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Annual Report
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University of Illinois Extension
-and-
Illinois Agricultural Experiment Station
-to-
Cooperative State Research, Education and Extension Service CSREES-USDA

University of Illinois Extension - Office of Extension and Outreach
-and-
Illinois Agricultural Experiment Station - Office of Research

College of Agricultural, Consumer and Environmental Sciences
University of Illinois at Urbana-Champaign

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Submitted by,

Dennis R. Campion,
Associate Dean and Director
University of Illinois Extension

Mary Anne Lila,
Interim Associate Dean and Director
Illinois Agricultural Experiment Station

College of Agricultural, Consumer and Environmental Sciences
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

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Acknowledgments and Preface

This report has been developed to fulfill the requirements of the Agricultural Research, Extension and Education Reform Act of 1998 (AREERA) which amended the Smith-Lever Act, the Hatch Act and the National Agricultural Research, Extension and Teaching Act of 1997, and animal health and disease funds. AREERA focuses on funding through Smith-Lever 3(b) & 3(c), Hatch, McIntire-Stennis, and Evans-Allen. This report is the fifth annual report under Illinois current plan of work with CSREES-USDA. This plan of work was amended in 2004 at CSREES' request to extend it through 2005 and 2006.

Consistent with the CSREES Annual Report Guidelines this annual report addresses some but not necessarily all of the issues in the plan of work.

Interpretations of AREERA have strictly limited those activities which can be claimed as jointly-funded Extension and Research activities as well as what can be claimed as multi-state Extension activities. As a result of these interpretations, this report fails to disclose the extent to which integrated and multi-state activities now represent the way the College does business. The College has decades-old ties with sister institutions and personnel based in other states. Over the past decade, which has witnessed a reorganization of the College and U of I Extension, a guiding principle has been to integrate Research and Extension so that the citizens of Illinois can be better served.

Ad Hoc College Reporting Team:

Charles D. Clark
Joseph G. Latessa
Julia A. Ludwig
Nancy Rader
Richard A. Vogen

A. Programs

Note on Key Themes reported by Goal: Illinois has chosen to report on some key themes that were not specifically named in the state's original Plan of Work. This is done because of the interest that the federal partner has expressed by listing all of the themes found in the respective plans of the states and territories.

Overview

The mission of the College of Agricultural, Consumer and Environmental Sciences is discovering, advancing and integrating new knowledge to ensure nutritious and safe food, sustainable and innovative agriculture, strong families and communities, and environmentally sound natural resource management to benefit the people of Illinois and the world. To fulfill the University's land-grant mission, ACES is responsible for the Illinois Agricultural Experiment Station and University of Illinois Extension, subsidiary units authorized by federal and state statutes that complement the academic departments in the College.

Academic Departments and Quality: The College of ACES has seven academic departments: Agricultural and Biological Engineering, Agricultural and Consumer Economics, Animal Sciences, Crop Sciences, Food Science and Human Nutrition, Human and Community Development, and Natural Resources and Environmental Sciences. The College of ACES also provides intellectual and administrative leadership to the Division of Nutritional Sciences, an acclaimed interdisciplinary graduate program. The University of Illinois is among the elite group of institutions noted for the impact of research in food and agricultural sciences. ACES programs are generally considered to be among the top five of its peer institutions.

University of Illinois Extension reaches more than 2.6 million people face-to-face in Illinois with educational outreach programs in agriculture and natural resources; nutrition, family, and consumer sciences; 4-H youth development; and community and economic development. The statewide Extension system employs approximately 300 professional field staff, assisted by over 25,000 volunteers in all 102 counties in the state. Extension web sites receive well in excess of three million page views each month, accessed by users from nearly every country in the world.

Leadership Changes: Over the past year, Interim Associate Deans were named in both the Office of Academic Programs and in the Office of Research. A review of the Office of Academic Programs was conducted, and national searches are underway for permanent Associate Deans. A national search is also in progress for the State 4-H Director. A search

was completed for a permanent director of the Information Technology and Communication Services (ITCS) unit. Department leadership stabilized after head changes in every department since 2002.

Faculty Profile: The College of ACES has 227 FTE of tenure system faculty, with appointments divided among teaching (36%), Research (50%), and Extension (14%). State budget reductions and reallocations in the past four years were partly met through attrition and vacant faculty lines (~ 45 FTE). Examples of excellence in ACES include:

- A second scientist from ACES was named to the National Academy of Sciences for exemplary contributions to animal and human nutrition.

- Another ACES scholar was elected as a 2005 AAAS Fellow for distinguished contributions to the field of animal structural, functional and comparative genomics, and for providing leadership to the International Swine Genome Sequencing Initiative.

- Nine ACES faculty members were recognized as ISI Highly Cited Researchers.

- An ACES researcher obtained $10.4 million from NIH and the Department of Defense to fund a multidisciplinary team of UIUC scientists investigating the effects on various body tissues of soy isoflavones found in dietary supplements

- ACES researchers were awarded $10 million by the USDA to provide the initial genome sequence of the pig.

- The Division of Nutritional Sciences received the 2005 Bristol Myers Squibb Freedom to Discover Grant.

- ACES scholars serve as leaders of professional societies, including President of the American Agricultural Economics Association, President of the AAEA Foundation, President of the American Agricultural Law Association, and the President-Elect of the Society for Research in Adolescence.

Other examples include continuing leadership for campus initiatives in food security, aging, and family resiliency, international leadership in sequencing the genome of cattle, national training grants from NIH and USDA, collaborative leadership with the U.S. Department of Energy, Purdue, and Argonne National Laboratory in bio-based process development, center funding from the National Institutes of Health for investigations in food bioactivity and disease interactions, and nationally

recognized efforts to manage several leading crop pests, including corn rootworm, soybean rust and soybean cyst nematode.

Resident graduate student enrollment declined to 505 students, including 35 students advised in ACES but reported to campus as College of Engineering students. Current graduate students in ACES are 58.3% female, 41.7% male, 4.6% underrepresented minority (6.3% of U.S. students), and 27.7% international. The College has eight graduate programs, offering M.S. and Ph.D. degrees, and four extramural M.S. programs. In CY 2005, 106 M.S. degrees (117 in AY 2004-2005) and 57 Ph.D. degrees were conferred.

Strengths/Initiatives: The key strength of ACES is the capability to combine high-impact integrative research and education with cutting-edge scholarship across disciplines that are defined by our interrelated domains of interest, serving needs of global and local audiences.

Among the many major initiatives, a few are particularly noteworthy for future support:

- South Farm Modernization – creating the integrative field-scale laboratory of the future.

- Council on Food and Agricultural Research (C-FAR) – fostering stakeholder engagement in translational research.

- U of I Extension – supporting the integrity of and increasing entrepreneurship in the system of engagement that serves as the University's face to all of the citizens of Illinois.

- Food and Nutrition Institute – building the platform for expanding opportunities in an area of established excellence.

- Comprehensive Faculty Teaching Development – to enhance student learning.

Others are well along the path to success:

- The Institute for Genomic Biology is operational, with the spectacular new facilities due to open next year. ACES faculty members are well represented among the IGB leaders.

- The innovative Family Resiliency Program, led by ACES faculty, will soon have its new home in Doris Kelley Christopher Hall.

Budget Redirection: State budget reductions and reallocations mean unmet demands and lost opportunities. The recurring state base budget was assessed a reduction / reallocation of 3.6% in FY 2006. In addition, ACES returned recurring funds to the campus via the 0.3% tax to support the TOP and spousal hire programs.

Vision and Direction: Throughout the past year, the College engaged in a process to develop a statement of strategic intent, which was adopted in the fall of 2005. This built upon planning processes in previous years that examined the College's identity, culture, mission, and vision. As the University and the campus undertake their strategic planning processes this year, the College of ACES is incorporating the work done to date and its anticipated planning efforts into a common framework with the institution's strategic planning process.

Current Impacts of State Budget Rescission and Reduction:

ACES implemented a budget reduction of $1.7 million in FY 2006, approximately 3.6% of the recurring state base, to cover the state budget reduction and reallocation, fund the salary program for continuing faculty and staff, and contribute to a variety of university and campus "unavoidable" costs, such as funding for UI Integrate, utility price increases, deferred maintenance costs, and new area operations and maintenance funds.

UI Extension was affected in three areas of the FY 2006 state appropriations process. From the University's base budget reduction, Extension lost $333,814, resulting in fewer academic and staff positions. Contained in the Illinois Department of Agriculture budget, the general support line for Extension was cut to $1,693,000, while the county board match was increased to $11,840,000. County board match is the state's obligation to match locally committed funds to Extension. Late in the process, a new appropriation of $5,000,000 was inserted into the Illinois Department of Agriculture budget, earmarked for UI Extension in Cook County.

The appropriation for the Illinois Council on Food and Agricultural Research (C-FAR), funded through the Illinois Department of Agriculture, remained at $3.5 million in FY 2006, after successive reductions from $15.0 million appropriated in FY 2002 to a low of $3.5 million in FY 2005. The sustained low level of the appropriation has curtailed internal grants for the four participating universities, allowing for only a limited managed research portfolio and sharply reducing capacity to engage in research projects of specific interest to stakeholders in Illinois.

Uncertainty regarding a possible FY 2006 rescission remains. Originally the campus advised units to retain 2% flexibility in current year GRF spending for a possible rescission. In addition, actual funding through the Illinois Department of Agriculture for C-FAR and UI Extension programs reflects reserves of 2% for rescission.

Recurring reductions have impaired flexibility to fund multi-year commitments, startup costs, spousal accommodations, and other initiatives. Units have increasingly relied upon forward spending to provide competitive startup packages where critical faculty hires were needed. Dropped course offerings and loss of teaching assistants translate to fewer seats for students in ACES courses, especially seats for non-majors. Programs affected by the faculty lines relinquished last year included futures marketing, textile marketing and consumer behavior, and plant molecular biology, in addition to previous years' impacts. The consumer and textile marketing program and the Functional Foods for Health program have been discontinued.

College capacity for information technology support, communication services, and advancement functions has eroded, and departments are increasingly concerned about reliance on indirect cost recovery and revolving funds for critical research and staff support functions. Larger support staff reductions relative to net faculty losses have aggravated program support deficiencies, while the added short-term burden of Banner implementation falls primarily on departmental support personnel. Lack of program management and support staff impedes the growing need to facilitate grant writing and management of complex opportunities.

Partnership value: Partner relationships are highly valued in ACES. Private and public organizations regularly seek assistance from ACES faculty and draw on unique expertise in entities such as the National Soybean Research Laboratory. Policy makers have called upon the College for input on issues such as federal farm and agricultural research policy, food security/safety, animal industry development, and global climate change. Numerous other examples indicate that stakeholders value direct relationships with the College, both on-campus and off-campus. Reach is extended with tools like *Farmdoc*, an acclaimed online source for research-based outreach, www.farmdoc.uiuc.edu, the *Urban Programs Resource Network*, among the University's most dynamic and highly accessed web sites, www.urbanext.uiuc.edu, and the Midwest Dairy Consortium, which leverages teaching and outreach capabilities in several Midwestern states. The *ACES Afield Newspaper* is used to update key agricultural stakeholders relative to ACES teaching, Research and Extension. In some areas, the dwindling faculty research base threatens the ability to keep pace with demands for outreach programs.

U of I Extension: Extension provides educational programs throughout the state, in local units, in regional centers, and from campus specialists. Loss of center educators and faculty specialists threaten capability to meet needs in core program areas and weaken stakeholder connections. Local support and associated county board match from the state is critical to local units. Local Extension programs in Cook County received a major boost in the FY 2006 state appropriation process, with a new $5.0 million budget line item through the Illinois Department of Agriculture earmarked for Cook County Extension. In response, University of Illinois Extension is currently ramping up its Cook County efforts up in strategic program areas.

Research and Extension coordination: The critical links between Research and Extension are the campus-based subject matter specialists and the center educators located throughout the state. Partial restoration of Extension faculty positions was included in the University's budget request for FY 2005 and FY 2006, but the request did not survive the state budget process. However, the Chancellor committed $100,000 to begin rebuilding Extension faculty capacity.

Opportunities to Address

Consistent with our strategic intent to be "Globally Preeminent and Locally Relevant," ACES will invest its discretionary resources to achieve a desired leadership position and exceptional value in key areas of strategic opportunity, including:

- Bioscience innovation: processes, products, environment, and energy.
- Progressive food and agricultural systems with sustainable landscapes.
- Complementary advances in food, nutrition, and health.
- Resilient families and communities.
- Decision support for people, enterprises, and public policy.

The College will invest to achieve its intent to be globally preeminent and locally relevant in domains that are consistent with our mission, have a fundamental base of excellence in advanced areas of discovery, contribute to our educational enterprise, and create value for our stakeholders.

Bioscience Innovation: Processes, Products, Environment, and Energy:

Biotechnology: Commitment to molecular biology remains a top priority, including investment in genomics and its functional derivatives. The Institute for Genomic Biology will enhance dimensions from animal and plant genomics and bioinformatics, to metabolism, comparative physiology and nutrition, and whole organism biology, to the socioeconomic implications of biotechnology. Unique opportunities exist to translate new knowledge from molecular biology with field scale studies of whole organisms and biophysical systems on the new South Farms.

Bio-based initiatives: The College is well positioned to lead on issues related to the management and use of bio-based resources to benefit society and the environment. Significant research efforts exist in ACES and among Midwest collaborators, related to air, water, renewable energy, bio-based resources, and bio-refining. The College has the potential to bring together a nationally prominent critical mass around sustainable agricultural, food, and energy systems.

Progressive Food and Agricultural Systems with Sustainable Landscapes**:**

Food systems: The College of ACES has redoubled efforts to lever strengths in food value chains and consumer behavior where we can truly be a globally preeminent intellectual center. Food systems are viewed in ACES from multiple perspectives, from sustainable local production systems to global supply chains.

Integrated landscapes: Continuous rather than bounded systems, integrated landscapes focus on issues ranging from systems biology and biocomplexity to precision technology and management. Global issues pertaining to urban-rural interface are critical, due to changing demographics, urbanization, land use, environmental impacts of agriculture and human activity, economies of scale and scope in the food and agricultural sector, and emerging opportunities for "green" industries (horticulture to turf grass), companion animals, and restoration ecology and wildlife. Given the ideal laboratory of the South Farms and transfer of the arboretum to ACES, exciting concepts for green spaces and multiple uses can become features of the integrated landscape.

Complementary Advances in Food, Nutrition, and Health**:**

Food, nutrition, & health: Interdisciplinary opportunities to investigate disease prevention, obesity, food bioactivity, and global nutrition are manifest on this campus. Interdisciplinary collaboration is clearly evident in nutritional sciences, the World Initiative on Soy in Human

Health, work in bioactive foods, and chemo-prevention of cancer and other diseases. The effort to establish the Food and Nutrition Institute will pay substantial dividends to the University.

Food security: Institutionalized as a campus initiative, the food security initiative is creating novel approaches to complex systematic problems. This area is of keen interest to public and private partners, who are forging new relationships with the College and the University.

Resilient Families and Communities**:**

Human development and family resiliency: The mission of the College of ACES explicitly emphasizes a commitment to quality of life for people. The commitment to family resiliency is supported by the campus initiative and major donations for Christopher Hall and the endowed chair in family resiliency, building a platform for unparalleled scholarship.

Leadership: Leadership studies are being institutionalized with the arrival of new faculty in leadership and community development, in tandem with our communications, agricultural education, and agribusiness management programs. Programs in Extension provide the outreach basis for individual and community leadership development. The College will provide intellectual and structural underpinnings to partner with the campus to develop the leadership curricula and programs that will serve students across campus. The new doctoral program in community studies and outreach will provide an intellectual home for scholarship.

Earth and Society Initiative **-** This initiative provides seed money to support innovative ideas and novel approaches to the complex, interdisciplinary and national environmental problems. Examples of currently funded projects include the Illinois Program on Nutrient Dynamics that is using the U of I new South Farms as a living/learning laboratory to provide better understanding of the impacts of human inputs on agricultural lands. The second project is exploring disease emergency and ecosystem health by coordinating research, education and outreach activities of a diverse assemblage of University of Illinois centers, programs, labs and individuals whose interests converge at the interface of emerging infectious diseases, anthropogenic environmental change and biodiversity conservation.

Decision Support for People, Enterprises, and Public Policy:

Public policy engagement: Food, agricultural, and community leaders play crucial roles in state, national, and international policy decisions

relating to trade, intellectual property, transportation, regulation, and funding for Research, Extension, and education programs. For example, the Gardner/Farm Bureau Chair in Agricultural Policy advances the essential role of the College in state and federal agricultural policy.

Scientific literacy and communications: Raising the level of scientific understanding, increasing awareness of the role of science in society, and translating scientific knowledge for adaptation and application is a signal opportunity for a next-generation land-grant institution. ACES and Extension have unique capabilities to move in this direction. A high-visibility global outreach program on biotechnology already raises the University's profile in substantive policy forums.

Engagement and outreach: Significant opportunities exist to expand the knowledge and tools available to individuals and enterprises to make informed and substantially improved decisions. For example, the *Farmdoc* program offers producers excellent practical tools for business decision making.

eXtension: Internet and related technologies portend huge opportunities to expand the reach and impact of education and Extension activities. University of Illinois Extension participates in national planning for innovation in educational delivery methodology. As the campus considers strategies to expand online education, Extension and ITCS are important resources.

CSREES GOAL I – An Agricultural System that is Highly Competitive in the Global Economy

Indications of the Scope of Research and Extension Programs under Goal 1 - See Appendix A.

Slightly more than half of the College of ACES research portfolio is invested in Goal 1 research activities. This is a drop from about two-thirds of the portfolio reflecting a loss in funding for Goal 1 research due at least in part to a reduction in state funding. There has been a corresponding drop in the number of Goal 1 research projects from just under 250 to 156 projects. The proportion of Extension expenditures in the Goal 1 area has risen slightly since 2004 and the number of teaching contacts have risen slightly from 325,110 to 358,120.

Key Theme – Agricultural Competitiveness

ISO Quality Management Certification Program for Grain

a. Early in 2001, educational programming to farmers and agribusiness was conducted regarding identity preservation of grain and ISO9000 Quality Management Systems. The ability to maintain the identity of agricultural products through the supply chain was a major issue throughout agriculture. Although ISO Quality Management Systems were used internationally in automotive, aerospace, steel industry and a vast number of manufacturing industries, the concept was just beginning to be examined as it applied to agricultural production. Topflight Grain Cooperative, having 19 locations in the Macon County area, requested Extension assist them in the creation of a quality management system to benefit the Cooperative and their member patrons.

   Extension met with the Cooperative's Senior Management and reviewed surveys and research done by the cooperative. Very little material was available concerning quality management systems and the application to grain elevators. The Senior Management wanted to move forward with the concept; however, the University of Illinois lacked the expertise in the area of ISO Quality Management Systems. A partnership was created with Millikin University, Topflight Grain Cooperative and University of Illinois Extension. Millikin's Staff had ISO experience in the aerospace industry and the textile industry. Extension had experience in education to adult audiences and a background in agricultural production. Topflight grain was eager to institute a quality management system.

Educational meetings were held to explain agricultural terms, grain industry concepts and agricultural processes to the Millikin Staff and at the same time held educational meetings with Topflight personnel explaining the ISO Quality Management terminology, concepts and requirements. This part of the process filled the first year of the project. Documentation of all cooperative functions and operations are required as well as a detail system of communication within the cooperative. One of the major goals of a Quality Management System is that all employees from the individual sweeping the floor to the President of the Cooperative know the direction, the goals, and philosophy of the organization. This educational process took an additional two years.

Topflight Grain Cooperative received the International Certification of ISO9001 Quality Management System in March of 2004.

b. Impact –

- The first multi-location grain elevator to become ISO certified in Illinois and possibly in the United States.
- The foundation for grain identity preservation was established.
- The first step in international grain sales was completed.
- Increased revenue to the Cooperative and its member farmers.
- Outstanding communication between the employees, management and member patrons of the Cooperative.

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Value-Added Processing of Corn for Ethanol and Other Uses

a. Progress - We have developed an enzymatic dry grind process that uses novel separation techniques and use of enzymes to recover germ, pericarp fiber and endosperm fiber separately at the beginning of the process. The enzymatic dry grind process was evaluated for ethanol yield and DDGS composition. A dent

corn hybrid was processed using the laboratory enzymatic dry grind process and compared with a conventional dry grind process. Final ethanol concentrations in the enzymatic milling process were 27% higher than the conventional process. The protein content of DDGS from the enzymatic process was approximately 58% compared to 28% protein content for DDGS produced from the conventional process. Currently, we are evaluating enzymes and optimizing addition rates needed for the enzymatic dry grind process. We are also evaluating pericarp and endosperm fiber produced in the enzymatic dry grind process as lignocellulosic feedstocks for ethanol production.

b. Impact - There are currently 85 dry grind plants in operation or under construction, with capacity of 4.3 billion gallons per year. Most of the dry grind plants are cooperatives and are located in rural communities. Each of those plants could implement the enzymatic milling dry grind process and potentially improve the sustainability of the plant. Recovery of valuable co-products, more ethanol production per batch and improved protein content of DDGS will improve the overall economics of ethanol production for the dry grind ethanol industry. Enzymatic dry grind process will also improve the sustainability of the ethanol industry.

c. Source of Funding – Hatch, Industry Funds

d. Scope of Impact – National

The Effects and Causes of Agricultural Policy in Its Domestic and International Contexts

a. Progress - This research focused on measuring producer welfare effects, examining institutions, exploring human capital requirements, and assessing alternative public policies. Combining theory with numerical integration methods resulted in better procedures for measuring producer welfare effects.

Agricultural policy formation was studied within a game-theoretical framework. The framework was based on institutions as rules and institutions as equilibria. The research shows that viewing institutions as both rules and equilibria facilitates comparative institutional analysis. The application was applied to agricultural policy decision-making in Norway where farmer's organizations have the legal and exclusive right to enter into negotiations with the government about direct budget support

and administrative prices. The welfare effects of the Common Agricultural Policy (CAP) were examined.

About 1,000 Illinois households were surveyed to obtainestimates of the amount of time spent by conventional and alternative farmers building the human capital used in their management practices. Conventional farmers reported spending about three hours per week keeping up with information about their production practices while alternative farmers spent nearly four hours per week. This difference was statistically significant, suggesting that chemical inputs and human capital are economic substitutes.

The adoption of organic practices was found to require at least two hours more learning time per week than the adoption of either genetically modified organisms (GMO) or integrated pest management (IPM) technologies. Farmers spent one to two years learning about organic practices before adopting them. The quantitative results of this study will be useful for future empirical work that investigates the potential costs and benefits of using subsidies to induce conventional farmers to switch to alternative production practices.

While elimination of foot and mouth disease (FMD) in other regions would provide the United States the benefit of reduced risk of an outbreak here, it would also imply greater competition in the global meat market from countries that become free from the virus. A model of FMD control was developed that is spatial and dynamic and captures both economic and epidemiological factors for national or regional analysis. This multi-market model measures the direct impacts of an animal disease, the indirect impacts on related sectors of the economy, and the spread of these impacts over time and space under different disease control scenarios. Results suggest divergent control strategies and costs. Because FMD control requires international cooperation, researchers have concentrated on assessing the institutional constraints on coordination among countries.

This research recognizes the importance of heterogeneous incentives, differential sensitivities to neighbors, and hard boundaries on interactions. The research highlights specific factors that work against international cooperation to address FMD in Latin America.

b. Impact - This research is expected to better enable measurement of producer welfare effects in the many real-world circumstances in which risk and uncertainty are important elements.

It is anticipated that the research will improve and make more rigorous the ways that economists think about institutions. The research indicates the effects of particular public policies as well as the likely consequences of proposed policies in the United States and certain developing countries.

It provides insights on human capital needs of conventional farmers compared to those who adopt alternative production practices.

Interim findings on food and mouth disease control have been presented in seminars and conferences and it is anticipated that these research findings will lead to improved management of animal disease control efforts in the United States and globally.

c. Source of Funding – Hatch, State Funds

d. Scope of Impact – National and International

Key Theme – Agricultural Profitability

To Develop and Implement Effective Tactics for Management of Phytophthora Blight of Vegetables

a. Progress - The research on management of Phytophthora blight, caused by Phytophthora capsici, of vegetables emphasized three major objectives: (i) to determine the effectiveness of seed treatment on controlling P. capsici on cucurbits; (ii) to evaluate the effectiveness of plant resistance, induced by red-light treatment against P. capsici in pepper, pumpkin, and tomato, and (iii) to evaluate the effectiveness of integrated approaches of seed-treatment, calcium application, red-light-induced resistance, cultural practices, and fungicide sprays for managing P. capsici.

For the first objective, studies were conducted in the laboratory, greenhouse, and field. The results showed that mefenoxam (0.65 fl oz of Apron XL LS/100 lb seed) or metalaxyl (1.5 fl oz of Allegiance FL/100 lb seed) effectively controls pre- and post-emergence of seedling infection in cucurbits until five weeks after seeding.

For the second objective, studies were conducted in the greenhouse and fields. In the greenhouse, 4-week-old seedlings of bell pepper, pumpkin, and tomato grown under red light (600-700 nm) were inoculated with P. capsici. Control plants, grown either in natural daylight (NDL) or under white light (WL), were also inoculated. Only 21 to 36% of red-light treated seedlings became infected, whereas 78 to 100% of the seedlings grown either in NDL or under WL became infected and died. Red-light treatment of seedlings during nights (12 hrs per day) for four weeks is the most effective. Although red-light treatment was effective in the greenhouse and delayed the incidence of Phytophthora blight in the field, the treatment alone did provide season-long protection for the plants against P. capsici.

For the third objective, field studies were conducted. Calcium application (soil and/or foliar) alone did not provide season-long protection against P. capsici. Integrated use of seed-treatment, red-light treatment, and calcium application (soil and foliar) was effective against Phytophthora blight. Seed-treatment plus fungicide spray in pumpkin and red-light treatment plus fungicide spray in pepper and tomato reduced incidence of the disease.

Five fungicides (dimethomorph, famoxadone-cymoxanil, cyazofamid, copper sulfate, and copper hydroxide) can be incorporated in the disease strategies for control of Phytophthora blight. In experimental plots, under heavy disease pressure, seed treatment with Apron XL LS and spry applications of dimethomorph (6.4 oz of Acrobat 50WP/A) plus copper sulfate (2 lb of Cuprofix Disperss 36.9DF/A) alternated with famoxadone-cymoxanil (10 oz of Tanos 50DWG/A) plus copper hydroxide (2 lb of Kocide-2000/A) resulted in only 11.7% vine and 9.8% fruit infection, compared to 36.7 and 49.4% vine and fruit infection, respectively, in untreated plots. An integrated management using fungicide seed treatment with Apron XL LS, field scouting and disking areas with localized infected plants, and spray applications of fungicides Acrobat plus copper hydroxide (1.33 pt of Champ 37.5F/A) alternated with Tanos plus Champ at 7-day intervals reduced yield losses in commercial pumpkin fields to less than 10%, compared to more than 50% yield losses in unsprayed fields.

b. Impact - Illinois produces approximately 33,000 acres of cucurbit crops, eggplants, peppers, and tomatoes. More than 90% of processed pumpkins produced in the United States are grown and processed in Illinois.

Phytophthora blight causes up to 100% yield losses in commercial fields of these crops. Losses to Phytophthora blight in Illinois in pumpkin and pepper fields alone could exceed $10,000,000 per year. The pumpkin processing industry, a unique and profitable food industry in Illinois, was seriously threatened by Phytophthora blight. Using effective methods developed in this research, Phytophthora blight can now be controlled effectively. Crop losses from up to 100% are reduced to less than 10%. Due to heavy pre- and post-emergence seedling death caused by P. capsici, growers had to replant fields for a second and even a third time.

Seed treatment developed in this study effectively controls seedling death caused by P. capsici and widely implemented by cucurbit growers. Effective management of Phytophthora blight resulted in expansion of pumpkin and pepper production throughout Illinois.

c. Source of Funding – CSREES Special Grant Funds

d. Scope of Impact – Illinois

Introgression of Herbicide Resistance Between Waterhemp and Smooth Pigweed

a. Progress - The genus Amaranthus includes several weed species (pigweeds) that hinder crop production worldwide. Many populations of pigweeds have evolved resistance to certain herbicides. Recent research by us and others has indicated that hybridization among pigweed species may contribute to their success as weeds by increasing genetic variation. In particular, hybridization may result in movement of herbicide resistance from one species to another. Much attention has been placed in recent years on the potential movement of genes from genetically modified crop plants to weed species. In contrast, there has been little attention placed on movement of genes among weed species, which is likely a more common event.

We previously have demonstrated, using controlled crossing experiments, that herbicide resistance can move between smooth pigweed and waterhemp. One objective of this project was to determine the frequency at which this might occur under field conditions. A field experiment was established to determine the frequency at which hybrids were produced on smooth pigweed plants growing in proximity to waterhemp plants.

A second experiment was conducted to determine the reciprocal rate of hybridization (hybrids produced on waterhemp). Seeds were harvested from the maternal plants, germinated in the greenhouse, and seedlings subjected to herbicide treatment. Because the species serving as the male parent for each hybridization experiment contained a dominant herbicide-resistance gene, the herbicide treatment enabled identification of hybrid progeny. Hybrid identities were then confirmed using molecular and cytogenetic approaches.

The entire study was repeated over two growing seasons. On average, 33% of the seeds produced by female waterhemp plants were hybrids (i.e., derived from pollination by smooth pigweed). When the normally self-pollinated smooth pigweed was used as the female parent, 1% of seeds produced were hybrids. Hybridization frequencies of these magnitudes were unexpected.

A second objective of this project was to investigate how gene exchange between the two species occurs at the genomic level. We determined that hybridization between the two species typically does not result in polyploidy (i.e., an increase in the number of chromosomes). Rather, gene exchange can occur simply by independent chromosome assortment (i.e., by the same manner in which gene shuffling occurs when two individuals of the same species cross).

In addition, as part of this project, we developed reliable procedures to identify naturally occurring hybrids between smooth pigweed and waterhemp. These procedures, which include a combination of morphological analysis of plants and a cytogenetic approach (DNA content analysis), will allow us to conduct field surveys to quantify hybridization between these two species.

b. Impact - This research has discovered and quantified high frequencies at which hybrids between smooth pigweed and waterhemp may be formed under field conditions.

Results suggest that the pigweed species, which are among the worst weeds in the U.S. and throughout the world, should be considered a complex of species capable of exchanging genetic material. In addition to helping in the prediction and management of herbicide resistance in weeds, this research has broad implications regarding how plant species evolve to become more weedy.

Invasive weed species threaten our natural ecosystems and, in terms of agricultural crop production, they cost us billions of dollars each year.

c. Source of Funding – NRI Competitive Grant Funds, State

d. Scope of Impact – National

Control of Phytophthora Blight of Bell Peppers

a. Progress - The research on control of Phytophthora blight (Phytophthora capsici) of pepper emphasized three major objectives: 1) evaluate the efficacy of fungicides for control of Phytophthora blight, 2) screen pepper cultivars for resistance to P. capsici, and 3) induce resistance in the plants against P. capsici.

For the first objective, fungicide control of Phytophthora blight of pepper, cyazofamid (Ranman 400SC), a new fungicide, at the rate 2.75 fl oz per acre (A), alone or tank-mixed with dimethomorph (Acrobat 50WP, 6.4 oz/A), famoxadone-cymoxanil (Tanos 50WDG, 10 oz/A), or metalaxyl (Ridomil Gold Copper WP, 2.5 lb/A), spray-applied onto foliage (using 50 gal of water/A) at 7-day intervals reduced disease incidence (percent plants infected with P. capsici) by 25 to 30%. In order to have effective fungicide control of the disease, four or more applications of these fungicides are needed with interval applications not exceeding 7 days and fungicides should be mixed with Silwet L-77 (2 fl oz/A).

For the second objective, to identify resistant pepper cultivars to P. capsici, 65 cultivars/accessions of bell pepper were tested in the greenhouse and field. In the greenhouse, 8-week-old seedlings were inoculated with P. capsici. Almost all of the infected seedlings died by 23 days after inoculation. Four cultivars (Aristotle, Emerald Isle, Paladin, and Reinger) and six accessions (Abbot-1, Abbot-2, Abbot-13, BHN-1P, BHN-2P, and Syngenta-7326) were found resistant to P. capsici. These 10 resistant cultivars/accessions in the greenhouse tests, and two susceptible bell pepper cultivars (Maxi Bell and California Wonder) to P. capsici were evaluated in a naturally infested commercial field near Shawneetown, IL. All 10 cultivars/accessions resistant to P. capsici in the greenhouse were also resistant to Phytophthora blight in the field. The final stand of asymptomatic plants in the field ranged from 82 to 100 for the resistant cultivars/accessions; for the susceptible cultivars, only 57% of Maxi Bell plants and 50% of California Wonder plants survived.

For the third objective, induction of resistance in bell pepper plants, a study was conducted in the greenhouse to investigate the effects of red light (600-700 nm) on the subsequent occurrence of seedling infection of a susceptible bell pepper Hybrid SPP 6112 to P. capsici. Four-week-old seedlings were inoculated with P. capsici or transplanted into pots filled with artificially-infested soil mix. Red-light treatment of seedlings for four weeks reduced Phytophthora damping-off by 74%. Although the greenhouse results of red-light treatments were impressive, the results from field tests were inconsistent. It appears that red-light induced resistance in the seedlings prior to transplanting is not providing season-long protection against P. capsici in the field. Additional research is needed to determine the effectiveness of red-light treatment on protecting pepper plants during full growing season in the field.

b. Impact - Phytophthora blight causes up to 100% crop losses in pepper fields.

Introduction of resistant cultivars, particularly Paladin, has encouraged pepper production in Illinois and increased grower's income. Integrated approaches of using resistant cultivars, incorporating induced resistance by red-light treatment in crop production, and application of fungicides could provide effective strategies for controlling Phytophthora blight of peppers.

The results of this research have been well received by pepper growers, pepper industries, pepper breeders, and pepper pathologists throughout the United States, Canada, and Mexico as I have been asked for presentations on management of Phytophthora blight of peppers.

c. Source of Funding – Hatch, State Funds

d. Scope of Impact - Illinois

Key Theme – Animal Genomics

Livestock Genome Sequencing Initiative

a. Progress - We previously localized a quantitative trait locus (QTL) on chromosome 6 affecting milk fat and protein concentration to a 4 cM confidence centered on the microsatellite BM143. We characterized the genes and sequence variation in this region, and identified common haplotypes spanning five polymorphic sites in the genes IBSP, SPP1, PKD2, and ABCG2 for two sires

segregating for this QTL. Expression of SPP1 and ABCG2 in the bovine mammary gland increased during lactation. SPP1 was fully sequenced, and all the coding exons of ABCG2 and PKD2 were sequenced for these two sires. Only the single nucleotide change capable of encoding a substitution of tyrosine to serine (YS) corresponded to the segregation status of all three heterozygous and 15 homozygous sires for the QTL in the Israeli and U.S. Holstein populations (P = 0.00008). The allele substitution fixed effects on the genetic evaluations of 335 Israeli sires were -340 kg milk, +0.15% fat, and +0.13% protein (F-value = 200). None of the other polymorphisms gave significant effects for fat and protein concentration in models that also included YS. The allele substitution effects on the genetic evaluations of 670 cows daughters of two heterozygous sires were -226 kg milk, 0.09% fat, and 0.08% protein (F-value = 394), with partial dominance towards the S homozygous.

