on a new mission: to produce replacements for fossil fuels. To accomplish this new directive and continue to keep food production up, crop biomass must be increased. Using the chromosome engineering techniques of flow cytometry and in situ hybridization, near-isolines of corn will be developed that differ only with respect to heterochromatin. There is speculation that heterochromatin, while being devoid of coding genes, influences various cellular and whole plant characteristics. The presence of these large heterochromatic knobs results in larger nuclei that in turn results in larger cells in corn. Larger cells result in more biomass. For this relationship to be proven conclusively and to be of use to corn breeders and ultimately the farmer, inbred lines of commercial value with increased heterochromatin will be developed.

What has been done

We have determined the area of adaptation of various prairie cordgrass species differing in chromosome number. In addition, we have used sympatric populations of PCG differing in chromosome number to begin to dissect the best chromosome complement for biomass production in Illinois. Work has recently been completed that determined the extent of chromosome variation on the biomass of tomato fruit. This knowledge will be applied to dicot plants used for biomass. Research has also been completed that identifies technological problems associated with measuring the chromosomal DNA content of maize.

Results

The actual range of adaptation in the United States was established for PCG. While some information had previously been available, we were the first to develop a comprehensive map of the range of adaptation of PCG. This will allow breeders to select natural germplasm that has the highest probability of being successful in specific geographic regions. Also, a comparison of two natural PCG populations that differ in chromosomal composition were compared to determine how PCG adapts to different environments in a specific locale and how this adaptation affects biomass production. The response of these different chromosomes to stress has been assessed as well to provide useful information to plant breeders who are attempting to breed for PCG varieties that are adapted to marginal land. This information will be used to produce biomass on non-cropland and alleviate the competition of food vs. fuel production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources

201	Plant Genome, Genetics, and Genetic Mechanisms
206	Basic Plant Biology
601	Economics of Agricultural Production and Farm Management
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

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)

Evaluation Results

In response to questions asked of the youth after completing the **Wired for Wind National Science Day** experiment in 74 4-H clubs or groups, 95% indicated they liked science and felt they were good at doing science, 99% felt that science is useful in solving everyday problems and only 4% felt that science was boring. In addition, observation of the youth's involvement evidences knowledge gained about how wind energy is captured through wind turbine blades.

Key Items of Evaluation

With increasing numbers of wind turbines appearing in Illinois, the youth involved in the science experiment have hands-on experience and information through guided discussions with theri group leader to help them connect with the function of turbines and how they capture the energy of wind for generating power.

V(A). Planned Program (Summary)

Program # 13

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 FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	45.0	0.0	0.0	0.0
Actual Paid Professional	34.8	0.0	0.0	0.0
Actual Volunteer	0.0	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
1905811	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1905811	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
17226556	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

In the midst of restructuring Extension program delivery boundaries and reductions in staff, the **4-H Youth Development Program** was successful in achieving the goal of strategically moving the Illinois 4-H program in a preferred direction -- with a focus on sustained learning experiences for youth, growth in 4-H

club membership, and developing the organizational capacity to have impact. After a six-year overall decline in 4-H Club enrollment, Illinois 4-H achieved a 4% increase over 2010 figures enrolling 23,543 youth. One hundred twenty-nine [129] new SPIN clubs were started with a total of 1,019 members and 194 adult leaders. Nearly 175,300 youth [8% of the Illinois youth population] were involved in some type of 4-H program such as after-school group programs, conferences, and camps.

Metro Educator positions [6] were established in areas of 100,000 or more and began exploring how to work with existing youth groups in offering sustained science and/or gardening opportunities for younger youth and helping older youth develop civic engagement and leadership skills. Educational priorities for all 4-H delivery systems focused on: [1] learning employment skills; [2] experiencing healthy relationships, [3] becoming physically fit; [4] thinking green; and [5] engaging in science.

