FY 2001

Annual Report

-of-

University of Illinois Extension
-and-
Illinois Agricultural Experiment Station

-to-

Cooperative State Research, Education and Extension Service CSREES-USDA

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

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FY 2001

Annual Report of

Accomplishments and Results

To

Cooperative State Research, Education and Extension Service
(CSREES)

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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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.

CSREES GOAL 1: An agricultural production system that is highly competitive in the global economy

The mission of the College of Agricultural, Consumer and Environmental Sciences (ACES) is to enhance the quality of life of rural and urban people through teaching, research and outreach programs focused on human activity, food, fiber and natural resource systems. Technology advances provide the underpinnings for many of the College of Agricultural, Consumer and Environmental Sciences (ACES) initiatives, which includes both Extension and Research. Development of capacity in biotechnology and the implementation of a plan to improve the College's research facilities continue to be important areas of work.

This past September the U of I Board of Trustees authorized the University to obtain $115.7 million in financing to proceed with major elements of the College's plan to modernize campus-based (South Farms) and agricultural field research locations. The Board of Trustees also authorized the University to seek $60 million in state funding for the proposed Illinois Food and Nutrition Institute.

Illinois-Missouri Alliance for Biotechnology (IMBA)

The University of Illinois has partnered with the University of Missouri and Southern Illinois University under the federally funded Illinois-Missouri Biotechnology Alliance (IMBA). Other cooperators include Iowa State University, USDA-ARS, Northwestern University and commercial firms. This project has as its goal to open new options for the corn and soybean industries in the Midwest and the nation.

Rapidly growing population, urbanization, and affluence, especially in Asia, are causing a dramatic increase in the consumption of animal protein. These changes are leading to unprecedented growth in animal production and in global markets for animal products. Corn and soybeans are economically and nutritionally superior to other grain crops for feeding swine, beef, dairy, poultry, and confined fish. These classes of livestock are increasingly being produced in large scale facilities around the world. With superior technology, Illinois, Missouri, and surrounding Midwestern states can be principal global suppliers, not only of corn and soybeans, but also of value-added livestock and other food products produced from these crops. To capture these emerging markets, however, the U. S. will have to compete vigorously against sophisticated foreign producers and will have to address consumer concerns about quality, safety, and efficacy of products containing genetically modified corn and soybeans.

IMBA continues to support *AgBioForum*, a unique, web-based, peer-reviewed journal designed to reach and educate a broad audience on issues of central importance. AgBioForum articles are widely reproduced in the classroom, by the media, and as references in academic journals. Total readership has surpassed 175,000 (about 150 unique visitors a day) and includes scientists and

interested lay persons from universities, industry, government, international organizations, and commercial sites. In 2001, AgBioForum produced and distributed a major special issue on the influence of governmental policy on the development of agricultural biotechnology in Europe.

A group of social scientists has discovered that European attitudes towards foods from genetically engineered plants or animals are more heterogeneous than Americans typically believe. There is strong objection to genetic engineering of animals, but attitudes towards functional foods are variable. A significant proportion of the European population simply objects on the basis of ethical grounds. These and other insights into the attitudes of a key customer of American products will be important in international marketing.

Another group of scientists is analyzing news media coverage of agricultural biotechnology, particularly as it relates to communication of risks. If the subject is food safety, the stories tend to emphasize benefits as opposed to risks. If the subject is biosafety, though, then there is less emphasis on benefits. In both Europe and the United States, environmental risks have been the focus of stories that report on agricultural biotechnology, and this has likely had a major effect on consumers.

Soybean Disease Biotechnology Center

Established within the National Soybean Research Laboratory (NSRL) at the University of Illinois through federal appropriations in FY02, the Soybean Disease Biotechnology Center represents an important initiative for soybean producers in Illinois and the United States. About 15 percent of total soybean production is lost to disease each year. That amounted to approximately 69 million bushels in 2001. While there were significant improvements in soybean yields during the last few decades, there was no reduction in the percentage of crop lost to disease. Soybean cyst nematode (SCN), sudden death syndrome (SDS) and other diseases continue to be major threats to the U.S. soybean industry.

The Soybean Disease Biotechnology Center will be the first line of defense against major soybean diseases, especially the soybean cyst nematode (SCN), that threaten the industry. The Center is bringing the power of new sciences of structural, comparative, and functional genomics and genetic transformation to bear on SCN and other current and potential disease threats, including major diseases not yet in the U. S. such as soybean rust.

The Soybean Disease Biotechnology Center is strongly supported by two unique campus resources, the Keck Center for Comparative and Functional Genomics and the National Center for Supercomputing Applications. They offer high throughput genetic sequencing, unequaled bioinformatics capabilities, and unique, one-of-a-kind genetic analysis tools, including micro-arrays. Center researchers also have ready access to the University of Illinois Biotechnology Center, which provides recombinant DNA and protein services, immunological resources, flow cytometry, high capacity transgenic plant production, and cell and tissue culture facilities.

The Soybean Disease Biotechnology Center connects with the new St. Louis-headquartered Danforth Plant Science Center and participates in the Illinois-Missouri Biotechnology Alliance. Its association with the NSRL will insure that research in the Soybean Disease Biotechnology Center will fully complement and benefit from other public and private soy research programs across the nation. This will insure that the results of fundamental soybean disease biotechnology research are quickly translated into practical technology, useful information, and sustainable competitive advantage for the industry.

Livestock Genome Sequencing Initiative (LGSI)

During the first year of the Livestock Genome Sequencing Project (FY02), 60,000 new sequences from the cattle genome (cattle genomic inserts in bacterial artificial chromosomes, or BACs) were generated at the University of Illinois. These 60,000 new "sequence tagged sites" are being integrated with maps that are being created collaboratively with the USDA-ARS and the British Columbia Cancer Research Centre. The sequences generated provide the necessary "anchoring" of the cattle map to the map of the human genome. The second year's work will allow the sequencing of 60,000 additional cattle BAC-ends for the whole-genome cattle map and 60,000 BAC-ends for the swine gene map. When completed, the resulting maps will permit rapid isolation and characterization of genes affecting health, well-being and productivity of cattle and pigs and will provide an indispensable template for the DNA sequencing of both genomes. Preliminary discussions are already underway with other institutions and federal agencies to create the funding base for complete sequencing of the cattle and pig genomes.

For the long-term protection and security of our nation’s food supply, the ability to rapidly diagnose and respond to threats from exposure to infectious and chemical agents rests increasingly on our knowledge of the genomes of critical plant and animal species. Mapping and sequencing genes are the essential first steps to learning the function of each gene. Knowledge of gene location and sequence, as is amply demonstrated by the human genome-sequencing project, opens a whole new vista of approaches to health, welfare, and quality of life issues and serves as the basis for future biological research. Diagnostics and cures for some of the major scourges of mankind, including cardiovascular disease, cancer, diabetes, and obesity are among the potentials of this initiative.