We therefore propose that this YS polymorphism is the causative site for this QTL. These results clearly demonstrate the value of resequencing of genomic regions known to contain QTL.

For the pig, the following research results are reported. The recent availability of the complete human genome sequence and thousands of homologous porcine sequences provides a tremendous resource for the construction of such a map of the porcine genome. Using the INRA-Minnesota porcine Radiation Hybrid (IMpRH) panel, we have constructed a radiation hybrid map composed of 2,272 markers, including 206 ESTs and 2,066 porcine BAC-end sequences (BESs). The average spacing between comparative anchor loci is 1.15 Mb based on human genome sequence. This radiation hybrid map has the highest resolution of any porcine genome map to date, and should greatly facilitate the positional cloning of porcine genes influencing traits of economic importance. Additionally, this map will provide a framework for anchoring contigs generated through BAC fingerprinting efforts as well as assist in the selection of a BAC minimal tiling path and assembly of the first sequence-ready map of the porcine genome.

b. Impact - Identification of the mutation that is responsible for lower milk yield and production traits will have a significant impact on dairy cattle improvement.

A relatively simple genetic test can be used to eliminate the undesirable allele from the bull population. The development of a high resolution pig RH map consisting of more than 2,000 markers that are linked to the human genome will facilitate identification of

genes controlling economically important traits for swine production.

c. Source of Funding – CSREES Special Grant Funds

d. Scope of Impact – National

Germ Cell and Embryo Development and Manipulation for the Improvement of Livestock

a. Progress - Recently, development of microscale embryo culture devices (microchannels) has opened new avenues for manipulation of the IVF system to improve the efficiency and overall production of porcine embryos by more closely mimicking the function of the oviduct. It is believed that the delivery of sperm cells in the microchannel simulates the flow pattern of spermatozoa past the oocytes similar to the release pattern of sperm cells from the sperm reservoir in the oviduct. This study was designed to compare the incidence of polyspermy of pig oocytes fertilized in PDMS-glass microchannels (MC) to conventional microdrop methods (controls).

Staining data revealed a higher incidence of monospermic penetration and a lower number ($P<0.05$) of spermatozoa per oocyte in the microchannels as compared to the controls. These data support the idea that the microfluidic environment reduces the incidence of polyspermy during IVF of porcine oocytes while maintaining comparable penetration and male pronuclear formation rates. Furthermore, it appears as if the number of sperm present near the oocytes during fertilization is decreased using the microchannel IVF system. In conclusion, the microfluidic technology has shown the potential, with an increase in monospermic penetration, to shift the paradigm of assisted reproductive technologies.

The objective of this second study was to determine the effects of over-expression of a mammary-specific transgene, bovine alpha-lactalbumin, and suckling intensity on milk production in sows and the resultant piglet growth of litters suckling these transgenic sows. Lactational response to increased nursing stimulation was determined by fostering Yorkshire litters either the same age (d0) or seven days older (d7) than sow lactational age to sows either non-transgenic (C) or transgenic for bovine alpha-lactalbumin (bALA). Twenty first-parity Yorkshire sows were allocated between four treatments (bALA-d0, bALA-d7, C-d0, C-d7) dependent on sow genotype and age of litter fostered. Litters were

standardized at 10 piglets each and fostered to subject sows at 36 hours postpartum. Least squares means and standard errors for daily milk yield of bALA-transgenic sows with d0 and d7 foster litters were 7.1 + .4 and 9.1 + .4 kg, respectively. Least squares means and standard errors for daily milk yield of control sows with d0 and d7 foster litters were 6.7 + .4 and 7.0 + .4 kg, respectively. Mean total milk yield of sows with d7 foster litters (7.9 kg/d) was significantly greater ($P<0.05$) than milk yield of sows with d0 foster litters (6.9 kg/d). bALA-transgenic sows with d7 foster litters (bALA-d7) produced significantly more milk than anticipated based on results from other treatments, where as a significant interaction existed between genotype and day of foster ($P<0.05$). The bALA-transgenic treatment with d7 foster litters resulted in a 31% increase in milk produced as compared to the combined mean of remaining treatments. The bALA-transgenic treatment produced a significant increase in milk yield from d0 to d7 of 2.0 kg/d (28%) as compared to a 0.3 kg/d (4%) increase in milk yield for control sows under increased suckling intensity.

b. Impact - The microchannel system may provide a tool not only for optimizing embryo culture but also to enhance basic understanding of early embryo development.

Precise control over local environmental conditions will allow exploration of questions about, for example, the effects of different components of culture medium on viability. Transgenic pig results suggest that alpha-lactalbumin (A-LA) maybe limiting for lactose synthesis, and lactose may be limiting for milk production. Results suggest that over-expressing A-LA will provide an avenue to increase milk production. This may be useful in beef and dairy cattle as well as sheep, goats and pigs.

The production of the A-LA transgenic swine will continue to allow analysis of the effects of over expression of A-LA on milk composition, milk yield and lactose synthase activity. The development of more efficient oocyte and embryo culture systems will allow the genetic improvement of livestock via embryo transfer and associated technologies. The production of transgenic swine may allow for improvement of piglet growth and health in swine production systems. These observations may have profound effects on milk and meat production.

c. Source of Funding – State, Multi-State Funds

d. Scope of Impact - AR, CA, CO, IL, IA, LA, MD, OR, UT, WA, WI

Estimation of Genetic Effects on Longitudinal and Time-To-Event Livestock Data

a. Progress - Longevity is an important aspect of the economic efficiency of U.S. livestock production units. Survival models were used to characterize lamb and sow longevity in two large data sets. Lamb mortality records during the first year of life of 8,642 lambs from a composite population were studied using survival analyses. Heritability estimates from the complementary log-log sire model ranged from 0.13 to 0.21 for the different periods studied within the first year. These estimates were greater than the complementary log-log animal model estimates that ranged from 0.04 to 0.12. Maternal effects were important early in life. Subsequently, records from birth to weaning of 8,301 lambs were analyzed using a competing risks model.

Specific causes of mortality were grouped into dam-related (e.g., dystocia and starvation), pneumonia, disease (excluding pneumonia), and other categories. The significant influences of type of birth and age of dam effects were consistent across category of mortality and the sex effect was significant for all categories except the other category. Estimates of variance components indicated strong maternal effects for all categories except for Pneumonia. Estimates of additive genetic heritabilities from the discrete maternal effects models were 0.08, 0.09, 0.16, 0.19, and 0.14 for overall, disease, dam-related, pneumonia, and other categories, respectively.

A biological and economic study of sow longevity and production in commercial U.S. herds was undertaken using similar statistical tools. Two indicators of sow longevity, herd life (total number of days from first service until removal from the herd) and productive days (total number of days the sow gestated and lactated until removal), were calculated using records from 148,568 sows in 32 commercial herds from Central Illinois from January 1995 to May 2001. The largest difference in longevity between the major genetic lines was approximately one parity. There were differences ($P < 0.05$) in the instantaneous sow removal rate or hazard from the major lines. These differences constitute evidence that sow longevity could be improved by using specific genetic lines. Assuming a zero discount rate per parity, genetic lines with longer herd life resulted in greater profit than genetic lines with shorter herd life.

In a follow-up study, the sow longevity records were analyzed using independent competing risks. The reasons for removal were

grouped into the categories fertility, reproduction, litter performance, disease, injury, and death. There was a significant effect of genetic line on the relative hazard of removal for all removal reason categories except for fertility. These results illustrate the importance of accounting for reason of removal in the analysis of sow longevity. Ignoring the cause of the defining event in mortality and replacement studies may hide important genetic and systematic differences. General survival and competing risks approaches helped to identify opportunities for management intervention to maximize profitability.

b. Impact - Early removal of animals from the herd due to mortality, health problems and poor performance is a major bottleneck in the livestock industry.

In the sheep industry, genetic improvement of lamb survival is based on accurate and precise estimates of genetic parameters. Often the actual time of mortality is unavailable but can be inferred and discrete time methods can be used instead of the continuous time methods. The similarity of results among survival analysis methods demonstrates that the discrete methodology is a viable alternative to study livestock survival data.

In the swine industry, the investment in replacement gilts is a major budget decision as typically forty percent of the sows are removed before recovering the initial cost. Our study provided an understanding of the factors influencing sow longevity. Important differences in genetic lines were observed that could be translated into economic benefits. Our findings suggest that the magnitude of the economic improvement attained through the use of sow genetic lines with longer longevity depends on the economic context under which the evaluation is made. In addition, our results demonstrated the value of applying a competing risks model to survival data.

The multiple factors involved in mortality indicate that ignoring the cause of the event may hide important genetic and management differences. The results from this study suggest that there are opportunities to change management and selection practices to improve lamb mortality that are specific to the removal cause.

c. Source of Funding – Hatch Funds

d. Scope of Impact - National

Genetic and Functional Genomic Approaches to Improve Production

a. Progress - Preliminary analyses of SSC2 and SSC6 have revealed the presence of ETL for both lean yield and meat quality. Both of the identified ETL exceed the genome-wise significance threshold of $p<0.0001$ and have an additive mode of inheritance. The IGF2-intron3-G3072A mutation was also found to be segregating in the IMQP. The effect of the G3072A mutation on loin-eye area and backfat measurements also exceeded the genome-wise significance threshold using an imprinting model. ETL exceeding the chromosome-wise significance threshold were identified for percent intramuscular fat (by proximate analysis) and percent moisture on SSC13, and for backfat and percent intramuscular fat on SSC18. Both had additive modes of inheritance. Interbreeding of the IMQP F1s produces a variety of coat color phenotypes including varying degrees of solid, striped, and spotted individuals. On occasion, solid white piglets are produced. Experimental matings between white F2 animals produce all white offspring, suggesting that the genotype is true-breeding. These animals have been genotyped at the MC1R locus and were homozygous recessive or e/e, typically associated with a red phenotype.

   Furthermore, analysis at the KIT gene reveals that they are normal, i/i genotypes. To understand the molecular basis of this phenotype, an analysis of candidate genes involved in coat color was initiated. Exons of the agouti (ASIP) gene were amplified from the founder animals of the IMQP and PCR fragments were directly sequenced. A G to A point mutation was identified in exon 3 of ASIP, corresponding to a non synonymous substitution (E to K) at position 68 of the agouti protein. Unfortunately, initial analysis of the E68K mutation reveals no association with the recessive white phenotype. However, due to the effects of agouti mutations in the mouse and the putative role of ASIP in humans analyses for potential effects on growth, carcass and meat quality traits are currently being conducted.

b. Impact - The results from this study augment the understanding of the inheritance of growth, carcass and meat quality traits in pigs. Furthermore, the potential for identification of significant ETL within commercial breed crosses, such as Berkshire and Duroc, was demonstrated. The identified ETL can potentially be used in marker-assisted selection programs for genetic improvement.

c. Source of Funding – State, Multi-State Funds

d. Scope of Impact – AL, IL, IN, IA, MI, MN, NE, NC, OH, OK

Key Theme – Animal Health

Enteric Diseases of Swine and Cattle: Prevention, Control and Food Safety

a. Progress - Our studies have shown that a ganglioside (sugar-containing lipid) present on porcine intestinal cells is required by certain strains of rotavirus to infect pigs and cause diarrheal disease. Unfortunately, this natural ganglioside, exploited by rotavirus as a receptor molecule, is present in only small concentrations which prohibit its large scale production and use as a rotavirus-inhibiting drug. Therefore, we are actively pursuing the synthesis of a mimetic of this ganglioside using commonly available and relatively inexpensive starting compounds.

This synthetic neoglycolipid mimetic contains the same sugar molecule present on the natural ganglioside receptor which is recognized by rotavirus but contains a different lipid or fat portion. This new lipid component is readily abundant and is also a natural compound commonly found in animals and humans. Also, the synthesis of this new mimetic requires only a single step and thus the molecule can be produced quickly and in relatively large quantity.

When we tested this neoglycolipid, named SLPE, for antirotavirus activity we found it displayed a potent ability to inhibit both virus binding and infectivity in vitro. Furthermore, the amount of this neoglycolipid required for inhibition of rotavirus infectivity was nearly identical to that required for the natural ganglioside receptor.

We are currently conducting experiments evaluating the in vivo efficacy of this neoglycolipid to protect pigs from rotavirus disease in the natural field setting. In these preliminary field trials, the neoglycolipid blocked infection, virus shedding, and diarrheal disease using a twice-a-day dosage administered to newborn pigs at the time of virus infection. We are also investigating, in collaborative studies with Dr. Sharon Donovan, Department of Food Science and Human Nutrition, the synergistic effect of SLPE and specific porcine milk oligosaccharides as well as soybean derived flavonoids, which we have also found to exhibit anti-rotavirus activity.

In other studies, we are investigating another common gastrointestinal disease of animals and people known as cryptosporidiosis. Cryptosporidiosis is caused by a protozoan parasite, Cryptosporidium parvum, most often transmitted to humans through ingestion of water contaminated with Cryptosporidium parvum oocysts. Once ingested, the oocysts break open in the intestine to release sporozoites that infect intestinal cells and cause diarrheal disease which can be life-threatening, especially in AIDS patients and people with compromised immune systems.

In earlier studies, we described an in vitro cell suspension assay that measures binding or adhesion of sporozoites to intestinal cells. This assay involves the incubation of individualized sporozoites and intestinal cells in suspension with end-over-end rotation at 37C. Binding of the sporozoites to these cells is readily observed and quantified by phase contrast microscopy. This assay was used to screen a variety of naturally occurring molecules for their ability to inhibit parasite binding to intestinal cells. Of the compounds tested, only sugar-rich molecules known as mucins, which are commonly found as a protective coating in the intestinal tract, markedly inhibited sporozoite binding.

We also found that cell surface membranes, isolated from bovine intestinal cells in the form of membrane spheres or vesicles (PMV), inhibited sporozoite binding. We have purified and characterized the inhibitory component from these PMV. Interestingly, the molecule responsible for inhibition of sporozoite binding is a fat or lipid molecule commonly found, in various forms and concentrations, in many foodstuffs including those used to prepare calf diets.

We are currently investigating the use of this molecule to supplement calf diets as a dietary therapy for protecting against bovine and possibly human cryptosporidiosis. Additionally, we are finishing preliminary experiments aimed at identifying specific sporozoite genes turned on as a consequence of the early stages of intestinal cell infection. Finally, in collaborative experiments with Dr. Prasanta Kalita, Department of Agricultural and Biological Engineering, we have determined the cryptosporidium oocysts are effectively retarded from overland transport and runoff into adjacent waterways by vegetative filter strips (VFS). We have determined and that the mechanism of this retardation is specific adhesion to the clay particles of the soil that occurs as a consequence of reduced flow over a vegetated surface as compared to bare soil.

b. Impact - Group A rotaviruses are among the most important agents associated with severe diarrhea in the young of both animals and people. Receptor therapeutic approaches aimed at blocking virus attachment, combined with nutritional therapy capable of blocking virus replication is likely to be a more field applicable, producer acceptable and deliverable strategy to combat rotavirus in both the majority of people and agricultural animals affected by the disease than traditional vaccine approaches. Due to the zoonotic nature of Cryptosporidium parvum, the economic loss to the cattle and dairy industries caused by this parasite is compounded by the risk of environmental contamination and human infection.

The oocysts are environmentally hearty and exceptionally resistant to chemical eradication. The discovery of parasite genes activated during initial recognition and adhesion of host cells may provide options for inhibiting invasion, perhaps by blocking a unique metabolic pathway or by using receptor mimetics.

Our results with vegetative buffer strips suggest they are a best management practice for diary farms to reduce or eliminate overland transport and runoff of oocysts in to adjacent waterways.

c. Source of Funding – State, Multi-State Funds

d. Scope of Impact - AZ, IL, IA, KS, MI, MN, NE, OH, SD, WA

Porcine Reproductive and Respiratory Diseases: Methods for the Integrated Control, Prevention and Elimination of the PRRS Virus

a. Progress - The natural response of pigs to porcine reproductive and respiratory syndrome virus (PRRSV) infections and vaccinations needs to be altered so that better protection is afforded against both homologous and heterologous challenges by this pathogen. Studies conducted during the reporting period demonstrated the ability of cytokines and synthetic double-stranded RNA to augment the T helper1 (i.e., interferon-gamma) immune response of swine to PRRSV. Thus, exposure to PRRSV in the presence of a variety of Th1 polarizing molecules can positively influence the development of the cell-mediated immune response of swine to this pathogen. Conceivably, such intervention could be applied to improve the formulation of anti-PRRSV vaccines.

To extend these observations related studies were aimed at deciphering the involvement of innate immune factors in the development of the host responses to PRRSV vaccination. In these

studies, efforts to enhance Th1 immunity, by utilizing an expression plasmid encoding porcine interferon (IFN)-alpha (pINA) as an adjuvant, resulted in a temporary increase in the frequency of PRRSV-specific IFN-gamma secreting cells (SC) but only minor changes overall in the expression of Th1 associated cytokine or innate immune marker mRNA by virus-stimulated PBMC. Administration of pINA, however, did correlate with decreased IL1B secretion by cultured, un-stimulated PBMC but had no effect on their ability to release IFN-gamma. Thus, while exogenous addition of IFN-alpha during PRRSV vaccination has an impact on the development of a Th1 immune response, other alterations will be required for substantial boosting of virus-specific protection.

It has become increasingly evident that the link between innate and adaptive immunity in viral infections occurs through the interaction of dendritic cells with type I IFN and dendritic-cell controlled polarization of T-cell function. The production of IFN-alphaby plasmacytoid dendritic cells (PDC) has an autocrine effect that promotes functional and phenotypic activation events necessary for their optimal expression of co-stimulatory molecules and subsequent ability to cause naive T cells to differentiate into IFN-gamma-SC. Our studies have now demonstrated that PRRSV is a poor stimulator of IFN-alpha production by porcine PDC. This limited response of PDC to PRRSV may be at least partially responsible for the weak initial IFN-gamma response against PRRSV in swine and has implications regarding the development of an effective vaccine against this pathogen.

A field study was also conducted with the objective of determining if cell mediated immunity (CMI) to PRRSV correlates with protection against reproductive failure in sows on commercial swine farms during clinical outbreaks of PRRS. Evidence that a strong cellular immune response correlates with protection against clinical PRRS was found in three of the four farms examined.

b. Impact - Several major advances were made at the University of Illinois in understanding the immunobiology of PRRS virus as well as the molecular epidemiology of this virus. We expect that these advances will contribute to the development of a more effective vaccine as well as the development of control measures to prevent the spread of this virus.

c. Source of Funding – State, Multi-State Funds

d. Scope of Impact - IL, IA, KS, MN, MO, NE, NC, SD, VA

Differentially Expressed Early Invasion Genes of Cryptosporidium Parvum

a. Progress - The mechanism of *Cryptosporidium parvum* sporozoite invasion of host cells remains unclear. The investigation of this parasite's transcriptome is difficult due to the relative abundance of host cell genetic material and the lack of a culture system for the isolation of all the life cycle stages. Due to these difficulties, molecular techniques have previously been used to identify either a single specific parasite gene or a group of genes expressed concurrently by parasite and host. In either case, it has not been possible to isolate the mRNA of the parasite during the adhesion/invasion stages in the absence of host genetic materials.

We have developed a protocol, using a host cell substitute that will allow us to identify only the parasite genes expressed during the earliest stage of host cell invasion (initial adhesion). We are using suppressive subtractive hybridization (SSH) to identify differentially expressed parasite genes transcribed during the initial binding of the parasite to the host cell membrane. Instead of using intact host cells, which would include host genetic materials, we will use plasma membrane vesicles (PMV's) derived from these cells which include host cell surface molecules but not nucleic acids.

We have found *C. parvum* sporozoites are able to bind, but not to invade, these vesicles. This effectively uncouples the initial stage of infection from the rest of the invasion process and ensures that only transcripts expressed in the adhesion stage are isolated. The lack of host mRNA ensures that all transcripts are of parasite origin. Only differentially expressed transcripts will be amplified with this procedure; however, appropriate controls will be used to confirm this. Using this approach we have been successful in accumulating large quantities of oocysts and isolating high quality mRNA from total sporozoite RNA. We also have identified amplified PCR products that appear only in forward subtracted sporozoites (sporozoites exposed to PVM subtracted with sporozoites not exposed to PMV). We have reproduced these results twice and are currently in the process of constructing libraries, and screening the clones to prove they were differentially expressed when exposed to PMW.

We have confirmed differential expression of one candidate gene by Northern blotting. Preliminary sequence analysis of the cloned gene suggests a multidomainal protein with homology to 3 known cryptosopridia genes. This information is confidential and will be

reported in detail in future reports once these results are published. This will be the first demonstration of parasite genes specifically expressed in response to sporozoite attachment to host cells.

b. Impact - Due to the zoonotic nature of *Cryptosporidium parvum*, the economic loss to the cattle and dairy industries caused by this parasite is compounded by the risk of environmental contamination and human infection. This is especially serious in light of the potentially fatal consequences of cryptosporidiosis in AIDS patients, many of whom are already harboring the pathogen. The oocysts are environmentally hearty and exceptionally resistant to chemical eradication. The discovery of parasite genes activated during initial recognition and adhesion of host cells may provide options for inhibiting invasion, perhaps by blocking a unique metabolic pathway or by using oral receptor mimetics or natural dietary lipids.

c. Source of Funding – Hatch Funds

d. Scope of Impact – National

Functional Food Ingredient Effects On Canine Nutrition and Health

a. Progress - The objective of this research was to determine whether supplemental pullulan or g-cyclodextrin influenced food intake, nutrient digestibility, microbial populations, and fecal characteristics of dogs. Pullulan and g-cyclodextrin are novel carbohydrates that are synthesized by microorganisms and are considered slowly digestible. Adult female ileal cannulated dogs (n = 5) were fed a commercially available dry, extruded, kibble diet twice daily. At each feeding, the following treatments were administered via gelatin capsules in a 5 x 5 Latin square design: 1) Control (no supplement); 2) 1 g high molecular weight pullulan; 3) 2 g high molecular weight pullulan; 4) 1 g g-cyclodextrin; or 5) 2 g g-cyclodextrin. Fecal and ileal samples were collected during the last 4 days of each 14-day period to quantify select microbial populations and nutrient digestibilities.

Treatment means were compared using preplanned orthogonal polynomial contrasts. Food intake decreased linearly ($P < 0.05$) with increasing g-cyclodextrin supplementation. No differences ($P > 0.05$) were noted in ileal or total tract nutrient digestibilities. Increasing pullulan supplementation resulted in a linear increase ($P < 0.05$) in ileal bifidobacteria and lactobacillus spp. concentrations. Dogs supplemented with pullulan tended to have an increasing

quadratic response ($P < 0.10$) in fecal concentrations of lactobacillus spp. A trend for increasing quadratic response ($P < 0.10$) in ileal bifidobacteria and lactobacillus spp. concentrations was noted in dogs receiving g-cyclodextrin. A decreasing quadratic response ($P < 0.05$) in fecal C. perfringens concentrations was noted for dogs supplemented with g-cyclodextrin.

While dogs supplemented with increasing concentrations of pullulan exhibited a linear increase ($P < 0.05$) in fecal score, dogs supplemented with increasing concentrations of g-cyclodextrin exhibited a linear decrease ($P < 0.05$). Results of this study suggest that dietary supplementation with pullulan and g-cyclodextrin may have beneficial effects on microbial ecology of dogs without negatively affecting nutrient digestibility.

b. Impact - Pullulan and g-cyclodextrin supplementation in dogs may result in positive changes in gastrointestinal tract bacterial populations, potentially leading to an improved health status of the animal.

c. Source of Funding – Hatch, State, Industry Funds

d. Scope of Impact – National

Swine Nutrition and Bacterial Populations in the Gut

a. Progress - We have made significant progress in experiments evaluating the impact of spray-dried plasma, a mannan oligosaccharide (MOS) product, and several cereals in the diet of newly weaned pigs on their digestive tracts, health and growth performance. Preliminary examination of our results suggests that spray-dried plasma has only modest impacts on gut flora, although it dramatically increases growth rate. It appears from early results that MOS has larger impacts on gut flora, and we have also completed measurements of intestinal morphology. Pigs challenged with a pathogenic E. coli appear to get less sick if fed rice or barley instead of corn. We have shown that threonine appears more limiting than valine in diets for lactating sows when evaluated over a full lactation period, as well as over short periods. We are nearing completion of the animal portion of a project to determine whether soybean meal produced in the U.S. is often overheated.

b. Impact - Publication of our summary of the data on the efficacy of a mannan oligosaccharide product will increase the number of

pork producers and feed manufacturers around the world who use this technology.

Results of our on-going research on the effects of mannan oligosaccharide and spray-dried plasma in the digestive tract will help the industry understand how to best use these products, and perhaps guide development of succeeding generations of products. Our observations that rice or barley in the diet of pigs reduces the clinical signs after challenge with a pathogenic E. coli are preliminary, but may lead the industry to change rather dramatically the small amount of special feeds that pigs eat immediately after weaning, and to thereby improve pig health.

Our present and planned research on amino acid requirements of lactating sows will guide the industry to more effective utilization of soybean meal and crystalline amino acids, and perhaps to improved productivity. Our studies on the digestible reactive lysine content of soybean meal will either identify an opportunity to improve the quality of this critical feed ingredient, or verify its superiority over other protein supplements.

c. Source of Funding – Hatch, State, Industry Funds

d. Scope of Impact – National

Key Theme – Animal Production Efficiency

Developing Facilities and Equipment to Add Value and Improve Environments in Livestock Production

a. Progress - An industry partner has agreed to cooperate with the University of Illinois in providing funding and technical advice to advance our research on thermo-chemical conversion of swine manure to liquid crude bio-fuel and concentrated fertilizer sources. We have developed and are operating a continuous flow system on a laboratory bench scale. All system outputs (oil, post process water, solids and gases) are being analyzed for potential environmental problems and to assess their economic value. A farm-scale version is currently in the design phase.

b. Impact - The value of energy that can be extracted from swine manure in the U.S. is $10/head even at a $30/barrel crude oil price. That is $500 million added value potential for U.S. swine producers. Other benefits are possible from fertilizer and reduced pollution potential

c. Source of Funding – Hatch, Industry Funds

d. Scope of Impact – National

Avian Infections Bronchitis Virus: A Possible Cause For Reproductive Impairment in Roosters

a. Progress - Several years ago we discovered stones in the reproductive tract (epididymal region) of roosters of the laying and broiler breeder strains. These stones, composed of calcium carbonate, are associated with a decrease in testosterone concentrations and sperm production and a 35% reduction in fertility. These stones have been found in roosters throughout the United States, Brazil and Japan. It was suggested that immunization with the live attenuated avian infectious bronchitis virus (AIBV) may be the cause.

To test this hypothesis, we have used specific pathogen free (SPF) roosters. At 2,6,10, and 14 weeks after hatching, one group of roosters was immunized with the live AIBV whereas the other group of roosters was not immunized.

In experiment 1, roosters were euthanized at 12, 16, 20 and 26 weeks of age and the epididymal region was prepared for histology. No stones were present in the epididymal region of roosters at 12 and 16 weeks of age whereas stones were forming and were present in the epididymal region of roosters at 20 and 26 weeks of age, respectively. Further analysis of the stones indicated that they contained sperm. It appears that as the stones form, the core of the stone is cellular debris around which calcium is deposited.

In experiment 2, we used control roosters (not immunized) and roosters immunized with the live attenuated AIBV at 2,6,10, and 16 weeks of age and seminal plasma was collected from adult roosters and analyzed for amino acids and proteins by 1D SDS-PAGE and 2D gels. The concentrations of a number of amino acids, specifically tyrosine, arginine, and histidine in seminal plasma were lower in the seminal plasma of roosters with epididymal stones. Results from the 1D SDS-PAGE indicated the absence of 36 kDa and 100 kDa in seminal plasma collected from roosters with epididymal stones. Results from 2 D gels indicated also a difference in proteins in seminal plasma from roosters with stones compared to roosters without stones.

In experiment 3, we characterized differences in sperm concentration, morphology, sperm storage and fertilization between vaccinated and non-vaccinated roosters. Semen samples for vaccinated roosters contained less sperm than semen samples from non-vaccinated roosters. Many sperm from vaccinated roosters retained the cytoplasmic droplet. Examination of the perivitelline membrane for sperm holes as an indication of the number of sperm that attempted to fertilize the egg indicated that fewer sperm from vaccinated roosters attempted to or were able to fertilize eggs compared to the sperm from non-vaccinated roosters.

Collectively these results indicate that immunization of roosters with the live attenuated AIBV causes stones in the epididymal region, alters the protein and amino acid concentrations of the seminal plasma and decreases fertility.

b. Impact - The purpose of this research is to increase profits for the poultry industry. Currently the hatchability of eggs of broiler breeders (chickens sold in grocery stores) is 83%. Just a 1% increase in hatchability would increase the profits of the broiler breeder industry $36 million annually. Hatchability could be increased 1% or more if the fertility of roosters was improved. The current practice of vaccinating roosters with the live attenuated avian infectious bronchitis virus which causes stones in the reproductive tract and reduces fertility 35% needs to be changed to improve profits for the poultry industry.

c. Source of Funding – Hatch, State Funds

d. Scope of Impact – National

Beef Carcass Merit as Affected by Age, Breed, Feeding Program, and Marbling EPD

a. Progress - As increasing numbers of cattle are being marketed on a grid basis, carcass value rather than live weight is becoming the primary determinant of profitability. Carcass value is determined by weight, quality grade, yield grade, choice-select spread, and premiums and discounts.

Early-weaned Simmental steers (n = 192) of known genetics were individually fed in a four-year study to determine performance and carcass factors explaining variation in carcass value and profitability. Steers were weaned at 88.0 days and fed a high concentrate diet ($108.99/T) for 84.5 days prior to allotment. Steers consumed a 90% concentrate diet ($98.93/T) consisting

primarily of whole shelled corn and corn silage, for 249.7 days and harvested at 423.3 days of age.

Five-year price data were collected for feedstuffs, dressed beef, and grid premiums and discounts. Average dressed beef price was $110.67/45.4 kg. Premiums ($/45.4 kg) were given for Prime ($5.62), premium Choice ($1.50), yield grades (YG) 1 ($2.46), 2A ($1.31) and 2B ($1.11). Discounts ($/45.4 kg) were given for Standard (-$17.72), Select (-$8.90), YG 3A (-$0.12), 3B (-$0.19), 4 (-$14.16) and 5 (-$19.56), and hot carcass weight (HCW) extremes (409-431 kg, -$0.64; 432-454 kg -$11.39; > 454 kg, -$19.71). Input costs included annual cow costs ($327.77), veterinary/medical and labor ($35/hd), feed markup ($22/T), yardage ($0.25/hd/d) and interest (10%). Dependant variables were carcass value and profit per steer. Independent variables were yearling weight EPD, marbling EPD, daily DMI, ADG, feed efficiency, HCW, 12th rib fat, calculated YG and marbling score (MS). Carcass value was correlated ($P < 0.05$) with yearling weight and marbling EPD, DMI, ADG, feed efficiency, HCW and MS. Carcass weight, MS and YG accounted for over 79% of the variation in carcass value among steers; explaining 57, 12 and 10%, respectively. Profit was correlated ($P < 0.05$) with DMI, ADG, feed efficiency, HCW and MS. Marbling score, DMI, ADG, YG and HCW accounted for over 77% of the variation in profit among steers; explaining 30, 14, 12, 12 and 9%, respectively

b. Impact - The beef industry is moving toward marketing cattle based on the value of individual carcasses. This study shows the relative importance of factors affecting carcass value and profits. Depending on the choice-selects spread, quality grade, carcass weight, feed efficiency, yield grade and year were the major determinants of profits.

c. Source of Funding – Hatch, Sale of Products Funds, State

d. Scope of Impact - National

Molecular Mechanisms Regulating Skeletal Muscle Growth and Differentiation

a. Progress - The rapid softening and flaking of fish fillets after harvest are a major concern to the aquaculture industry. Incubation of trout fillets with a calcium-containing solution was shown to reduce meat firmness suggesting that the calpain enzyme system may be important in controlling fillet softening and quality in post harvest rainbow trout. Components of the rainbow trout

calpain proteolytic system were isolated by laboratory techniques and their activities characterized. We examined the role of the calpain system in post harvest fish muscle.

We also conducted research into the identification and characterization of the enzymatically active subunits of rainbow trout calpains (Capn1 and Capn2) and their roles during muscle loss induced by starvation. Characterization of the two forms of trout calpain demonstrated that they were approximately 65% identical with mouse calpains. Starvation of rainbow trout fingerlings for 35 days increased the presence of the calpains. Calpain enzymatic activity was increased 1.23 fold suggesting a potential role of calpains in protein mobilization as a source of energy under fasting conditions in the trout. Additionally, cloning of the rainbow trout calpain regulatory subunit (cpns) revealed a unique change in a specific region of the protein (domain-V). Domain-V found in mammalian systems contains a glycine-rich consensus region and is known to play a role in membrane targeting, but this consensus region is absent in the rainbow trout. Divergence of the trout calpain regulatory subunit from the mammalian counterpart suggests potentially different functional and activation mechanisms for the fish calpains. Understanding of the mechanisms controlling muscle protein mobilization in the live trout and the deterioration of post harvest fish muscle will be of tremendous value to the industry.

Utilizing our “in-the-egg” model of embryonic manipulation and enhanced post hatch muscle development, we examined the effects of early administration of growth factor (rhIGF-1) on expression of the growth hormone secretagogue receptor (GHSR) during chicken embryonic development. Normal expression of GHSR was observed to increase slightly through embryonic day 5 and remain relatively constant throughout embryogenesis in the control chick. Expression patterns of GHSR, after administration of rhIGF-1 on day 3, demonstrated similar patterns to controls with the exception of a significant increase on day 8.

These data suggest that GHSR may be active in regulating GH secretion during early embryonic development, and up-regulation of the GHSR gene following IGF-1 administration may have an important role in the determination of post hatch muscle growth.

b. Impact - Development of methods to improve the rate and efficiency of muscle growth in livestock species will be essential to allow animal agriculture sytems to meet projected increases in

both population and demand, and to allow domestic production to remain globally competitive.

This research has shown that muscle growth can be enhanced and that specific genetic and cellular events are correlated with these changes in growth patterns. Meat from animals with enhanced muscle growth rates can vary in quality but that numerous techniques can be employed that will allow the meat to be very acceptable to the consumer.

c. Source of Funding – Multi-State Funds

d. Scope of Impact - AZ, CA, HI, ID, IL, IN, IA, KS, MI, MN, NE, NC, OH, OR, SD, UT, WA, WI

Strategies to Reduce the Response of Slaughter Weight Pigs to Handling Stress

a. Progress - The effect of nutritional management strategies (including feed withdrawal and dietary energy sources) on the stress responses (temperature and blood acid-base status) were investigated in slaughter weight pigs subjected to a standard handling model. In addition, the effect of floor space on the truck during transport on the incidence of dead and downer pigs at the packing plant was evaluated under commercial conditions.