Emphasis on engaging youth in science included clubs participating in the 4-H National Youth Science Day completing an experiment and sharing that experience with others at retail outlets [See Sustainable Energy impact report section]. The 4-H robotics project involvement continued to expand with 895 youth enrolled in one of three project levels and with forty counties sending state fair delegates to the conference to be judged. Over the past three years, participation in the **State 4-H Robotics Team Competition** has increased from 11 teams to 27 this past year. In addition, youth in 24 robotics special interest [SPIN] clubs met to complete robotics activities. **4-H Tech Wizards**, designed to establish mentoring programs for at-risk, underserved youth in an after-school setting, engaged 210 youth participants. The State 4-H Office also conducted robotics workshops for 4-H leaders and youth across the state. State and national partners played an important role in providing grants to support these science experiences and opportunities for awarding college scholarships

Cook County continued to offer youth science classes through its **Mobile Science Laboratory**. **Science Siesta** designed for girls in grades 4-6 introduced them to fun hands-on science activities and career opportunities. The program aims to dispel myths that science is too difficult, not fun, and more suited to males.

Illinois Summer Academies are three-day conferences on the University of Illinois campus that provided high school teens with opportunities to explore a college campus and hands-on workshops on potential careers in 4-H science or leadership development training. **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 on-going but smaller in scope this past year due to the reduction in Extension educators with consumer economics expertise. More information can be found in the Agricultural and Consumer Economics impact report section. A grant-funded national applied research project, **Health Jam**, involved over 329 youth from five counties in two-day camps that allowed them to explore health careers and to learn about pursuing a healthy lifestyle in keeping their bodies fit. [See Childhood Obesity planned program impact report as well as the impact report in this program]. The purchase of **Wisercise** curriculum designed to increase youth physical activity was piloted in elementary schools in several locations. Teachers worked with fifth graders who conducted/led physical activities in third grade classrooms. [See Childhood Obesity planned program report]. **Breaking the Code,** a research-based prevention simulation and guided discussion on bullying for junior-high and senior-high youth had been a key program in teaching youth strategies to negate unhealthy relationships that are detrimental to positive youth development.

Building youth leadership skills is both a national and Illinois area of focus. At the state level, opportunities and training were provided for **Youth Leadership Team** members to plan and conduct conferences and to articulate the impact of the 4-H program to legislators. Youth also served on a number of committees to plan events through hands-on experience and mentoring by Extension staff members and adult leader advisors. The impact of those activities is documented in the impact report section of this 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 a critical element of positive youth development. This past year slightly less than 19,000 volunteers gave time and talents to the 4-H Youth Development program in Illinois with 3,233 serving as club leaders. Leaders had instant access to a new series of online tips, **Leaders on the Go**, written in a question and answer format. Illinois 4-H volunteers learned about positive youth development, 4-H program management, and new and emerging curriculum through one or more of the three evening sessions of the **2011 North Central Regional Volunteer e-Forum** hosted at local Extension offices. Illinois had the largest number of participants [101] in this newly formatted conference which had previously been hosted by an individual state. In addition, the State 4-H Office promoted staff participation in the national **Everyone Ready** online professional development modules focused on working with volunteers.

2. Brief description of the target audience

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

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	104458	0	236914	194395

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	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
2011	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 Positive Youth Development
4	Number Of Youth Planning To Adopt An Option For Responding To Bullying
5	Number of Youth Developing Leadership Skills
6	Number Of Youth Who Indicate Increased Knowledge Of Science, Engineering, And Technology

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	Actual
2011	164

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 if the need for future scientists, engineers, mathematicians and technicians is not met.

What has been done
University of Illinois Extension 4-H conducted Health Jam for 329 youth in five counties, using a two-day camp format and an eight-week Walk Across Illinois activity. During the camps, the youth learned how to keep their bodies healthy and fit and explored health professions.

Results
Using a pre- and post-test evaluation format, 164 youth [49.8%] of the 329 participants were able to list at least one additional health profession on the post-test.

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 Positive Youth Development

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number Of Youth Planning To Adopt An Option For Responding To Bullying

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	222

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Violence and bullying in schools is increasing among teens in the U.S. There is a scarcity of materials focused on bystanders and for junior high and high school students.

What has been done
A team of Extension educators developed a research-based prevention simulation and guided discussions for junior-high and senior-high youth, supported by statistical research on bullying among teens in the Breaking the Code [BTC] program. Objectives are: Youth will [1] see the effects of bullying and understand the power of their decisions as bystanders in a bullying situation; [2] identify options for responding to bullying; and [3] be motivated to take a stand

against bullying. BTC is a simulation that tells the story of youth observing everyday situations where bullying occurs using scenarios that are narrated or performed as skits. Bystanders begin to realize the choices they make have a big impact on the victim, the normalcy and acceptance of bullying, and the social climate of their school. Guided discussion assists students in processing the experience. At the end of 2011, Extension educators had completed presentations in 12 schools reaching 585 students and 16 bullying prevention workshops in grade-school classrooms and day camps.