In livestock, the initiative will enable powerful, environmentally safe approaches to disease prevention, resistance, and treatment; stress alleviation; increased productivity and profitability; improved food quality, safety, functionality, and diversity; improved odor and waste management; improved environmental quality; and enhanced quality of life for food animals. Above all, the initiative will address the growing aspirations of the world’s population for

nutritious, healthy, safe, and affordable livestock products and will provide new technology to secure those products against bioterrorist threats. Even though it is an international undertaking, there is a very important global competitiveness dimension to this initiative as well. To illustrate, China, the world's largest pork producer, and Denmark, the largest pork producer per capita and a major world exporter of pork and pork products, have launched an aggressive swine genome sequencing initiative. Independent efforts to sequence the cattle genome are underway in New Zealand. If the U. S. is to remain technologically competitive in global food markets, it is absolutely essential for the U.S. to be among the first to map and sequence food animal genomes. This fundamental biological information is the foundation for sustainable competitive advantage.

Other Initiatives

Interactive Agronomy Handbook

The printed version of the Illinois Agronomy Handbook has been popular with the farming community since it was first published in 1967. The University of Illinois sells 10,000 to 12,000 printed copies of the handbook every two years when it is printed to farmers, advisors, bank managers, and crop consultants.

But more and more people are seeking searchable, interactive tools on the Web. The Agronomy Handbook online provides people with free, instantaneous information and offers calculators to help them customize the data to their own needs. A wireless Web component would be especially beneficial to farmers who need information fast.

The online version takes the printed handbook a step further by incorporating calculators so users can enter their own values and the calculations are made for them, telling them how much fertilizer to apply, for instance.

One calculator, AgMath, walks the user through step by step conversions for area, yield, volume, length, temperature and mass. Another tool on the "bench" is Agriweather. This tool lets the user create customized climate data and predictions for their area of Illinois, such as daily, monthly, seasonal or annual rainfall amounts. With cooperation from the Illinois State Water Survey, up-to-the-minute weather information is available on the site.

The wireless Web site makes the online handbook a real time saver for farmers. For example, if a farmer is out in a corn field scouting for first or second generation European corn borer, he or she can enter the information directly after scouting and determine gain or loss from an insecticide treatment. If the insecticide needs to be applied, a call can be placed at that moment to the applicator so application can be done in a timely manner to avoid damage to the crop**.**

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

About two-thirds of the College's research portfolio is invested in Goal 1 projects. Roughly one-fourth of Extension's efforts and budgets are directed to this goal. Much of the research portfolio is directed to projects which are specific to Illinois. In the last reporting year, Extension staff,

including those with joint Research and Extension appointments had more than 339,000 face-to-face teaching contacts.

Key Theme: Adding Value to New and Old Agricultural Products

Optimizing Ag Production Facilities

a. Small businesses, and particularly new manufacturing and production ventures, suffer from a lack of cohesive industrial engineering information. Production facilities are often outgrowths of small prototype and hand-assembly methods rather than facilities planned for current or projected production levels. As a result of the uncoordinated growth, facilities may operate far below capacity, restrained by poor coordination between manufacturing operations or poor infrastructure.

   University of Illinois researchers use systems-modeling software similar to that used in designing control systems in aircraft and apply it to the factory situation. The optimization application tool allows small businesses to make better use of available resources without requiring additional capital investment.

b. Impact - Working with a local food manufacturing plant, a University of Illinois graduate student was able to illustrate how the company could increase profits by $1.6 million a year by making better use of the existing equipment. The growth of small Illinois businesses could increase the state's employment outlook and overall economy.

c. Source of Funds - Hatch, State

d. Scope of Impact – Primarily Illinois

Key Theme – Animal Health

Biology and Control of Emerging Strains of Poultry Disease Respiratory Agents

a. Fowlpox is a common disease of chickens and turkeys. To prevent fowlpox, birds are vaccinated with live, attenuated fowlpox virus vaccines. However, in spite of regular immunizations outbreaks of fowlpox have occurred in all regions of the U.S. in previously vaccinated chicken flocks resulting in significant mortality and economic losses. Thus, it appears that current vaccines are not providing adequate protection. In this regard, using molecular techniques, we have found that the viruses responsible for the disease outbreaks contain intact reticuloendotheliosis virus (REV) integrated in the fowlpox virus genome (natural genetic engineering). Interestingly, the less virulent fowlpox virus vaccines contain only a remnant of REV. Since REV has been associated with immunosuppression and tumor formation, we feel that the presence of intact REV in fowlpox virus may play an important role in these outbreaks.

b. Impact - Respiratory disease continues to be the most common and economically important contributor to overall disease losses in poultry in the United States and many other countries.

c. Source of Funds – Hatch, State

d. Scope of Impact - National

Key Theme: Animal Production Efficiency

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

a. The amount and composition of milk that a sow produces has a significant impact on the growth, health and development of her offspring. Piglet growth and health influences are all subsequent aspects of pork production. In swine, 44% of the growth of suckling pigs is accounted for by the volume and solids content of the mother's milk. Low milk production decreases piglet growth rate and results in decreased piglet weaning weight when the piglets are weaned. This decreased weaning weight affects overall pig performance through the nursery, grower and finishing stages and also affects general piglet health. Transgenic animals are animals that contain a gene or engineered gene that they would not have obtained through normal breeding or mating practices. The genes are transferred into the animals by injecting the gene of interest into a developing embryo. In a small percentage of the embryos, the injected gene becomes part of the animal's chromosomes. This allows the gene to behave like any of the animal's other genes and the gene is passed on to the offspring in a normal fashion. Alpha-lactalbumin is a major whey protein of cow and pig milk that is involved in regulating the production of lactose or milk sugar. Our hypothesis is that if more lactose is produced, the lactose will draw water by osmosis into milk and increase milk volume. Thus, we proposed that increasing the level of alpha-lactalbumin in pigs will result in greater lactose production and greater milk volume. We have previously found that this occurs in mice. Our project objective was to study the effects of increasing alpha-lactalbumin levels on milk production, milk composition, piglet health and survivability in sows transgenic for the bovine alpha-lactalbumin gene. Using this transgenic approach we have been able to increase the total

alpha-lactalbumin production in these sows by approximately 50%. The growth rate of piglets nursing transgenic sows was compared to those nursing control sows. At weaning (day 21), piglets suckling transgenic sows weighed approximately 500 grams (about one pound) more than piglets suckling the control sows. The over- production of the alpha-lactalbumin protein from the inserted transgene in first parity sows has a significant impact on milk composition early in lactation and a significant increase on piglet growth. The potential impact on the swine industry is that increasing sow milk production 10% would result in an additional $2-5 per litter weaned (average litter size 7.8 piglets). Further, the increased weaning weight will improve the weaning transition and shorten the number of days to market or puberty. Potentially an additional $5 per animal. Considering that 90 million pigs were born in 1997, this is a potentially tremendous economic advantage to pork producers.

b. Impact- Transgenic pig results suggest that alpha- lactalbumin may be limiting for lactose synthesis, and lactose may be limiting for milk production. Results suggest that over-expressing alpha- lactalbumin 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 alpha- lactalbumin transgenic swine have and will continue to allow analysis of the effects of over expression of a-LA.

c. Source of Funds – Hatch, State, Regional Funds

d. Scope of Impact – Regional Research with AR, CA, CO, CT, IA, LA, OK, OR, UT, WA,