Objectives : 1) To evaluate the impact of nutritional management strategies (feed withdrawal and dietary energy sources) on the blood acid-base status and muscle glycolytic potential of pigs subjected to a standardized animal handing model. 2) To evaluate the effects of floor space on the truck during transport on the incidence of dead and downer pigs at the packing plant. APPROACH: Nutritional management strategies were used with market weight pigs (110 to 120 kg) for varying periods prior to being subjected to a standardized animal handling model. The handling model consisted of moving pigs through a handling course a predetermined number of times using either high intensity (normal handling) or low intensity (gentle handling) treatment. Indices of stress response were determined by measuring rectal temperature and blood acid-base parameters immediately prior to and after the handling procedure. Floor space on the truck during transport was studied under commercial conditions within a production system in Illinois (The Maschhoffs). Small groups (4 to 6) of market weight pigs were removed from each pen and were handled using sorting boards and, if necessary, electric prods. Pigs were loaded onto straight, double deck semi trailers that were

owned and operated by the production system. Two different floor spaces (0.4 and 0.5 m2/pig) were compared on each deck of each load during transport. Differences in floor space treatments were created by varying the number of pigs per compartment on the truck. Upon the completion of loading, pigs were transported approximately 3 hours to a commercial packing plant, where packing plant employees identified all dead and downer pigs during unloading. UI investigators characterized downer pigs as stress related or injury related.

b. Impact - Through these nutritional management strategies, we developed intervention strategies to reduce the stress response of pigs to pre-slaughter handling, which should result in reduced transport losses and improved pork quality. Additionally, we found that floor space on the truck had a major impact on transport losses at the plant. Increasing the floor space from 0.4 to 0.5 m2/pig resulted in over a 2-fold reduction in the incidence of dead and fatigued pigs on arrival at the packing plant.

c. Source of Funding – Hatch, State, Industry, Other Federal Funds

d. Scope of Impact – National

Non-Feed Withdrawal Molting Programs Developed for Molting Commercial Laying Hens

a. In the commercial egg industry in Illinois and the United States, the management practice using feed withdrawal to induce a flock to molt has been under extreme scrutiny. This is because animal rights groups have voiced their concern about using this practice. Thus, about five years ago, the United Egg Producers (UEP) commissioned five universities to conduct induced molting experiments in order to develop alternative molting programs which employed non-feed withdrawal to molt laying hens.

The studies conducted to date used techniques ranging from feeding hens without added salt in the diet to using readily available, low cost feed ingredients to develop molt diets that are low in energy level and protein content. The results of these studies indicated that molting laying hens without feed withdrawal can be done successfully.

The University of Illinois was one of the institutions commissioned by the UEP to conduct research and we found that feeding laying hens diets consisting of wheat middlings, soybean

hulls, in combination with corn (low protein and low energy) were successful in providing for acceptable post-molt egg production performance and economical benefit compared to using a standard feed withdrawal method.

This research information was provided for the Illinois egg producers and those in the U.S. by presenting the data at many scientific and producer meetings throughout the state and in the U.S.

b. Impact – Based on the finding of these studies, the UEP has revised their recommended molting guidelines to state that only non-feed withdrawal molting methods will be permitted after January 1, 2006.

The acceptance of our research by the commercial egg producers in the state has been good. Several egg producers have tried the program with our largest egg producer (1.6 million hens) having adopting a modified program which we developed. Thus, this Research and Extension effort has made a huge impact on our states' and national egg production companies.

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Using Internet Technology - Dairy Certificate Program
http://online.ansci.uiuc.edu/

a. Dairy Extension has developed to an international and national dairy outreach teaching program using the Internet as a delivery system, CD recorded lectures, power point visuals, and streaming video. Instruction is available "on demand" when students have time. This approach is appealing to dairy farm managers needing research-based knowledge, students that cannot attend formal classes at the University of Illinois, students at other universities that do not have dairy classes available, feed industry personnel, campus students wanting applied classes with a blend of professional interaction, and veterinarians needing continuing education units. This outreach approach is the only dairy program available in United States with foreign student enrollment. The "Dairy Certificate Program" was formally recognized and approved by the Graduate College (awarded when students complete five classes and associated labs).

To address the problems of poor connectivity in rural United States and other regions, a hybrid CD ROM/Internet-based course has been developed. This was the first animal sciences course offered in the United States using this combined technology. Hoard's Dairyman Magazine featured the course in their national magazine (circulation of 105,000 worldwide, with an advertising value of $5000). This advertising and program success resulted in the course being offered every semester due to increased demand.

b. Impact – Class statistics:

- Five hundred and twenty one students including Academic Outreach adult enrollment; nine students from Southern Illinois University and Illinois State University; 48 students from the University of Illinois College of Veterinary Medicine; graduate students from Michigan State University, North Dakota State, Texas A & M, University of Alberta; and 104 on-campus students from the University of Illinois Department of Animal Sciences.

- 51% of students were from Illinois, 38% from elsewhere in the United States, and 11% from foreign countries (Canada, Puerto Rico, South Africa, Malta, Argentina, New Zealand, Costa Rico, and Australia).

-University of Illinois Information and Technology and Communications Services purchased 65 CD ROM's for agricultural teachers.

- Diamond V Yeast Company purchased 700 CD ROM's for their national and international sales force and customers. Over 1300 CD ROM's have been sold through Academic Outreach.

- Four graduate students in the Department of Animal Sciences have been trained in developing and delivering these courses. This training should be valuable for these students.

c. Source of Funding – Federal, State, Cost Recovery

d. Scope of Impact – National, International

Key Theme – Biotechnology

Soybean Gene Expression and Regulation

a. Progress - The objectives of this research are to understand the regulation of gene expression in soybean as revealed by examination of unusual mutations in genes that affect pigmentation of the seed coat. One of these genes shows a form of gene silencing, another affects both pigmentation and cell wall structure, and others contain mutable alleles that may be due to transposable elements. Progress includes discovery of a tissue specific gene silencing phenomena as determined using quantitative RT-PCR for the CHS gene family in soybean to determine the differential expression of the CHS genes in mutations of the I locus that controls seed coat pigmentation. We also report the sequence of a region containing the I locus.

b. Impact - This research will benefit the biotechnology industry and soybean producers and consumers by providing basic information on gene regulation in soybean, specifically of the flavonoid pathway and gene silencing. This information will be applicable to designing better vectors for genetic transformation that will overcome the problem of gene silencing in transgenic plants. A better understanding of molecular genetics of the flavonoid pathway may enhance our understanding of plant disease resistance or the modification of flavonoid products in the seed for improved nutritional and health value.

c. Source of Funding – State, Other Federal Funds

d. Scope of Impact – National

Soybean Research Illinois – Soybean Disease Biotechnology Center

a. Progress - For soybean cyst nematode (SCN) research, new DNA-based markers were developed to predict how well SCN will grow on resistant varieties. A comparative genetic map is being developed to confirm these markers are linked to SCN virulence. One new marker was converted to a real-time PCR assay used to quantify frequency of virulent SCN growing on SCN resistant soybean. For gene therapy research, the abilities of three soybean-infecting viruses to invade embryonic tissues were tested as vectors for a viral-based gene delivery system. Tobacco ringspot virus invaded soybean embryos most efficiently and viable seed was produced. For wide hybridization research, Glycine

tomentella, a wild perennial soybean relative, has notable resistance levels to soybean rust, soybean cyst nematode, soybean aphid, and bean pod mottle virus. Wide hybridization produced viable progenies from crosses between soybean and G. tomentella.

Progeny are being screened for resistance to yield-reducing diseases. A G. tomentella linkage map using SSR markers is being developed, and soybean SSR primers are being successfully used for G. tomentella. For microarray technology research, microarrays were used to examine the genetic differences between susceptible and resistant responses to sclerotinia stem rot (SSR) and sudden death syndrome (SDS), and genetic differences are currently being characterized. For soybean transformation research, Agrobacterium-mediated transformation experiments showed that multiple genes can be inserted into soybean which will allow manipulation of several enzymes in critical resistance pathways. A possible root-specific promoter (rolD) is being tested for tissue-specific expression of transgenes.

Research and Development (R&D) risk and obsolescence of technologies influence how much R&D incentives are created, how fast technological advancements will be achieved, and how soon those technologies will be made available to consumers. A model was constructed with which to quantitatively argue economic risk of R&D and compare obsolescence rates of patented technologies. Risk associated with R&D in seed industries does not decrease with diversification of R&D. This suggests that selection and elimination processes for R&D projects might have played a role in reducing economic risk and promoting private investments in agricultural industries. The NSRL uses the Internet (www.vipsoybeans.org; www.stratsoy.uiuc.edu; www.nsrl.uiuc.edu) to effectively and rapidly disseminate research findings to the soybean industry, especially soybean growers.

b. Impact - One important limitation to the use of SCN resistant soybean cultivars is that resistance is not complete and some populations of SCN can adapt to resistant cultivars, rendering the resistance ineffective. The development of a rapid, reliable test that can be used to assess the virulence profile of a SCN population would allow growers to plant the most effective SCN resistant soybeans for their field populations of nematodes.

Effective SCN virulence management will help preserve valuable SCN resistant soybean germplasm. For virus-based transformation strategies, tobacco ringspot virus is the best candidate of the three viruses for the development of virus-based transformation

strategies for soybean. Microarray technology will enable the development of new defense-related markers to rapidly identify soybean varieties with resistance to specific pathogens. For intellectual property protection of soybean innovations, differences in obsolescence rates imply that increased stringency in the enforcement of utility patents can either increase or decrease economic efficiency in the R&D activities depending on types of technologies. This in turn proposes a technology-specific approach to enforcement of intellectual property protection in order to facilitate economically efficient R&D activities in different industries.

Research presentations, program overviews, and news events that emphasize the Center's advancements in soybean biotechnology research are available online for rapid dissemination.

c. Source of Funding – CSREES Special Grant Funds

d. Scope of Impact – Illinois

The Illinois – Missouri Alliance for Biotechnology

a. Progress - Eight subprojects have been awarded competitively with funding from this grant. The subjects are as follows:

1. Genetic enhancement of the antioxidant content of soybean oil (to USDA-ARS). The major focus of this research will be the development of soybean lines with seed oils that have increased oxidative stability. Oxidative stability is central to the use of soybean oil for food processing. About 96% of the 18.3 billion pounds of soybean oil consumed annually in the United States is used for food applications. This represents an annual market of approximately $3.5 billion dollars.

2. Identification of plant disease defense genes (to Ohio State University and the Donald Danforth Plant Science Center). This project will address the profitability of soybeans at the production level through basic research that will lead to identification of genetically defined processes and traits that can be modified for enhanced disease resistance.

3. Targeting resistance to soybean cyst nematode (University of Missouri and Southern Illinois University). This collaborative, innovative, discovery research will seek to define the underlying mechanism of soybean resistance to SCN, the product of which has both economic and environmental potential.

4. Breeding for enhanced molecular farming in maize (University of Illinois). This project will develop methods and technologies for enhancing corn profitability. New germplasm will be created that combines existing genetic strategies for increasing protein yields and transgene containment in a single maize genotype, which promises to remedy the major limitations of producing recombinant proteins in maize seeds.

5. Development of corn/soy plastic composites (Iowa State University). With the help of this research, soy/corn plastics can be made at a significantly lower cost than most petroleum-based resins using well established technology. Anticipated is that new, affordable polymer composites with industrially viable properties will be developed that should find wide utility as structural materials.

6. Compliance costs for regulating biotech crops (University of California-Davis and the University of Missouri). The objective of this research is to provide the first estimates of the private compliance costs of the regulatory approval system for agrifood biotechnologies.

7. Novel crop technologies and the ethanol industry (University of Missouri). The project will evaluate and optimize the impacts of three early corn biotechnologies on the ethanol industry, prior to physical adoption.

8. Evaluating the outcomes of IMBA-sponsored research (University of Illinois). This project will measure the extent to which research funded by the Illinois Missouri Biotechnology Alliance led to and is leading to new and improved technology employed in the industries involved in producing, processing, distributing, marketing, and utilizing corn and soybeans.

b. Impact - The Illinois-Missouri Biotechnology Alliance (IMBA) is a joint program of the University of Illinois and the University of Missouri and is funded by a Congressional Special Grant administered by the United States Department of Agriculture (USDA). The purpose of IMBA is to fund biotechnology research that is an integral part of a Research and Development (R&D) program directed at expanding the volume of profitable businesses in the United States (U.S.) food and agricultural sector. Initially, the IMBA program was limited in scope to corn and soybeans. However, the scope of IMBA interest now encompasses all concepts of these industries including production, processing, marketing, utilization, inputs and support services, as well as

economic, social, environmental, and natural resource concerns. The geographical focus of IMBA is Illinois and Missouri along with other Midwestern states having similar crops, soils, climate, and socio-economic conditions.

c. Source of Funding – CSREES Special Grant Funds

d. Scope of Impact – National

Key Theme – Home Lawn and Gardening

4-Seasons Teleconference Series

a. Homeowners garden for several reasons, including enhanced beauty of property, food production, therapeutic effect, recreation, enhanced value of property, controlling chemical use in their own personal environment, exercise, saving money, and energy conservation.

Gardening is the number one hobby in the United States and a major source of exercise for many Illinois residents.

To help meet the needs of gardeners, U of I Extension has offered a total of 12 different sessions by distance education each year for the past three years. The total attendance for all 36 sessions combined was 10,171. A follow-up mail survey was conducted with 231 folks who registered for one or more of the sessions offered.

b. Impact – Depending on the topic, between one in five to two out of every three will have followed up on a recommended practice. This means at least 2,034 and more likely more than 6,781 have adopted at least one recommended practice.

- More than 96 percent would recommend the sessions to others.

- More than 80 percent would share the information learned with others and on average would share the information learned with at least five people. Applying this to the attendance of 10,171, information from the sessions will have been shared with up to 50,855 non-participants.

- Almost 90 percent or more than 6,200 would be more satisfied with their gardening efforts

- Two-thirds (more than 4,700) credit the sessions with gardening to having a higher level of physical activity (exercise).

c. Source of Funds – Local, State, Federal

d. Scope of Impact - Illinois

Ask Extension – Hort Corner
http://web.extension.uiuc.edu/askextension/?AskSiteID=34

a. The green industry is a multi-billion dollar industry in Illinois. Home horticulture is important in enhancing the value of Illinois homes, improving the natural environment and as a source of pride and recreation for many citizens. The demand for good horticultural information for homeowners frequently outstrips the supply. One way Illinois responds to this need is through the "Ask Extension – Hort Corner" web pages.

The Ask Extension – Hort Corner is a website that allows visitors to ask a question of a U of I Extension Horticulture Educator or review the questions asked and answers received by previous visitors via an online web form. The archive of questions and answers are organized by topic and provide a database visitors can use to find answers to their own questions or use to increase their horticultural knowledge. People posting questions through the web form are given the opportunity to include their email address so they can receive their answers directly. Those not choosing to include their addresses are invited to return to the website to receive their responses.

In the fall of 2005 an email survey was conducted with the more than 700 folks posting questions between June 1 and September 16, 2005. Of these, 677 had working email addresses and 145 responded.

b. Impact – Of those responding:

- 86 % followed or planned to follow the suggestions offered in response to their question.

- 95.6 % of those who followed the suggestion were at least somewhat satisfied with the results with almost two-thirds reporting they were satisfied.

- 78 % felt the site had expanded their knowledge of horticulture.

- 83 % rated the website with four stars or better when asked "how many stars (between one and five with five being the best.)

- 62 % recommended the site to others.

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Key Theme – Invasive Species

Development, Evaluation and Safety of Entomopathogens for Control of Arthropod Pests

a. Progress - Microsporidia (unicellular pathogens related to the fungi) pathogenic to the gypsy moth, *Lymantria dispar* (L.) in Europe, are under consideration for release against the gypsy moth in North America. Field studies (conducted in Slovakia because release is not yet permitted in the U.S.) found that one relatively virulent Vairimorpha species, inoculated into oak stands via ultra low volume sprays, produced infections in a small number of nontarget moth larvae, but did not persist in the nontarget populations in the following years (2003 and 2004).

In 2003 and 2004, a different microsporidian species, *Nosema lymantriae*, produced infections in gypsy moth larvae but no nontarget insects collected from the sprayed trees became infected. Final studies, in which the field dosages will be increased 4 to 5 times will complete this evaluation; however, the results suggest that these microsporidia would be safe to release in North American gypsy moth populations as recycling natural enemies.

A first trial of field-level transmission studies indicated that infected larvae inoculate uninfected larvae feeding on the same oak tree hosts. A second trial will be conducted in 2005. These data show that releasing microsporidia via infected laboratory-reared larvae should allow the microsporidia to enter the natural gypsy moth populations without the need for spraying spores into the environment.

Studies of tissue level competition between microsporidian species when two species are simultaneously or sequentially orally inoculated into the same host are being expanded to determine whether transmission efficiency between hosts is a factor in competition for the host. These data will be used to determine whether more than one microsporidian species should be released

in a single site. Taxonomic issues are being addressed to determine whether a closely related group of gypsy moth microsporidia represents a single species or a complex of similar species.

The studies show that microsporidia are relatively variable, exhibiting differences in virulence, tissue specificity and morphology even when ribosomal DNA sequences are identical or differ by one base pair. A proposal to release three species of microsporidia, *Nosema portugal*, *Nosema lymantriae*, and *Vairimorpha* sp. (description as Vairimorpha disparis nearing completion) into Illinois gypsy moth populations has been submitted to USDA APHIS in the format of the North American Plant Protection Organization. Other microsporidian pathogens of pest insects are being identified, including a species from the black vine weevil, *Otiorhynchus sulcatus*, and a grasshopper species in the genus *Romalea*.

b. Impact - The evaluation of microsporidia as classical biological control agents against the gypsy moth has determined effectiveness against the target host and potential effects on nontarget species. Because microsporidia do not occur in North American gypsy moth populations but naturally occur in European populations, they have potential for use as classical biological control agents, which would augment the effects of other natural enemies.

Current field studies have confirmed laboratory predictions that impacts on nontarget species, including other insects, are little or none, nor does parasitism by wasps utilizing immune-suppressant viruses facilitate microsporidian infections in nontarget species. Some species of microsporidia may inhibit others if multiple species are simultaneously released in the same gypsy moth population.

Our conclusions have resulted in the filing of a NAPPO proposal to release three species of gypsy moth pathogenic microsporidia into Illinois populations of the gypsy moth.

c. Source of Funding – Multi-State Funds

d. Scope of Impact - AL, AZ, AR, CA, DE, FL, GA, IL, KY, LA, ME, MN, NJ, NY, OH, PA, SC, VT

Key Theme – Niche Market

Physicochemical Studies of Soybean and Muscle Proteins for Developing Novel Food Products With Improved Shelf-Life and Nutritional Value

a. Progress - Novel techniques and calibrations were developed for accurate, rapid and reproducible analyses of whole soybeans, soybean flours and soybean protein concentrates.

Such analyses involved a combination of Fourier Transform Near Infrared (FT-NIR), FT-Infrared (FT-IR) and High-resolution, [H-1 decoupled] Carbon-13 Nuclear Magnetic Resonance (HR, C-13 NMR) for fatty acid and amino acid composition analyses of intact, whole soybeans, soybean flours and soybean protein concentrates. FT-NIR and FT-IR calibrations for fatty acids in soybeans were based on both Gas Chromatography-Mass Spectroscopy (GC-MS) and HR C-13 NMR data for a large number of standard and validation samples. FT-NIR calibrations for amino acid composition determination in soybeans were carried out by comparison with measurements on standards carried out by HR, C-13 and H-1 NMR.

These novel NIR and IR calibrations were also tested and successfully validated with a large number of developmental soybean lines (generated by the research group of Dr. Randall Nelson in parallel genetic selection programs at NSRL/UIUC).

Several practically important conclusions were reached based on our measurements of over 25,000 samples per year for 3 years. Thus, it was found that it is practically possible to improve significantly both protein composition and the agronomic yield (the latter was obtained in parallel studies by Dr. Randall Nelson's group). It was also found that FT-NIR can be calibrated for rapid and accurate composition analyses of soybean and meat-based products, as well as health foods. Therefore, such FT-NIR calibrations can be widely utilized in fundamental, food chemistry/analytical research, soybean genetic selection and breeding programs, as well as in the food industry for food composition analyses of proteins, fats, moisture, small sugars and isoflavones. Accurate and reliable NIR calibrations of meat analysis and meat-based food systems are also being investigated.

b. Impact - Recent studies of the health benefits of soybean proteins in human foods showed their potential for the prevention and treatment of cardiovascular diseases and also, tentatively, for

prevention of Alzheimer's Disease (AD) in ageing human populations that are at risk for AD.

This project examines novel and improved methods of soybean composition analyses, as well as the physiochemical interactions of soybean proteins with meat proteins. It also aims to establish the amino acid/fatty acid profiles and composition improvements of soybeans with the purpose of designing and developing novel health food products with improved soy protein quality, shelf-life, texture and taste, as well as of high nutritional quality. There is a niche market- estimated to be on the order of a billion US$- for such novel health food products based on soybean and meat proteins with high nutritional qualities that can be utilized in diets designed to improve human health and prevent disease in certain human populations that are at risk for cardiovascular/cerebrovascular disease and AD.

c. Source of Funding – Hatch, Industry Funds

d. Scope of Impact – National

Key Theme – Organic Agriculture

Illinois Organic Production Conference

a. The second annual Illinois Organic Production Conference provided four tracks: field crops, specialty crops, livestock, and related issues (such as national organic standards, local food systems, organic wine growing and certification basics for processors and handlers).

Sponsored by University of Illinois Extension and the U of I Agroecology/Sustainable Agriculture Program, the two-day conference featured an organic reception, evening sessions and panels.

b. Impact – Number of people to be reached annually – 260

Number with changes in knowledge, attitudes and skills – 120

Number who will adopt practice changes including policy decisions and improved decision making. - 85

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Sustainability of Organic Systems in Illinois

a. Progress - An Organic Agriculture Task Force has been organized and is developing further research activities that are appropriate for this project. A Professional Development Opportunity workshop was held providing an overview of organic food production, marketing, status of university research and other resources that are available in Illinois and the region. Work was begun on a series of fact sheets, with one being completed, Organic Certification in Illinois. The University of Illinois, in conjunction with Michigan State University, Purdue and Iowa State University, was awarded a grant from the American Farmland Trust and Region V, EPA for a unique project. The New Ag Network (http://www.ipm.msu.edu/new-ag/aboutNewAg.htm) brings seasonal advice to field crop and vegetable growers interested in organic agriculture.

Information is provided in an on-line newsletter that features crop updates from organic growers and articles from university specialists about a variety of practices and new findings useful for organic growers. This site serves those interested in transitioning to organic as well as those currently practicing low-input or organic agriculture. The development of locally-based food systems has become a major focus of sustainable agriculture in Illinois and nationally. Local food systems impacts environmental, economic and social factors within a region in ways consistent with sustainable agriculture principles.

Research is needed in this area to determine consumer trends and develop marketing and delivery infrastructure that supports farmers and consumers ready to participate in a community-based food system. ASAP co-sponsored a major state-wide forum on local food systems in Illinois. Many interested parties participated in the day-long event, and several projects and organizations have since been initiated. Overall, activity in this area has mushroomed in the state, including research, education and entrepreneurial enterprises.

ASAP plans to be involved in ways that support locally-based food systems and the farmers who participate. ASAP has begun a major reorganization of the College of ACES programs currently addressing sustainable and organic agriculture in Illinois. Over the last ten years the research and outreach activities within these topic areas have increased dramatically.

Our challenge is to insure that all these new participants are identified with sustainable agriculture within the College of ACES, and that Illinois residents seeking sustainable ag information from the College have easy access to the full range of resources available. A new website is being designed. The planning began in earnest during 2004. This new site will include all the research and Extension programming applicable to sustainable agriculture and be structured for easy access and maximum flexibility as the program continues to grow over the next several years. ASAP is at the core of this expansion and reorganization. It is anticipated that the new program will serve to highlight the growing demand for this information in Illinois and generate an increase in research addressing sustainable agriculture topics.

b. Impact - As economic and environmental pressures mount on the current row-crop system that dominates much of the upper Midwest, alternatives for the productive, sustainable use of this land are needed.

Current examples of successful farmers (including organic operators), detailed analysis of their operations, along with on-farm research, provide means for defining a diverse and robust Illinois landscape of the future.

c. Source of Funding – Hatch Funds

d. Scope of Impact – Illinois

Key Theme – Ornamental/Green Agriculture

Horticulture Crop Water Requirement

a. Progress - The effect of sand amendment source on the properties of sand-soil mixtures was investigated. It was found that the physical properties of even mono-disperse amendment of the same textural classification varied sufficiently from place to place and even from the same site from time to time to require alteration of the prescribed mix recipe. General mixture guidelines can be established; however, these were found to require refinement in order to produce a consistent water-air ratio in the mix. This variation in amendment physical properties did not affect the mix stability, including compaction resistance. A simple empirical test has been developed to determine the requisite recipe changes in each situation. This will be published as a departmental fact sheet.

b. Impact - A previous soil physical amendment model by the investigator formed the basis for the development of the soil mixtures recommended for worldwide use in U.S. Golf Association Greens Section Greens. It is expected that this model will improve the reliability of blending and testing soils for golf greens and other shallow-drained soils. Billions of container-grown plants are grown annually in the U.S. alone. Soils in these shallow-drained areas tend to be poorly aerated due to excess water retention. This model will improve the blending and testing of soils for containers, thereby potentially reducing crop loss due to the effects of poor soil aeration.

c. Source of Funding – Hatch Funds

d. Scope of Impact – National

Key Theme – Plant Production Efficiency

Conservation, Management, Enhancement and Utilization of Plant Genetic Resources

a. Progress - Five-year evaluations were completed on 12 taxa of woody perennial plants received from the Plant Introduction Station in Ames, Iowa. Over the span of these evaluations, plants were subjected to moderate drought combined with much higher than average summer temperatures in at least one season. Taxa showing the best adaptation are listed along with plants that failed to survive. Growth data is given after each plant name (height x width in m). *Acer tegmentosum* (2.70 x 1.23), *Caragana rosea* (1.36 x 2.13), *Cotoneaster franchetii* var. sternianus (2.18 x 3.03), *Diervilla rivularis* 'Summer Stars' (1.18 x 2.16), *Eleutherococcus henryi* (1.46 x 1.80), *Euonymus obovatus* (.35 x 1.25), *Fraxinus* x 'Northern Gem' (3.10 x 1.23), *Fraxinus* x 'Northern Treasure' (3.90 x 1.83), *Fraxinus mandshurica* (2.73 x 1.00), and *Lonicera prolifera* (1.40 x 1.80) all performed reasonably well. All plants of *Clematis fruticosa* 'Mongolian Gold' failed due to drought injury and two out of three plants of Robinia neomexicana (one surviving plant, 1.30 x .80) failed to survive winters. Taxa showing the highest ornamental quality included *Acer tegmentosum* (vertically striated green and white bark), *Diervilla rivularis* (yellow flower display, bronzy purple new leaves), *Fraxinus mandshurica* (cultural adaptability) and *Lonicera prolifera* (bright blue foliage color).

In separate experiments, landscape leaf-waste pellets were successfully used as a carrier for the application of isoxaben,

prodiamine and pendimethalin, three preemergence herbicides, for container production of chrysanthemum, wintercreeper euonymus and Japanese spirea. The use of this organic carrier produced equivalent efficacy and phytotoxicity ratings to conventional spray applications of prodiamine and pendimethaline alone or combined with isoxaben on both chrysanthemum and wintercreeper. The leaf waste pellets were not an effective carrier for the application of isoxaben alone. Japanese spirea plants showed some phytotoxicity symptoms related to use of the pellets and the pellets alone were not effective for weed control when applied as a 0.6-cm mulch in containers.

b. Impact – These experiments demonstrated the cultural adaptability of a number of introduced and native (outside of Illinois) species without showing any tendency of invasiveness, and conversely found several species that are not well adapted to culture in the Midwest.

Experiments with landscape leaf waste pellets showed that this commonly available organic waste product can serve as an effective carrier of several preemergence herbicides for the control of annual weeds in container production of landscape plants. Since the application of herbicides on leaf pellets can be made without spray drift or application to shoots, the risk of herbicide contact with nursery workers is reduced, promoting a safer work environment along with reduced potential for phytotoxicity. This organic carrier also has the potential to reduce herbicide loss to the environment compared to direct spray applications.

c. Source of Funding – Multi-State Funds

d. Scope of Impact - CA, IL, IN, IA, KS, MI, MN, MO, NE, ND, OH, SD, WI

Corn and Soybeans Classics

a. University of Illinois Extension Specialists and Researchers have used a series of regional meetings to bring current research directly to corn and soybean producers. This program involves a cadre of Crop Science Specialists, most of whom have joint Extension and Research appointments. The program is planned and executed around Illinois' producers expressed desire to hear about the research being conducted from the scientist who is actually conducting the research. This approach is effective.

In 2005 there were "Classics" in Bloomington, Rochelle, Moline, Springfield, Mt. Vernon, and Collinsville with 1,326 people attending. These folks drove an average of 46.33 miles to attend the meetings, showing a demand for these educational opportunities.

b. Impact – Responses (see below) to two questions on the questionnaire distributed to attendees showed that 99-100% of responders felt the meeting was worth the time and expense and learned information to assist them in making more informed management decisions.

Responses to two questions on the questionnaire distributed to attendees at the 2005 University of Illinois Corn & Soybean Classics.

Location	Evaluations Returned	Meeting was worth the time and expense	Attendance will assist in making more informed management decisions
Blooomington	69%	100%	99%
Rochelle	69%	100%	100%
Moline	86%	99%	99%
Springfield	75%	99%	100%
Mt. Vernon	78%	100%	100%
Collinsville	78%	100%	100%

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Crop Management Conferences

a. In February and March 2005 **a new program delivery effort** by University of Illinois Extension was offered. The effort was titled "Crop Management Conference", and was conducted in southern and northern Illinois (Effingham and Malta, respectively). The conferences provided an in-depth focus on current crop production and field crop pest issues.

At each location, the conference was held on two consecutive days and consisted of general sessions and concurrent break-out sessions taught by University specialists, researchers and Extension Educators. The conferences addressed topics identified by producers and agribusiness in the respective geographic areas.

b. Impact – 189 producers and agri-business (seed, fertilizer, chemical suppliers) representatives attended the two conferences. At each conference, an on-site evaluation was conducted and the **combined summary of the respondents revealed the following**:

- 66% response rate.

- 70% were Certified Crop Advisers.

- 100% indicated if the conference was held again they would attend.

- 94% indicated the content of the conference met their expectations.

- 95% indicated their knowledge of new crop management techniques was increased as a result of attending.

- 84% indicated they will implement new crop management technique(s) learned at the conference during the upcoming cropping season.

The evaluation asked how useful ("very, somewhat, not") the information was presented in each session.

- At the southern conference, 9 of 24 (38%) sessions were ranked "very useful" by 60% or more of the respondents.

- At the northern conference, 7 of 19 (37%) sessions were ranked "very useful" by 60% or more of the respondents.

Plans are being developed to offer a Crop Management Conference in southern, central, and northern Illinois in 2006.

c. Source of Funds – State, Federal

d. Scope of Impact - Illinois

Soybean Breeding and Genetics

a. Progress - The objective of the project is to improve soybean through plant breeding and genetic research. This work is being done because soybean farmers need improved varieties with greater disease resistance and yield. A new germplasm line, LDX01-1-65 was released from the program during 2004. This line was released because it has two soybean cyst nematode (SCN)

resistance genes backcrossed into it from wild soybean (*Glycine soja*).

These genes map to regions when SCN resistance genes in current varieties are not located, showing that the line should be a source of new SCN resistance genes. For genetics research, we have made progress in studying resistance to SCN, brown stem rot (BSR), and soybean aphid. We have recently completed studies on rhg1, the major SCN resistance gene in varieties. We studied the effect of rhg1 on resistance, yield, emergence, and for allelic differences.

To determine these effects, a series of near isogenic line populations, which are genetically fixed for most of the genome except for the region surrounding the gene, were developed. These studies have shown that rhg1 has a very large impact on resistance, increases yields and reduces SCN populations in infested fields, has limited or no impact on yield in fields with little SCN infestation, and is associated with reduced seedling emergence. Finally, we recently showed that rhg1 alleles from two SCN resistance sources have different functional alleles based on resistance phenotype. This is the first report of more than one resistance allele at a soybean resistance QTL.

We recently tested five populations that were each developed by crossing a different BSR resistant PI to a susceptible cultivar. Unfortunately, the resistance in all of these populations was mapped to the same genetic region where all other mapped BSR resistance genes are located. Because we have been unable to identify soybean lines that carry resistance genes on other linkage groups, we initiated the screening of additional soybean lines for BSR resistance. We evaluated BSR resistance levels on a set of over 600 PIs that were recently introduced from China. From this group, we identified ten with a high level of resistance. Crosses were made with some of these PIs to find resistance genes that map to other locations in the genome. In collaboration with Glen Hartman, a USDA-ARS pathologist at UI, we have studied the genetic basis of aphid resistance.

This collaboration has led to the mapping of a major aphid resistance gene.

Because resistance is conferred by a major gene that we mapped, this resistance is being backcrossed into elite soybean varieties and experiment lines. We plan to start field testing aphid resistant lines in 2005 and hope to have varieties to farmers by 2008.

b. Impact - The goal of this project is to improve soybean through breeding and genetics research.

During the past year, impact has been made in a number of areas. One area that the program has had impact is in the release of LDX01-1-65, a germplasm line that has two soybean cyst nematode (SCN) resistance genes backcrossed into it from wild soybean (*Glycine soja*). These genes map to regions where SCN resistance genes in current varieties are not located, showing that the line should be a source of new SCN resistance genes. This line was requested and sent to breeders from 13 soybean breeding companies. These breeders are using this line as a parent in their breeding programs.

The genes from G. soja will have an impact on the soybean breeding industry by broadening the diversity of SCN resistance genes in varieties, which should slow the process of SCN overcoming resistance. The identification of a soybean aphid resistance gene will have a major impact on soybean breeding since this is the first soybean aphid resistance gene reported and it has the potential for controlling the pest and reducing insecticide usage.

In 2003, an estimated seven million acres of soybean were sprayed in the Midwest with insecticides to control the aphid. This aphid resistance gene is being licensed to soybean breeders in the public and private sector and varieties should be available to growers in a few years with the gene. The deployment of this resistance could have a large positive environmental impact through eliminating the spraying of millions of acres with insecticides.

c. Source of Funding – Hatch, State, Industry Funds

d. Scope of Impact – National

Assessing Crop Rotation Effects in Illinois

a. Progress - The study underway examines the effect of rotational sequence and sequence order on the yields of corn (*Zea mays* L.), soybean [*Glycine max* (L.) Merrill.], and wheat (*Triticum aestivum* L.) rotated in either of the two possible orders. Averaged over three years at Monmouth (2002-2004), tillage had little effect on yields of rotated corn, soybean, or wheat, but in continuous corn, no-till yielded more than 20 percent less than tilled corn. Furthermore, continuous corn yielded 45 percent less than corn in the corn-soybean rotation, making continuous corn economically

unsupportable at this location. Surprisingly, continuous soybean yielded only 7 percent less than soybean in the corn-soybean rotation. Both corn and soybean yielded about the same regardless of which crop (wheat or the other, opposite crop) they followed in the 3-year rotation. Yield of corn in the 3-year rotation averaged 5 percent more than in the 2-year (corn-soybean) rotation, and yields of soybean averaged 12 percent more in the 3-year rotation than in the 2-year rotation. Wheat yields were 7 percent higher when wheat followed soybean than when wheat followed corn in the 3-year rotation, making the corn-soybean-wheat rotation slightly preferred over the soybean-corn-wheat sequence.