Results

To date, pre/post student evaluations have been completed with 585 students in settings conducted by Extension Educators. Data from student evaluations have continued to show double to near double increases in the number of students who: [1] would help the victim -- 222 [37%] additional students checked this on the post-test [244 pre-test versus 466 post-test]; [2] would ask an adult for help -- 204 [35%] additional students checked this on the post-test [174 pre-test vs. 378 post-test]; and [3] would confront a bully -- 210 [36%] additional students checked this on the post-test [194 pre-test vs. 404 post-test]. Additionally, approximately one-fourth of the student respondents were now able to understand that their decisions can affect bullying and that one person can make a difference when their pre-test responses were compared to their post-test responses. Educators have also witnessed additional impact during the guided discussion to process the experience. As an example, an educator witnessed students apologizing to another student for the way they had treated him/her.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

Outcome #5

1. Outcome Measures

Number of Youth Developing Leadership Skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	30

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Illinois residents in a 2009 Extension survey indicated a need for greater involvement of residents in local planning and expanding leadership opportunities and skills for youth. When youth are allowed entry into influential settings of decision making, it is theorized that they can become significant resources for creating the kinds of contexts, ecologies, and communities that enable positive youth development for themselves and for others.

What has been done
Both at the state level and county level, opportunities are created and offered to youth to view and practice leadership. At the state level, 4-H members make decisions and carry out various statewide events. The Illinois State 4-H Youth Leadership Team [YLT] involves 15-20 older 4-H members and recent 4-H alumni in coordinating and assisting with various regional and statewide 4-H activities such as planning and implementing the Illinois 4-H Jr. Leadership Conference and serving as the training team for the Speaking for Illinois 4-H program. These youth served two to four years and received training and mentoring in leadership development, team-building, and public presentations. This year an evaluation was designed and sent to 66 former YLT members to assess how their experience as a member of this group helped them develop 19 leadership life skills and to determine application of these skills in settings after leaving 4-H.

Results
Thirty youth [46%] completed the survey by indicating 'no', 'maybe', or 'yes' for the various skills and roles included in the survey. Nine respondents [30%] checked 'yes' their participation allowed them to develop all 19 leadership skills. All of the respondents checked 'yes' that their participation allowed them to develop skills in working as a team member and serving as team/group leader. Respondents also indicated being motivated by their YLT experience to assume other positions of leadership. When asked to comment on the most important skill[s] they gained from serving on the YLT group, they again mentioned group/team skills [11 comments], communication skills [8], planning [5], and working with a wide/diverse range of people [6], another critical skill in today's global society. The majority had participated in college clubs or organizations and at least one third had participated in a college sorority or fraternity. Eighteen [60%] had served as an employment manager or group leader, two indicated they had served as an elected official, and one served as a military leader. The survey is currently being modified to collect responses online from youth who served in other state and county 4-H leadership group roles.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #6

1. Outcome Measures

Number Of Youth Who Indicate 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	Actual
2011	101

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 if the need for future scientists, engineers, mathematicians and technicians is not met. 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
The 4-H Incubation and Embryology project has been carried out in elementary school classrooms for over two decades using hands-on science concepts in caring for and observing the growth process of chicken embryos from the inception of the eggs through hatching of chicks. The majority of youth participants were in K-3 classrooms, but middle school youth were also engaged in the activities this past year. Curriculum development and training was provided by the Extension poultry faculty member, state 4-H staff, and local educators. Evaluations were collected from a subset of 55 teachers in 29 schools to determine their perceptions of impact related to their students' science attitude and skill gains. Now in its tenth 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. This past year 206 girls participated in either the Urban Ecologist or the Vet Detective track.