Role of Estrogen in Epididymal Function in the Rooster

a. Poultry is produced worldwide and is an accepted source of meat by most people. Poultry is the number one source of meat in the world. Several years ago we made a serendipitous discovery that can seriously affect poultry production. We found that the reproductive tract of roosters were filled with small stones, similar to kidney stones in humans. Stones are present in young roosters several weeks after they are sexually mature and increase significantly with age. We first thought that these stones were due to the high calcium diet fed to these roosters. However, after reducing calcium and vitamin D in the diet, there was no reduction in the presence of stones. We did a survey of a large number of flocks throughout the United States, Japan and Brazil and have found these roosters also have stones. This is a worldwide problem. With further testing of these roosters for fertility, we found that fertility was greatly reduced whether roosters mated naturally or artificial insemination was used. The fact that fertility was reduced when sperm were obtained from roosters with epididymal stones in contrast to roosters that did not have epididymal stones indicates that these stones are also interfering with the proper maturation of sperm. As artificial insemination is used more extensively in the poultry industry, the problem of epididymal stones will have a significant impact on production of poultry because, according to our data, 25-50% of the eggs collected from hens artificially inseminated will not be fertile. As is obvious, this will be a severe problem for hatcheries and their ability to provide a sufficient number of chicks. Studies are in

progress to identify the cause for these epididymal stones. This research has been funded by the USDA and Animal Health and Disease Funds.

b. Impact – This study has two significant findings. We are showing the importance of estrogen in regulating the male reproductive tract. Previous to our studies, estrogen was considered to have no specific function in males; it was considered to be a "female" hormone. The fact that male reproduction is responsive to estrogen is of great importance. There are several sources of estrogen in our environment that could impact male reproduction. The first source is feed because soybeans are used as a protein source in poultry feed as well as in feed for other domestic animals. Soybeans are a rich source of phytoestrogens, which bind to the same receptors in animals as does estrogen. Furthermore, high concentrations of phytoestrogens in poultry diets have the potential to have a negative effect on reproduction. The second source of estrogen in the environment is the presence of many chemicals used in manufacturing, pesticides, herbicides, etc. that exhibit estrogenic activity in animals. Exposure to these chemicals can disrupt reproduction in poultry.

c. Source of Funds – State, NRI Competitive Grant and Animal Health and Disease

d. Scope of Impact – National

Molecular and Species Specificity of Fertilization

a. Fertilization and early embryonic death account for major economic losses in animal agriculture. To reduce those losses, we need to understand the underlying principles of fertilization and development but, unfortunately, we have a very poor understanding of the molecular steps involved in fertilization, particularly in agriculturally-important animals. The overall goal of this research is to better understand how the proteins in the egg coat bind sperm and to identify the specific molecules that allow sperm and eggs to adhere. In Specific Aim 1, we will determine the precise location on sperm of proteins that bind the egg coat. We will determine if the location changes during sperm maturation. The last three Specific Aims are focused on identifying and characterizing putative egg coat receptor/s on porcine sperm. In Specific Aim 2 we will identify genes encoding proteins from porcine sperm that bind to the egg coat. In Specific Aim 3, we will determine the site of synthesis and the final cellular location of candidate porcine egg coat receptor proteins identified in Aim 2. Putative receptors identified in Aim 2 should be synthesized by germ cells and located on sperm at the site identified in Aim 1. In Specific Aim 4, we will test the function of candidate porcine egg coat receptors. A better fundamental understanding of fertilization is essential to improve fertilization and early development rates. These studies will identify and study the receptors on a species with great agricultural importance. We have developed a technique to label egg coat proteins with a bright fluorescent tag and allowed the labeled proteins to bind sperm. Using fluorescence microscopy, we found that egg coat proteins bind primarily to the tip of the sperm. After sperm release a vesicle that aids in penetration through the egg coat, egg coat proteins bind to a much larger area of the sperm. We expect zona receptors involved in the first stage of egg coat binding and the second stage of egg coat binding to be

located in these discrete regions of sperm. In Specific Aim 2, we have determined the DNA sequence of many candidate receptors for the egg coat. We have obtained sequences from about 50 genes, some appearing to be good candidates for an egg coat receptor. We will complete the sequence analysis of these clones. Next, we will determine where these receptors are found on mature sperm and we will be certain these receptors are made in developing sperm. In the final Aim, we will test the function of egg coat receptor candidates by determining if blocking these candidates affects sperm-egg binding.

b. Impact - Fertilization failure and spontaneous early death of embryos in the uterus account for major economic losses in animal agriculture. However, we have a very poor understanding of how sperm and eggs interact. Our knowledge of the key proteins that allow sperm to bind eggs is particularly deficient in agricultural animals. The purpose of this research is to identify the genes encoding proteins on porcine sperm that are important to bind sperm to eggs. One or more of these sperm proteins will also help sperm release enzymes so sperm can penetrate through the egg coat and fertilize the egg. We will determine the region of sperm that binds the egg coat. We will use a screen to identify proteins that bind the egg coat and we will be certain they are found on sperm. We will test the biological importance of these proteins during fertilization by blocking them. A better fundamental understanding of fertilization is essential to improve fertilization and early development success rates. One may be able to use these results to develop more accurate fertility assays or add supplements to semen from subfertile males to improve their fertility. These studies will identify and study sperm proteins that bind the egg coat on swine, a species with great agricultural importance.

c. Source of Funds - Hatch, State

d. Scope of Impact - National

Key Theme: Aquaculture

Intensive Commercial Aquaculture Research and Demonstration Project

a. The general research goal of the Intensive Commercial Aquaculture Research and Demonstration (ICARD) Project is to ascertain the economic viability of commercial recirculating aquaculture systems in Illinois and the Midwest. This goal supports the statements of "Vision for U.S. Aquaculture" by the Joint Subcommittee on Aquaculture and by the American Farm Bureau Federation (FBF) in the drafts of the National Aquaculture Development Plan: "To develop a highly competitive, profitable aquaculture industry in the United States to meet consumer demand for cultivated aquatic foods and products that are of high quality, safe, competitively priced, nutritious, and are produced in an environmentally responsible manner" (AFBF, 1996).

b. Impact - The project addresses the economic viability of commercial recirculating aquaculture systems in Illinois and the Midwest.

c. Source of Funds – State, USDA/CSREES Special Grant

d. Scope of Impact - Midwest

Key Theme: GIS/GPS

Leave the Driving to Automatic Guidance

a. Recent advances in precision farming, agricultural machinery and information technologies have provided U.S. farmers effective means to maximize their productivity with minimal resources. For example, current technology allows a farmer to apply the right amount of fertilizers and/or herbicides to needed areas only. However, these labor-intensive jobs require farmers to drive their tractors and maneuver different implements. Today's farm machinery is becoming increasingly wide, making it difficult to align the tractor in the field for the next pass without an overlap or gap. Aging agricultural workers will find it difficult to work all day because of the tedious and laborious tasks.

University of Illinois researchers have developed automatic guidance technology to pinpoint a tractor or combine location in the field, find the right pathway for the machinery and drive it down the desired path. This automatic guidance technology combines a number of sensors such as a camera and a global positioning system (GPS) to determine the location and path.