Using yield data and current crop and input prices, the 3-year rotation at Monmouth produces average annual returns similar to those from the corn-soybean rotation, though the higher corn and soybean yields in the 3-year rotation were necessary to compensate for the lower income from wheat.

b. Impact - This work is continuing to solidify information that will allow crop producers to assess relative economic returns to different cropping sequences and practices, particularly when including wheat in the rotation.

While the income from soft red winter wheat in Illinois is usually less than the income from corn or soybean, higher yields of corn and soybean in the 3-crop system produced a profit potential about equal to that from the corn-soybean rotation at Monmouth. An additional advantage is the spreading out of field operations, and the fact that wheat responds to weather conditions differently than does corn or soybean, hence providing some measure of stability over years. If income from the 3-year cropping sequence is similar to that in the corn-soybean rotation, including wheat as the third crop will help to buffer the crop production system against soil loss and against income fluctuations.

c. Source of Funding – Hatch, Sale of Product Funds

d. Scope of Impact – Illinois

Illinois Grape Industry

a. Currently featuring 63 wineries and approximately 193 vineyards across the State, the Illinois wine industry produces 500,000 gallons of wine per year and creates an annual economic impact of $20 million. Although this is a rapidly growing industry in Illinois, the industry is currently without a state funded viticulturist or

enologist. Through the efforts of the Illinois Grape Growers and Vintners Association (IGGVA), a nonprofit organization dedicated to developing the viticulture and enology interests of Illinois through information exchange and cooperation among Illinois grape producers and vintners, a $550,000 grant was awarded by Gov. Rod R. Blagojevich through Illinois Department of Agriculture to continue efforts to expand development and awareness of the state's wine industry. From these grant dollars, funds were appropriated to conduct grape production workshops in three regions across the state. Elizabeth Wahle, Food Crops Extension Specialist, accepted responsibility for conducting workshops in Central Illinois and also for acting as first point of contact for new and established grape growers in the region. For the purposes of the workshops, Central Illinois was defined as the area between I-80 (northern limit) and I-64 (southern limit).

A series of three workshops were held on a monthly basis, beginning in April, and four UI Extension Specialists from both the IPM and/or Horticulture Team provided the core instructional training. Topics included nutrition, canopy management, root stock selection, and the integrated management of diseases, insects and weeds in a grape production system. Workshops were hosted at an active vineyard and winery, so that in addition to formal classroom instruction, participants were able to have hands-on instruction in the field.

b. Impact – Forty-five potential and current grape growers were involved in the workshop series, and workshop evaluations indicated a high level of satisfaction for the overall program in terms of facilities, program content, and expertise of presenters.

The success of this program in part has led to a second year of funding to support additional workshops. In addition, grape research is on the rise at the University of Illinois as a result of improved relationship between UI Extension staff and Illinois grape growers.

c. Source of Funds – State, Federal

d. Scope of Impact - Illinois

CSREES GOAL II – A Safe and Secure Food and Fiber System

Indications of the Scope of Research and Extension Programs under Goal 2 - See Appendix A.

Research projects in the area of food safety and security have risen slightly from 22 to 25 and staffing support has risen substantially increasing from 46 staff years to 59 staff years as funding support for Goal 2 rising by about $2.3 million. Extension efforts have not matched these increase and would appear to have dropped somewhat from efforts estimated at a cost of $5.6 million in the previous reporting year to just under $4.7 million. There was a corresponding drop in face-to-face teaching contacts from more than 322,000 in 2004 to 289,881 in 2005. Part of this change may be due to a greater reliance on web-based information delivery

Key Theme – Food Accessibility and Affordability

Modifying Milk Fat Composition for Improved Manufacturing Qualities and Consumer Acceptability

a. Progress - Two studies determined mammary gene expression patterns in dairy cows using a cDNA microarray consisting of 7,872 cDNA inserts.

Annotation was based on similarity searches using BLASTN and TBLASTX against human and mouse UniGene databases and the human genome. Cy3- and Cy5-labelled cDNA from liver and a reference standard (derived from a mixture of cattle tissues) were used for hybridization. Loess-normalized log-transformed ratios (tissue/standard) were used with a global gene error model (to account for variation due to signal intensities) and Benjamini and Hochberg's False Discovery Rate (0.05) to determine differential gene expression. In experiment 1, mammary and liver tissue were collected at -14, 1, and 14 d relative to parturition from two multiparous Holstein cows fed according to current NRC recommendations. Significant effects of tissue type (1,040 genes), day (20), and tissue by day (392) interactions were detected. Among genes with a significant tissue by day interaction, expression ratios greater than 5-fold in liver compared with mammary were found for 15, 12, and 13 genes on d -14, 1, and 14, respectively. Among those showing tissue-specific expression, there were 26 genes with >5-fold expression in mammary compared with liver, and 44 genes with >5-fold expression in liver compared with mammary. Expression patterns in liver clustered together on d -14 and 14, and in mammary on days 1 and 14. Differences in

expression patterns within these clusters ranged from 11% (liver) to 30% (mammary).

In experiment 2, simultaneous gene expression patterns were determined for 4 adipose depots [mesenteric (MS), omental (OM), subcutaneous (SQ), perirenal (PR)], mammary (MG), and liver (LV) of lactating cows. Tissues were collected at slaughter from multiparous cows around peak (50 DIM), mid (95 DIM), and late (245 DIM) lactation. Clustering analysis of tissues around peak lactation revealed five groups of expression patterns. Genes in SQ, LV, MG, and PR formed individual gene trees but MS plus OM clustered together. A total of 355 sequences varied significantly across tissues. The same 24 genes were 5-fold or greater in SQ than either LV or MG, including some associated with electron transport, intracellular signaling, inflammatory responses, apoptosis, and ribosomal structural function. One gene involved in glucose metabolism was 3-, 5-, and 20-fold greater in MS, OM, and PR than in SQ. Thirteen genes were 5-fold or greater in LV than MG, and 10 were 5-fold or greater in MG than LV. Results show the power of microarrays to dissect gene expression patterns in mammary tissue, and will help to understand the molecular regulation of milk fat synthesis. Body lipid balance (digestible C16 and C18 fatty acid intake minus C16 and C18 fatty acid secretion in milk fat) was studied over an entire lactation in cows fed diets supplemented or not with dietary fat. Calculated body lipid balance was negative for non-supplemented cows at all time points, whereas dietary fat supplementation resulted in positive lipid balance by month 3 of lactation. Body lipid balance is a viable technique for determining whole-body use of fatty acids in lactating cows.

b. Impact - When combined with whole-animal data that show effects of physiological state and various dietary factors on milk fat production and composition, microarray technology should greatly increase our understanding of the biochemical changes in genes encoding enzymes and regulatory factors for milk fat production.

Future studies will allow us to examine the effects of different nutritional programs on genes affecting production of altered dairy products. Results from all experiments reported from this project have advanced our understanding of factors that affect milk fat composition, which will allow production of dairy products with altered composition more desirable to consumers.

c. Source of Funding – State, Multi-State Funds

d. Scope of Impact - CA, ID, IL, IA, KY, MN, NY, OH, SC, SD, UT, VA, WI

Key Theme – Food Accessability and Affordability

Multi-Cultural (National/International) Extension Symposium at the American Phytopathological Society Annual Meeting – August 2, 2005

a. Food security in the world is threatened by crop losses due to insufficient knowledge regarding plant disease management. Thus, effective Extension programs are needed to improve crop production and food security in the world. However, transferring plant pathology knowledge among Extension/Research Specialists and growers in the world is affected by cultural barriers. Multi-cultural education is essential to ensure establishment of effective international Extension programs. Multi-cultural activities also result in more creativity and leadership. "One world, one village" is a reality and we have to adjust our activities to meet this concept. This symposium was a step forward in establishing effective multi-cultural (national/international) outreach programs.

Presenters from the American University, Cornell, USDA, The Ohio State University, and the University of Illinois covered the following topics:

- Culture, communication, and conflict.
- Agricultural Extension: lessons from Africa, Andean America and Asia.
- Plant pathogen identification: national and international challenges.
- Agricultural Extension in the Middle East and in the Midwest.
- Training for international Extension.

The half-day symposium was organized by Dr. Mohamad Babadoost of the University of Illinois.

b. Impact – 250 plant pathologists and scholars involved and trained.

c. Source of Funding – Federal, State

d. Impact – National, International

Plant a Row for the Hungry – Rockford, Illinois Success Story

a. Shirley Thompson, an Extension Master Gardener since 1998, won the national Scotts "Give Back to Grow Award" for her leadership in Plant a Row for the Hungry (PAR). Thompson has been the leader of the Winnebago County PAR at its inception in 2001. She used her organizational skills, love of gardening and compassion for her fellow man to propel the PAR program from nothing to a major force in alleviating hunger in five years.

Her simple plan was to establish community gardens (including one at the Illinois Extension Service Office) for PAR harvest, set up collection points and educate the public on hunger and how to alleviate it through gardening. While her plan was straightforward in design, her efforts to execute it have been Herculean. See below (b. Impacts) for how the program under Thompson's leadership has expanded every year.

Thompson is also central to spreading PAR beyond her area. Stephenson County sent a representative to one of the garden shows. County Extension Director Margaret Larsen was so impressed with Thompson's education program that she decided to launch PAR in Stephenson County, with Thompson's help. That program collected 2,200 pounds in 2005 and plans to expand next year.

b. Impact –

	2001	2002	2003	2004	2005
Community Gardens	1	2	2	3	4
Collection Sites	2	3	3	3	5
Pounds Collected	6,280	1,660*	6,271	8,643	16,078

* Thompson admits that 2002 was a disappointment due to bad weather and other factors. "We didn't know how to publicize PAR, and we had to learn," she says.

In 2005 U of I Extension Plant a Row activities resulted in the donations of 191,215 pounds of produce.

c. Source of Funding – Local, State, Federal

d. Scope of Impact - Illinois

Key Theme – Food Handling

Improvement of Thermal and Alternative Processes for Foods

a. Progress - The purpose of this work is to develop and verify methods for measurement and prediction of engineering and biochemical properties of foods as needed in process design and analysis. A second objective is to identify and describe transport mechanisms occurring in food processes.

Fouling of food processing equipment is a major problem in the food industry since many process streams contain compounds responsible for fouling. Fouling of evaporator surfaces is a significant factor in efficient production of fuel ethanol. Of interest was the effect of fouling on efficiency of the corn processing industry, which depends on evaporator concentration of various process streams, such as thin stillage from dry grind processing, to allow handling and storage of coproducts. Implications of process design on fouling rates of thin stillage were being measured using an annular fouling probe. Improvement in efficiency of this process would have dramatic impact on process economics as well as product quality. Ongoing research is studying the effect of process temperature, pH, and acid during processing of thin stillage from dry grind corn processing. Maintenance of evaporators requires additional capital investment, labor and energy consumption by the dry grind industry.

b. Impact - For a sustainable and competitive corn process industry, an understanding of how biological materials interact with food processes is needed. Many food processes require removal of water for safe storage and transport of the final product. Evaporators consume a large portion of energy and capital investment in many processes, such as dry grind corn processing. Few publications have reported the parameters responsible for increased evaporator fouling. Research to date has measured the tendencies for process materials to reduce the efficiency of evaporation, which adds costs for production.

c. Source of Funding – Multi-State Funds

d. Scope of Impact - CA, DE, FL, GA, GU, ID, IL, IN, IA, MD, MI, MO, NE, NJ, NY, NC, ND, OH, OR, PA, SD, TX, WA, WI

Key Theme – Food Quality

Membrane Technology in Food Processing

a. Progress - A process has been developed for producing a higher-value coproduct (corn oil) in dry-grind ethanol plants using in-house materials only. The COPE (corn oil and protein extraction) process was optimized so that traditional products are still marketable (e.g., DDGS, CO2 and ethanol) while maximizing yield of oil. Factors that were tested for significance were temperature, concentration of ethanol in the extractant, time of extraction and solvent-to-solids ratio. Two potential feedstocks available in a dry-grind ethanol plant were studied: dry-ground whole corn and distillers dried grains with solubles (DDGS).

With dry-ground whole corn, optimum conditions are a solvent-to-solids ratio of 4 ml/g corn, an ethanol concentration of 100%, 30 minutes of extraction time and a temperature of 50 degrees C. Under these conditions, a single batch extraction yields ~ 3.2 g of oil per 100 g corn, which is an extraction efficiency of 81% of the oil in the corn. A 3-stage extraction, where the same corn is re-exposed to fresh ethanol in successive stages, results in a yield of 4.5 g oil/100 g corn, equivalent to an extraction efficiency of 95% and ~2.5 lb. of oil per bushel of corn. This is better than current wet-milling technology that typically extracts 72% of the oil and dry de-germination methods that extract 65% of the oil.

Our results show that pre-drying the corn is not necessary to extract the oil. Indeed, even 95% ethanol, which is cheaper to produce, was effective in extracting oil from whole corn. A single batch extraction with 95% ethanol, but with a higher solvent ratio of 8 ml/g corn, yielded 3.5 g oil/100 g corn (83% of the oil in the corn). As reported earlier, DDGS is not a good feedstock for ethanol extraction of the oil, since it contains too many undesirable by-products that are coextracted with the oil. The extract was dark brown in color and had off-odors.

A method for the analysis of corn oil and free fatty acids in ethanol miscella was developed using gel permeation chromatography. Two Phenogel columns were connected in series to a refractive index detector and tetrahydrofuran was used as the mobile phase. Sample preparation involved only dilution with the mobile phase and filtration. Individual free fatty acids eluted as one peak. Reproducibility of the method was good with a relative standard deviation of less than 3.17%.

b. Impact - The data obtained in this research is sufficient for purposes of scaling up to pilot and semi-works scale. Apart from the additional revenue generated by corn oil (about $3 million for a 30 million gallon per year ethanol plant), another advantage of the COPE process is that the product is corn oil and not germ, the extraction is accomplished with high yields using conventional oil extractors and there is no need to pre-wet or pre-dry the corn.

c. Source of Funding – Hatch and State Funds

d. Scope of Impact – National

Future Foods - Illinois

a. Progress - While much research has been conducted on off-flavors in soy liquid products such as soymilk, very little research has been done on off-flavors in food matrices besides liquids. Seven commercially produced soy protein isolate and concentrate samples were analyzed for both protein (via nitrogen analysis) and total solids content. The samples were analyzed using the Dumas method for nitrogen determination for protein content. Three soy protein isolate (SPI) samples were selected from the 7 samples analyzed to be used in the development of model matrices of soymilk, soy yogurt and soy cheese. Descriptive analysis is scheduled to be initiated in August 2005 to identify and quantify sensory attributes of commercially available soymilks, soy yogurts and soy cheeses and laboratory-made model systems developed from the 3 selected SPIs. The samples will also be analyzed by instrumental methods. The results of descriptive analysis will be correlated to instrumental data by multivariate statistical methods, which will enable us to identify major groups of compounds responsible for soy off-flavors specific to the corresponding food matrix. The knowledge gained from a study comparing these three food matrices may allow us to better understand the flavor function of soy and how to best present soy to the U.S. consumers. The outcome of this study will have a significant impact on promoting the sales of soy-derived food products by providing means to reduce the undesirable taste/flavor characteristics, which in turn will result in significant increase in the utilization of soybeans.

The other part of the project focused on lunasin (trademark), a unique and novel cancer preventive peptide present in soybean. Concentrate, isolate, and hydrolyzed soy protein contained an average of 2.19, 3.74, and 4.43 g lunasin/100g flour, respectively. Soy concentrate, low in isoflavones, presented 2.1 g/100g flour. Hydrolyzed soy protein products contained the highest

concentration of lunasin. Soy molasses had eight times lower concentrations than soy flour. Ion exchange chromatography can recover 85% of lunasin from waste streams. Lunasin was not a very potent DNA human topoisomerase inhibitor and contributed little to the anti-topoisomerase activities of SPI and its hydrolysate. Soybean derived peptides play an important role in soybean physiological activities, particularly those related to the prevention of chronic diseases. However, the potential of soybean derived bioactive peptides is yet to be fully appreciated.

b. Impact - The outcome of this study will have a significant impact on promoting the sales of soy-derived food products by offering solutions to food manufacturers that will reduce the undesirable taste/flavor characteristics specific to the type of food system. Also, isolated bioactive peptides from soybean have potential as nutraceutical ingredients. It is feasible to isolate lunasin from different soy streams that can be commercially utilized in cancer prevention.

c. Source of Funding – Industry and CSREES Special Grant Funds

d. Scope of Impact - Illinois

Key Theme – Food Safety

Food Safety and Food Preservation Teaching Contacts

a. Food selection, preparation, preservation, and storage present food safety challenges. University of Illinois Extension is recognized by many consumers as a resource for answering questions and concerns relative to food safety and preservation. Annually, Extension personnel receive over 12,500 requests for help relative to food safety and preservation. Telephone interviews with samples of these consumers reveal that more than 95 percent of them adopt the practices recommended by Extension.

b. Impact - Between 1999 and 2005, there have been more than 146,250 instances where consumers have used Extension to help them adopt food safety practices. This understates the full impact of Extension on consumer food safety practices as it does not include the impact of circular letters, website information and group instruction in food safety by Extension staff and volunteers.

c. Sources of Funds - Local, State, Smith-Lever

d. Scope of Impact - Illinois

Commercial Food Handlers Need to Wash Their Hands Too

a. According to the National Restaurant Association, the average food-borne illness outbreak costs a single business $75,000 including lost business, medical costs and litigation. As of 1999, Illinois requires certified food service sanitation managers to attend a minimum of five hours of training to retain their certification. Over the past six years, 3,772 food service staff have been re-certified through refresher courses taught by University of Illinois Extension Educators. These courses have done more than meet a minimum re-certification requirement; over 79 percent reported improving one or more food handling practices as a result of the training. Since many establishments have only three or four certified employees, one can assume that this training has impacted more than 1,078 establishments (assuming 3.5 trainees per establishment).

b. Impact –

- 2,780 food handlers improved one or more food handling practices.

- 1,078 food establishments now serve safer food.

c. Source of Funds – State, Federal

d. Scope of Impact – Illinois

Management of Grain Quality and Security for World Markets

a. Progress - A calibration for extractable starch in maize was developed for the Foss Infratec 1229 near infrared transmission (NIT) grain analyzer.

The calibration was based on over 2,267 samples collected over five crop years. Extractable starch in maize can be predicted using the Infratec 1229 NIT spectrophotometer with a standard error of prediction (SEP) of 1.24, coefficient of determination (R2) of 0.79, and ratio of laboratory standard deviation to SEP (RPD) of 2.15 for a validation set using one elimination pass. With no elimination passes, 8 of 389 samples were not predicted well, giving an SEP of 1.34, R2 of 0.80 and a RPD of 2.2. Regression coefficient peaks corresponded to some of the wavelengths known for starch-cellulose, water, and negative protein and oil absorption bands. A calibration for a Fourier-Transform Near-infrared Reflectance (FT-

NIR) spectrometer was developed for predicting soybean oil properties for biodiesel fuel. Biodiesel fuel depends on fatty acid composition of the soybean oil. Vegetable oils (soybean oil) are converted into methyl esters by trans-esterification prior to use as biodiesel. Four types of biodiesel, including two types of soybean methyl ester, yellow grease methyl ester, and genetically modified soy methyl ester differing in fatty acid compositions were blended with biodiesel levels from 0-100%. These samples were scanned at room temperature (20-22C) on a FT-NIR machine using a transmission accessory cell with a 1-cm pathlength. Three regression methods: partial least square regression (PLS1), principal component regression (PCR), and multiple linear regression (MLR) were evaluated as calibration models for predicting the percentage blend, specific gravity and viscosity of biodiesel fuel. Principal Component Analysis (PCA) of the NIR absorption data revealed two major variations were captured in the first two principal components, PC1 variation was due to the varying amount of blend level in diesel and PC2 was due to the presence of differences in the biodiesel source. Two principal components accounted for (PC1 89%, PC2 8%) 97% of the total variation in the NIR data.

b. Impact - The near-infrared transmission calibration for extractable starch is the primary means used by wet millers, seed companies, and the grain trade for determining the percentage of extractable starch in corn hybrids that are used in the high extractable starch market. This potentially affects about 19% of the corn grown in the U.S. today.

c. Source of Funding – Hatch, Multi-State, State and Industry Funds

d. Scope of Impact - IL, IN, IA, KS, KY, MI, MN, MT, NE, ND, OK, TX, WA, WI

Mastitis Resistance to Enhance Dairy Food Safety

a. Progress - Photoperiod research at the University of Illinois during the past 3 years has confirmed that Holstein cows exposed to short day photoperiod (8 hours light, 16 hours darkness; SDPP) during the dry period have enhanced immune cell responsiveness in vitro at calving and produce more milk in the subsequent lactation than do those exposed to long day photoperiod (16 hours light, 8 hours darkness; LDPP).

The objective of the research reported here was to investigate the effect of photoperiod length during the dry period on intramammary

infection (IMI) prevalence, somatic cell counts (SCC), and milk components in early lactation. Data from five groups of cows (n=143 total) were analyzed. The 5 cows were from the University of Illinois dairy (1 group), a local 3,000 cow dairy (3 groups) and mixed sources within Illinois (1 group). All were healthy, multiparous Holsteins that entered the study on the day of dry-off. Group 1 cows were exposed to SDPP (n=19) or LDPP (n=20) throughout the dry period. Group 2 cows were exposed to SDPP (n=6) or LDPP (n=7) or were exposed to SDPP and administered prolactin by means of a subcutaneously implanted pump to block upregulation of prolactin mRNA expression (SDPRO; n=7). Cows in groups 3-5 were exposed to SDPP (n=18), LDPP (n=21), or ambient lighting conditions (AMB; n=21) throughout the dry period, or were exposed to AMB for 39 days and SDPP for the last 21 days of the dry period (SD21; n=23). All cows were returned to AMB after calving.

Duplicate milk samples for bacterial culture were collected from each quarter on the day of dry off (before administration of cephapirin benazthine) and the day of calving (before the first milking). Duplicate composite samples obtained at the same times were tested for SCC and milk components. Milk sampling was repeated on days 7, 14, 21, 28, 60, 90, and 120 after calving for cows in groups 1 and 2. For cows in groups 3-5, SCC were available for the first 5 DHIA tests after calving. Repeated measures ANOVA revealed no differences in log 10 SCC or milk components among cows in the different photoperiod groups over time. The only exception was higher milk urea nitrogen concentration in SDPP cows than LDPP cows at calving.

The number of bacterial isolates per cow varied widely and did not differ among photoperiod groups, either at calving or during early lactation. Sixty two percent of LDPP cows had IMI in one or more quarters at calving, compared with 59% for SDPP cows. Quarter IMI rates were 21% for SDPP and 27% for LDPP cows. In summary, based on our sample sizes, photoperiod conditions did not influence either SCC or IMI prevalence at calving or in early lactation. Therefore, the increase in milk production observed in cows housed in SDPP during the dry period does not appear to be associated with an increased risk of mastitis.

b. Impact - Cows housed in short-day photoperiod conditions during their dry period produce more milk in the next lactation than do cows housed in long-day conditions.

Results of our research suggest that photoperiod conditions during the dry period have no impact on milk components or mastitis prevalence in early lactation. Therefore, photoperiod manipulation can be used as a non-invasive means to enhance milk production without compromising milk quality or udder health.

c. Source of Funding – Hatch, State and Multi-State Funds

d. Scope of Impact - IL, IA, KS, LA, MI, MN, MO, NY, OH, PA, TN, VT, WA, WI

Key Theme: Food Security

4-H "CAN" Make a Difference

a. For the seventh consecutive year, University of Illinois Extension's 4-H "CAN" Make a Difference anti-hunger initiative received the Statewide Food Drive of the Year Award for outstanding leadership on behalf of Illinois citizens in need. The recognition was presented by America's Second Harvest, a nationwide food bank network, and the Illinois Food Bank Association

The program has hundreds of corporate and organizational sponsors, including Illinois food manufacturers, agricultural commodity groups, state agencies, banks, businesses, and civic groups. A key to the program's success is the outstanding statewide leadership of a team of collegiate 4-H youth. The members of the coordinating team connect 4-H clubs with local food pantries, shelters and meal programs. University of Illinois Extension Educators are working to produce curriculum materials for youth groups that are concerned about local, state, national, and global food security issues. The project provides youth a firsthand look at hunger and helps them design strategies for action.

b. Impact - Last year for the third year in a row, 4-H youth collected more than 1,000,000 pounds of food (500 tons). Youth contributed more than 1.5 million hours of volunteer service at local food banks, pantries, shelters and meal programs throughout the state.

c. Sources of Funds - Private, Local, State, Smith-Lever

d. Scope of Impact - Illinois

CSREES GOAL III – A Healthy, Well-nourished Population

Indications of the Scope of Research and Extension Programs under Goal 3 - See Appendix A.

Substantial increases have occurred in the investment of research dollars in human nutrition research increasing by about $4.7 million. Total staff support for Goal 3 have almost doubled increasing by about 36 staff years. Increase in Extension efforts in this area have been more modest with about an eight percent increase in effort and a corresponding increase in face-to-face teaching contacts. However, almost 900,000 of Extension's face-to-face teaching contacts are Goal 3 related or roughly one-third of Extension's 2.6 million face-to-face contacts during 2005.

Key Theme – Human Health

Dining with Diabetes

a. Illinois has the sixth largest prevalence of diabetes in the U.S., with approximately 567,000 adults having been diagnosed with diabetes. It is estimated that an additional 3 million people in Illinois are at increased risk of undiagnosed diabetes because of the risk factors of age, obesity, and sedentary lifestyles.

During 2005 1,617 people with diabetes and/or their caregivers participated in the educational series, Dining with Diabetes. All U of I Extension Nutrition and Wellness Team Educators have been involved in the state-wide implementation of this dynamic program. Not only have significant knowledge and behavior results been achieved, but coalitions have been forged with state and local agencies as well in order to improve the health and well-being of those with diabetes in Illinois.

Dining with Diabetes is a nutrition education program with cooking demonstrations for people with diabetes and their families. Extensively revised by Illinois Extension Educators over the past 3 years, the 3 sessions plus a 6-month reunion meeting are designed to help participants better plan a healthy food intake, thus leading to better control of blood glucose levels. Each session includes tips for managing diabetes, cooking demonstrations, and taste testing of healthy recipes.

The goals of Dining with Diabetes include:

-Increasing knowledge of healthy food choices for the diabetic diet.

-Presenting healthy versions of familiar foods that are easy to prepare.

-Demonstrating cooking techniques that use new or more healthful ingredients.

-Encouraging behavior changes by providing tasting of healthy foods.

-Providing opportunities for participants to share and learn from one another.

b. Impact - Overall, mean post-test knowledge scores have improved from 67% to 84% correct. There was significant improvement in the participant''s belief that they could overcome barriers to achieving a healthy diet. They also felt more strongly that there were benefits to their health if they maintained a healthy diet.

Impact on one lady as reported by Pam Jacobs, Unit Leader, Monroe County to Nutrition and Wellness Educator Carol Schlitt:

"It was another great success story at the Dining with Diabetes reunion last night...one participant shared that this program made the difference for her! Since the April course, she laminated the recipe sheets to use them on a regular basis, has become very consciousness about portion control and began walking twice a day. She has lost 45 pounds, prescription medicine intake has been reduced and her asthma condition has improved. She is very enthusiastic about the improvement of her health and expressed appreciation for providing this course to move her in this position direction!"

"Thanks again Carol, as always I appreciate your expertise and enthusiasm to teach programs that are making a wonderful impact in people's lives!"

Comments from participants:

"This class answered many of my questions on preparing diabetic meals."

"Portion size — I really watch my serving sizes."

"I was able to lose 22 pounds and bring my blood sugar down from 148 to 118."

"Began watching total carbs instead of just sugar."

" I am more aware of different oils and the best types for heart health. I know I can have a little sugar in meals — if controlled. I found this class very, very helpful."

c. Source of Funds - Local, State, Smith-Lever

d. Scope of Impact - Illinois

Healthy Moves for Healthy Children

a. Chicago Head Start teachers noticed an alarming trend a few years ago: an increasing number of obese children in their classrooms. So they asked University of Illinois Extension Nutrition and Wellness Educators for help.

Extension Specialist Robin Orr was eager to work on this problem. "I had decided that reaching three- to five-year-olds was the key to solving the obesity epidemic," Orr said. "You can't begin early enough to teach good nutrition and the importance of exercise."

That was the beginning of Healthy Moves for Healthy Children, which has reached an estimated 2,000 preschoolers in the Chicago area to date and has now moved into Head Start facilities in Decatur to reach an additional 366 children.

The program targets teachers and staff training them to incorporate one nutrition activity a week and to keep the kids moving through physical activity. Teachers are given a set of laminated cards that contain ideas for physical activities and easy-to-use recipes that children can make in the classroom.

b. Impact – Follow-up evaluations show that teachers:

- show improvements in understanding the importance of healthy snacks.

- better attitudes towards the importance of healthy snacks for children.

- better understanding of appropriate serving sizes of milk for a four-year-old.

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Key Theme-Human Health

Illinois Senior Wellness Initiative

a. The overall goal of this project is to educate, inspire and empower rural seniors to improve their health and that of their community. This is a grass roots program where teams of rural seniors participate in an experientially-based holistic wellness conference and then receive a mini grant of $500 to transfer their knowledge into a local community wellness project or event. Additional goals include:

1. Meet new friends.

2. Experience joy, fun and excitement.

3. Obtain cutting-edge, credible health and wellness information for yourself and others in your community.

4. Become acquainted with exhibitors, speakers and staff.

5. Understand the importance of nature, laughter and health in daily well-being.

6. Learn about leadership and activities planning.

7. Increase knowledge of funding sources to support local wellness programs/events.

8. Develop a realistic action plan to implement a wellness activity or event in one's community.

This project is funded by State of Illinois, Attorney General's Office (Vitamin Anti-Trust Settlement Grant) and U of I Extension.

b. Impact –

Select Examples of Local Wellness Programs Developed by Participating Communities:

Jerseyville "Swinging Seniors"

- Participated in the "Santa for a Senior" program and provided 60 local homebound seniors their Christmas wish lists.

-They also held a bake sale and raised an additional $150 to buy gifts.

- Made Christmas centerpieces, held a senior trivia day and a Valentine's cakewalk.

- Developed a "Leap into Spring" project where seed packets, pots and gardening gloves were delivered to homebound residents in the county.

- Partnering with a church group for a sightseeing tour to enjoy the fall colors of Hermann, Missouri and Soulard Market in St. Louis.

- Implementing the "N'Balance" fall prevention program at the JCH Wellness Center.

Franklin County "Rock'n Roll Seniors" Team

- Held a Christmas Ideas Day and Health Fair: Featured blood pressure, hemoglobin, and bone density tests offered by local hospitals. Food was served and crafts sold. They gave away 400 pedometers and had 800 attendees.

Monmouth "Strom Center, Inc." Team

- Developed a "Health Enhancement" program housed on the 2nd floor of their senior center complete with treadmill, stationary bike, rowing machine, and exercise videos.

- Offered a "hand wellness" area complete with paraffin treatments, hand exercises and manicures.

- Purchased pedometers as a motivator for seniors to continue moving!

Additional Evidence of Impact:

- Conference attendees rated the 2005 Senior Wellness Conference very high with a mean score of 9.36 out of a possible 10 (on a 10-point scale where 1= very dissatisfied and 10=very satisfied).

- The thirteen participating communities have implemented a total of 32 new wellness programs and events in the last year.

- Across the thirteen communities approximately 2,887 individuals have participated in the wellness programs and events.

What Senior Wellness Team Members Say about the Program:

- "Everything ran smoothly. The conference was entertaining and informative."
- "I liked that more programs (sessions) were offered twice so I did not miss out."
- "The variety of topics and the enthusiasm of the presenters and participants."
- "Writing about your life was very eye-opening and enjoyable."
- The educational sessions were interactive and held my interest well."
- "You gals always do such a great job on this. You're a joy to work with all year long. Thank you."

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Post-Harvest Quality and Safety in Fresh-Cut Vegetables and Fruits

a. Progress - Glucosinolates are chemical compounds found in cruciferous vegetables like broccoli, cabbage, horseradish and kale. These chemicals are believed to reduce cancer in human and animal models. In order for these chemicals to be activated they have to be hydrolyzed by an enzyme, also found in these vegetables, called myrosinase. Myrosinase (beta-thioglucosidase), therefore, hydrolyzes glucosinolates into biologically active compounds called isothiocyanates.

Horseradish is an important crop in Illinois. Nearly 65% of the U.S. comsumption of horseradish is grown in Madision and Saint Clair Counties, east of St. Louis. Significant differences in myrosinase activity were detected among 27 accessions of horseradish roots, ranging from 1.2 to 57.1 units g-1 DW. The same 27 accessions were also found to have significant differences in total glucosinolates. Two accession, 810-A and 753-A contain between two to 100-fold higher than the currently grown commercial

varieties. These accessions will be released for commercial production in the near future. The myrosinase enzyme has also been characterized and cloned with the objective of increasing its level in vegetable issues.

b. Impact - Data from this study will help us shed more light on how chemicals in horseradish are converted into active compounds that help fight cancer. It will also help in future research to identify cultivars with better health qualities. Data from this study have been shared with the horseradish industry.

c. Source of Funding – Hatch, State and Multi-State Funds

d. Scope of Impact - AL, AR, CA, FL, GA, IL, IA, LA, MD, MI, MS, NY, OK, OR, PA, TN, TX

Enhancement of Food Lipids for Human Health

a. Progress - In collaboration with Dr. Jack Widholm's laboratory (UIUC) we are in the process of genetically manipulating ACP levels in soybean plants.

Soybean embryos experienced a decrease in lipid content in response to antisense inhibition of expression of ACP; these studies are now being confirmed and are being extended into generation of full soybean plants. We have made significant progress in analysis of soybean seed for alteration in lipid content as a result of growth in elevated carbon dioxide and/or ozone. We are investigating these hypotheses: 1) seeds from plants grown under high carbon dioxide would increase in lipid content, 2) high concentrations of ozone would reduce total lipid, and 3) under combined elevated carbon dioxide and ozone, CO2 would attenuate the negative effect of high O3.

Alterations in total lipid in response to changes in atmospheric composition were not uniform amongst cultivars. Certain cultivars did not experience differences in total lipid with treatment. Others experienced increased lipids under high CO2 and others decreased lipid in high O3.

We have begun analysis of emulsion-based salad dressings containing honey as a potential replacement for both sweetener (high fructose corn syrup) and for EDTA (a synthetic antioxidant used to stabilize the oils). Blueberry honey was very effective after three months storage at protection against oxidation of oil in french dressing formulations. This may prove to be a strong application of

honey for the food industry. We have also begun to analyze the antioxidant capacity and phenolic distribution in grapes and raisins that are processed from these grapes. We are in the process of working out all the details for a human raisin/grape feeding study to begin this spring.

b. Impact - The basic work on ACP has resulted in the collection of much information about the specific roles of ACP isoforms in plant fatty acid and lipid biosynthesis. Now extension of this into crop plants of economic importance should reveal valuable information that may be useful to the optimization of soybean plants.