Results
Using a scale of 1-4 teachers were asked to rate their students' level [as a group] with respect to five factors before participating in the multi-week incubation and embryology project and after participating. As might be expected, the teachers' ratings showed the greatest gain [2.25 average points] with respect to 'understanding the needs of a developing embryo'. However gains in 'demonstrating observation skills' revealed a 0.96 point increase and 'exhibiting an interest in SET topics' ratings increased by 0.97 points. 'Verbalizing concern for living creatures' average rating increased by 0.86 points. Problem solving skills ratings increased very little, perhaps because this skill was not encountered as a part of the project. In response to an invitation to share comments and successes, the teachers frequently mentioned these five areas as ones that were impacting the students' knowledge or behaviors. They also mentioned noticing the development of students' empathy, compassion, and caring. Of the 107 participants who completed both the pre-test and post-test evaluation at the end of Science Siesta, 67 [62%] learned the steps of the scientific

method. Seventy-one [66%] already knew why it is important to use the scientific method, but an additional 17 [16%] were able to select the correct answer on the post-test. Of those participating in the Urban Ecologist Track, all 16 learned something about watersheds or water pollution. Of those participating in the Vet Detective Track, 63 of 91 [69%] learned something about animal disease and diagnosis.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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)

Evaluation Results

The **Illinois State 4-H Youth Leadership Team [YLT]** engages 15-20 older 4-H members and recent 4-H alumni in coordinating and assisting with various regional and statewide 4-H activities. This past year a survey was prepared and mailed to 66 former Illinois State 4-H Youth Leadership Team members seeking to determine how this experience affected their development of 19 leadership skills and their motivation to assume other positions of leadership after ending their 4-H experience. Thirty youth [46 %] completed the survey by indicating 'no', 'maybe'" or 'yes' for the various skills and roles included in the survey. Nine respondents [30%] checked 'yes' their participation allowed them to develop all 19 leadership skills. An analysis of the 'yes' responses to the 19 skills follows:

From 90-100% of the 30 youth respondents checked the following:

- Serve as a team/group leader [100%]
- Work as a team member [100%]
- Communicate effectively with a small group [96%]
- Effectively work in group settings [90%]
- Plan events [90%]
- Treat others with respect. [90%]

Skills checked 'yes' by 80-89% of the youth included:

- Keep an open mind in discussing ideas different from my own [86%]

- Be self-motivated to meet deadlines [86%]
- Plan, teach, evaluate a workshop or seminar for peers [86%]
- Evaluate programs according to goals set for program [86%]
- Speak in front of a large group [83%]
- Relate to/work with different leadership styles [83%]
- Set priorities in completing tasks [83%]
- Organize group to set/reach goals [80%]
- Effectively serve in youth and adult partnerships. [80%]

All other skills were checked 'yes' by at least half of the youth respondents.

- Think before speaking/acting [66%]
- Seek out issues in the community that need attention [60%]
- Manage time more effectively [56%]
- Budget funds for events/personal life. [50%]

When asked to comment on the most important skill[s] they gained from serving on the YLT group, they again mentioned group/team skills [11 comments], communication skills [8], planning [5], and working with a wide/diverse range of people [6], a critical skill in today's global society.

Respondents also indicated their YLT experience motivated them to:

- Accept leadership roles in college or the community -- 28 of 30 [93%]
- Participate in other groups in high school, college, and/or my community -- 26 [86%]
- Serve as mentor/volunteer leader for young people -- 24 [80%]
- Volunteer my time for groups in my community -- 22 [73%]
- Volunteer for community service projects. -- 20 [66%]

The majority of youth had participated in college clubs or organizations and at least one-third had participated in a college sorority or fraternity. Eighteen [60%] had served as an employment manager or group leader, two indicated they had served as an elected official, and one served as a military leader. The survey is currently being modified to collect response online from youth who served in other state and county 4-H leadership group roles.

Key Items of Evaluation

The subjects of this study had assumed roles in planning and carrying out 4-H events attended by significant numbers of other youth. These events often included leadership for small groups and teams of younger youth. The skills youth respondents identified most often as ones they developed through the YLT experience mirror those they were expected to apply as part of their YLT role and responsibilities -- group/team skills, communication skills, and planning skills. These are also skills that employers seek and reward. In addition, responses suggest that the skills they gained are being applied in adult settings, further supporting 4-H's contribution in the positive development of youth to become into contributing adults in their communities and workplaces.