Researchers have also developed an advanced steering control system to drive the machinery automatically following the desired pathways accurately. This technology has been successfully tested on five different makes and types of tractors and one combine harvester. One of the research tractors has driven itself for two seasons in the field both day and night doing planting and cultivation at normal operating speeds**.**

This technology will free farmers from driving machinery and allow them to make on-the-spot decisions for other tasks. It will reduce farmers' fatigue from driving machinery along crop rows, increase the efficiency of precision farming production and will increase farm safety. This technology will likely be available to farmers in one to two years.

b. Impact - Reduced labor costs
- Increased precision including in use of soil amendments and crop protectants.
- Increased farm safety

c. Source of Funds - Hatch, State

d. Scope of Impact – National

Key Themes: Innovative Farming Techniques

Economic and Environmental Costs and Benefits Associated With Precision Farming Technology

a. In research on farm information systems, we have developed a practical variable rate application program for nitrogen and constructed a validation procedure for testing this approach that can be implemented by farmers, farm managers or crop consultants. Three years of on-farm research results have demonstrated potential economic benefits from variable rate application of nitrogen fertilizer. With a cost-effective validation procedure, farmers or crop consultants can gain information enabling them to learn and adjust future management decisions to increase net returns from variable rate nitrogen.

b. Impact - The work done on these research projects has provided important economic evaluation of the impacts of site-specific information systems. We have identified new guidelines for implementing variable rate fertilization, which increase per-acre economic returns. The approaches have also provided a means of assessing current infield results and modifying the variable rate systems by statistically evaluating the yearly agronomic and economic results. Results have been published and presented at regional and international meetings.

c. Source of – Hatch, State

d. Scope of Impact - National

Key Themes: New Uses for Agricultural Products

On-Farm Use of E Diesel

a. Government-mandated emissions reductions, to be phased in during this decade, have placed considerable pressure on engine manufacturers to redesign their engines. Modifying fuel, instead of or in addition to the engine, is an attractive and relatively

inexpensive alternative, especially if the alternative fuel contains renewable components such as ethanol.

Laboratory tests in unmodified engines have shown that ethanol-diesel blends (E diesel) can provide substantial reductions in air pollution from engine exhaust. Over-the-road durability tests with E diesel have shown no abnormal deterioration in engine condition. Similar tests in off-road vehicles, such as tractors and combines, had not been conducted to any great extent in Illinois until the beginning of 2000.

With the assistance and cooperation of farmers in Illinois, University of Illinois researchers have been evaluating E diesel in side-by-side tests with pairs of unmodified tractors and combines running in the field on the blend and on standard diesel.

After one year of on-farm testing, E diesel has had an impact on participating farmers. They are requesting the program be expanded to include other tractors and combines used on their farms. Details of this project have impacted various organizations, in particular, the National Corn Growers Association and the Equipment Manufacturers Institute, which published details of the project in a document released to its members in November 2001.

These on-farm demonstrations of the successful introduction of E diesel for use in standard, unmodified engines are providing convincing evidence for farmers and industries that this fuel is a viable alternative to standard diesel.

b. Impact – Reduced air pollution
Reduced reliance on imported oil

c. Source of Funds – Hatch, State

d. Scope of Impact – National

Corn Zein Plastics

a. Producers often wrap hay bales in polyethylene wrapping to protect bales in the field from moisture and mold. The plastic wrapping is labor-intensive to use because it often shreds during removal and is unhealthy for livestock that consume the shredded pieces. University of Illinois researchers have created a flexible, biodegradable and edible corn zein film that has plastic qualities and is highly water-resistant. Corn zein is similar in structure to plastic, but it is environmentally safe. The researchers have developed a process to extrude zein resins into resin pellets, which could be sold from the corn millers directly to plastics manufacturers.

The research innovations could be used for biodegradable agricultural mulching films and packaging for fresh foods. Another application might be fast-food wrappers and trays that could be composted rather than sent to the landfills, thus saving space and providing fertilizer.

b. Impact – Reduced labor inputs
- Decrease in health risks to livestock
- Decrease in solid waste disposal

c. Source of Funds – Hatch, State
mailto:g-padua@uiuc.edu
d. Scope of Impact - National

Key Theme: Niche Market

Branded Livestock Project

a. Current economic trends favor more concentration in the agricultural sector with fewer livestock operations. Without the development of alternative markets to sustain enterprises that are not economically positioned to engage in aggressive acquisition, Illinois will continue to see the attrition of it's livestock industry. Compelling evidence of this situation has been the loss of 21% of the Illinois sow herd within the last year (2000). This type of decline in livestock numbers ultimately results in the erosion of the infrastructure needed to maintain the livestock industry in Illinois.

The beef industry already has fairly well established standards and methods for grading quality. Lamb was selected as a test model because the sheep industry appeared to be the worst case scenario for a consumer driven industry.

First, a connection was made with a producer in Sycamore, Illinois who had an interest in creating a branded lamb product. Next, a consumer survey was conducted to find out how often people purchased lamb and what they were looking for. The results of the survey showed that taste was the most important factor to consumers. Less fat was also a desired characteristic.

The research team used the consumer feedback from the survey to develop age, weight and feed specifications for the producer. By controlling the lambs' diet with a high concentration of corn-soybean meal, the qualities reflected in the survey could be consistently achieved.

In the three years since the creation of the Heartland Lamb label, sales for the Illinois producer have grown from selling just two lambs the first week to approximately 100 lambs per week. The product has been marketed to selected independent grocery stores and ‘white table cloth' restaurants where supplies can be more easily met. Consumers now have another option in the meat counter.

Producers are realizing more profit from this new branded lamb since customers are willing to pay 10% more for label.

Because the branded lamb carcasses must meet very specific criteria, Illinois producers will be encouraged to improve their flocks through managed breed and feed programs.

Also, the research results from the project will help develop similar marketing relationships with processing plants and sales markets throughout Illinois, increasing the potential profit for Illinois lamb producers.

b. Impacts – Increase in marketing of over 5,000 lambs per year

c. Source of Funds – Federal, State

d. Scope of Impact - Illinois

Illinois Value Project

a. New trends are emerging in production agriculture. While the food system is still diverse, a dominant emerging trend involves greater linkages and negotiated relationships among input suppliers, farmers and the end-users of farm products. One aspect of this change has been a shift to smaller, "niche" markets and more customized markets that are tailored to processors' needs. Many farmers view these more specialized markets as opportunities since they often entail a cash incentive or premium that can boost farm income and improve market security. However, producers often find a lack of information when they attempt to explore these opportunities.

The University of Illinois launched the Value Project to study value-enhanced/added agricultural and food systems, including new types of cooperative ventures, that have the potential to have a positive impact on rural communities, especially among small-to medium-size producers. The Value Project's activities include a survey of 70,000 Illinois farmers to determine their interest and involvement in value-enhanced commodities, fact sheets on value-enhanced corn and soybean technology, a value-enhanced market survey, specialized enterprise surveys, research on group action institutions such as producer alliances, surveys of new generation cooperatives, studies of new collaborative ventures, and organization of pilot projects to implement rural development.