We have also focused on optimization of soybean plants through a detailed study of what changes in lipids occur during growth under atmospheric conditions of elevated ozone and carbon dioxide. There is great potential to increase lipid content in select soybean cultivars under future atmospheric conditions; other cultivars may not be viable. More research should be conducted to obtain a better understanding of the mechanism for regulating lipid deposition under high CO2 and O3 and to what extent it can be controlled.

Our laboratory has significantly advanced the scientific basis for using honey as a healthy food/ingredient. We have extended this into salad dressing applications, demonstrating a beneficial application of this food ingredient to the food industry. Our grape and raisin research is expected to reveal important information regarding bioavailability of such antioxidants and their ability to protect against oxidative stress.

c. Source of Funding – Hatch and State Funds

d. Scope of Impact – National

Key Theme – Human Nutrition

Component Interactions for Efficacy of Functional Foods

a. Progress - This program consists of 9 projects aimed at research (4), education (2) and outreach (3). Three institutions and one USDA-ARS lab are collaborating. Four foods are targeted. Soy: Soybeans were grown and processed into flour, the isoflavone and saponin content determined and mouse diets prepared.

A mouse colon tumor prevention feeding trial is ongoing. Berries: Flavonoid fractions from grape and berry cultures, labeled with 14C, were fed to rats. Serum 14C was detectable and accumulation

of 14C was quantified in regions of rat brain. The same proanthocyanidin compounds that inhibit urinary tract infection also inhibited cancer. Simple flavonoid mixtures were effective against the initiation stage of cancer, while more complex dimers and trimers as well as anthocyanins inhibited promotion, and complex proanthocyanidin compounds were effective in anti-proliferation.

Broccoli: Analyzing extracts from 22 broccoli cultivars for chemical content and antioxidant capacity, there was little to no correlation between cellular antioxidant capacity and chemical antioxidant capacity. This suggests that antioxidant capacities estimated in vitro may not reflect activity in the whole cell. High selenium-broccoli extracts protected cells from DNA damage when cells were treated for 24 hours; no protection was found after only 4 hours. The timing of this protection was similar to that of upregulation of antioxidant enzymes; suggesting a relationship.

Tomatoes: Inhibiting enzymes in the carotenoid synthetic pathway produced high amounts of 15-cis phytoene and 15-cis phytofluene in culture and radiolabeling produced 14C-(15-cis) phytoene. In cultured prostate cells, 22% of the 15-cis phytoene accumulated inside the cells. In rats pre-fed a 10% tomato diet for 4 wks, phytoene or phytofluene increased in liver at the expense of other carotenoids. We cloned the carotenoid mono-oxygenase II gene from rats, finding homology between the rat gene and the mouse, ferret or human gene to be 92, 82 and 82%, respectively.

Education: A half day symposium entitled Relative Bioactivity of Functional Foods and Related Dietary Supplements was held on April 18 at Experimental Biology in Washington DC. Over 400 people attended including scientists from academia, industry and government. Talk summaries have been submitted to Journal of Nutrition. Outreach: Six web-based continuing education modules for RDs, covering functional foods and cardiovascular health, were completed. The marketing kick-off was at the 2004 Sports, Cardiovascular, and Wellness Nutritionists annual meeting in Colorado Springs in April. Six cancer prevention modules are under development as are three modules for oncology nurses.

b. Impact - Health effects of semi-purified or purified dietary supplements may not always reflect effects of the foods from which they were extracted. Because dietary supplements are regulated as foods, there is an error in the popular assumption that whole foods and isolated bioactive components act similarly. This assumption could impact the health and safety of the consumer.

Whole foods may provide very different efficacy and safety of bioactive food components to extracts sold as dietary supplements, yet whole foods are less well studied. We have provided continuing education for RDs in this area, written chapters in several fundamental texts, and are developing continuing education for oncology nurses.

c. Source of Funding – CSREES Grant Funds

d. Scope of Impact – National

CSREES GOAL IV – Greater Harmony Between Agriculture and the Environment

Indications of the Scope of Research and Extension Programs under Goal 4 - See Appendix A.

Investments in research relative to Goal 4 have increased by about $ 2.3 million with a corresponding increase of about 30 staff years in research projects relative to agriculture and the environment. Extension effort and face-to-face contacts have been relatively constant at about $ 4.6 to $ 4.8 million with between 162,000 to 168,000 teaching contacts

Key Theme – Air Quality

An Improved Model of the Impacts of Ozone Pollution on Soybean

a. Progress - Based on current ozone levels within the contiguous U.S. (EPA AirNow) it can be calculated that ozone induced decrease in soybean yield may cost U.S. agriculture some $2bn per year (Morgan et al., 2003). Peak daily ozone concentrations during the summer in central Illinois, and much of the state, average 60 ppb with higher levels in counties adjacent to Chicago and St. Louis (EPA AirNow), Illinois therefore accounts for a substantial portion of this predicted loss. Most models for forecasting current year yields and future yields under global climate change take no account of ozone. Those projections which have been made assume that the impact of ozone is fixed regardless of environmental conditions. However, ozone impacts are variable, damage being diminished by drought, rising CO2, low temperatures, low light and growth stage (Morgan et al., 2003). Ozone elicits damage by entering via the stomata, the more open the stomata the greater the damage for a given ozone concentration.

We have shown previously, for wheat, that mechanistic prediction of stomatal aperture can accurately simulate cumulative ozone damage (Martin et al., 2000). Our work in this CRIS project is developing a model of soybean growth incorporating a physiologically-based response to ozone and its interactions with temperature, light, humidity and CO2 to improve prediction of current and future damage to the soybean crop.

A leaf level model of ozone uptake and damage to capacity for carbon assimilation by soybean is being developed, based on our previous approach for wheat (Martin et al., 2000). The model is being parameterized from prior chamber studies of stomatal and

photosynthetic responses to ozone (reviewed: Morgan et al. 2003). These responses will be tested within SoyFACE (Ainsworth et al., 2004, Rogers et al., 2004). This leaf model is being incorporated into our whole plant physiological model of partitioning and production (www.life.uiuc.edu/plantbio/wimovac, (Humphries & Long, 1995)). Partitioning coefficients will be derived from our surveys of prior soybean studies (Ainsworth et al., 2002, Morgan et al., 2003) and phenology following the methods used in the DSSAT crop modeling system, using responses of yield and biomass observed within SoyFACE (www.soyface.uiuc.edu).

Finally the model will be used with current national ozone distributions and future projected distributions to assess the impact of ozone on future soybean production by region.

b. Impact - Soybean is the number two crop of the U.S. in terms of area planted. However, it is very vulnerable to ozone which likely lowers current yields by between 10 and 20%. The effect of ozone is also likely to be increased by global climate change.

Although ozone has decreased in some parts of the U.S., it has continued to increase in many rural regions. The Intergovernmental Panel on Climate Change predicts that these increases will continue through this century. Accurate forecasting of the future impacts of ozone and climate change on the soybean crop in different regions of the U.S. will be critical to planning and setting priorities for crop improvement.

c. Source of Funding – Hatch, State Funds

d. Scope of Impact – National

Indoor Air Quality for Livestock Buildings

a. Progress - The investigator's air quality team recruited two new PhD students. One is working on the particle spatial distribution measurement using a multipoint aerosol sampler developed by the investigator's group. The experiment includes variables such as ventilation scheme, air velocity distribution, dust source and strength and ventilation rates. Another is working on computational fluid dynamics (CFD) simulation of indoor air quality. The models will be validated using the experimental data. The air cleaning technology team focuses on the aerodynamic air cleaning by further developing the deduster and evaluating the prototypes in swine buildings. The team also worked on the thermochemical conversion (TCC) process to convert swine manure into oil. We have

successfully converted 70% of swine manure into crude oil in our earlier batch reactor research. The investigator has developed a continuous TCC reactor and is working with the government agencies and industry to develop a pilot plant for swine farms.

b. Impact - Indoor air quality has a profound impact on quality of life and our economy. Increasing concern of indoor air quality is largely contributed to the awareness of poor health, the so-called sick building syndrome (SBS). The SBS of the building inhabitants can be defined as the illness and discomfort associated with poor indoor environments but with no clear identification of the source substances. Symptoms of SBS include irritation in sensory organs (eyes, noses, throat, ears and skin), fatigue, headache, respiratory disorder and nausea. Approximately one million buildings in the United States are sick buildings, within which 70 million people reside or work (Cone and Hodgson, 1989). These sick buildings do not include agricultural buildings such as animal facilities and grain elevators. Most of these agricultural structures have unique, often more serious, air quality problems.

c. Source of Funding – Hatch, State, Other Non-Federal Funds

d. Scope of Impact – National

The National Atmospheric Deposition Program

a. Progress - NRSP-3, the National Atmospheric Deposition Program (NADP) provides quality assured data and information on the exposure of managed and natural ecosystems and cultural resources to acidic compounds, nutrients, base cations, and mercury in precipitation. This is made possible through cooperative support (SAES, universities, government agencies-federal/state/local/tribal, and NGOs) for the 261-station National Trends Network, 87-station Mercury Deposition Network, and 8-station Atmospheric Integrated Research Monitoring Network.

The NADP provides the only database of precipitation chemistry measurements from across the U.S., and these data support informed decisions on air quality issues related to precipitation chemistry. NADP data are used by scientists, policy-makers, educators, and the public and are freely available via the NADP Web site, which enables on-line retrieval of individual data points, seasonal and annual averages, trend plots, concentration and deposition maps, reports, and other information.

In 2004, the NADP Web site received 75,477 unique visitors, up 40 percent from 2003. Registered data users more than doubled in the last 12 months and user sessions rose by nearly 90 percent. Using the more than two decades of NADP data on the chemicals in precipitation, USDA Forest Service scientists examined the bio-geochemical processes that affect uptake, retention, and cycling of nutrients in our forests.

A 2004 report states that base cation (calcium, magnesium, potassium) depletion in soils of the northeastern and southeastern U.S. is due in part to long-term exposure to acidic deposition. Certain temperate forest soils are so depleted that trees draw more nutrients from atmospheric deposition than from bedrock, the historic source. Calcium losses from red spruce needles as a result of acidic deposition make trees more susceptible to disease, frost, and drought.

In an important new educational effort, NADP staff members partnered with the American Chemical Society (ACS) to develop an activity for the April 2004 ACS earth day program. Students were instructed to build a simple rain collector, measure rainwater pH, then go to the NADP Web site, where they could compare their measurements with the nearest NADP sites and print a certificate of completion. Participation in 2004 ACS earth day activities tripled in comparison with 2003, prompting the ACS to award a Salute to Excellence plaque to the NADP for commitment to education.

Halifax, Nova Scotia, was the site of the 2004 scientific symposium and NRSP-3 Technical Committee meeting, 21-24 September. With partial support from Environment Canada, the symposium and meeting attracted 114 participants and featured 37 presentations and 29 poster papers. The theme of the symposium was the recovery of U.S. and Canadian aquatic and terrestrial ecosystems from sulfur emissions reductions and decreased sulfate deposition. The symposium followed more than a day of NADP committee and subcommittee meetings. During its annual meeting, the Technical Committee let stand a decision to terminate support of field chemistry measurements at NTN sites as of 31 December 2004.

b. Impact - The NADP National Trends Network was the chief source of sulfate and nitrate deposition data used in the International Joint Commission 2004 report, assessing progress under the Acid Rain Annex of the 1991 United States-Canada Air Quality Agreement to limit or reduce emissions of sulfur and nitrogen oxides.

c. Source of Funding – Multi-State Funds

d. Scope of Impact - CA, CO, FL, GA, IL, IN, KY, LA, ME, MD, MA, MI, NE, NY, NC, OH, OR, PA, TX, UT, VA

Key Theme – Integrated Pest Management

An Integrated Pest Management Facilitator for the North Central Region

a. Progress - In August 2001, Susan T. Ratcliffe accepted the position of North Central Regional IPM Facilitator. As facilitator, she has continued to work with the Directors (Larry Olsen, Michigan State University and Michael E. Gray, University of Illinois) of the North Central Integrated Pest Management Center (NCPMC) on numerous projects including preparation of the NC IPM Center Proposal and the NC IPM Center State Contact RFA. She assisted the chair of NCR-201, Jon Tollefson, Iowa State University, in the preparation of the annual committee meeting for North Central IPM coordinators. The annual meeting for NCR-201 was held in Indianapolis, IN on April 7, 2003. Dr. Susan Ratcliffe served as co-chair and local arrangement chair for the 4th National IPM Symposium that was held in Indianapolis in April, 2003. Over 700 individuals attended the three day event and evaluations of the event have been very positive. Sponsors for the event included USDA CSREES, RIPM Grant Programs, IPM Centers, EPA, ARS, OPMP, APHIS, IR-4, and SARE. A regional Soybean Rust Training Teleconference and a national Sudden Oak Death Training Teleconference were conducted and evaluated by participants. Overall evaluations were very positive and future training projects are under development.

b. Impact - Dr. Susan Ratcliffe worked with Dr. Michael Gray to develop a publication highlighting the North Central Region IPM Grants Program from 1998-2000. The publication included summaries of 26 proposals funded by this grant program and the impact these projects had on integrated pest management.

The National Pest Alert for Soybean Rust has been completed and over 250,000 have been distributed. This document was developed in cooperation with USDA CSREES IPM Centers, Plant Diagnostic Centers, ARS, and APHIS. The West Nile Virus Pest Alert was reprinted and 250,000 copies have been distributed to inform the public of this potential threat.

The most recent National Pest Alerts were Ralstonia and a Spanish version of the Soybean Rust document. These Pest Alerts and related information can be found at

http://www.ncpmc.org/NewsAlerts/index.html. A monthly newsletter, the North Central IPM Center Connection, has been developed and broadly disseminated to provide information regarding IPM activities in the North Central region. To view the newsletters, please visit http://ncipm.org/connection.html.

c. Source of Funding – CSREES Special Grant Funds and State

d. Scope of Impact – National

Crops Workshops - Northern Illinois Crops Training Center

a. University of Illinois Extension Educators work closely with Department of Crop Sciences researchers in developing and maintaining more than 20 replicated research plots at Department of Crop Sciences/Agricultural Research & Demonstration Centers, on farm locations and joint efforts with community junior colleges. These same centers provide the opportunity to provide hands-on education to grain producers and crop input suppliers.

During 2005, three workshops were held during the growing season at the Northern Illinois Crops Training Center. These workshops focused on different issues pertaining to crop development, crop production and field crop pests. Similar workshops have been held over the last five years. The workshops incorporated formal presentations, field exercises and hands on exercises for all participants. Attendance for the past five years totals more than 540 participants.

A mail survey of those attending the 2005 workshops had a 69 percent response rate. Respondents could identify themselves in multiple ways: 49% checked “producer,” 40 percent checked "seed dealer," 33 percent "crop consultant,"30 percent "fertilizer dealer," 28 percent "chemical dealer," and ten percent "farm manager."

b. Impact – Typically for these workshops producers and farm managers reported growing 150,000 acres while ag dealers and consultants reported servicing more than a million acres of crops.

Total of 1,150,000 acres impacted

The percentage of respondents "strongly agreeing or agreeing" to each item for the three workshops were:

Met my expectations averaged 96%.
Increased my knowledge averaged 94% over six items.

Provided useful information average 97%.
Provided hands-on learning averaged 86%.
Would recommend to others averaged 97%.

From the 2005 workshops:

Almost 90% reported being more comfortable in identifying soybean rust.

75% reported scouting for soybean rust.

85% reported digging corn roots to evaluate corn root worm conditions.

82% reported "recording late-season weed escapes" to help plan the following year's weed control program.

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Distance Education Workshop on Corn Rootworm

a. On February 4 and 11, 2005 two teleconferences entitled: "Corn Rootworm Management: Situation, Issues & Options" were held and attracted over 750 participants from nine states in the North Central Region.

b. Impact – Prior to the first training teleconference, participants were asked to complete a survey designed to evaluate their current knowledge of corn rootworm biology and management options. Following the second training session, participants were asked to complete a second questionnaire to assess the educational value of the training teleconferences.

The pre-training survey asked "Are you familiar with the life cycles of northern corn rootworm and western corn rootworm?" Eighty-five percent of the participants indicated they were familiar with the life cycles, but exit survey responses indicated 95% of the participants' knowledge regarding life cycles improved as a result of the training.

These responses show the value of continued, in-depth educational sessions to improve pest management decisions by producers.

Perhaps the most disappointing response was with regard to the lack of scouting and the use of economic thresholds to make decisions on corn rootworm management. Only 51% of the participants indicated they scout and use economic thresholds to make treatment decisions for corn rootworm. Reasons cited for not scouting or using economic thresholds included:

1) confusion about scouting methods (34%),

2) prefer not to be in fields (11%), and

3) corn rootworms create management problems every year (49%).

Overall, participants indicated the training teleconferences were worth their time (98%) and will assist them in making more informed decisions about the management of corn rootworms (98%).

c. Source of Funding – State, Federal

d. Scope of Impact – Nine Midwest States

Sustainable Systems for Managing Weeds in Vegetable Crops

a. Progress - Illinois farmers planted 22,400 acres of snap beans for processing in 2002 (about 10% of the U.S. total). Most of the Illinois acreage was treated with herbicides. Snap beans in Illinois are produced in environmentally-sensitive areas requiring cost-effective, and consistent biological methods of weed control if reliance on herbicides is to be reduced.

Field studies were conducted over two growing seasons to investigate the potential of mustard green manures to control weeds in Highstyle snapbean at Champaign, IL on a clay loam soil, and Havana, IL on a sandy soil.

In the first year, the weed suppression and snap bean growth performance in three mustard green manure treatments, yellow mustard (*Brassica juncea*), southern giant curled mustard (*Brassica juncea*), and a Caliente 119 Blend which is a proprietary mixture of *B. juncea* and white mustard (Sinapis alba L.) used by potato growers in the Pacific northwest, were compared to performance in a bare ground control treatment. At Havana there were fewer grasses in the mustard treatments than in the control. The mustards did not suppress the broadleaf weeds. At Champaign, where the soil type was heavier and there were few grasses, there were no

differences in weed dry mass between the control and the mustard treatments. Snap bean growth as a percent of the control was reduced substantially in the yellow mustard and southern giant curled mustard at Havana. At Champaign, snap bean growth was substantially greater in the southern giant curled mustard than in the yellow mustard or in the mustard blend.

In year 2, while results differed somewhat between the Havana and Champaign locations, the general trend was mid-season weed control by southern giant curled and the Caliente 119 Blend. A germination study in the greenhouse using weeds common to snap bean plots in the state confirmed the results of the field experiment, and provided samples for measuring the relationship between glucosinolate content of mustard and weed control.

b. Impact - Our research will improve the understanding of how changes in cropping practices impact on weed populations. It also will allow problem weeds of vegetable crops to be controlled in an economical and environmentally-friendly manner.

c. Source of Funding – Hatch, State

d. Scope of Impact - Illinois

Improving Western Corn Rootworm Management in Rotated Corn

a. Progress - Three plots (area = 4 acres) were established with a central strip of YieldGard Rootworm (YGRW) corn (a transgenic variety expressing the WCR-toxic Cry3Bb1-protein from Bt) with two adjacent 0.8 acre plots of soybean and wheat or double-cropped wheat-soy on the east and west sides of the central corn strip.

Movement of WCR from YGRW into rotated crops is measured by detecting Cry3Bb1-protein in gut contents of WCR captured at various distances from YGRW. In 2003, we trapped WCR adults on Pherocon AM sticky traps placed in soybean (10.8 WCR/trap/d), wheat (3.7), and double-cropped wheat-soybean (3.5). Soybean captures exceeded the economic threshold (5 WCR/trap/d), suggesting economic injury could occur in corn following soybean in 2004. As predicted, there was economically significant root-injury in first-year corn following soybean (root-rating = 5.0), but not in corn following wheat (root-rating = 2.7), or double-cropped wheat-soybean (root-rating = 3.1). The 2004 sticky trap captures in soybean (19.3 WCR/trap/d) and double-cropped wheat-soybean (5.9) were above the economic threshold. Captures on wheat field

sticky traps (4.1) were below threshold. Captures on sticky traps in 2003 were an excellent predictor of root injury in 2004. Significant injury is expected in 2005 first-year corn after soybean and double-cropped wheat-soybean. Over 51% of males and 33% of female WCR collected next to YGRW strips were positive for Cry3Bb1 protein; they must have moved from corn to soybean, wheat, or double-cropped wheat-soybean within the previous 24 hours. The proportion of Cry3Bb1-positive WCR falls with distance from the adjacent YGRW strip.

Approximately 68% of WCR in Row 1 of the soybean field were positive for Cry3Bb1 protein compared to 71% and 81% of WCR in Row 1 of double-cropped wheat-soybean and wheat, respectively. At 32 rows from corn, 15%, 28%, and 41% were positive for Cry3Bb1 in soybean, double-cropped wheat-soybean and wheat, respectively. The overall percent of Cry3Bb1-positve WCR in soybean, double-cropped wheat-soybean, and wheat were 45%, 44%, and 64%, respectively. Movement rates between corn and wheat (7.4 m/d) were higher than rates between corn and soybean (5.3 m/d) or double-cropped wheat-soybean (6.3 m/d).

Dry and hot conditions in wheat stubble may increase the WCR movement rate through wheat resulting in fewer opportunities for egg-laying. WCR adults were more abundant in soybean than in adjacent plots of wheat or double-cropped wheat-soybean. We hypothesize that reduced root injury in corn rotated with wheat is due to lower populations of egg-laying females in wheat. However, due to highly clumped egg recovery distributions these 2003 data did not reveal significant differences in eggs/sample based on the rotated crop.

Soil samples collected in 2004 are not yet processed to extract the eggs. In 2004, more WCR flew between corn and soybean than between corn and other crops. Discovering differences in WCR movement and egg-laying between various rotated crops may help growers reduce their risk of economic injury in rotated corn by suggesting crops that are less attractive to egg-laying WCR.

b. Impact - Many producers can no longer rely on rotation of corn with a non-host crop (i.e., plants on which western corn rootworm (WCR) larvae cannot survive, like soybean) to manage WCR injury in rotated corn.

A population of WCR now lay eggs in corn and crops rotated with corn (previously females remained in corn and laid eggs almost exclusively therein). Due to "rotation-resistant" WCR activities,

fields of non-host crops are no longer free of WCR eggs. Corn growers are forced to make costly ($19/acre) soil insecticide applications at planting to protect corn roots from feeding by WCR larvae. Understanding circumstances that promote movement of rotation-resistant WCR into rotated crops like wheat or soybean for egg-laying will improve WCR monitoring and management.

We confirmed that corn planted on ground where wheat was grown the previous year was free from economically damaging levels of WCR larval injury to corn roots. This study assesses the protection against WCR injury provided by a corn-wheat rotation. Measurement of WCR beetle abundance and movement in the rotated crops will help identify crop characteristics that may make them less attractive sites for WCR activity.

Identification of crops that are effective in rotation with corn will help growers to return to rotation as their main IPM (integrated pest management) tactic and cut costly insecticide applications to corn acres. WCR movement data from this project are being used by industry and government to evaluate non-Bt refuges for use with anti-rootworm transgenic corn varieties.

c. Source of Funding – CSREES Special Grant Funds

d. Scope of Impact – National

Key Theme – Natural Resources Management

Governor's Conference on the Management of the Illinois River System

a. In 1985, a group of concerned scientists, citizens and river activists began to focus new attention on the growing problems of sedimentation and erosion along the Illinois River and its tributaries. Collectively, this group of individuals formed the nucleus for the planning committee for the First Governor's Conference on the Management of the Illinois River System, which was held at the Hotel Père Marquette, Peoria, IL on April 1 - 3, 1987. Governor James R. Thompson believed bringing various state and federal agencies and organizations together in a common forum would help begin the process of discovering solutions to these problems.

Since 1987, this conference has continued to be held on a biennial basis in Peoria – midway on the Illinois River between Chicago and Grafton. Governors Jim Edgar, George Ryan, and Rod

Blagojevich have continued this strong tradition by providing a governor's designation to this conference, thus demonstrating the high priority being placed upon our natural resources.

Over the past twenty years, conference attendance has grown from 150 to over 350 participants who represent a diversity of backgrounds, agencies, organizations, and communities. Each conference planning committee presented an agenda designed to continue the tradition of bringing the latest in developments and management techniques to those working towards protecting the Illinois River System for future generations.

University of Illinois Extension is highly regarded by the State Administration, state and federal agency officials, and by leaders of state organizations for an important role of providing leadership to the biannual conferences.

b. Impact – At the June 29, 2005 meeting of the Conference Planning Committee for the 2005 Governor's Conference on the Management of the Illinois River System, the Conference Co-Chair and Extension Natural Resources Educator Bob Frazee challenged the 30+ members of the State Conference Planning Committee to go back to their respective agencies and organizations and reflect on significant Illinois River programs which had been developed as a direct result of the ten biennial Governor's Conferences on the Management of the Illinois River System held from 1987 – 2005. Responses elicited from these state and federal agencies and organizations provided the basis for a very impressive impact evaluation. They showcased tremendous long-term adoption and implementation of new conservation practices throughout the Illinois River Basin, development and passage of state and federal legislation for massive Illinois River watershed programs and significant improvement in the environmental health and quality of the Illinois River and its watershed resources.

The foundations for the following programs can be directly attributed to successful interagency and multi-disciplinary cooperation, fostered at the Governor's Illinois River Conferences and subsequently implemented at the local, state and federal level:

- Formation and operation of the Illinois River Coordinating Council;

- Development of the Integrated Management Plan for the Illinois River System;

- Illinois Conservation 2000 Programs – 12 years - $268 million program;

- Illinois River Conservation Reserve Enhancement Program – led by efforts of U.S. Congressman Ray LaHood – 123,000 acres presently enrolled - $500 million program;
- Illinois Rivers 2020 Initiative - $2.5 Billion Program;

- Development and funding for over twenty watershed restoration programs involving partnerships with 16 conservation organizations and governmental agencies; (Examples include: USFWS Partners for Wildlife and Fish Program has assisted landowners in restoring over 6,000 acres of habitat along the Illinois River; U.S. Army Corps of Engineers Habitat Restoration and Enhancement Projects completed at Swan Lake, Banner Marsh, Lake Chautauqua, Stump Lake, and Peoria Lake Islands; USFWS established the 11,122 acre Emiquon National Wildlife Refuge of which the Service now owns 2,114 acres and The Nature Conservancy owns 7,063 acres; IDNR completed land acquisition efforts at the Double T Fish and Wildlife Area, the Duck Ranch at Henry, IL; TNC's and IDNR's Spunky Bottoms restoration of 2,000 acres; The Wetland Initiative's 2,500 acre Hennepin Hopper restoration effort; The Audubon Society's purchase of Plum Island; and Ducks Unlimited's Spring Lake acquisition and restoration;

- Development/funding for low-cost streambank stabilization methods on over 500 severely eroding streambank sites in Illinois;

- "Mud to Parks" Dredging & Re-Use of Sediment from the Illinois River. Seventy-five barge loads of sediment were dredged from the Illinois River, barged up the Illinois River to Lake Michigan and used to convert the closed Brownfield Steel Mill site in Chicago to a lakefront park;

- Major riverfront development projects planned and constructed in numerous cities adjacent to the Illinois River from Grafton to Chicago involving hundreds of millions of dollars in improvements from public and private investments;

- And the National Scenic Byways Designation for Illinois River Roads by the U.S. Department of Transportation

c. Source of Funds – State, Federal

d. Scope of Impact - Illinois

Key Theme – Nutrient Management

Characterizing Soil Organic Nitrogen to Detect Sites Nonresponsive to Nitrogen Fertilization

Progress - Major progress has been made in developing the Illinois soil N test (ISNT) as a means to estimate potential N mineralization and thereby improve fertilizer N management for corn production. This test has its origin in the finding that conventional methods of fractionating soil organic N are subject to serious errors, which were eliminated by developing new diffusion methods for N-distribution analysis of soil hydrolysates. When applied in subsequent studies using soil samples collected from on-farm sites that differed in whether corn was responsive to N fertilization, the amino sugar fraction was identified as a key difference, with higher concentrations being obtained for nonresponsive than for responsive soils.

Subsequent work led tothe ISNT as a simpler technique that allows amino sugar N to be estimated without the need for acid hydrolysis, so as to detect sites where N fertilization will be ineffective. The latter capability has been amply verified in 102 – response evaluations to date, which leave no doubt that the ISNT also provides a quantitative basis for N fertilization of responsive soils. There are obvious implications for site-specific N management to improve the economic profitability of corn production, while reducing the adverse environmental effects of excessive N fertilization. Additional work focused on utilizing diffusion methods for (i) inorganic-N analysis of soil, water, and wastewater; (ii) N-isotope analysis by direct combustion; (iii) urea-N analysis of soil extracts; (iv) N- and C-isotope analysis of amino acids in soil hydrolysates; and (v) rapid estimation of soil cation-exchange capacity.

b. Impact - The Illinois N test has major economic and environmental implications for corn production in Illinois and elsewhere. By identifying sites where N fertilization is ineffective, this test has the potential to improve profitability for the producer, while reducing the adverse environmental effects of excessive N fertilization. Additional impacts may be expected in regard to resource and energy conservation.

c. Source of Funding – Hatch, Other Non-Federal Funds

d. Scope of Impact - Illinois

Assessing Nitrogen Mineralization and Other Diagnostic Criteria to Refine Nitrogen Rates for Crops and Minimize Losses

a. Progress - For decades, scientists have been trying to develop a nitrogen soil test that accurately predicts N need. Much of this work has focused on nitrate testing, a procedure that has not worked consistently in the more humid areas of the Corn Belt (particularly for fields that were nonresponsive to applied nitrogen). Surprisingly, the number of such nonresponsive sites is much larger than many would expect.

On-farm research in Illinois demonstrated that 17% of the cornfields studied needed no nitrogen for optimum yield, even though the nitrate level in those fields was below the level that would indicate no response. Recent Illinois research has demonstrated that hydrolyzable amino sugar-N was highly correlated with lack of response. We have further identified a simple analytical procedure that will reliably estimate this amino sugar-N. During the 2003 and 2004 crop years, locations were identified where the amino sugar-N test failed to accurately predict responding sites. Further work has shown that a combination of the amino sugar-N test with topographic position improves the calibration of the test. Calibration of the test is being done on 30 centimeter samples, but there have been some instances where sampling to a depth of 60 centimeter has enhanced the predictability of the results.

b. Impact - When the research is completed to allow this test to be released for public use, the benefits to be derived will allow farmers to reduce N rate on some fields or areas of fields, thus saving input cost and correspondingly reducing energy consumption associated with fertilizer application as well as minimizing the potential for adverse effect on the environment.

c. Source of Funding – Hatch, State, Multi-State Funds

d. Scope of Impact - AK, CA, FL, IL, IN, IA, KS, MN, MO, NE, NY, OH, OR, SD, WI

Key Theme – Pesticide Application

Best Management Practices to Reduce Pesticide Runoff From Turf

a. Progress - Pesticides are commonly used on highly managed turfgrass sites, and pesticide runoff represents the most likely mode of off-site transport of applied pesticides. This project is designed to examine management practices that can be used to minimize the potential for pesticide runoff from turf.

Our research site consists of 12 runoff plots that are 9.1 by 3.05 m with a 0.91 m buffer strip separating each runoff plot. The plots are covered with creeping bentgrass (*Agrostis stolonifera* L.) mowed at a height of 1.2 cm, which is typical of golf course management practices in the northern U.S. A collection flume at the base of each plot collects and delivers all runoff from an individual plot into a collection device. In 2003, a series of runoff experiments were conducted to determine the effect of time interval between application and runoff event, the effect of clipping removal versus clipping return, and the effect of post-application irrigation on pesticide runoff from turfgrass. In 2004, effort was directed towards analyzing the results of these experiments and presenting initial findings at the 2004 American Chemical Society annual meetings.

To summarize our findings to date, light irrigation (0.25 cm) after application is ineffective in reducing pesticide runoff from a future runoff event. There was a slight reduction in pesticide runoff when post-application irrigation was applied at 15 minutes after pesticide application. This may indicate that until the pesticide application has dried on the foliage, some reduction in runoff potential can be achieved by a light irrigation. However, the utility of this finding is questionable since many pesticides must be allowed to dry on the leaf surface if foliar absorption is the goal, and if root uptake is the goal, most users are instructed to irrigate immediately following the pesticide application. However, this data does indicate that better movement of the pesticide into the turf will occur if the pesticide is watered in immediately, within 15 minutes of application. Even allowing an hour of drying time will keep more of the pesticide on the leaf surface. Secondly, the longer the interval between pesticide application and runoff, the less pesticide runoff will occur. And while that finding is obvious, it was surprising how little reduction in runoff potential occurred with time.

There were no significant differences in pesticide concentration in the runoff that occurred at 1, 2, or 3 days after pesticide application.

Finally, we examined the effect of clipping removal on pesticide runoff. Removing clippings following a pesticide application reduced pesticide concentration in runoff by 20 to 53%, depending upon the pesticide. This practice can be helpful in reducing pesticide runoff, provided the clippings are handled in a manner that prevents any runoff or leaching from the collected clippings.

b. Impact - This research helps demonstrate the level of pesticides in runoff water from turf, while low, is significant. Practical management steps that can be taken to reduce pesticides in runoff water are few, but clipping removal holds the most promise for reducing the amount of pesticide residues available during a runoff event.

Post-application irrigation is ineffective as a method to significantly reduce pesticide runoff. Finally, the longer the interval between pesticide application and runoff event the better, but the nature of the pesticide plays a large role in determining the reduction in runoff potential. Water soluble pesticides appear more available for runoff up to 3 days after application whereas water insoluble pesticides showed markedly reduced runoff when runoff occurs 24 hours after application or longer.

c. Source of Funding – Hatch Funds

d. Scope of Impact – National

Dynamic Soybean Pest Management for Evolving Agricultural Technologies and Cropping Systems

a. Progress - A network of nine suction traps placed along a north-south transect in Illinois is proving to be an effective tool for predicting the occurrence and abundance of soybean aphid in the following season's crop. The fall flight of soybean aphids from the soybean crop to buckthorn, their overwintering weed host, seems to be an indicator of the likelihood of significant soybean aphid populations during the next year.

In years when fall trap captures were low (2001 and 2003), significant soybean aphid populations were very rare in the following growing season. Conversely, a statewide outbreak of soybean aphids occurred during 2003, following relatively large fall 2002 trap catches. More data is necessary to definitively assess this predictive capability, but a convincing pattern appears to be developing. This seems especially true when populations of multicolored Asian lady beetle populations are factored into the

prediction. Multicolored Asian lady beetles have been identified as the most significant predator of soybean aphids. During years when soybean aphid trap catches were low in the fall, populations of multicolored Asian lady beetles were high enough to significantly suppress soybean aphid populations the next year.

During the 2003 soybean aphid outbreak, multicolored Asian lady beetle populations were extremely low, enabling soybean aphid populations to exceed damage thresholds. Based on these limited observations and 2004 data, the potential for significant infestations of soybean aphids in 2005 seems great. Field surveys and suction trap catches will confirm or refute this prediction.

For a grower, one of the most difficult aspects of managing soybean aphids is an adequate scouting and sampling method. To address this shortcoming, a modified sequential sampling plan has been developed and proposed for adoption by field scouts and growers. Current thresholds for soybean aphid are set at 250 or more aphids per plant through the pod set stage of soybean development. This threshold incorporates a 7-day lead-time during which insecticide applications can be scheduled. The new sampling plan does not establish a new threshold, but provides a simplified treat versus do not treat decision tool, limiting the need for detailed, time-consuming counting. Grower adoption of this technique may lead to improved treatment decisions, especially useful at very high or very low aphid densities.