Since the Value Project was launched in 1998, the percentage of value-enhanced corn produced in Illinois has increased from about 5.5 percent of the total crop to about 15.5 percent, or a total of 1.65 million acres. Value-enhanced soybean production increased from 4 percent of the 1998 Illinois crop to more than 14 percent, or nearly 1.5 million acres. It is estimated that about 7,000 additional Illinois farmers began producing value-enhanced corn and/or soybeans between 1998 and 2000. About two-thirds of the 16,800 specialty crop farmers who increased their acreage during this period increased their farm income by an average of 12.5 percent. It is estimated that Illinois farmers received a total of about $32 million in additional farm income in 1999 and 2000 from value-enhanced corn and soybeans.

b. Impacts - The Value Project "has become one of the most effective forces for integrating research and Extension activities in the area of specialty farm product development," said Illinois Farm Bureau President Ron Warfield (February 20, 2001)

- The following new alliances or coalitions have resulted or benefited from direct Value Project inputs: Prairie Premium Ag Coalition (McDonough County); Central Illinois Grain Alliance (Woodford County), Omni Ventures (Greene, Macoupin, Jersey, Madison, St. Clair, and Washington Counties); Agricultural Development Association (Crawford County); Southeastern Illinois Ag Coalition (Jasper County); and Dieterich Agri-Economic Association (in Effingham County). The Value Project also collaborates closely with the statewide Producers Alliance and the Ag Guild of Illinois.

c. Source of Funds – Federal, State, Local

d. Scope of Impact – Illinois, Midwest

Key Theme: Plant Genomics

Soybean Breeding and Genetics

a. The objective of the research is to improve soybeans through plant breeding and genetics. This work is being done because soybean farmers need better varieties with greater yield and more disease resistance. During the past year, varieties and lines were crossed to form populations; populations were advanced generations, and breeding lines were derived. The yields of lines were determined by testing them in field locations in Illinois. Lines were also selected for disease resistance through direct resistance testing and through marker evaluations. Breeding lines with high yield and disease resistance were identified and these lines will be evaluated in the field again next year. Genetic research is being conducted to identify the locations on chromosomes where disease resistance genes are located. During the past year, we confirmed the locations of new genes that confer resistance to soybean cyst nematode (SCN). These resistance genes are from the wild soybean species Glycine soja and they should be useful for improving the diversity of SCN resistance in varieties. We also have identified the location of a major brown stem rot (BSR) resistance gene from a source of SCN resistance. This identification will help us select for both SCN and BSR resistance at the same time. We have continued with the evaluation of plant introductions (PIs) to identify better sources of resistance to white mold. PIs were identified with a high level of resistance and these are being used as parents in the breeding program to develop new varieties with a high level of white mold resistance.

b. Impact - The goal of this project is to improve soybeans through breeding and genetics research. During the past year, we have made progress in identifying the locations of important genes that provide resistance to soybean cyst nematodes and brown stem rot. We have also made progress in identifying soybean breeding lines that have a high level of resistance to white mold.

c. Source of Funds – Hatch, State

d. Scope of Impact – Midwest

Comprehensive Resources and Datasets for Mapping Genes Controlling Maize Traits

a. There is increasing interest in modifying corn grain composition to increase the value of the grain. However, there is sometimes an associated reduction in grain yield when kernel composition is modified, which negatively impacts the economics of the value-added concept. Molecular marker assisted selection of small chromosomal segments was proposed to address this problem. However many of the results on kernel composition and grain yield were performed in different studies and in different locations. This research project is taking advantage of several molecular marker mapping populations that have already been developed, with molecular markers genotyped, evaluated in the field, phenotypic data collected for certain traits, and marker-trait associations determined

or under analysis. We are moving molecular marker - trait data sets on several per se and testcross populations for kernel composition traits, plant morphology traits, and disease resistance into uniformly designed Excel spreadsheets.

b. Impacts - This presents an opportunity to increase the value and safety of corn grain through genetic means by integrating and summarizing and making more useful and available information collected on chromosomal regions and genes controlling kernel composition, disease resistance, plant morphology and grain yield.

c. Source of Funds – Hatch, State

d. Scope of Impact - Midwest

Key Theme: Plant Health

The Role of Ethylene in Ozone-Induced Damage to Photosynthesis

a. The objective of this research is to understand the interaction between the air pollutant ozone (O3) and the plant hormone ethylene in producing damage to photosynthesis in soybeans. Surface ozone is one of the most damaging air pollutants to plants. The process of photosynthesis is particularly susceptible to O3 damage and directly influences plant yield. Data of the U.S. Environmental Protection Agency suggests that rural ozone pollution decreases soybean yields 10-20% on average in Illinois, equivalent to $250-500 million in lost revenue. In addition, plants respond to O3 exposure by producing ethylene, which appears to correlate with the degree of O3 damage.

b. Impact - Rural ozone pollution can decrease soybean yield 10-20% in Illinois, resulting in up to $500 million in lost revenue. Previous studies suggest ethylene insensitivity may lead to ozone insensitivity; therefore, ethylene insensitive mutants or lines may be useful in developing soybean varieties resistant to ozone. Mutant analysis may reveal specific genes to be selected for increasing ozone resistance.

c. Source of Funds – Hatch, State

d. Scope of Impact – Midwest

Pumpkin Production

a. Illinois ranks first in pumpkin production among all states in the nation. There are approximately 20,000 acres of pumpkins grown each year in Illinois-8,000 to 10,000 for processing and 10,000 to 12,000 for jack-o-lanterns. In fact, more than 65% of processing pumpkins produced in the U.S. are grown in Illinois.

But Illinois pumpkin crops have suffered huge losses due to a disease caused by the soil-born pathogen, Phytophthora capsici. This destructive pathogen has caused up to 100% yield losses in fields in the past few years. It attacks pumpkins and other vegetables such

as cucumbers, eggplants, melons, peppers, squashes, tomatoes, and zucchinis and causes seedling death, foliar blight and fruit rot. The losses caused by this pathogen have been so extensive that some growers have had to abandon raising the crops in their own areas and seek production of the crops in other areas.

Four-week-old seedlings of pumpkin, pepper and tomato grown under continuous red light in a greenhouse for four weeks were inoculated with P. capsici. The plants were then kept under natural light on the greenhouse bench. Control plants were either grown under natural light or continuous white light. Within 14 days of inoculation, 78 to 100% of the control plants died, but only 21-36% of the red light-treated seedlings became infected. Red-light treated pepper plants were transplanted in a field, highly infested with P. capsici, and the plants survived well, while most of the control plants were killed by Phytophthora blight.

If the seedlings can maintain the red-light induced resistance, the red light therapy could become a new, non-chemical method to control the disease caused by P. capsici.

b. Impact – Pumpkin production maintained; disease levels reduced

c. Source of Funds – Hatch, State

d. Scope of Impact - Illinois

Key Theme: Precision Agriculture

Improved Applications of Pest Control Substances

a. The use of remote sensing to improve agricultural production is now one step closer to reality on farms across the country. The new Illinois Laboratory for Agricultural Remote Sensing operates as a collaboration with the University of Illinois, the U.S. Department of Agriculture, the National Aeronautics and Space Administration Commercial Remote Sensing Program and the National Center for Supercomputing Applications. “The function of this lab will be to engage agri-business in applied remote sensing research, so as to investigate opportunities,” according to Professor Lei Tian. “It will also develop new product ideas and application prototypes for these companies”. Current projects at the remote sensing lab include a multi-state, soil sensing project to characterize soils for ultimate crop production and remote sensing based on variable rate application for herbicides. Down the road, Dr. Tian envisions the use of remote sensing to be applied as mini-sensors, in order to develop a monitoring network for crop conditions. The futuristic smart seed project could see pin-sized sensors placed on items as small as a crop seed.