Screening of ancestral soybean lines identified as the major genetic contributors to modern soybean varieties has led to the discovery of a single-gene source of resistance to soybean aphid. In field cage studies with high populations of soybean aphids, resistant cultivars consistently showed no difference in yield or agronomic traits when compared with commercial varieties. Laboratory studies identified a single dominant gene that carried resistance to soybean aphid. This gene can be easily introduced into commercial varieties using backcrossing techniques. Once soybean aphid-resistant commercial varieties are available, savings to growers will be significant.

b. Impact - Based on estimates from the Illinois Agricultural Aviation Association and reports from Cooperative Extension personnel, we believe as many as 1 million acres of soybeans were treated with an insecticide to control soybean aphid in Illinois in 2003. This represents 10% of the total soybean crop. This translates to approximately $12 million in treatment costs. Many of these treatments were likely unnecessary because of low aphid densities or because of natural declines in populations; however, it is also

likely that many fields suffered yield losses due to lack of treatment. These studies are aimed at improving treatment guidelines and providing additional tools for management and control of soybean aphid.

c. Source of Funding – Multi-State Funds

d. Scope of Impact - AR, GA, IL, IN, IA, KS, KY, LA, MI, MN, MS, MO, NE, ND, OH, TN, TX, VA, WI

Key Theme – Soil Erosion

Streambank Stablization Fact Sheet (Brochure)
http://www.wq.uiuc.edu/Pubs/Streambank.pdf

a. Streambank erosion is increasing in severity due to greater volumes of surface water runoff from agricultural and urban areas. Such erosion can reduce the amount of tillable crop land while adding to the sentiment load of creeks, rivers and other waterways.

University of Illinois Extension has typically held workshops focus on training agricultural producers and individuals from conservation agencies and engineering firms on cost-effective methods to stabilize eroding streambanks.

In 2004 a fact sheet was produced detailing how to diagnosis and "treat" streambank erosion problems by the Illinois Department of Agriculture, Association of Illinois Soil and Water Conservation Districts, and University of Illinois Extension, Ten thousand copies produced and distributed to landowners, farmers, engineers, planners, conservation agency staff, local University of Illinois Extension Units, and county Soil and Water Conservation Districts.

The is approach attracted statewide and national farm media attention:

- Illinois Agri-News, October 29, 2004. "Streambank Publication Provides Latest Stabilization Techniques".

- Iowa Farmer Today, November 6, 2004. "Streambank Erosion Can be Fought Without Breaking Bank".

- Prairie Farmer, December 2004. "Stifle Streambank Erosion".

- BEEF Cow-Calf Weekly, March 2005. “Latest Streambank Stabilization Techniques Detailed”.

- Farm Journal, March 2005. “Cheaper Ways to Control Streambank Erosion”.

- National Beef Producer, April 2005. “Economical Erosion Control”.

- BEEF, April 2005. “Latest Streambank Stabilization”.

- Wallaces Farmer, May 2005. “Control Streambank Erosion”.

These articles resulted in requests for more than 2,100 requests for copies from 25 states and three countries. In 2005, the publication was made available on the WWW.

b. Impact - The impact of this publication has not been determined.

While undoubtedly less effective than the workshop approach, it is worthy to note that within six months of attending workshops held in 2003, 19 participants reported stabilizing 124 severely eroded streambank sites totaling approximately 56, 400 feet (more than 10.5 miles.)

c. Source of Funding - State, Federal

d. Scope of Impact - Illinois

Tillage Seminars

a. Best management practices are critical to limiting soil erosion and preventing water problems. Regional tillage seminars are held annually throughout Illinois. Over the past four years more than 1,630 participants have attended. Typically three-fourths to two-thirds of the participants are farmer owner/operators. The remaining participants are agribusiness and agency staff.

b. Impact – Total number of participants over three years – in excess of 1,630.

Typical results are that all participants rate the seminars as “good” to “excellent.”

Typically, all will rate the program as useful to very useful.

As a result of attending one of the seminars, 44 percent of the farmer/owner operators reported intentions to make changes in their farming operations. At the top of the list was "use more strip-till" and "trying one of the light tillage tools."

c. Sources of Funding – Local, State, Smith-Lever

d. Scope of Impact – Illinois

Key Theme – Water Quality

Development and Evaluation of TMDL Planning and Assessment Tools and Processes

a. Progress - The objective of this project is to develop, improve, and evaluate watershed models and other approaches for TMDL development and implementation.

We have collected hydrologic and water quality data from the Little Vermilion River (LVR) watershed for developing and improving computer simulation models. These data include tile flow, river flow, nutrient, and herbicide concentrations from 1991 to 2004. The long-term monitoring data from the LVR watershed are being analyzed to understand the effects of various agricultural management practices on water quality. These results will help develop TMDL guidelines for tile-drained watersheds. Work is in progress to develop a phosphorus transport model. This model simulates dissolved phosphorus and P in sediment in river or a small stream. The model has been validated with data obtained by other researchers in England.

b. Impact - Evaluating the accuracy of a computer model using data from a single site is risky. It is of critical importance that models be evaluated with the widest range of possible conditions. This need can best be met through this multi-regional project with a broad range of conditions from which the models can be tested.

This Illinois study will also provide a new phosphorus transport model and its suitability for use in developing TMDL guidelines.

c. Source of Funding – Hatch, Multi-State, Other Federal Funds

d. Scope of Impact - AL, AR, FL, GA, IL, IN, IA, KS, KY, LA, MD, MI, MN, NJ, NC, OK, OR, SC, TN, TX, VA, WVA

Illinois Commercial Manure Hauler/Applicator Training Program

a. This program was developed at the request of commercial manure applicators in Wisconsin. Wisconsin Extension looked for help in addressing this issue from Extension colleagues in Michigan and Illinois. In addition to the fact that this idea was industry-generated, what makes this program unique is that it has built into it several financial incentives for participants with ten insurance companies—10 to 40% reductions in liability insurance premiums for applicators that complete the program.

The key to successful implementation of nutrient management plans is educating not only the livestock producer, but also those individuals who provide information and support to the producer's decision making process. The commercial manure application industry is often overlooked in this approach, yet in Illinois they apply tens of millions of gallons of manure for hundreds of livestock producers. As regulations and oversight of manure application rates increase, livestock producers will be looking to commercial applicators to assist them with record keeping, minimizing odor, proving where the manure was actually applied, and being a good neighbor.

University of Illinois Extension was contacted by Michigan and Wisconsin Extension staff about working together to create a multi-state three-level training program that each state would recognize,

thereby avoiding unnecessary duplication, since many commercial applicators work in multiple states.

Over a two year period working with Extension staff in other states, Illinois developed, written and tested training materials and quizzes, for Level 1 in Illinois. University of Illinois Extension has also done the same for Level 2 modules: Illinois Rules; Safety; Recordkeeping, Calibration and Land Application/Odor; and GPS (no quiz for GPS). So far, we have had 6 opportunities for manure applicators to become trained and certified. Those workshops have resulted in 40 people from 20 different companies attending a total of 129 individual training contacts.

Since manure applicators from other states also work in Illinois, it hard to say how much of the Illinois manure the companies

attending our workshops apply, but a conservative number would be 30%.

b. Impact -

"We just want to be proactive," said Michelle Stewart, co-owner of Stewart Spreading, a manure hauler in LaSalle County that has been working with University of Illinois Extension on the training program. "We'd rather step up to the plate and say, 'Yes, we are doing something, instead of having [state regulators] hound us."

"We need a policy in effect so that all employees know what to do if there is a problem in the field and know how to protect the environment, the customer and ourselves" noted Illinois applicator Rick Alton, Alton Irrigation, Rock falls, IL. "Just by having the program in effect and in front of the employees, we enhance (in their mind) that you don't want spills, so they check their equipment more often."

On the regulatory front, Illinois EPA ag waste engineer Lee Heeren sees applicator training as the key to problem prevention. "The trend is larger operations with more manure to handle. More and more farmers are looking at contracting that responsibility to someone else. People who specialize in this are more versed in rates, regulations and contingency plans." They know how to handle manure, and what to do if something goes wrong. "I encourage our applicators to get involved. (Every time they've gone to training), they come back with some positive things they can use in their own operation. If we can avert a spill here and there, it's very worthwhile"

c. Source of Funds – State, Federal

d. Scope of Impact – Illinois, Michigan, Wisconsin

Pond Management Seminars

a. July 7, 2005—Sam Smith, a farm pond owner in central Illinois, frantically calls his local Extension unit. Early this morning he went out to his pond only to find his biggest fish are either dead, or close to it. He suspects something has gotten into his pond and is killing his fish. The same day, Kent Montgomery from northern Illinois calls his Extension office. He has a large quantity of "pond weeds" on his pond, and he wants to know how to get rid of them.

These stories are typically replayed throughout many counties each year. Pond owners request information from University of Illinois Extension on aquatic plant management, fish and general pond maintenance. Unfortunately, by the time many realize they have a problem, it is too late to effectively address it.

To provide an effective program, the Extension's natural resources management team, after surveying interest from local Extension offices, decided to provide a 1 ½-hour, statewide teleconference/PowerPoint seminar for pond owners on November 9th (afternoon) and November 15th (evening). Offices were given a CD several weeks in advance containing PowerPoint files, fact sheets, a farm pond owner survey, Certified Crop Advisor sign-up sheets, a meeting evaluation form and basic instructions. Local site coordinators ran the PowerPoint shows, as presenters provided narration through the TeleNet system.

Statewide, 38 offices participated in the seminars, with about 22 offices participating in both the morning and evening sessions. Approximately 550 people participated over the two sessions.

Information from the pond owner survey will be used to provide follow-up programming for this topic. The survey contained questions relating to the age, size and use of the owners' pond, along with questions relating to aquatic plant and fish management.

b. Impact – Evaluations show that pond owners plan to use information from the seminar to properly manage fish populations, to watch closely for pond plant problems and to treat ponds for aquatic plant control earlier in the season. They are also now aware of potential oxygen problems in ponds, and they have ideas on how to alleviate this problem.

Quotes from participating Extension offices:

"It was very well presented, tied together very nicely, and it should be a regular annual program that we can count on as each year we have the need (to) teach new pond managers or new pond owners about this topic!"

"The PowerPoint and teleconferencing is very well suited for this type of topic! Each of us individually would not have the audience to justify the investment of time/travel, but collectively you can reach a good number this way!"

"What a success! The pond management telenet has been an achievement in program delivery. This program has great appeal for the farmer and the person with small acres."

"Great job by you and your team to pull this off. Please consider offering these opportunities in the future."

c. Source of Funds - State, Federal

d. Scope of Impact - Illinois

Key Theme – Wetlands Restoration and Protection

Flooding Impacts on Carbon and Nitrogen Budgets of Floodplain Tree Species

a. Progress - Nonstructural carbohydrates afford immediate or reserve capacity in plants to support growth and metabolism, including that associated with symbiotic function. Seasonal patterns in the tissue allocation and accumulation of nonstructural carbohydrates are particularly complex in large, temperate and boreal perennial plants and profoundly influence their growth, function, reproduction and ultimate survival. Such patterns have been little studied in perennial actinorhizal plants.

Our goal was to measure the seasonal accretion of nonstructural carbohydrates in leaves, stems, roots and nodules of Alnus incana subsp. rugosa in relation to changes in growth rate, accumulation of fixed nitrogen, and temporal regimes of imposed root hypoxia induced by artificial flooding. Nonstructural carbohydrate accretion was greater in foliage than in other tissues during spring (May 10-July 10) and summer (July 10- Sept. 10), shifting to stems, roots and nodules in the fall (Sept 10-November 8) in unflooded seedlings.

Nearly three fourths of the seasonal nodule growth and nearly two thirds of the seasonal root growth occurred in the fall. The accumulation of nonstructural carbohydrates relative to growth rates increased continuously from spring to fall in all tissues except nodules, which grew mostly in the fall while maintaining overall plant levels of N fixation similar to those of the summer season. Contents of nonstructural carbohydrates declined from November to the following July consistent with the depletion of winter reserves to support rapid early growth in the spring.

Mortality was complete for spring and summer flooded seedlings while those flooded in the fall did not die. Fall-flooded alders, however, accumulated lower levels of plant nonstructural carbohydrates than unflooded plants both in November and the following July after overwintering. The ratio of nonstructural carbohydrate accumulation to the accretion of fixed nitrogen increased from spring to fall in all tissues except nodules. In unflooded A. incana subsp. rugosa seedlings foliar nonstructural carbohydrate contents were reduced by 76% with a concurrent similar increase in stem nonstructural carbohydrate contents, indicating efficient resorption of foliar starches and sugars.

Fall flooding stopped root and nodule growth and diminished foliar nonstructural carbohydrate resorption to 55%, further reducing alder seedling capacity to support subsequent spring growth and vigor. This contrasts with the pattern of foliar N resorption which is low relative to other temperate deciduous trees, but which increases in efficiency with fall flooding. Results indicate that sugar and starch allocation and accumulation vary seasonally in A. incana subsp. rugosa seedlings and that environmental stress will differentially inhibit symbiotic function, other plant processes, growth, and survival according to season of occurrence.

b. Impact - Speckled alders are wetland trees that form extensive stands along streams, near lakes, in bogs and in wet meadows of the northern and eastern United States. Although clearly associated with wetlands, these trees are not tolerant of root inundation. They survive in wetlands by producing a shallow root system and root nodules giving the root system and symbiotic nodules access to oxygen to support root/root nodule growth and function.

Other alder species, such as red alders of the Pacific Northwest, can tolerate root inundation by floodwaters or fluctuating water levels for months at a time. Current studies indicate that hydrological changes that result in prolonged flooding would eliminate speckled alder seedlings and ultimately speckled alder stands which are an important source of nitrogen for supporting phytoplankton and, ultimately, fish productivity of associated streams and lakes.

The potential impact on alders and their watersheds due to hydrological changes in northern and northeastern lakes and streams can now be assessed more accurately. Hydrological projects which alter water levels and flow regimes in speckled alder communities can be assessed more precisely for impact on the larger ecosystem as a result of research findings to date. Deleterious impacts on associated sport fisheries can thereby be avoided.

c. Source of Funding – McIntire-Stennis Funds

d. Scope of Impact – National

Farm and Watershed Level Policy Analysis: Agro-Environmental Implications

a. Progress - Research was undertaken in two areas. The first area examines the efficacy of existing land retirement programs, the Conservation Reserve Program (CRP) and a supplementary program, the Conservation Reserve Enhancement Program (CREP) in Illinois. This research examines the extent to which both programs are abating off-site sediment loadings and analyzes their cost-effectiveness using data on actual enrollments in these programs in a watershed in Illinois. We then analyze the impact of differences in program design and selection mechanism on the performance of these programs.

Second, this paper examines the land parcels that could have been enrolled in CREP to achieve its current level of sediment abatement more cost-effectively. We also explore ways in which CREP could be redesigned to improve program targeting and cost-effectiveness and achieve the purpose of improved targeting for which it was created.

We first develop a conceptual framework to analyze the problem of a social planner selecting land for retirement to reduce sediment loadings. For our numerical analysis we combined a hydrological model together with detailed GIS data about location and physical attributes of land parcels enrolled in CRP and CREP in the La Moine watershed in Illinois to evaluate the extent to which enrollments are abating sediment and the cost at which they are doing so. Our results show that the average cost of sediment abatement differs considerably across programs in this watershed. Relative cost-effectiveness of CRP can be explained by its ability to enroll land parcels that have a higher slope, a higher erodibility index, higher on-site erosion and a lower soil rental value than CREP. We also find that while CREP has been able to reduce sediment loadings it has done so at a much higher cost. Actual land retirement acreage and program cost are more than three times as large as those in the cost-effective land retirement scenario for CREP.

The second area analyzes incentives for the adoption of efficiency-enhancing technologies and its implications for policy. We analyze the decision problem of a regulator allocating scarce water among

agricultural users when there is asymmetry of information about their type or land quality and its implications for the adoption of modern irrigation technologies. Adverse selection is found to significantly reduce the adoption of modern irrigation technology. We show that even with asymmetric information, incentives for water trade can exist and lead to additional technology adoption with gains to all parties. We also examine the potential for achieving economic growth while preserving the environment through investment in efficiency enhancing technologies. We derive conditions under which individual preferences for environmental quality and private incentives for investment in such technologies can preserve environmental quality while allowing economic growth even in the absence of environmental regulations. Conditions under which these technologies can enable an environmentally regulated economy to achieve a higher rate of sustainable balanced growth than otherwise are analyzed.

b. Impact - Our analysis has several useful policy implications for CREP.

Given a sediment goal, our results suggest that the eligibility criteria for land parcels enrolled in CREP should be expanded to include sloping, less productive cropland within a specified buffer.

Second, buffer width could be substantially narrower than the typical flood plain along the main tributaries of the Illinois River.

Third, the requirement for enrolling 85 percent of cropland from riparian areas and only 15 percent from highly erodible areas should be removed.

Fourth, instead of 'first come, first enrolled' with maximum rental payments for a soil type, there is a need to introduce competitive bidding.

Finally, some proxies for environmental benefits from enrolling a parcel in CREP should be developed and geographical criteria for eligibility should be supplemented with a mechanism for selecting parcels based on a benefit-cost ratio.

We suggest practical approaches to facilitate this and improve the targeting of CREP. Our results on irrigation technology adoption suggest that under asymmetric information, even a thin secondary market can improve the allocation of water resources and induce additional adoption of modern irrigation technologies. Finally, our dynamic model suggests that pollution taxes or a combination of

input taxes and technology subsidies can be designed to achieve economic growth while preserving environmental quality.

c. Source of Funding – Hatch, State, Other Federal Funds

d. Scope of Impact – National

CSREES GOAL V – Enhanced Economic Opportunity and Quality of Life for All Americans

Indications of the Scope of Research and Extension Programs under Goal 5 - See Appendix A.

Total dollars investing in research related to Goal 5 represent only about six percent of the College's research portfolio with 2005 investments of $ 2.5 million and about 80 percent of that funding coming from non-federal funds. About 44 percent of Extension's efforts were directed to Goal 5 roughly the same percentage as last year. Fully one-third of face-to-face program delivery by Extension staff was directed towards Goal 5 objectives. The unduplicated count of 4-H youth rose slightly in 2005 to a total of 292,302 4-H members.

Key Theme – Agricultural Financial Management

2005 FAST (Farm Analysis Solution Tools) Workshops
http://www.farmdoc.uiuc.edu/fasttools/index.asp

a. FAST (Farm Analysis Solution Tools) are a suite of Microsoft Excel spreadsheets designed to assist those in agriculture make better decisions via user-friendly computer programs. FAST aids users in performing financial analysis, assessing investment decisions and evaluating the impacts of various management decisions.

In 2005 a series of five workshops were held throughout Illinois to provide 395 landowners, operators, lenders, and other agribusiness people with hands-on experience using these analysis tools.

b. Impact B Evaluations of similar programs in the past have shown that more than 90 percent of participants find such sessions useful or very useful. For example, an evaluation of the FAST workshops conducted in 2003 found that 98 percent of the participants found these workshops useful or very useful.

Using a conservative coefficient of 90 percent, **at least 540 Farm Income 2005 Workshop participants** would have found the workshops useful or very useful and more than half, **at least 300** would use the information in decision-making.

c. Source of Funding B Local, State, Federal

d. Scope of Impact - Illinois

Market Risk Management, Information and Price Relationships: Illinois Commodities

a. Progress - Research evaluated several dimensions of market risk management, information, and price relationships important to participants in many agricultural markets.

One area of research focused on factors that drive derivative usage in small and medium-sized enterprises (SMEs). The influence of these factors on hedging behavior cannot a priori be assumed equal for all SMEs. To address this heterogeneity, we proposed a generalized mixture regression model which classifies firms into segments so that their hedging response to the determinants of derivative usage is the same within each segment. Using a unique data set of 415 SMEs in the hog industry, we found that factors like risk exposure, risk perception, risk attitude, and the decision making unit, among others are useful in explaining hedging behavior. However, the effects of these factors are not homogeneous across firms, and the roots of the heterogeneity can partially be traced to differences in attitudes, perceptions, and to differences in ownership structure.

Academically, the results identify factors that influence derivative use, and demonstrate that heterogeneity is critical to developing an appropriate understanding of hedging behavior. From an industry perspective, the results identify the importance of the decision making unit which suggests that managers of SMEs rely heavily on the expertise and advice of consultants and bank account managers. Hence, the use of derivatives among SMEs can be stimulated through targeted programs that promote the advantages of derivatives to the members of these support groups.

Second, the heterogeneity in derivative use suggests that financial institutions need to use varied hedging mechanisms to attract different segments. Another area of research provided an overview of the issues and research questions in agricultural futures markets. Futures markets have experienced a dramatic growth over the last 20 years with most of the increase outside of the U.S. There has been a continual introduction of new contracts, new trading rules and systems, and changing corporate structure and affiliations among futures market exchanges. We reviewed selected research and contributions to agricultural commodity futures and options markets, focusing on the recent empirical contributions aimed at resolving the most current issues and identification of future research challenges. The review provides a discussion of the

empirical contributions in inter-temporal price relationships for storable commodities, hedging, and price behavior.

Other research has investigated the ability of selected agricultural futures and options markets to forecast price and its volatility. Volatility forecasts are particularly useful in identifying the price risk associated with buying or selling at specific points in the future. Work on the corn and soybean markets suggests that the implied forwards volatilities generated by the options incorporate effectively market information in their forecasts of price variability in the future. However, the implied forward volatilities for wheat and hogs are much less effective.

b. Impact - We continue to provide information of value to industry and to the dialogue that exists among professionals interested in these areas. AgMAS continues to provide information to producers on the efficacy of their marketing alternatives and decisions. Findings from our research also have been used to develop a new generation of pricing contracts offered by the grain industry. Research also has identified the importance of heterogeneous behavior in explaining producer use of derivatives. This finding highlights the activities in the grain industry to customize risk management opportunities and signals that exchanges who provide the underlying risk management platform should consider a wider portfolio of risk management instruments. On another level, our research has introduced novel procedures and constructs to the agricultural economics literature that will be used in future analysis of marketing behavior and industry performance. It has also highlighted what is known about two primary risk management tools in agriculture, futures and options markets, and what yet needs to be understood.

c. Source of Funding – Hatch, State, Industry Funds

d. Scope of Impact - Illinois

Agricultural Finance Markets in Transition

a. Progress - Outcomes and activities of the NCT-194 project included extensive multi-university collaboration and joint research on topics related to supply of capital in agricultural and rural markets. The annual meeting was held at the Federal Reserve Bank of Chicago with approximately 75 attendees. The annual meeting included a panel presentation from participants in the failed merger attempt between Rabobank and the FCA of America Association. This work

led to related academic work analyzing the merger and includes a series of papers published in follow-up to the failed merger.

The committee also assembled a set of special papers to be published as a special issue of the Agricultural Finance Review. In addition, a pre-session at the AAEA has been organized as a result of this committees work, and an additional proposal for a special selected paper session at the annual meeting submitted. The committee continued a tradition of organized collaboration among universities and industry representatives in agricultural finance. There were sessions and papers presented (and proceedings published) that related to government programs in agricultural finance, investment characteristics of agricultural assets, crop insurance, and the potential for loss of data sources at the ERS.

b. Impact - The project resulted in a substantial number of publications, many of which were coauthored across multiple institutions. It also resulted in a special edition of the Agricultural Finance Review with a series of invited papers that will also serve to guide the research agenda of future committees.

c. Source of Funding – Hatch, Multi-state, State, Industry, Other Non-Federal Funds

d. Scope of Impact - AL, AR, FL, GA, IL, IN, IA, MI, MN, NJ, NY, ND, OH, PA, TX

Economic Performance of Market Advisory Services

a. Progress - The AgMAS Project has monitored and evaluated about 25 advisory services each crop year since 1995.

The most recent results from the evaluation of corn and soybeans advisory services used data over 1995-2001. When both average price and risk are considered, only a small fraction of services for corn and a moderate fraction for soybeans outperformed market benchmarks. On the other hand, a majority of the services outperformed a farmer benchmark for both crops. Since farmers can subscribe to one or more services it is also important to analyze the potential risk reduction gains from diversification across market advisory.

Results show that increasing the number of (equally-weighted) services reduces portfolio expected risk, but the marginal decrease in risk from adding a new service decreases rapidly with portfolio size. The risk reduction benefits of naive diversification among

advisory services is relatively small compared to the results obtained in previous studies for stock portfolios, and this is mainly because advisory prices, on average, are highly correlated. A one service portfolio has only a 20%, 16% and 32% higher standard deviation than the minimum risk naive portfolio for corn, soybeans and 50 /50 revenue, respectively. Most risk reduction benefits are achieved with small portfolios. For instance, a four service portfolio has only 5%, 4% and 9% higher risk than the minimum risk naive portfolio for corn, soybeans and 50/50 revenue, respectively.

Based on these results, there does not appear to be strong justification for farmers adopting portfolios with a large number of advisory services. Farmers may well choose portfolios with as few as two or three programs, since the relatively high total subscription costs associated with larger portfolios can be avoided while obtaining most of the benefits from diversification. Further research was conducted to estimate marketing profiles and loan deficiency payment/marketing loan gain profiles for the advisory services followed by the AgMAS Project for the 2001 corn and soybean crops. Marketing profiles are constructed by plotting the cumulative net amount priced under each program's set of recommendations throughout a crop year. Loan deficiency payment/marketing loan gain (LDP/MLG) profiles are constructed by plotting the cumulative percentage of the crop on which the LDP/MLG was claimed during the crop year. Marketing profiles provide information to evaluate the style of advisory services in several ways.

The percentage of crop priced is a measure of within-crop year price risk. The higher the proportion of a crop priced, the lower the sensitivity of the farmer’s position value to crop price changes. For example, when 100% of the crop is priced there is no price sensitivity, which means that changes in price do not affect the value of the farmer’s position. On the other hand, when the amount priced is 0%, the value of the farmer’s position will vary in the same proportion as the change in price. Marketing profiles, therefore, allow investigation of the evolution of price sensitivity under each service’s set of recommendations along the marketing window.

b. Impact - The research provided valuable information that will improve marketing decisions of crop producers. The results suggest that corn and soybean producers can improve their revenue per acre by about 12 dollars per acre by following the services' recommendations. While this was not without substantial risk, this improvement also is not inconsequential when compared to the net

returns experienced in recent years. Finally, the research has had a positive impact on the way grain is marketed in the U.S. through the stimulation of new and innovative marketing contracts.

Specifically, the findings have been used as the empirical foundation for a new generation of pricing contracts offered to producers by the grain industry. Firms such as Diversified Services, Cargill and e-markets have developed new contracts that simply assure that producers receive the average price for grain over some pre-specified time period. An example of the influence of AgMAS research in this regard can be found at the e-markets website. The use of these new-generation marketing contracts appears to be growing rapidly.

c. Source of Funding – CSREES Grant Funds

d. Scope of Impact – National

Key Theme – Child Care/Dependent Care

S.A.F.E. Club

a. The intent of S.A.F.E. Club is to provide a "safe" place for elementary children before and after school while developing the children's social and educational skills. It is offered on school days from 7:00-8:15 a.m. and 3:15-6:00 p.m. for elementary children who need before and/or after school care. Capacity is currently limited to 21 children due to the size of the facility.

With nearly a decade of operation, S.A.F.E. Club offers between 35 to 40 youth a variety of activities including arts and crafts, recreation and games, reading, music, time for homework, and free time for the children to pursue their own interests in a safe environment. A typical day will include free play, a nutritious snack, organized outdoor or gym activities, large group free time, and learning centers with a choice of various activities such as crafts, games, puzzles, and a homework center. These activities are changed on a regular basis to insure continued interest.

b. Impact – Annual evaluations by parents find children increase their level of life skills and appreciate supervised homework time and having a safe place to be.

c. Source of Funding – Local, State, Federal

d. Scope of Impact - Illinois

Taking Care of You: Powerful Tools for Caregiving

a. As the population of the United States ages, many families are faced with providing care for multiple generations. According to a report by the National Council on Aging, 80% of all care provided to older people in our country is provided by family members. According to the United States Census, this adds up to over 23 million people, or one fourth of all households, who provide long term care to an older relative.

The number of Americans over age 65 is expected to increase from 34 million in 1995 to 62 million by 2025. It is estimated that 12 million older adults will require some form of long term care by 2020.

Caring for an ill or disabled family member or friend is often rewarding but it can also be very stressful. Research shows that caregivers are at higher risk for depression and stress-related illness than non-caregivers. As caregiver burden increases, the health of the caregiver often declines. Family and interpersonal relationships are often impacted by the stress of caregiving.

Family Life Educators licensed as Master Trainers have worked closely with area agencies on aging to provide class leader training workshops on an annual basis since 2001. These are intensive three day sessions that provide participants with all materials and certification to implement the class series in their communities. Participants have included aging network staff, clergy, nurses, counselors, hospice workers, and staff from the Illinois Department on Aging.

Totals of the surveys returned indicate that as a direct result of this training, over fifty class series have been held in Illinois, reaching over 450 individual caregivers. Five new support groups have been started as a result of the class series.

b. Impact – In pre/post participant surveys, over 90% of caregivers reported they felt their stress levels were reduced and they were taking better care of themselves. Over 80% felt they had improved their communication skills. Just a few of the comments include:

- I took a vacation for the first time since my husband got sick.
- I’m taking better care of myself so I’m a better caregiver.

- I used “I” messages during the care conference with nursing home staff.

- Using the deep breathing exercises before I go to bed has helped me sleep better.

- My daughter-in-law told me I’m using words she never heard me say before.

- My daughter jumped on me about not keeping her dad shaved. I didn’t say anything back to argue, but later I told her I felt hurt, using “I” messages. Before this class, I would never have told her I was hurt, I would just have cried inside.

Applying the results to the 450 caregivers known to have been trained:

More than 400 caregivers have experienced a reduction in stress.

More than 360 caregivers reported improved communication skills.

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Key Theme – Children, Youth, and Families at Risk

A Five-Year Study of the Impact of Welfare Reform on African American Families and Children in Chicago

a. Progress - The research addressed a critical research and policy question: How will poor families be affected by recent changes in welfare regulations? Such changes include a mandatory work requirement, time limits on the receipt of assistance, and no additional aid to newly born children. To address this question, a purposive, community-based sample was drawn to include African American mothers with at least one child between the ages of 0 and 4 and who received government welfare income.

Intensive ethnographic research methods were used to understand how families fared. Specific data collection strategies entailed in-depth interviews with mothers, observation of families within their homes and in other neighborhood settings, and unobtrusive

neighborhood observations and resource mapping. Key topics explored in interviews and observations focused on daily routines, social support, male-female relationships, neighborhood resources, welfare and work histories, childcare strategies, and other related areas.

Grounded theory guided analyses and key insights were allowed to inductively emerge from the data. Data analysis included verbatim transcription of interviews, coding of transcripts and field note descriptions of observations. Insights from the data covered key areas: Knowledge of Current Changes: Women varied in their knowledge of new welfare regulations. For the most part, women had only a partial understanding of the changes. In other cases, this knowledge was inaccurate.

Response to Changes: All of the women acknowledged the importance of required employment. Yet they believed that reform proposals did not address key issues, such as limited availability of jobs in inner-city neighborhoods, inadequate childcare options, and broader family responsibilities (caring for elderly or disabled family members).

Most women believed that the withdrawal of government benefits to additional children was discriminatory and that time limits to become gainfully employed did not adequately reflect the time needed to transition to economic independence.

Coping Abilities of Families: While many of the women in the study were unmarried, 'single' mothers, they were often part of extended kin networks. These networks varied in terms of their composition and resources available to mothers. Women's responses to welfare reform varied depending on characteristics of the social support network. Poor women with more affluent network members drew upon these kin coalitions for economic and childcare support. Women with poorer network members had already exhausted their resources prior to welfare reform and were more negatively affected in their family functioning and parenting abilities.

b. Impact - Limited research exists on the impact of welfare reform on families and this study offers insights for researchers concerned with family functioning and policy makers concerned with policy implementation.

For family researchers the findings suggest the characteristics of vulnerable and resilient families as they responded to the mandates of welfare reform. Resilient families with resource-rich kin support were more likely to transition to economic independence, while providing supportive care for their children. The converse was the case for women with impoverished or limited network support.

The research also suggests that family resilience and vulnerability are related to neighborhood context. Impoverished, inner-city neighborhoods placed additional coping demands on families as they sought employment and quality childcare. The research suggests the importance of policies that consider the variable coping abilities of families. As they seek economic independence, vulnerable families will require more assistance than more resilient families.

Policymakers also will need to consider key barriers to economic independence for poor African American women such as limited jobs in the inner-city and reliable, high quality childcare. Without attention to these key issues, a sizable number of women will remain unable to secure jobs that pay a living wage and adequately care for their children.

c. Source of Funding – Hatch, State Funds

d. Scope of Impact - Illinois

Families United for a Stronger Education (F.U.S.E.)

a. The Families United for a Stronger Education (F.U.S.E.) program serves Latino families with the goals of increasing awareness of higher education, knowledge of culture and positive family relationships. In the summer of 2003, University of Illinois Extension and Sauk Valley Community College collaborated to begin a Bilingual Mothers with Daughters Program. Bilingual Mothers with Daughters is based on a program from Oregon State University Extension.

The Bilingual Mothers with Daughters program was later renamed Families United for a Stronger Education and now includes all family members, regardless of gender. As Educators for University of Illinois Extension, it is our goal to expand knowledge through research-based educational programming. Our educational

programs reflect the Experiential Learning Model, in other words, learning by doing hands on activities.

The rationale for offering the program involved analyzing many sources of data. Census data indicated a large population of underserved Hispanic/Latino families, poor educational outcomes, and a high teen pregnancy rate. Extension was uniquely poised to meet the needs of this population through our partnership with local community agencies and institutions.

Given the above information, along with qualitative data gathered f rom Hispanic/Latino families, the F.U.S.E. program has the following goals:

- Increase awareness of higher education opportunities, processes, and provide greater exposure to higher education systems.
- Increase awareness of the contributions the Hispanic/Latino culture has had in America.
- Increase knowledge of how cultural heritage impacts our daily lives.
- Start a bilingual 4-H Community Club.

b. Impact – Mothers completed a twenty-question survey and eight of the twenty increased a full point or more, as a result to F.U.S.E. programming. Some of those questions and average values were:

Question	Back…Before I participated in Bilingual Mothers with Daughters	Now…After I participated in Mother with Daughters	Increase
Had/have control over own personal goals and future	2.25	3.5	1.25
Showed I Care	2.3	3.3	1
Plan to finish high school	2.5	3.5	1
Plan to go to college	2.25	3.25	1
Met someone of Latino/Hispanic heritage with a college degree	1.7	3.3	1.6
Encouraged daughter to reach her goals	3	4	1

Daughters also completed a twenty-question survey and 13 questions rose ½ a point or more as a direct result of the Bilingual Mothers with Daughters program. Some of those questions and average values were:

Question	Back…Before I participated in Bilingual Mothers with Daughters	Now…After I participated in Mother with Daughters	Increase
Planned/Plan to finish high school	3.1	3.75	.7
Planned/Plan to go to college	3.1	3.9	.8
Have visited a University	2.8	3.5	.7
Met someone of Hispanic/Latino heritage with a college degree	2.7	3.2	.5
Manage stress positively in my life	2.25	3.1	.85

Participants were asked to answer the question, "As a result of participating in the Mothers with Daughters Program…," and their answers certainly demonstrate impact.