b. Impact – “Precision farming makes both economic and environmental sense, but it has been oversold,” states Dr. Tian. “With present sensing technology, it is not likely to reach its full potential.” But remote sensing can make the difference. Images recorded from an airplane or a satellite can provide a great deal of information and have been used in a range of applications, from environmental assessment to military strategy. Exact

locations are pin-pointed through Global Positioning Systems. In the future, a farmer will be able to see what is happening throughout a farm field. This technology will provide a way to capture precisely where a crop is stressed so that in those specific areas, application rates can be adjusted.

c. Source of Funds – Hatch, State

d. Scope of Impact - National

Key Theme: Small Farm Viability

Sustainable Systems for Managing Weeds in Vegetable Crops

a. Weed management in vegetable crops has traditionally relied on extensive tillage along with older herbicides. Both these approaches to weed management cause environmental damage, are costly, and are not sustainable. The objective of this project is to develop alternative approaches to weed management in vegetable crops that are economical and environmentally-friendly. One approach is to modify nitrogen (N) fertility programs to favor crop growth over weed growth. We used eastern black nightshade in tomatoes as a model system. Both are solanaceous species that require high levels of soil nitrogen for best growth. We found that high-levels of nitrogen favor eastern black nightshade growth over that of the tomato and that tomato is more efficient in using nitrogen than nightshade. Fertility programs that apply lower levels of nitrogen directly to tomatoes could reduce weed-crop competition while protecting the environment. A second study evaluated a foam mulch system for growing tomatoes and basil. The foam mulch consists of cellulose fibers which suppress weed emergence and later will degrade in the environment. We found that tomato and basil growth and yield in the foam mulch system were comparable to that in the standard black plastic mulch. The color of the foam mulch impacted on crop growth with the best basil growth in the blue foam mulch and the best tomato growth in the red foam mulch. The foam mulch system has potential, especially for small-scale producers, to reduce input costs and disposal problems associated with standard plastic mulch systems.

b. Impact - Vegetable production is an important alternative enterprise on many small to mid-size Illinois farms. Weed management is generally the most costly and environmentally damaging operation performed on these farms. Our findings will reduce inputs, thus lowering production costs and increasing profitability while protecting the environment.

c. Source of Funds – Hatch, State

d. Scope of Impact – State

CSREES GOAL 2: A safe, secure food and fiber system.

The College of ACES addresses food safety and security concerns at multiple levels from the molecular to the home food preserver; to risks facing the elderly and young children. Research projects funded by Hatch, state and other funds are exploring ways to reduce or eliminate hazards at their source. For example, University of Illinois researchers are trying to eliminate or control potential reservoirs of salmonella on swine farms. University of Illinois researchers are working on the accuracy of DNA testing for genetically modified corn as well as doing meta-analysis of biotechnology safety studies.

To avoid food-borne illness once food leaves the processor, consumers and commercial food handlers need to select, store and use food in such a way that its safety and quality is maintained. University of Illinois Extension programs take the research-based food safety information to commercial food handlers and citizens, including youth. Illinois regulations require that at least one certified food handler be onsite wherever food is prepared or served to the public. Consumers learn safe food handling through face-to-face meetings, publications, the WWW, as well as from Master Food Preservers and by asking University of Illinois personnel specific food handling, preservation or safety questions. Some are in response to a crisis (e.g., “Power has been off for two days…what do I do about the food in my freezer?”)

Each year, U of I Extension provides food safety, food preparation and nutrition education to over 2,000 youth through Youth Cooking Schools. Extension Educators answer thousands of consumer food safety and food preservation questions from consumers annually.

For a number of Illinois citizens, especially children in poverty, the question is not just if their food is safe…it's whether there is sufficient food at all. University of Illinois Extension has addressed this question through poverty simulations, which sensitize citizens to these issues, and by facilitating collaborations with and among local organizations and agencies.

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

During the past year the College had a total of 38 research projects addressing food safety and security. University of Illinois Extension-paid staff members had more than 189,000 face-to-face teaching contacts under this goal. Prior evaluations of these kinds of informal educational programs have shown that between 50 to more than 95 percent of those persons reach adopt approved food handling practices. Additionally, U of I Extension workers and volunteers respond to more than 40,000 food safety/food preservation calls annually.

Key Theme: Food Accessibility and Affordability

Living in a State of Poverty

a. According to the Illinois Hunger Coalition, one out of five Illinois children are at risk for going to bed hungry. Effective local interventions are used to change the knowledge and attitudes of the local agency personnel and citizens regarding being poor.

"You learn that it is frustrating when you have to take care of all the bills, and you have to feed a family, and get your children to school, and you have a very limited income!"

That's how one participant in a welfare simulation summed up the experience. Since 1997, University of Illinois Extension has been sponsoring welfare simulations for employees of the Illinois Department of Human Services, local health and mental health agencies, and related agencies as well as local community leaders and interested citizens. The simulation, which was developed by the Reform Organization of Welfare (ROWEL), places participants in "families" who are living in poverty. These "families" try to make it through four "weeks" of poverty using various community resources.

The simulations are used to help participants understand the plight of people living in low-income families in order to facilitate development of more effective educational programs for low-income participants. Nearly all participants had high praise for the program:

"This was very emotional for me. I have been a social worker for ten years and until today I didn't realize how our paperwork and regulations affected our clients."

"I used to criticize a local family for buying groceries in a convenience store. Now I realize that they probably had no transportation which would enable them to shop anywhere else!"

"It takes a lot of energy to be poor."

During the last two years, 31 simulations have been held with each reaching at least 50 to 70 people. A review of pre/post qualitative reports from participants regarding attitudes, perceptions and experiences with limited resource concerns revealed that virtually all participants experienced changes in attitude and perceptions. When applied to the participation data for the last 24 months of at least 1,700 agency people, local leaders and volunteers, it seems reasonable to assume 1,000 experienced changes in attitudes and perceptions regarding limited resource persons and those who face low levels of food security by virtue of their economic status.
This past year participants at one simulation were asked about the likelihood the experience would lead them to changes in behavior. The following was reported:

- About one-third were very likely to change the way they did their job
- About 60 percent were likely to be more thoughtful about policies impacting poor people

- Almost half said their attitude about people using food stamps had changed
- About 30 percent were more likely to speak up regarding poor people

b. Impacts - 31 communities impacted

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

d. Scope of Impact - Illinois

Food Security Local Collaborations

a. For the last 12-month reporting period, 69 of 76 local University of Illinois Extension offices reported establishing collaborations to address access to food issues with more than 875 other organizations and/or agencies or volunteer groups.

b. Impacts - 787 cooperating agencies and organizations to meet local hunger needs

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

d. Scope of Impact – Illinois

Assessing Job Satisfaction, Training Needs and Stress in Social Service Employees Working in Food Pantries and Homeless Shelters in Chicago

a. The safety net in America is comprised of independent religious organizations as well as the federal government. Although government programs such as the food stamp program serve a large portion of the low-income community, food pantries that provide crisis care are abundant in our urban cities. These food pantries and homeless shelters are run primarily by para-church and religious organizations. It is doubtful if these para-church organizations provide training and benefits to the workers in these facilities. This study will determine the magnitude of the problem of job stress and level of training for workers in these para-church organizations. To determine the extent of this problem, a survey has been administered in the Chicago, Illinois metropolitan area. The survey collected data regarding: (1) demographic information, gender, age, ethnic origin, years in position; (2) data on work time, time since last vacation, paid time off; (3) benefits, sick leave, vacation, holiday pay, medical insurance; (4) job satisfaction, affect on family; and (5) training, how much training they received, how much training is required, if they feel they need more training. Next, a similar survey will be conducted with workers in the upper end of the hospitality industry. A comparison will be made between the two groups.

b. Impact - The objective of this study is to determine the demographics, training needs, job satisfaction, and stress of inner-city social service workers and para-church employees working in food pantries and homeless shelters in Chicago.

c. Source of Funds – Hatch, State

d. Scope of Impact – National

Key Theme: Food Safety

Private Strategies, Public Policies and Food System Performance

a. Research under this project continued to address the policy and structural issues arising from changes in consumer demand, food regulation and new technologies. Specific investigations include examination of quality and safety assurance systems in livestock production, the impact of food safety regulation on the international food trade, market structure adjustments to the introduction of genetically modified corn and soybeans, and how electronic market systems are improving market performance.

b. Impact - This research has improved understanding of the impact of food safety issues on food markets. Better information about hazards, more affluent consumers, increased international trade in fresh products, and the imposition of new regulations in many countries have increased the incentives for improving and certifying food safety outcomes. These incentives will have implications for farm-level production through bringing about greater demand for specific processes and management techniques to minimize hazards, and for third party certification of farm- level quality assurance. This research has informed outreach efforts such as a World Bank strategy paper and agribusiness toolkit, and a new website to help pork producers understand the implications of salmonella control.

c. Source of Funds – Hatch, State, Regional Research

d. Scope of Impact – Multi-State Research with AR, CA, CTS, FL, GA, IN, IA, KS, LA, MD, MA, MI, MN, MT, NE, NH, NJ, NYC, NC, OH, OR, RI, TX, VA, WI, USDA/ERS, USDA/RBS, USDA/AMS, USDA/PSA, CDCP, FDA, GAO

Illinois Dairy Producers Wipe Out Antibiotic Residue Contamination

a. Illinois dairy producers notched a historic "first" in December 2001 as no antibiotic residues were detected in raw bulk tank milk tested by law at each farm. Earlier, the state's dairymen had surpassed the national positive load average of 0.10 percent with only 0.06 percent of loads testing positive. Any milk that tests positive is dumped and never reaches consumers.

“The milk coming out of Illinois is a very high quality product," said Richard Wallace, University of Illinois Extension dairy veterinarian and leader of a five-year educational program to help Illinois producers and the industry eliminate antibiotic residues in milk.

Antibiotic residues can contaminate milk when producers use the drugs to treat animals. For the past five years, University of Illinois Extension and the Illinois Department of

Public Health have combined several efforts to educate producers and the industry about the problem and ways to prevent it.

"Ever since the program commenced, we have seen a steady decline in the number of tankers that tested positive for antibiotic residues on the farm," said Wallace. "The program has involved producers, state inspectors, industry representatives and veterinarians."

The multifaceted effort has involved speakers on the topic at University of Illinois Extension-sponsored Dairy Days, the annual fall conference for veterinarians, and the annual Illinois Sanitarians and Field Representatives Conference.

Wallace also produced a book on milk quality to send to all the state's dairy producers that included a checklist of the best management practices. "We also produced a large, laminated card to hang in dairy barns. It lists the ten most common reasons for antibiotic residue occurring in milk and the ways to prevent each one. If you travel around Illinois and visit dairy farms, you'll find that card hanging in many milking parlors."

Twice a year, Wallace sends out a newsletter, *Quality Milk Issues,* which also includes information on the prevention of antibiotic residues.

"Consumers need to know that any milk testing positive for antibiotic residue is immediately dumped and never enters the food chain," he said. "This program benefits producers and the industry by pointing out ways to avoid loss of a product necessitated by a positive test."

"Illinois producers have always been ahead of the national average and now they've set a new standard."

b. Impact - Increased product quality and farm income

c. Sources of Funds – Smith-Lever, State

d. Scope of Impact - Illinois

Studies to Reduce the Aflatoxin Problem in Corn

a. In order to attempt to prevent the formation of the toxic and carcinogenic compound aflatoxin by the fungus Aspergillus flavus, corn plants have been produced that carry the antifungal genes chitinase and beta-1,3-glucanase that are expressed only in the seed since they are controlled by a seed-specific promoter. The genes are expressed in all parts of the seed, especially late in seed development when the fungus grows the most. The genes have been crossed into the breeding lines B73 and Mo17 for further testing. Some of the transformed lines are more resistant to fungus growth and aflatoxin formation than the original line but are not as good as Tex6. Resistance from Tex6 has high heritability and is controlled by a relatively small number of genes. This inbred line, developed at the

University of Illinois, is one of the best sources of naturally occurring resistance to Aspergillus ear rot and aflatoxin production.

b. Impact – This project identified naturally-occurring sources of resistance to Aspergillus ear rot and aflatoxin production and developed, through transformation, potentially novel sources of resistance. Aflatoxin may cause human cancer and other human health problems, and these results are important in the process of creating resistant, commercially-usable corn hybrids.

b. Source of Funds –USDA/CSREES Special Grant, State

d. Scope of Impact - Midwest

Commercial Food Handlers Need to Wash Their Hands Too

a. According to the National Restaurant Association, the average foodborne 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. In the past 24 months, 1,898 foodservice 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 about 475 establishments (assuming four persons trained are equivalent to one establishment.) Currently Extension Educators are training an average of 50 to 100 commercial food handlers per month.

b. Impacts – 1,499 food handlers improved one or more food handling practices
- More than 475 food establishments now serve safer food

c. Source of Funds – Smith-Lever, State

d. Scope of Impact – Illinois.

Youth Cooking Schools

a. Cooking Schools have taught basic nutrition, food safety and food preparation to youth between the ages of eight and 12 years. Directed toward low-income youth, the educational campaign is conducted at no cost to the children.

In the past three years, more than 6,800 youth have participated in more than 400 schools; each school consisting of five half-days of hands-on educational activities.

Getting children involved with food is an effective way to improve eating habits and health. Hands-on cooking experiences can expose children to new foods, teach them

about healthful eating and develop their sense of self-efficacy. This experience increases the likelihood of a change to better eating habits. Plus, according to the young cooks, "It's lots of fun!"

Cooking Schools are a collaborative effort. For instance, a retired chef from Marriott donates his time at one site in Peoria. And all the programs have achieved a high degree of visibility and success in their communities.

Outcomes were determined by pre- and post-tests. After participation in the program, more children reported following safe food practices, preparing food items and selecting foods according to the Food Guide Pyramid. Typical outcomes (summarized across multiple sites and two years of pre- and post-tests) include: over 18 percent showed increases in knowledge about how bacteria can cause food poisoning. On average, 12 percent gained knowledge on how to avoid cross-contamination of food. In 1999, ten percent more could identify how to correctly cook ground meat in the post-test than in the pre-test. In 2000 more than 20 percent increased their post-test score in this area. The increase in youth who can correctly identify the number of servings of bread and cereals, fruits and vegetables and meat and meat alternates was statistically significant across sites and years. Youths showed a statistically significant average gain of two points on the post-test after the program. Over two-thirds (68 percent) showed a gain in post-test scores over pre-test scores.

b. Impact – Sixty-eight percent of youth show gain in food safety, nutrition and preparation tests

c. Source of Funds - Federal, State, Local

d. Scope of Impact – Illinois

Safety of Biotechnology

a. With the current world population at about six billion and the estimated ten billion people expected by the year 2040, many scientists believe that modern methods of biotechnology must be used to produce enough feed for livestock and food for humans.