"We communicate more"

- 4 mothers and 4 daughters"

"I spend more time with my mother/daughter now"

- 6 mothers and 3 daughters

"It is very impressive because before I didn't talk to her (mother) and now we are very close"

"From now on I am going to encourage my daughter to go to college"

c. Source of Funding – State, National

d. Scope of Impact - Illinois

Key Theme – Community Development

Community Swap

a. Since 1993 more than 182 communities have participated in a U of I Extension Community Swap. Teams of visitors "swap" communities for a daylong visit, where they pose as tourists, prospective business owners, relocating families, or out-of-town shoppers. The teams visit downtown areas, business districts, community entrances, neighborhoods, parks, and other public places. Each team later shares its objective impressions of the host community, describing the features which were most attractive and offering suggestions for improvement. The visiting community shares this information through a written report and color slides presented at a town meeting.

To determine what has happened as a result of these community building efforts, swap leaders were surveyed three to five years after completion of the "swap"program.

b. Impact - Each swap typically involves 17 people in the planning and actual exchange and result in the following outcomes:

Influenced Comprehensive Planning	33.3%
Influenced Development or Refinement of Economic Plan	44.4%
Influenced "Operation Main Street" or a Similar Program	18.5%
Anything Else	25.9%
Community Swap has not Influenced Anything	22.2%

In addition, 70% of participants stated something that changed their community because of Community Swap. The most common changes mentioned were "Changes in street signs improved community appearance" and "Better planning tools; we now have an economic development plan". The most commonly stated use of the data provided by community swap was "Allows us to address our weak areas and take actions to fix them" .

Respondents declared that the most important outcome from Community Swap was "Provided a unique outsider's look at our community", & "Awareness of what other people think of our community." Almost entirely all the respondents (96%) stated that they would recommend Community Swap to other communities. Mostly, respondents recommended Community Swap because it allows "Small communities to pause and reflect about what makes up their communities and how it will thrive in the future" and

"Community Swap speaks to the citizens who can make things happen, in small ways, while letting the city's government know changes is possible".

c. Source of Funding – Local, State, Federal

d. Scope of Impact – Illinois

Rural Seniors & Their Homes

a. The growing number of seniors in Hancock County has prompted local economic development groups to look more closely at caring for their senior population. Seniors are living longer and staying healthier than at any point in history, yet most seniors reach a point when they need some assistance with the activities of daily living.

In Hancock County, 18.2 percent of the population is 64 years of age or older. This figure represents about 3,600 seniors. Nationally, it is projected that the number of older households in the United States will grow by nearly 53 percent between 2000 and 2020.

First and foremost communities need to be sure that adequate affordable housing is available that will allow seniors to live independent, healthy, and active lives.

While most seniors wish to remain in their homes for as long as possible and want services in their communities rather than in group settings such as nursing homes, unique challenges often complicate the provision of adequate and affordable housing for older persons in rural America. To meet the changing needs of people as they grow older communities should consider providing adequate housing at three different levels.

A second level of housing for seniors provides supportive services for activities of daily living. By combining apartment-style housing with personal care and other services, residents can live independently and take part in decision-making. Communities throughout Illinois are creating these types of supportive living facilities.

Although nursing homes provide an important care option, only a small percentage of seniors will actually require nursing home services.

As part of the comprehensive planning process for the City of Carthage, University of Illinois Extension conducted a community-wide survey in the spring of 2003. Five- hundred fifty-eight

households, 46.5% of all households in Carthage, completed surveys. Two housing issues, increasing the stock of affordable housing and building special housing for older adults, were ranked third and fourth on the list of priorities with slightly more than 60% classifying these as high or very high priorities.

During the subsequent 18 months, University of Illinois Extension led a local senior housing study team. The committee included bankers, realtors, health service providers, seniors, and county economic development staff. What began as a Carthage-only development effort, expanded to include the entire county

A series of community meetings were held to both provide information about alternative senior housing options and to learn more about local concerns regarding senior housing. In each community meeting, Extension staff facilitated a guided discussion to discover local needs and capacity to support senior housing development.

University of Illinois Extension facilitated additional outside expert review of the local situation, follow-up visits to each of the communities by Area Office on Aging staff and HUD project consult further solidified the community's positions and understanding of housing funding options.

During the summer of 2005, a HUD application was submitted. The proposed building for the housing project would be of wood frame construction with a total of 7,420 square feet.

The project(s) will consist of (two- three) eight one-bedroom living units, one two-bedroom living unit, community room, small office, public toilet, laundry room, janitor's closet/mechanical room, and four small storage rooms off the main, interior corridor.

All living units will have a living area, private bathroom with shower, toilet and sink/vanity, private kitchen and two (interior and exterior) entrances. The exterior entrances will have small concrete porch.

b. Impact – A Housing and Urban Development (HUD) Section 202 application submitted in May of 2005 for affordable housing to be located in Carthage, Illinois was awarded for 1.4 million dollars.

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

The Illinois Rural Recreation Development Project

a. The Illinois Rural Recreation Development Project (IRRDP) helps rural communities to develop sustainable local recreation and leisure services in collaboration with organizations and individuals in rural communities. IRRDP believes that recreation and leisure are essential to enhance individual and community life, and that rural communities are valuable and deserve recreation and leisure opportunities. Rural communities, however, lack resources and professional leadership for the provision of general recreation and park services.

   In 2005 eight communities participated in IRRDP. Also, one community became self sufficient; meaning it now operates without direct IRRDP support.

b. Impact – Overall, approximately 720 youth and 80 adolescents (i.e., youth leaders) were served through the program.

   The annual program evaluation revealed that on average, youth participants made five new friends through the program and over 75% (of the youth) stated that being in the program made them want to play outdoors more often. This is a significant finding since being indoors has been shown to be the most important predictor of childhood obesity.

   Satisfaction among parents of participants remained relatively high (i.e., 8.1 on a 10-point scale).

   In 2006, IRRDP staff will focus on two areas:

   1. Helping towns identify funding sources that will foster sustainability.

   2. Developing a “Train the Trainer” program for camp directors to train their own camp staff.

c. Source of Funding – Local, State, Federal

d. Scope of Impact - Illinois

Urban Nature and Human Autonomic Functioning

a. Progress - The research is designed to determine the dose-response curve for the effect of urban nature on physiological responses to stress in humans. The central hypothesis is that moderate increases

in exposure to urban nature (in the form of trees, grass, and open spaces) results in measurable reductions in blood pressure, heart rate variability, and hormonal levels associated with stress. Through a series of studies, we will determine the dose of nature (concentration, duration, and frequency of exposure) necessary to produce autonomic profiles indicative of low risk for cardiovascular disease and stroke.

b. Impact - There is a critical gap in our knowledge regarding the shape of the dose-response curve for the effect of nearby nature on autonomic functioning. We expect to determine the dose of nature (concentration, duration, and frequency of exposure) necessary to produce autonomic profiles indicative of low risk for cardiovascular disease and stroke. Thus, the research proposed in this application is significant, because it is expected to provide the knowledge necessary to help reduce the incidence of cardiovascular disease and stroke, the number one and number three killers of North Americans, respectively.

As an outcome of these studies, there is the promise of new preventative strategies for the treatment of chronic autonomic activity associated with stress. These new approaches are expected to augment the efficacy of traditional therapies significantly, especially for the 80 percent of Americans living in metropolitan areas, many of whom have little or no contact with nearby nature.

In addition, the findings may be particularly important for African American residents of inner city neighborhoods due to the combination of increased risk that African Americans have for cardiovascular disease and stroke and the paucity of nature in most inner city neighborhoods. Finally, we expect the results will fundamentally advance the fields of environmental health and urban design.

c. Source of Funding – Hatch, State Funds

d. Scope of Impact – National

Key Theme – Family Resource Management

Financial Security in Later Life (FSLL)

a. People need to plan and take action for their financial security in later life (FSLL). Several societal factors have led to an increased need for an understanding of investment options and strategies; these changes include increased longevity and a change in employer-sponsored retirement plans. People are living longer and can expect to spend about one-fourth of their lives in retirement. Spending more time in retirement means that people need more resources when they retire.

University of Illinois Extension offers a variety of programs to assist people in implementing strategies to help insure their financial security in later life.

Among them are "Financing Options for Long-Term Care" teleconferences which reached 362 participants over the last two year.

Plan Well, Retire Well: Your How-to Guide website is designed to help young adults. Since going online in November 2003, the website has had over one-quarter million hits with 12,716 unique users.

Several workshops around the topic *of Planning for "What If…?" Tools for Protecting Your Family and Managing Your Assets* were taught in the Chicago area. Through these workshops people learn about the tools they can use in the event of disability, incapacity, death, marriage, remarriage, and divorce.

In the last two years, 911 participants have completed a Financial Security in Later Life related program.

b. Impact –

Knowledge Change as a Result of FSLL Related Programs

FSLL Evaluation Indicator	Number of Participants
Increased their financial literacy related to later life issues.	816
Increased their knowledge of risks, costs, and financing options for health (including long-term care).	154

Planned or Actual Behavior Changes as a Result of FSLL Related Programs

FSLL Evaluation Indicator	Number of Participants
Plan to utilize recommended financial management practices (e.g., calculate net worth, determine marginal tax bracket, develop and use a budget, etc.)	183
Have utilized recommended financial management practices (e.g., calculate net worth, determine marginal tax bracket, develop and use a budget, etc.)	185
Plan to manage their use of credit, reduce debt and/or reduce household spending in light of their long-term goals for later life.	356
Plan to initiate or increase contributions to a retirement savings plan.	322
Have initiated or increased contributions to a retirement savings plan.	2
Have determined retirement and/or future income needs.	106
Have developed a plan to achieve retirement and/or future income goals.	332

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Key Theme – Farm Financial Management

Annie's Project

a. According to the latest Ag Census numbers, Illinois has 5,253 of its 76,000 farm operated by women. This under-served audience sold over 182 million dollars in agricultural products from 726,000 acres in 2002.

Annie's Project began in February 2003 and is an educational program for Illinois farm women designed to accommodate women as principle farm operators and women who marry into farm operations. In phase one of Annie's Project, 86 Illinois farm women participated in a six-week management course delivered through seven community colleges. Women worked on the computer, Internet and gained organizational skills while learning how to put together a business plan and become a better business partner. Two programs, which developed out of the original curriculum, attracted another 153 women interested in grain marketing and farm financial record keeping using commercial financial software. The three software packages women trained on were QuickBooks™, Quicken™, and PCMars™.

b. Impact – 239 women with increased farm management skills

- A baseline survey revealed that women who are in Annie's Project generate average revenue of $212,000 per farm. (Total revenue: $50,668,000). Women gained a healthy respect for the role they play in managing such wealth and investments.

- Evaluations revealed a higher level of motivation to keep financial records on a regular schedule, more confidence in what women were asked to manage and a greater sense of contributing to a successful business, which they are beginning to better understand. Women also found value in the networks they developed with other women enrolled in the program.

c. Source of Funding – State, Federal (including USDA Risk Management Agency

d. Scope of Impact - Illinois

Key Theme – Impact of Change on Rural Communities

Rural Community Impacts of Structural Changes in Farmland Leasing

a. Progress - Two common and contrasting Midwestern rural community contexts, a stable, small and traditional agrarian community, and a rapidly growing and changing post-agrarian community, were studied ethnographically to document the diverse experiences of how older rural adults are 'aging in place'.

Healthy older adults over the age of 60 living independently were the focus, with 29 interviewed in the stable agrarian community and

35 interviewed in the larger, rapidly suburbanizing community. For different reasons, the established social bases on which older adult residents form their behaviors, networks, and psychological orientation tend to erode in these changing communities. As a result older adults are forced to adapt and in the process may experience higher levels of disengagement and stress. Control of farmland was the traditional mechanism held by the aging to assure family support as they became more dependent. As farms have concentrated and children outmigrate farmland ownership is becoming less of a predictor for care of aging landlords. In the agrarian community, in particular, those aging farmers who own around 300 acres or less expect their children to sell, in contrast to historic traditions of never selling farmland owned by the family.

No evidence was found, however, that older adults in either community have a problem getting the help they need, whether it is through informal or formal support networks, or where informal support networks are lacking in the rapidly suburbanizing community an array of formal services are readily available. But every change affects how those aging in place maintain their social capital, connectedness, and sense of community and therefore the well being of older adults, as well as their ability to continue living independently as they age in their communities. The research fills a gap in our understanding of a 'community effect' shaping the aging experience in diverse, small communities, and of how population growth or decline alters the opportunities, experiences, and institutions of import to older persons.

b. Impact - An unintended consequence of farm consolidation and suburbanization of rural regions is the decline in numbers of younger families who traditionally cared for dependent elderly. A 'community effect' from agricultural sector restructuring is that rural elderly aging in place are living through urban-like experiences of isolation and marginalization. This research indicates that our rural health care delivery policies must address this rapid change of taken-for-granted community support for a dependent population becoming most characteristic of rural places.

c. Source of Funding – Hatch, State Funds

d. Scope of Impact – National

Impact of Technology on Rural Consumer Access to Food and Fiber Products

a. Progress - Scientists from 11 states are exploring the attitudes of rural consumers toward television and Internet sources for information search and purchase of food and fiber products.

Experimental data collected from 358 rural consumers in six states suggest that exposure to Internet sources leads to positive changes in attitudes toward the sources, but exposure to home shopping networks leads to negative attitudinal changes. Publications describing this research are in progress. These experimental consumers were surveyed in late 2002 to early 2003 to determine effectiveness of incorporating hands-on experiences on actual purchase behaviors. Survey data collected from 2,198 rural consumers in 11 states were analyzed to test Roger's Diffusion of Innovation theory; data suggest factors that speed up or slow down the adoption of the Internet for purchase of products. Furthermore, factors have been identified that discriminate between adopters and non-adopters of the Internet for purchases.

Additional analyses of these data include determination/development of the following: a) indifferences in information search based upon product category and demographics, b) levels of satisfaction with product sources, c) levels of innovation of adopters of the Internet for purchases, d) effect of perceived time poverty on frequency of Internet purchases, and e) a profile of adopters and non-adopters of the Internet for purchasing products. Fact sheets have been developed to describe progress on this project. Follow-up panel data are currently being integrated into existing data and manuscripts are being prepared.

b. Impact - Eleven states are participating in this regional research project that accesses rural consumer shopping patterns and attitudes toward the use of computer and television shopping technologies.

The project will increase understanding of rural consumers and will facilitate development of programs and familiarize rural consumers with the broad array of product information about and convenient sources of food and fiber products. These data will also help rural retailers adjust to the changing marketplace, thereby enhancing economic and community development in small town areas.

All consumers purchase food and fiber products, making the project relevant to all areas of the U.S. In particular, non-metropolitan areas in the U.S., being a growing segment of the population, will benefit.

Specific outcomes include the following: a) decrease barriers to consumer use of emerging communication technologies, b) provide basis for development of Extension consumer counseling programs related to survival and quality of life in rural communities, c) inform both product and service providers as well as consumers about access to product information, d) develop Extension and rural community programs that strengthen rural small business development through technology transfer, and e) help small retailers incorporate appropriate technologies into their business operations to adjust to the changing business climate in the 21st century.

c. Source of Funding – Hatch, State Funds

d. Scope of Impact – National

Key Theme – Parenting

Intentional Harmony
http://web.aces.uiuc.edu/IntHarmony/

a. Most Americans are employed, at least part-time. The U.S. Department of Labor reported that 146.5 million Americans were employed midyear in 2003. Recent studies have reported that most people work more hours than they would prefer, and one third of American workers chronically feel overworked. Work-life conflict can have serious effects on emotional and physical well being and on relationships with family members. At work, stress is associated with increased dissatisfaction and absenteeism, low or compromised productivity, conflict with co-workers, worker turnover, and higher health insurance costs. Many employees increasingly find it difficult to manage the demands and rewards of work as well as the demands and rewards of personal and family life. These and other changes in the structures of families and realities of the workplace have resulted in renewed concern about managing work and non-work life.

The program that we developed is entitled ***Intentional Harmony: Managing Work and Life***. The overall goals of this comprehensive curriculum are to: increase knowledge of the causes, correlates, and outcomes of work-life stress; reduce the experience of work-life stress; and increase the use of adaptive work-life management strategies among program participants. The specific goals vary by module. The modules correspond to managing work and six domains of non-work life:

1. Work and parenting.
2. Work and relationships with a partner or spouse.
3. Workplace stress (workplace relationships).
4. Work and emotional well-being.
5. Work and physical health.
6. Work and extended family and friends.

b. Impact – As of February 2006, more than 2,500 members of the public have participated in and learned from *Intentional Harmony* workshops. Evaluation has been completed with a subset of 206. Of those, 179 showed improvement.

Applying these results to the 2,500 trained we would expect:

More than 2,170 would have shown improvement.

c. Source of Funding - State, Federal

d. Scope of Impact - Illinois

Key Theme – Workforce Preparation – Youth and Adult

Teaching and Learning for Higher Order Thinking: The Development of Teachers and Learners in the Context of Agriculture

a. Progress - The purpose of this project is to investigate the cognitive levels of teaching and learning in the context of agriculture. To accomplish this overall goal, Years 1-3 purported to conduct case study interviews among expert and novice teachers of agriculture at the secondary level, and ultimately develop an instrument for measuring the cognitive levels of teaching and learning.

In all, focus group and individual interviews have been conducted with 28 preservice teachers, 34 novice teachers, and 15 expert teachers. During the current fiscal year of the project, 13 more preservice, 20 novice, and 10 expert teachers will be interviewed. At present all data are being transcribed and coding and analysis will begin in the Spring of 2005. In regard to the post-secondary tier of this project, a case study of exemplary teaching in colleges of agriculture is being conducted at both the college and the national levels with a USDA Challenge grant.

In the 2002-2003 fiscal year, 23 faculty members participated in the initial case study, and a college-wide survey of teaching and learning was conducted. From the initial case study data, in the fall

of 2004, 8 faculty members were identified to participate in a case-study of exemplary teaching from the student perspective.

Faculty members have engaged in planning sessions and focus group sessions to identify data collection methods from this collective case study. In the spring, students in these 8 courses will be asked to complete an online questionnaire. This data will be ready for analysis and interpretation in the summer of 2005. The third tier of the project purported to study teaching and learning from the student perspectives.

Currently, case studies of two courses, one graduate level Animal Science course and one undergraduate level Natural Resources course serve as the context for this investigation. In the graduate level course, the reflective levels of thinking are measured to determine how course structure might impact reflective thinking. In the undergraduate course, critical thinking skills and dispositions were monitored in both qualitative and quantitative measures to determine how course structure might impact thinking. All data has been collected and is in the analysis stage for spring, 2005.

b. Impact - The expected impact of this project occurs at many levels. First, teaching and learning in the context of agriculture is unique. Many beginning teachers and faculty members struggle in this role. An investigation of this nature serves to inform both high school and college teachers regarding effective practice. At the student level, many students leave our secondary and postsecondary institutions with limited ability to think at higher levels of cognition.

An investigation of teaching practice and how it impacts student performance at higher cognitive levels serves to inform a nation in regard to being more productive citizens and workers.

c. Source of Funding – Hatch Funds

d. Scope of Impact – National

Food and Agricultural Sciences National Needs Graduate Fellowship Grants Program

a. Progress - The Division of Nutritional Sciences at the University of Illinois at Urbana-Champaign received support for 4 predoctoral fellowships in Human Nutrition in July 2002. The aim of this program is to prepare students to be full and active participants in the new frontiers of nutrition research by equipping them with the

necessary technical capabilities and by educating them in interdisciplinary, integrative approaches to nutrition research.

Research training will concentrate on protein and amino acids or lipids and short chain fatty acids and their roles in brain, intestinal, hepatic or skeletal muscular function. Students will receive training in a wide variety of state-of-the-art technical approaches, including multi-gene and protein expression analyses and multiple pathway analysis using stable isotopic kinetics. Three of the four fellowships were recruited in August 2003. The final fellowship was filled in August 2004. The 4th fellow received his B.S. in Biochemistry from the Eckerd College, Florida and is studying the translational regulation of skeletal muscle protein synthesis in the laboratory of Dr. Donald Layman.

All four fellows are exceptional in terms of their academic preparation and research experience. In addition, we have developed new courses to support the grant. The themes of our weekly seminar series in fall 2004 (One Carbon Metabolism) and spring 2005 (Regulation of Metabolism) both center on topics pertinent to the focus of the USDA National Needs Fellowship.

Lastly, we have developed two new graduate courses on topics related to the grant. The first was course taught by Dr. Nakamura on the biochemical basis of the association between dietary components and cardiovascular disease, with a focus on lipids. The second course taught by Dr. Gaskins presented post-genomic research approaches and their application to nutrition.

b. Impact - Nutritional genomics and delineating novel functions for nutrients are two areas of nutrition research destined to experience significant growth in the coming decade. This National Needs training program will prepare nutrition graduate students to be full and active participants in the new frontiers of nutrition research by equipping them with the necessary technical capabilities and by educating them in interdisciplinary, integrative approaches to nutrition research.

c. Source of Funding – CSREES Grant Funds

d. Scope of Impact – Illinois

Key Theme – Youth Development and 4-H

4-H Legislative Connection

a. University of Illinois Extension's 4-H Legislative Ambassador Program provides more than 3,500 4-H youth with an opportunity to connect with state government officials on a year-around basis to learn first-hand more about the legislative process. The 4-H Ambassador teams are organized by legislative and senatorial districts. Adult volunteers help facilitate the team's activities. The Ambassadors develop a plan to meet regularly with lawmakers to discuss issues of critical concern to youth and to serve as valued resources to state government officials.

This year, the Ambassadors hosted a 4-H Legislative Connection at the State Capitol. More than 800 4-H youth and their families traveled to Springfield to meet with lawmakers and present an annual report on the state of 4-H. State Award winning 4-H club community service exhibits lined the Capitol hallways. The 4-H youth participated in educational workshops, tours, and one-on-one meetings with their legislators. Highlights of the day's agenda were two mid-day Salute to 4-H programs in the Capitol Rotunda. These action-packed celebrations focused on the impact Illinois 4-H club's have on their local communities. Bipartisan House and Senate leadership introduced the 4-H Ambassadors in the House of Representatives and Senate Chambers and presented them with framed proclamations citing the merits of Illinois 4-H.

b. Impact – The success of 4-H Legislative Connection X was evaluated via a paper-pencil survey instrument:

- 92% of those in attendance rated this event excellent or very good.

- The six educational features were rated 95%, 85%, 93%, 92%, 78%, and 88% excellent or very good.

- 84% of the participants responded that they "increased their knowledge of the legislative process."

- Several parents wrote unsolicited letters praising the program. One parent reported that participating in the 4-H Legislative Ambassador program significantly changed the life of her child and provided new interest in community activities that were contrary to past negative behaviors.

- Two other parents indicated that attending the 4-H Legislative Connection event with their teens broke communication barriers that they had been having as a family and provided quality shared experiences that led to improving their family relationships.

c. Source of Funds - Smith-Lever, State, Local, Private

d. Scope of Impact - Illinois

Camp 56

a. During the last two weeks of June and the first two weeks of July, the Bureau County Extension Office conducted the first Camp 56 Performing Arts Camp in cooperation with the Princeton Theater Group. This project involved approximately 50 youth ranging from elementary students to teenagers. The camp coincided with Festival 56, a professional theater group.

Among the features of Camp56 was the campers' participation in a professional production of “Brigadoon”.

b. Impact – The Illinois Alliance for Arts in Education Board has met with the project team to discuss a two-day conference for Illinois arts teachers in conjunction with the Camp and festival next year.

In the words of the participants:

Camp 56 has been a lot of fun... I’m also using my camp week for my 4-H project for this year’s 4-H fair, doing computer design and performing arts projects. I love drama. I’m thinking of majoring in it in college. – 15 year old

The camp has been really good… Camp has taught me about articulation and how to project my voice. I also liked learning to improvise, too. – 12 year old

I’ve learned quite a few things at Camp, like how to improvise. I learned when something doesn’t go right, you have to go ahead and figure out a way to fix it. – 9 year old

Being in the camp has probably helped me feel more confident that I know what I’m doing. – 11 year old

They talked to us about improvising. If you forget your lines, you just have to think of something else and do it. – 9 year old

I like the fact we get to be in "Brigadoon." I've always wanted to be in a professional performance. – 15 year old

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Chick Embryology School Enrichment Program – Youth and Science

a. Chick embryology is a multi-faceted school enrichment program where Extension partners with local schools to teach science, care for living things and other life skills.

During 2005, a University of Illinois graduate student and faculty member conducted a study to assess teacher motivation and student outcomes of a the Chick Embryology School Enrichment Program.

b. Impact – There were three findings from this study:

First, teachers' reported that their motivation increased as they gained confidence after each year of conducting the unit and their motivation to teach the unit was primarily based upon helping students achieve state learning standards and benchmarks.

Second, student interest motivation in science and agriculture increased for all classes that participated in the unit.

Third, student science and agricultural knowledge comprehension and application increased after the completion of the unit.

In the last three years, 122,505 youth have participated in the Chick Embryology Project.

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Discover Chicago

a. The Discover Chicago Program provides a unique opportunity for youth from primarily small rural communities in southern Illinois to experience the cultural, economic and social contrasts of life in a major city. The program is open to southern Illinois youth in grades five, six and seven and to adult volunteers who wish to assist with

chaperon duties. The trip takes place annually on Saturday, Sunday, and Monday of the Columbus Day Week-end.

In the trip's six year history, 461 youth and 192 adult chaperons have discovered Chicago by making visits to the Field Museum, the Shedd Aquarium, the Museum of Science and Industry, and the Sears Tower. Participants' dining experiences include Medieval Times and the Rainforest Café. The opportunity to experience Chicago's mass transit system is fulfilled through a ride on the Chicago Transit Authority Train from O'Hare Airport to downtown Chicago.

b. Impact – In addition to the learning experiences built into the trip, youth have opportunities for their own personal growth. One youth participant raised the $225 trip fee totally on his own by doing odd jobs for months before the trip. Another youth participant had never been successful at spending the night away from home prior to the trip. His goal in participating was to achieve that success, which he accomplished. Several adult chaperons have commented that the trip provides an opportunity for them to spend quality time with a child or grandchild at an event that they both enjoy.

Evaluations have shown that the Discover Chicago trip is the first visit to Chicago for as high as 65% of youth participants, and for as high as 38% of the adult participants as well. The fact that many youth and adults are repeat participants is a testament to the quality and appeal of the trip.

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Illinois 4-H Urban-Rural Youth Cultural Exchange

a. The United States is continuing to increase in its diversity, and with this increased diversity comes opportunities for young people to learn about new cultures and customs. In fact, in our ever-increasingly global society, it is imperative that youth and adults alike take advantage of these opportunities and become more adept at relating to and learning from people with diverse racial, ethnic and religious backgrounds. Despite the increasing opportunities to experience diversity, however, it is clear that many of our young people are not able to take advantage of these opportunities. In parts of downstate Illinois, many youth do not have chances to interact with youth from outside their respective counties, meaning they remain largely within a white, rural environment. In the city of

Chicago, which is one of the most segregated places in the country, many minority youth do not have chances to interact with youth from beyond the boundaries of their own neighborhoods, meaning that their interactions are largely with people who share their race and cultural background.

The plan for the youth cultural exchange was to bring youth living in Chicago/Cook County together with youth living in the west and east central regions of the state two times for overnight stays, once in Chicago and once downstate, thus providing both sets of youth with the opportunity to form new friendships and to view life from a perspective completely new and different from their own experience. They would be able over the course of four days to forge bonds with youth from different cultural backgrounds as well as gain a better understanding of the urban and rural way of life.

The first Illinois 4-H Youth Cultural Exchange took place in the summer of 2004, with 30 youth participating. The second annual Youth Cultural Exchange took place in the summer and fall of 2005, and involved 25 young people, some who participated in last year's inaugural exchange as well as new youth participating for the first time. The youth from Cook County over the past two years have been 91% African-American and Latino, while the youth from the west central region have been 100% Caucasian.

b. Impact –

- 100% of Cook County participants reported a greater understanding of rural living;

- 100% of west central participants reported a greater understanding of urban living;

- 100% of all participants responded that they enjoyed making new friends during the exchange.

The Cultural Exchange through the words of the participants:

- "I have way more respect for them (farmers)."

- "It was really fun to know what they do there (Chicago)."

- "It was very well organized with good activities."

- "I would really enjoy being able to come again, only stay longer. I feel that this experience really taught me a lot. I made new friends, and can't wait until next time."

- "It has helped me understand that not everyone lives like me."

- "I learned that we're not so different."

- "I wasn't used to being with so many different cultures, but now I am."

- "More communicating because now we can talk about each other's cultures and understand."

- Everything was great because I found out stuff I didn't know."

- "I really had a great time. Thank you for a wonderful experience. I can't wait for next year."

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Illinois Horse Judging Oral Reasons Clinic

a. Oral reasons is an area where Illinois 4-H judging youth have historically been deficient based on comparing their oral reasons scores at national contests with those of youth from other states. Furthermore, fewer and fewer youth are participating in the oral reasons division of the State 4-H Horse Judging Contest, from which the state team is chosen. Moreover, 4-H horse leaders readily admit that they are unable to teach their 4-H'ers how to give oral reasons because they, themselves, are not properly educated on the subject.

Oral reasons are much more than just a required component of a judging contest. In preparing and delivering oral reasons youth learn the vocabulary and presentation skills necessary to explain their reasons for placing one horse over another. To give these oral reasons, the young judges must learn to think, organize and speak publicly.They are judged on organization, relevancy, accuracy, terminology, and presentation.

Oral reasons are a required part of most horse judging contests at which Illinois youth compete on a national level including the national 4-H horse judging events for Quarter Horses, Paint Horses, Morgans, Arabians, Saddlebreds, and Tennessee Walkers.

The program was designed to be approximately four hours in length with approximately 90 minutes of material presented at the start. The remainder of the program consisted of the participants working with facilitators on writing and verbally delivering sets of oral reason. After the oral delivery, format, terminology and speaking abilities were critiqued and the participants were given instant feedback.

During the 90 minutes of material presentation, the participants were kept involved by periodically being asked to draw pertinent items on the chalkboard which was very entertaining for all in attendance. Topics covered in the presentation included: criteria used to score oral reasons, proper organization of oral reasons, essential elements of a set of reasons, techniques to get beginners started on reasons, proper terminology for various classes, example sets of good oral reasons and example sets of bad oral reasons.

Both horse judging youth and coaches were encouraged to attend. This program will be repeated next year in the three remaining regions of Illinois (Northeast, Northwest, and South).

b. Impact – Participation has yet to reach 40 for the program as a whole; however, the program has received high marks on the evaluations. The average scores on the evaluation are as follows out of a perfect score of 5.0:

- The way the material was presented was very effective - 4.76.

- I am confident I will be able to improve my oral reasons using the information presented today - 4.86.

- The seminar content was excellent - 4.68.

- I will apply what I learned in this seminar – 4.84.

Additionally, here are some of the outstanding comments that participants wrote on the evaluations:

- I had fun drawing and liked that Debra involved us in her seminar. (youth)

- As a result of attending this seminar I will participate in the state horse judging contest in the reasons division. (youth)

- The one-on-one part of this seminar was great. (youth)

- Everything was explained in an understandable manner even for beginners. (coach)

- As a result of attending this seminar I will practice oral reasons and compete. (youth)

- Very relaxed atmosphere to learn in. (coach)

- As a result of attending this seminar I will participate in more horse judging contests. (youth)

- Basically for this being my first time at ever doing this, I learned a lot and feel I could go out and do well giving oral reasons at a horse judging contest. (youth)

- The hands-on practice was the most valuable part of this seminar. (youth)

- It was worth waking up at 5 AM to come here. (youth)

- This was great and very, very helpful for our team. (coach)

This program has received rave reviews on the small scale that it has been presented. There is great potential for this program as an annual program within the regions.

c. Source of Funding – State, Federal

d. Scope of Impact - Illinois

Leadership Development in Community Clubs

a. Anecdotal evidence, especially from 4-H alumni, about the value of 4-H life skills abound. Extension Youth Educators in Northwest Illinois, however, wanted to see if they could document life skill development of current 14-year-old 4-H members. They first identified specific behaviors which 14-year-olds might expect to gain from the 4-H club experience. These included confidence in parliamentary procedures, public speaking skills, skills in working with younger 4-H members, experiences or skills in working with

people whom they would not have met outside of 4-H, and knowledge of the local community gained through 4-H.

Using the Reflective Appraisal of Programs (RAP) [1] study design, a total of 41 14-year-olds were interviewed by telephone. The members were sampled at random from six counties. These members were asked about their years of experience in 4-H and leadership positions held in community clubs. Members were then asked to reflect upon each of the "life skill" areas listed above. They were then asked to what extent 4-H had helped them develop or feel comfortable with the skill. If the member responded that they had the skill, the interviewer asked them to recall what they had learned and how they had used the skill. Members were then rated as having evidence or no evidence of the skill.

To be categorized "as having evidence of the skill," they first had to claim to have a skill or experience and they also had to give a reasonable and plausible evidence of actually having the skill or experience. For example, they were first asked the extent to which they felt comfortable using parliamentary procedure **as a result of their 4-H club experience**. Then they were asked to recall some of the things they learned about parliamentary procedures. The rating was done independently by two raters who did not take part in the actual interviews.

b. Impact - More than three-fifths stated they felt comfortable in using parliamentary procedure and could substantiate that claim.

- Two out of five reported and substantiated the claim they had used parliamentary procedure learned through 4-H in other settings.

- Almost nine out of ten reported 4-H helped them to be more comfortable in public speaking situations.

- Almost three out of four reported that 4-H had helped them learn to work with younger members and they could give examples of how 4-H had helped.

- More than four out of five reported 4-H had helped them meet people they would have not met outside of 4-H.

- Three out of four said 4-H had helped them learn about their community and could cite examples.

[1] Claude Bennett formerly with CSREES, USDA, developed this approach.

- Illinois has more than 7,662 4-H members aged 14-years-old in a community club setting. It would seem reasonable to extrapolate these findings to this larger group.

c. Source of Funds – Local, State, Smith-Lever

d. Scope of Impact - Illinois

Service-Learning: Leadership Development Through Community Action - 4-H School Enrichment Program

a. Today's youth is tomorrow's leader. From the perspective of a democratic society, we expect our future leaders to be wise, concerned about citizens and connected to the community both locally and globally.

We focus on today as we anticipate tomorrow. University of Illinois Extension has a body of research on youth development education, one of which is Service-Learning (S-L). Service- Learning is a method by which students improve academic learning and develop personal skills through structured service projects that meet community needs. Service-Learning builds upon students' service activities by providing them with opportunities to learn by preparing, leading and reflecting upon their service experiences. Service-Learning is integrated into the academic curriculum. Students learn by doing and apply their academic skills, knowledge and abilities to service projects that meets community needs. Service-Learning helps to build up a sense of civic responsibility by designing, planning, and implementing their service projects. In short, evidence from a national study of Learn and Serve America programs suggests that effective S-L programs:

- improve academic grades;
- increase attendance in school; and
- develop personal and social responsibility

A curriculum is developed by U of I Extension professionals to address the S-L issue, for teenage students. Youth Educators of West Central Region have been implementing this S-L program as part of the 4-H school enrichment programming in the past four years. The curriculum is named Leadership Development through Community Action (LDTCA).

The number of participating schools and students kept increasing as the years passed by, as is shown below:

- 2002-03: two schools, 108 participants
- 2003-04: four schools, 330 participants
- 2004-05: six schools, 563 participants
- 2005-06: eight schools, 670 participants

Total youth participation - 1,671

b. Impact – An instrument using a retrospective pre-test/post-test and was administered at the end of each school year. An average of 50% gain in all 14 indicators of the nine life skills measured from pre-program to pos-program.

As measured by this self-report, the youths made gains in knowledge and behavior of the life skills in the areas of decision-making, communication, leadership, useful marketable skills, self-responsibility, respect, responsibility, caring and citizenship. As all life skill indicators showed gains, the greatest improvements are among: decision-making, communication, leadership.

Some other examples indicating the impact of the program:

- Academic improvement: LDTCA has met scores of IL learning standards in language arts by, writing, reading, speaking and listening. In science, math and social science by designing projects, planning landscaping and playground designing, measuring, calculating, planting, making computer graphs, developing power point presentations, and understanding community.

- Life skill improvement: planning, self respect/self worth, relating to others, teamwork, cooperation, responsibility, self discipline, volunteer ethic, etc.

The youth answered four open-ended questions:

1. Name three things you learned from this program, what they liked/disliked about the program, and other comments.

Majority of youths wrote that they learned

- "helping others and community,"
- "work as a team,"
- "responsibility and respect,"
- "work is hard but can also be fun," to name just a few!

2. What you liked best:
   - "I helped kids/people and brought them joy,"
   - "Getting to know other people in the community,"
   - "Get out of classroom to make my school a better environment," and a lot more very positive comments.

3. What you like to change? Most of them were happy with what had there and a few comments like:
- "Having longer time to interview people,"
- "(This should be) all school program," to cite just a few.

4. Your other comments:
   - "Fun!"
   - "I really liked it and would like to do it again,"
   - "This was the best thing to have students help the school/community and have fun while doing it,"
   - "I would definitely do it again,"
   - "I enjoyed helping the little kids,"
   - "We should have more of this," and a lot more pleasant comments!

There were no negative comments about this program.

- <u>Impact on Community-School Relationship</u>:
  1. Around 550 community leaders came to the Needs Assessment program and were interviewed by students, shared their knowledge and gave ideas about community issues. Leaders were amazed at many of the questions from the youth and had a different, more positive view of today's teenagers.
  2. Grant support: About $36,000 grant support for the implementation of this S-L program in the past four years, which indicates the recognition of the importance of this program. The grants were from ISBE, IL 4-H Foundation, Tazewell ROE53, and State Farm YSA.

c. Source of Funding – Local, State, Federal

d. Scope of Impact - Illinois

Key Theme – Workforce Preparation – Youth and Adult

Welcome to the Real World

a. "All my expenses cost more than I ever really thought!" is a comment expressed by young people who have participated in the Welcome to the Real World program. This active, hands-on real-life simulation gives young people the opportunity to explore career opportunities, make lifestyle and budget choices similar to those adults face daily. Students then evaluate the choices they have made.

This program puts students into a world of a 25-year-old, single, employed, independent person. The participants make decisions about housing, vehicles, utilities, insurance, entertainment, and other living expenses.

During the Welcome to the Real World program, students explore potential careers they would like to pursue in the future. After they choose a career and then proceed through the "Real World" simulation, deducting taxes, determining a savings amount, and spending their monthly "salary" on the necessary and luxury items that reflect the career and lifestyle they have chosen. Students also learn skills in writing and balancing a checkbook, saving, budgeting, and developing a spending plan.

b. Impact - An evaluation of this program (involving 635 high schoolers across ages and schools) produced the following results:

Nearly 95% of respondents agreed that the “program was interesting”, “the information was useful”, “the activities were helpful”, and “participating in this program would help me in the future.” Moreover, nearly 80% of the participants stated they had enough money to meets their expenses. Of the 20% who did not meet their expenses, only 50% of them stated that they were surprised at this.

The program also taught valuable life skills. Below are the life skills taught at Welcome to the Real World and what percentages these skills were learned.

Skill	% Already Knew	% Learned	% Learned of Those Not Knowing

Explore career possibilities n=618	56.1%	43.7%	99.6%
Write a check n=620	80%	20%	100%
Balance a checkbook n=618	68%	32%	100%
Open a savings account n=618	67.6%	32.2%	99.5%
Keep track of savings n=616	68.2%	31.7%	99.5%
Balance income of expense n=617	50.7%	49.3%	100%
Prepare a spending plan n=619	37.3%	62.7%	100%

More than 75% of the students reported learning one or more skills as a result of the program. More than 47% reported learning three or more skills.

Over the past five years 29,267 youth have participated in the Welcome to the Real World simulation. Projecting based on the study reported above, we would expect more than 21,950 o f these youth have learned one or more skill as a result of this experience and more than 13,755 learning three or more skills.

c. Source of Funding – Local, State, Federal

d. Scope of Impact - Illinois

Youthworks: Youth as Resources for Strengthening Human and Social Capital in Rural Areas

a. Progress - The YouthWorks Project began by establishing collaborative relationships with University of Illinois Extension Educators, local high school principals, agricultural educators, and FFA representatives, in two rural Illinois counties (Knox and Pike) that are facing similar challenges: youth retention and economic viability.

In each county, an Extension Educator was selected to serve as a Community Liaison for the project. These liaisons facilitated the introduction of the project to the target and comparison communities garnering community support and buy-in, provided vital information about participating communities used to tailor assessment instruments to meet local interests, assisted with implementation of baseline measures of youth and community well-being, and underwent training to lead the Community YouthMapping intervention. Students who participated in Community YouthMapping will present the YouthResource Directory created to their school and communities in a forum to be held this fall.

One outcome of this forum will be to identify gaps in services and resources for youth. We will facilitate the formation of a Youth Engagement Task Force that will partner youth with community leaders, and charge them with creating a plan to remedy one or two priority needs. Progress to date: New instruments were developed to assess youths perceptions of community receptivity, the degree to which they could play a meaningful role in their communities as adults, and intentions to live or work in their community in the future; 358 high school juniors and seniors, representing 4 high schools based in the 2 target and 2 comparison communities, completed the pre-test assessment; 16 junior and senior high school students from the two target communities participated in the Community YouthMapping intervention as a summer project learning communication and interviewing skills necessary for approaching business owners and agency directors.

They investigated all possible resources for youth in their community, administered surveys, conducted interviews with relevant personnel, and organized information; YouthMappers created a YouthResource Directory for their community detailing types of employment, educational, job training, recreational, and health-related opportunities and services available to youth, as well as instructions for successfully accessing these resources. The directory will be presented to their communities as a tool to use to both promote their town and to identify ways to make their community more attractive to youth; Business owners and agency directors completed surveys detailing how their organizations are designed to meet youth needs; Individual interviews were conducted with each Community YouthMapper to assess whether and how the intervention provided them with a new understanding of their home community, particularly in terms of its assets and liabilities for meeting the needs of youth.

The interview also addressed how the YouthMapping experience may shape their future plans for living and/or working in their community. Results from the student pre-test assessment surveys and Community YouthMapping interviews are currently under analysis.

b. Impact - Immediate impacts were apparent as a result of our Community YouthMapping intervention, assessed by individual interviews with youth participants and community liaisons.

Almost all YouthMappers reported discovering more opportunities available for teens in their hometowns than they had realized before the project began. Many commented that this experience helped

them see how they could live and work in their community as an adult. These early findings support the contention that youth retention may be enhanced through Community YouthMapping.

Youth reported that most community leaders and business owners viewed their project favorably and were receptive to helping them. In fact, two YouthMappers were offered jobs as a result of their community interviews being impressed by their interviewing skills, professionalism, and poise. Several businesses and organizations were stimulated to promote or create new opportunities for teens because of their interaction with the YouthMapper. For example, an opportunity to job shadow members of the police department resulted from YouthMappers interviews with their local police department.

YouthMappers identified areas their community could enhance in services for youth. In particular, a need for a safe central meeting place for youth to hangout was mentioned, as well as for additional recreational venues (e.g., movies, shopping) so that they would not have to travel to another town for these services. This observation, among others, will be shared at the community forum, giving the community the opportunity to make progress on this issue.

c. Source of Funding – NRI Competitive Grant Funds

d. Scope of Impact – National

CSREES Management Goals

Key Theme - Information Technologies

Exploiting Information Technology to Uncover Patterns in Complex Systems

a. Progress - Mandala is a Windows and Macintosh-compatible data management system designed in FileMaker Pro to support four major realms of data acquisition and management for systematics and biodiversity studies: specimens, literature, taxonomic names, and illustrations.

Development began in 1995 as part of a U.S. National Science Foundation PEET project on the fly family, Therevidae, and has progressed into the current feature-rich system that is freely available upon request from gkamp@uiuc.edu. Mandala can detail the complex history of a taxonomic name, citing not only who first described a species, but put the name into an hierarchical context with similarly related species. It can track and justify changes made to the concept of that species, linking them to the scientific literature and listing common names known to be associated with scientific names, all information that may be important in discerning the systematic work that has been conducted in the past on a particular species.

The database system can also export data for phenological plots to create a graph of when during the year specimens have been found in various localities and for specimens examined lists (detailed lists of which numbered specimens have been examined and verified by an expert in the preparation of a scientific paper, and for distribution maps of where specimens have been collected). Mandala can also provide links to the NCBI GenBank database of genetic sequences or any other sequence database with a fixed web address.

Mandala can track loans of specimens from one collection to another, treating specimens individually by unique specimen numbers or as groups of specimens with minimal identification, often sent to specialists to work up.

The database can catalogue images, maps, and illustrations. One of Mandala's primary strengths is its ability to organize numerous details about individual specimens for future analysis. Starting with a literal transcription of the label(s) attached to the specimen, the labels are then interpreted and parsed into discrete information

blocks for easier searching of politically bounded localities, named geographical features that may cross political boundaries, georeferencing, elevation, and data surrounding a collecting event in a specific locality e.g., when a specimen was collected, by whom, the collection method, and what the climatic and substrate conditions were at the time of collection.

A specimen may have not only the current concept of its taxonomic name, but a history of what others have thought it was, given the state of knowledge through time. Also able to be recorded in Mandala is the physical condition of the specimen and how it has been preserved; ecological/biological associations with other specimens collected at the same time or other taxa observed in association but not collected with the specimen; and a designation of type status. Mandala also features context sensitive help, electronic problem management, and tracks structural changes made to Mandala's architecture.

b. Impact - Mandala was demonstrated as an electronic poster at the XXII International Congress of Entomology in Brisbane, Australia, in August 2004 and at the Fifth biennial meeting of the National Science Foundation's Partnerships for Enhancing Expertise in Taxonomy (PEET V) in Urbana, IL in September 2004.

It is being used by several researchers in their taxonomic studies and will be used in two further National Science Foundation grants, one on Assembling the Tree of Life of the Diptera, the other on the Biodiversity of Arthropods in Fiji.

c. Source of Funding – Hatch, Industry, Other Federal Funds

d. Scope of Impact – National

Key Theme – Multi-Cultural and Diversity

Swine Reproductive Programming for Spanish Speaking Employees – 2005 Update

The Illinois Swine Reproductive Program, an introductory level reproduction program, is also being offered in Spanish for the non-traditional Hispanic-speaking workforce. This workforce is growing and will continue to be an important component to the future of the Illinois swine industry. This program was offered for the first time in June, 2003 and has continued annually. The programs attracted 80 individuals from businesses in Illinois and surrounding states that influence production of more than 65,000 to 70,000 sows.

Attendees are introduced to basic swine reproductive management using sequential translation of English to Spanish.

The 2005 program included advanced material focusing on improving and understanding replacement gilt management and sow management strategies to limit sow culling and improve longevity.

The impact of these programs has been through improved comprehension of tasks and job performance, improved worker retention, labor efficiency, and improved animal management for reproduction. The new advanced program is aimed toward enhancing the skills and knowledge-base for the more sophisticated Spanish-speaking audience involved in breeding herd management for the Midwest.

Plans are being made to offer a similar program in 2006.

B. Stakeholder Input Process

Stakeholders provide continuous feedback in terms of programming needs as well as programming results. The College of ACES has many channels for stakeholder input. The College, the Office of Research, the Office of Extension and Outreach, all academic departments, and many programs and projects in the College have advisory councils made up of stakeholders. The advisory councils meet at least yearly, but in many instances more frequently than that, and are active participants in determining the direction of the College units as well as specific programs. Several hundred stakeholders, representing both organizations and individuals, participate in this process on an annual basis. Stakeholder input is typically oriented towards input in the nature of the decision-making within the units and projects in the College, as well as focusing directly on the results from the College's activities for the stakeholder groups or for the state population at large. Stakeholders who function in an advisory capacity typically do not distinguish between research and outreach outcomes, and they form a powerful voice for the effective integration of Research and Extension activities.

The Council on Food and Agricultural Research (C-FAR) was organized to increase state funding for food and agricultural research. C-FAR is made up of such organizations as the Illinois Farm Bureau, the Audubon Council of Illinois, the Illinois Dietetic Association, the Horseradish Growers of Illinois, Illinois Rural Partners, and nearly 50 other equally diverse state organizations. While these organizations frequently disagree sharply on specific aspects of agricultural production and policy, nutrition, and rural development, all agree that a results-focused research program will provide a valuable contribution to resolving many of the issues affecting the health of the Illinois population, agricultural production and rural development. C-FAR has been successful in obtaining additional funding from the state legislature to enhance College-based agricultural research at the University of Illinois and other state institutions. Because C-FAR has been willing to expend the effort to increase the support for research it has acquired a significant role in helping to define the research agenda. By focusing continuous attention on the need to solve "real-world" problems and insisting on the timely sharing of research results with constituent groups, C-FAR has made a significant impact on the way in which the research and outreach agendas are being defined in the College.

Every Extension unit has a local council, which provides ongoing input in Extension program planning and evaluation. Councils are active in helping to identify local needs and provide formal and informal feedback on Extension activities. During 2004, more than 3,000 volunteers served on local Extension councils and planning committees throughout the State. The chair of each council, or his/her designee, also serves on the regional advisory council in each of the five regions in Illinois. Finally, Extension has a state advisory committee made up of three representatives from each region who meet at least twice a year for a multiple-day session with the state Extension administration to provide input on programming needs and Extension processes.

To strengthen the role of advisory councils at all levels, Extension has initiated an ongoing program of council training. In addition to training that takes place at the council level, a statewide-organized training effort is taking place through regional meetings to strengthen the capabilities of council members. The training sessions have targeted new council members. In addition, Extension has completed a Council Guide that provides all council members with background information on Extension policies, procedures, and programs.

Extension is currently engaged in a multi-year review of all local units, with special emphasis on programming quality, local programming impact, diversity of stakeholder input and the needs of undeserved audiences.

In program planning, Illinois relies very heavily on local input. The program planning process is structured on a four-year "rolling" basis. Each year, one of the four core programming areas, Nutrition, Family and Consumer Sciences, Agriculture and Natural Resources, 4-H Youth Development, and Community and Economic Development, is engaged in an in-depth program needs assessment process.

During 2005, 4-H Youth educators formulated a new state plan of work for 4-H Youth Development. This plan was based largely on the results of 180 focus groups held across the state which involved 1,312 youth, more than 26 percent who were members of minority groups. This effort was awarded the 2005 Outstanding Program Evaluation Award by the American Evaluation Association's Extension group.

During 2005-2006 our Community Economic Development Educators are providing leadership for a comprehensive statewide

planning effort for their areas of interests. Local Extension offices have involved a broad cross section of citizens in a survey effort reaching more than 2,200 citizens from all walks of life.

C. Program Review Process

No significant changes have been made in this process.

D. Evaluation of the Success of Multi-State and Joint Activities

Throughout this report we have reported consistently on integrated Extension and Research activities in terms of programming and outcomes.

Multi-State Activities and Joint

The following multi-state activities have both an Extension and Research component: Farm Progress Show, Illinois-Indiana Sea Grant Program; the Agri-Ecology/Sustainable Agriculture Program (Part-time Farming); the Plant Management Network and multistate conferences. All are ongoing processes that include institutionalized review. Illinois participates in the institutionalized reviews of each of these groups, but does not necessarily undertake an evaluation of its own. The entities just mentioned each have an advisory or executive committee that is multi-state and combines Extension and Research representation. The committees report to the North Central Regional Extension Directors at regular intervals.

The Illinois-Indiana Sea Grant Program was evaluated in preparation for the hiring of a new Extension specialist in aquaculture. As part of the preparation for the hiring process, representatives from the University of Illinois, Purdue University, and the Sea Grant program evaluated the accomplishments of the program and identified the directions in which the program needs to progress.

The fact sheets for the Local Government Information and Education Network have undergone peer review as well.

The multi-state conferences are evaluated to ask if they have contributed to improved program development and implementation to meet the needs of Illinois stakeholders. For some it is too soon to assess their overall impact in meeting the needs of all Illinois citizens.

Evaluation of Multistate

As noted above, most of the multistate activities are guided by advisory and/or administrative groups which assume responsibility for evaluating the activity or program.

The multistate nonintegrated activities include: e-Xtension, North Central Regional Center for Rural Development (NCRCRD), the

Local Government Information and Education Network, and New Horizon Spanish Radio Program. Most of the entities just mentioned each have an advisory or executive committee that is multi-state. These committees report to the North Central Regional Extension Directors at regular intervals.

The fact sheets for the Local Government Information and Education Network have undergone peer review as well.

The “New Horizon” Spanish Radio Program is evaluated by the state specialist providing leadership for this program.

The Extension conferences are evaluated to ask if they have contributed to improved program development and implementation to meet the needs of Illinois stakeholders.

E. Description of Multi-State and/or Integrated Activities

An image of CSREES-REPT (Revised 09/04) report form for Multi-state Extension Activities may be found in Appendix A.

Program Support - Program support for new faculty and faculty who have joint Research/Extension appointments.

Information Technology Support - Support for services related to the design, development and web management. of Research and Extension programs as well as program impact and reporting systems.

ACES Afield Newspaper - Annual college update that details teaching, Research and Extension activities in the College of ACES for agricultural stakeholders.

Farm Progress Show - The Farm Progress Show – billed as the Super Bowl of Agriculture – draws about a quarter-million producers and others associated with agriculture. The show rotates between Illinois and Iowa; Purdue University also participates in the Illinois show in odd-numbered years. The College of Agricultural, Consumer and Environmental Sciences collaborates on several interactive exhibits showcasing and integrating the education, Research and Extension functions of the College. Exhibits cover a broad range of topics including crop and livestock production technologies; risk management; nutrition and health; food safety and security; farm safety; strengthening rural communities; integrated pest management and more. http://web.extension.uiuc.edu/macon/fps_about.html

Conferences - Various multi-state Extension conferences that showcase current Extension initiatives. List attached.

Farmdoc Project - The goal of the Farmdoc (farm decision outreach central) Project is to improve farm decision-making under risk through education and research. To meet this goal, the Farmdoc website provides Illinois farmers with comprehensive integrated risk management information and analysis. Publications, decision tools and databases related to a variety of risk management issues are found throughout the site. Subject matter sections cover finance, marketing and outlook, management, law and taxation and policy. Specialty sections are devoted to the AgMAS (Agricultural Market Advisory Services) Project, crop insurance, farmland owners, prices and weather, and ag web resources. www.farmdoc.uiuc.edu

Market Maker - Illinois Initiative for the Development of Entrepreneurs in Agriculture (IDEA) is designed to provide high quality educational support and technical assistance to farmers and others in, or dependent on, the agriculture sector. IDEA staff believe there is an opportunity for farmers to add value to products and increase their profitability by marketing their products through alternative methods as opposed to the commodity marketing. In order to accomplish this, IDEA conducts research, develops educational products and provides services that encourage farmers to incorporate entrepreneurial strategies which direct their marketing efforts to meeting consumer demand. www.marketmaker.uiuc.edu

Partnership in the Plant Management Network (PMN) - PMN is a unique cooperative resource for the applied plant sciences. Designed to provide plant science practitioners fast electronic access to proven solutions, the PMN offers an extensive searchable database comprised of thousands of web-based resource pages from the network's partner universities, companies and associations. Other state university partners are SD, ND, NE, VA, OH, IN, KS, CO, AR, FL, MO. www.plantmanagementnetwork.org

Integrated Swine Program - This is a multi-discipline applied research project involving Research and Extension to investigate approaches to improving physical and financial performance of Illinois swine farms. The research is carried out on producer units and data is collected that allows full economic evaluation of management changes. The objectives are to establish optimum facility designs and animal management strategies for wean-to-finish pig production systems and to characterize the variation in pork quality under standard production practices and to develop production schemes to improve pork quality. http://labs.ansci.uiuc.edu/ellislab/7_isp.html

Laboratory for Community and Economic Development - Provides practical, research-based information and programs to help individuals, families, organizations, businesses, farms and rural and urban communities throughout Illinois through programs on community assessments, planning, leadership, entrepreneurship and developing tourism. Additional information may be found at http://communitydevelopment.uiuc.edu

Illinois Green Industry Project - The goal of this project is to follow up and update the 2000 survey of the green industry; to evaluate the impact of changes within the industry on the State's economy; to assess the economic impact of the Illinois green

industry as measured by sales, workforce, payroll and taxes paid; to begin to measure the changing structure of the industry; to identify constraints to business and market expansion; to provide crucial information to assist and expand existing outreach programs for training and educational purposes; to implement needs assessment for future program planning; to disseminate survey and program results to the industry and citizens of Illinois.
http://research.nres.uiuc.edu/report01-01/intro.html

Agroecology/Sustainable Agriculture Program (Part-time Farming) - The Agroecology/Sustainable Agriculture Program (ASAP) promotes Research and Extension which protects Illinois' natural and human resources while sustaining agricultural production over the long term. The program includes cooperative efforts of North Central land grant institutions and other partners, as facilitated and funded in part by the USDA Sustainable Agriculture Research and Education (SARE) program administrated by University of Nebraska. SARE offers competitive grants related to applied Research and Extension pertaining to sustainable agriculture**. http://www.aces.uiuc.edu/asap/index.html**

Illinois-Indiana Sea Grant Program - The Illinois Indiana Sea Grant Program provides up-to-the-minute information on Great Lakes issues, emphasizing concerns in the southern Lake Michigan region. Topics addressed include water quality, aquiculture and seafood safety, biological resources, sustainable coastal development, and coastal processes. It is funded by NOAA, University of Illinois, and Purdue University.
http://www.iisgcp.org/

Illinois Agricultural Entrepreneur Development Initiative - Designed to provide resources and technical assistance in business planning, product development, value added products and marketing. Program is associated with research projects funded by state funds. The "Illinois Branded Livestock Project" is an example of product development under this initiative.
http://web.extension.uiuc.edu/iidea/services.htm

Farm Analysis Solution Tools (FAST) - FAST are a series of Excel spreadsheets that help lenders and farmers evaluate various aspects of a farm business. The computerized decision aids permit users to perform financial analysis, assess investment decisions and evaluate the economic impacts of various management decisions. A series of workshops will be presented in 2006.
http://www.farmdoc.uiuc.edu/fasttools

Amish Growers Program - Funding used to conduct a workshop March 22, 2003 for Amish growers to explore the avenues for improvement of production and marketing of crops. Improvements in the Amish communities include establishing and expanding on-site marketing, increasing sale of crops substantially, starting vegetable production, starting successful educational and recreational programs to students, residents of the area, and tourists. On-going problem-solving efforts are underway to explore approaches taken by horseradish producers and industry to reduce incidence and severity of the internal root discoloration in commercial fields.

Earth and Society Initiative - This initiative provides seed money to support innovative ideas and novel approaches to the complex, interdisciplinary and national environmental problems. Examples of currently funded projects include the Illinois Program on Nutrient Dynamics that is using the U of I new South Farms as a living/learning laboratory to provide better understanding of the impacts of human inputs on agricultural lands. The second project is exploring disease emergency and ecosystem health by coordinating research, education and outreach activities of a diverse assemblage of University of Illinois centers, programs, labs and individuals whose interests converge at the interface of emerging infectious diseases, anthropogenic environmental change and biodiversity conservation.
www.environ.uiuc.edu/earthandsociety/earth_society_about.html

E-Extension Assessment - Assessment along with The Cooperative Extension Services of the U.S. states and territories and with other components of Land-Grant Universities and the CSREES in cooperation to build a national Extension system. The collaborative effort will allow the Extension system to more efficiently serve current and new customers in ways that provide accurate and just in time information for decision making. The information technology and the intellectual capacity for this system are in place to complement the dedicated Extension educators located in the 3000 plus counties of the U.S.

North Central Region Center for Rural Development (NCR CRD) - NCR CRD coordinates and supports Research and Extension activities in the areas of community and economic development throughout the North Central Region. The NCR CRD has a number of programmatic emphases which vary over time as the needs arise. Funding is provided to Iowa State for coordinating programs.

Local Government Information & Education Network - This program provides a variety of educational programs, materials and services to local government officials. Includes an annual series of informational updates via audio conferences, planning of annual conferences for professional associations, quarterly newsletters, fact sheets, and a series of publications on the roles and responsibilities of governmental officials. The network continues to work in areas of poverty, land use and civic education. As a result of work with the multi-state land use team, the fact sheets, written by Extension staff in Indiana and Ohio, have been adapted for Illinois. http://www.uic.edu/UI-Service/programs/UIUC289.html

New Horizon Spanish Radio Program - The program is used by the University of Illinois and is distributed bi-weekly and free of charge to communities in IL, IA, KS, MI, MN, MO, OH, and VA. The program is produced by University of Illinois students to educate and entertain and geared toward Hispanic populations who have come to the U.S. looking for a new start. New Horizon becomes a part of that new beginning by providing interviews on current topics of interest as well as informative sections related to health and Hispanic culture. New Horizon programs are also distributed to radio stations throughout the Midwest.

integratedsmulti-stater05.wpd

FY05 Multi-State Conferences

Conference	Location
4-H Council Board of Trustees Meeting	West Virginia
4-H Council Board of Trustees Meeting	Chevy Chase, MD
4-H Youth Futures College Within Reach Conference	Columbia, MO
4-State Dairy Nutrition & Mgt Seminar	Dubuque, IA
ADSA-ASAS Joint Annual Meeting	Cincinnati, OH
American Society for Horticultural Sciences Meeting	Las Vegas, NV
American Society on Aging Conference	Philadelphia, PA
American Phytopathology Conference	Ausin, TX
Anger Mgt Professioinal Dev Meeting	St. Louis, MO
Animals in the Food System Conference	Hickory Corners, MI
Annie's Project Meeting with Iowa State	Iowa City, IA
Aquatic Weeds Conference	West Lafayette, IN
ASAE Conference	Tampa, FL
ASAS/ADSA Midwest Meeting	Des Moines, IA
Assoc. for Financial Counseling & Planning Ed. (AFCPE)	Denver, CO
Beef Improvement Conference	Billings, MT
Board on Human Sciences & EFNEP Task Force	San Diego, CA
CACUBO Professional Dev Workshop	St. Louis, MO
Cambio de Colores Conference	Columbia, MO
CECEPS Meeting	Washington, DC
Character Education Conference	St. Louis, MO
CSREES Administrative Officers' Conference	Greensboro, NC
CSREES Extension Innovation Conference	Columbus, OH
CUPA-HR National Conference	Salt Lake City, UT
CUPA-HR National Conference	Nashville, TN
Disaster Education Network Conference	State College, PA
ECOP Meeting	Columbus, OH
ECOP Meeting	Nashville, TN
EFNEP Congressional Briefing	Washington, DC
Entomological Society of America Annual Meeting	Salt Lake City, UT
Evaluator's Institute	Washington, DC
Farm Credit Administration Meeting	McLean, VA

Farmworks Training	Hamilton, IN
Federal Employees Benefits Training	Washington, DC
Field Scale Hi-Tunnel Meeting	Benton, MI
Food and Nutrition Service Meeting	Washington, DC
FRAC Hunger/Obesity Meeting	Washington, DC
Grazing 102 School Presentation	Jasper, IN
Heart of America Grazing Conference	Wilmington, OH
IDA Annual Conference	Vancouver, BC
IEAA Fall Meeting	Vincennes, IN
International Master Gardner Conference	Saskatoon, Canada
Internationalizing Extension Conference	Gainsville, FL
Iowa Forage Conference	Des Moines, IA
Latino/Hispanic Conference	San Juan, Puerto Rico
LEAD 21 Meeting	Indianapolis, IN
Lenders Meeting	Hannibal, MO
Mid-South Wheat Meeting	Olive Branch, MS
NACAA Meeting & State's Night Out	Buffalo, NY
NAEFCS	Philadelphia, PA
NASULGC Meeting	San Diego, CA
National 4-H Congress Board Meeting	Atlanta, GA
National 4-H Leadership Meeting	Chicago, IL
National CYFAR Conference	Boston, MA
National Diversity Conference	Greensboro, NC
National Extension Technology Conference	San Antonio, TX
Nat'l 4-H Program Leaders Meeting	Tucson, AZ
Nat'l Assoc of Extension 4-H Agents (NAE4-HA)	Oklahoma City, OK
Nat'l Association of College Funding Advisors	Tampa, FL
Nat'l Community Education Assn. Meeting	San Diego, CA
Nat'l Council on Family Relations	Orlando, FL
Nat'l Ext Volunteer Conference	Little Rock, AK
Nat'l Extension Community Development Conference	Las Vegas, NV
Nat'l Junion Hort Association Conference	Milwaukee, WI
NC ANR Program Leaders Meeting	Fargo, ND
NC Director's Meeting	Chicago, IL
NC Director's Meeting & Natl 4-H BOT Meeting	Washington, DC & W. Va
NC State 4-H Director's Conference	Grand Rapids, MI
NEA-ESP Nat'l Conference	Colorado Springs, CO
NEAFCS Nat'l Meeting	Nashville, TN

NELD Conference	Washington, DC
NELD Conference	Milwaukee, WI
North American. Pesticide Applicator Certification & Safety Workshop	Madison, WI
North Central Region Volunteer Forum	Indianapolis, IN
North Central Regional Meeting	Caruthersville, MO
North Central Regional Meeting	Nebraska City, NE
Ohio Short Course - Horticulture	Columbus, OH
Partnering with Parents Workshop	Ames, IA
Perennial Plant Assn Nat'l Meeting	Knoxville, TN
Poverty Symposium	Wisconsin Dells, WI
Shaping a Healthy Future Conference	Jackson, WY
Society for Nutrition Education	Orlando, FL
USDA Conf - Research on Obesity	Washington, DC
USDA Grantsmanship Workshop	Washington, DC
Various Midwest Fruit, Vegetable & Farm Meetings	Indianapolis, IN
Work with nutrition center on school lunch prog w/UNC	Vietnam & Malaysia
World Pork Expo	Des Moines, IA
Young Child with Special Needs Conference	Las Vegas, NV

Multi-state Conferences 05.xls

APPENDIX A

Table 1 - University of Illinois College of ACES: Research Funding and Support

Table 2 - College of ACES: U of I Extension Funding and Teaching Contacts

Figure 1 - Image of the Form CSREES-REPT (Revised 09/04)

Table 1 - 2005 College of ACES Research and Funding Support

	RESEARCH FUNDING AND STAFF SUPPORT (FY 2005)						
	GOAL I	GOAL II	GOAL III	GOAL IV	GOAL V	Total	Multi-State
Total CSREES Research	6,441,312	726,070	1,596,568	2,397,657	429,446	$11,591,053	$1,021,206
Total Other Federal Research Funds	5,602,976	832,758	1,412,079	1,386,718	27,545	$9,262,076	$640,860
Total Non-Federal Funds	22,009,221	4,949,137	5,005,369	7,547,464	2,091,826	$41,603,017	$5,396,079
Total All Research Funds	$34,053,509	$6,507,965	$8,014,016	$11,331,839	$2,548,817	$62,456,146	$7,058,145
Total Number of Research Projects	156	25	39	81	22	323	45
Scientist Years	84.61	12.98	16.31	38.04	9.6	162	21.35
Non-Scientist Staff Support	253.56	45.86	63.4	101.56	21.45	486	63.97
Total Staff Support	338	59	80	140	31	647	85

Table 2 - 2005 College of ACES U of I Extension Funding and Teaching Contacts

	GOAL I	GOAL II	GOAL III	GOAL IV	GOAL V	TOTAL
Federal Funding - All Sources	2,419,159	802,104	2,765,573	816,379	5,300,798	$12,155,346
State Funding - All Sources	7,002,829	2,321,879	8,005,607	2,363,203	15,344,414	$34,939,318
Local Funding	2,574,778	853,701	2,943,476	868,895	5,641,785	$12,897,271
Other Funding	2,150,364	712,981	2,458,287	725,671	4,711,820	$10,791,768
Total Estimated Expenditures by Goal	$14,147,130	$4,690,665	$16,172,943	$4,774,148	$30,998,817	$70,783,703
Estimated Teaching Contacts by Goal	358,120	289,881	897,062	162,908	897,927	2,605,898
Estimated Knowledge/Practice Changes using the conservative assumption that 50% of participants achieve some level of change	179,060	144,941	448,531	81,454	448,964	1,302,949
Total 4-H Youth Enrolled					292,302	

Note: Values are extrapolated from the Extension reporting system used to meet U of I positive time reporting reuqirements and monitor U of I Extension's affirmative action program. Expenditures are assumed to be at the same proportion by source across all five goals.

Expenditure data source: fy05uie-expend-source4.xls; Effort and Audience Count Source: Weighted 2005ProgramYear_Contacts by GPRA Goals.xls

Form CSREES-REPT (Revised 09/04)

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Actual Expenditures of Federal Funding for Multistate Extension and Integrated Activities
(Attach Brief Summaries)
Fiscal Year: 2005

Select One: ☐ **Interim** x **Final**
Institution: University of Illinois
State: Illinois

	Integrated Activities (Hatch)	Multistate Extension Activities (Smith-Lever)	Integrated Activities (Smith-Lever)
Established Target %	2.2 %	0.6 %	0.6 %
This FY Allocation (from 1088)	5,301,860	8,621,246	8,621,246
This FY Target Amount	116,641	51,727	51,727
Title of Planned Program Activity			
Program support for res/ext joint appointments	291,874		202,546
Information Technology support	83,988		31,823
ACES Afield Publication	5,655		5,655
Farm Progress Show	21,272	12,318	12,318
Conferences	4,559	161,401	5,293
Farmdoc Project	46,417		35,983
Market Maker Project	5,362		2,702
Plant Management Network	1,000	1,000	1,000
Integrated Swine Program	10,200		25,164
Lab for Community & Economic Dev	4,000		50,000
Green Industry Project	40,000		10,000
Part-time Farming/Sustainable Agriculture	117,293	31,610	31,610
Illinois-Indiana Sea Grant Program		41,050	41,050
IL Ag Entrepreneur Dev Initiative			76,613
FAST Business Plan Program	10,257		18,555
Amish Horseradish Project	5,050		3,000
Earth and Society Project	52,365		10,206
Total	$699,292	$306,087	$563,518
Carryover	0	0	0

Form CSREES-REPT (Revised 0

Certification: I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays represented here accurately reflect allowable expenditures of Federal funds only in satisfying AREERA requirements.

ENT D

Dennis R. Campion
Director

3/09/06
Date