But there is considerable hesitation from consumers, producers, seed companies, and even other scientists to embrace biotechnology products intended for human consumption.

Currently in the United States, genetically-modified corn and soybeans that have reached the marketplace are approved for use in animal feed. Jimmy Clark, a professor of ruminant nutrition in Animal Sciences at the University of Illinois at Urbana-Champaign, reviewed the results from 23 research experiments which were conducted over the past four years at universities throughout the United States, Germany and France. In each study, separate groups of chickens, dairy cows, beef cattle, and sheep were fed either

genetically-modified corn or soybeans or traditional corn or soybeans as a portion of their diet.

Each experiment independently confirmed that there is no significant difference in the animals' ability to digest the genetically-modified crops and no significant difference in weight gain, milk production, milk composition, and overall health of the animals when compared to animals fed traditional crops.

The interest in Clark's review of the 23 independent research experiments rippled around the globe. Scientists and citizens from Japan, Argentina, Denmark, Switzerland, Germany, Belgium, Canada, Australia, France, Mexico, Spain, and the United Kingdom requested more information and copies of the complete report. Many expressed excitement over this confirmation that biotech products did not affect the animals that consumed them and the hope that this brings the world one step closer to approving biotech corn and soybeans for human consumption.

Bacillus thuringiensis (Bt) corn produces protein that kills the European corn borer, a common and very destructive pest in corn fields. Corn borers reduce the quality and yield of corn and damage the plant tissue, resulting in an increased opportunity for fungal growth. The fungi can produce a dangerous toxin that can kill horses and pigs and cause esophageal cancer in humans. So, eliminating the corn borer from corn reduces the chance for growth of the fungi from the corn plant, therefore improving the safety of corn for animals and humans.

b. Impact – Contributes significantly to a general understanding of the promise and safety of genetically-modified foods

c. Source of Funds - Federal, State

d. Scope of Impact - International

Key Theme: Food Security

Improvement of Thermal and Alternative Processes for Foods

a. Engineering and biochemical properties of foods needed for process design include rheological, thermal, mass transfer, and electrical properties. Development and standardization of methodologies for measurement of these properties is needed to ensure consistency of parameters across stations. Evaporation is a capital and energy-intensive unit operation used in many food processes. The heated surfaces of evaporators become coated with constituents of food materials being concentrated, resulting in fouling. The constituents responsible for fouling and processes that will reduce surface fouling will be investigated. Specific processes focused upon will be corn wet milling and dry grind ethanol processes. Reduction of fouling will make corn processing more efficient and cost effective in the long term. Extrusion is a process used to create many food products. Extrusion processors are concerned about consistency of their products.

Products obtained from corn are widely used in extruded products. Fluctuations in corn product quality are believed to generate unanticipated variability in extruded product quality, resulting in processing inefficiency and higher product costs. The amount of variability caused by corn hybrid will be investigated by milling single corn hybrids in pilot scale processes, then extruding the corn products in pilot scale extrusion to observe variability.

b. Impact - Engineering parameters are needed to design a wide variety of food processes. Variability of food materials makes it a challenge to make cost-effective and safe food products. An understanding of engineering parameters will ensure a safe and inexpensive food supply.

c. Source of Funds – Hatch, Regional Research, State

d. Scope of Impact – Multi-State Research with CA, FL, IN, IA, MI, MN, MO, NE, NJ, NY, NC, ND, OH, OR, PA, SD, TX, WA

Key Theme: Food Security

Illinois 4-H Food Drive - "4-H CAN Make a Difference"

a. The Illinois Hunger Coalition estimates that 1.5 million Illinois residents go hungry each year and children comprise half of that number. Unfortunately, these statistics are continuing to increase. The recent economic downturn, falling agricultural prices, increasing company closures, and rising unemployment have dealt critical financial blows to many Illinois families. Many must turn to local food pantries, shelters and meal programs for assistance in feeding their families. Most community efforts to help provide food at these facilities take place during the winter months. The Illinois Foodbank Association reports critical shortages of food supplies at local food pantries during summer months when children that use government subsidized meal programs during the school year are at home. For the past five years, Illinois 4-H youth have sponsored “4-H CAN Make A Difference” food drives at the Illinois State Fair and Du Quoin State Fair. Fair visitors and industry sponsors contribute non-perishable food during the event. In addition, 4-H clubs across Illinois host food drives at local fairs and community festivals where the youth distribute hunger awareness information and facilitate ways that local citizens can help.

b. Impact - Last year alone:
-Illinois 4-H youth collected more than 83 tons of food at the Illinois State Fair and local drives. All food is donated to Illinois food shelters and pantries
-contributed more than 213,000 hours of volunteer service at food banks, pantries, shelters and meal programs throughout the state
-more than 32,000 youth participated in some capacity; youth were involved extensively in leadership roles locally, at the county level and/or statewide
-for the third consecutive year, Illinois 4-H received the Illinois Foodbank Association's Statewide Food Drive of the Year Award for outstanding

leadership in providing sustenance to citizens in need
-officials at the Central Illinois Foodbank, which supports 287 food pantries in 37 Illinois counties, reported that during the time that the 4-H food drive was promoted, donations to local food pantries increased by 50 percent. The East Central Illinois Foodbank recognized 4-H youth for assembling the most food ever collected in a single food drive event.
-participating youth and adults became more aware of food security issues

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

d. Scope of Impact Illinois

CSREES GOAL 3: A healthy, well-nourished population.

The College of Agricultural, Consumer and Environmental Sciences is a world leader in the areas of human nutrition, the enhancement of naturally occurring food components which aid good health (functional foods) and in the development of commercial food processing techniques and food products. The College's research and outreach efforts span from basic molecular research to practical advice on good nutrition and food practices for consumers in Illinois and internationally.

The College's Extension and Research efforts also assist consumers and communities in issues of health care and creating and providing healthy environments.

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

Last year the College had a total of 46 research projects related to Goal 3. University of Illinois Extension have over 379,000 face-to-face teaching contacts related to this goal. College WWW sites related to human nutrition receive over one million "hits" each month.

Key Theme: Health Care

Lack of Health Insurance for Farm Workers

a. Farming is one of the most physically dangerous occupations, yet a significant percentage of U.S. hired farm workers don't have health insurance in case of accidents or illness. People without health insurance may not receive medical treatment or may run up huge debts from their medical treatments causing severe financial problems for their families.

   Researchers at the University of Illinois reviewed Census Bureau data from 1995 to 1999 involving 7,204 hired farm workers nationwide and found that 38 percent were without health insurance. Among the hired workers, those most at risk are likely to be poor, Hispanic and less educated. Of the farm workers who earned less than twice the poverty threshold, 53 percent did not have health insurance.

b. Impact - The study has important implications for policy makers. Small-sized firms, like most agricultural firms, may benefit from well-targeted reforms dealing with the tax treatment of health insurance premiums and in small group programs that pool small firms at the state level to purchase health insurance. In addition, the lack of health insurance indicates a need for continued support of public funding for community health efforts. Providing educational programs to help the low-income farm workers increase their skills in order to shift to other industries may also increase the health insurance coverage of hired farm workers.

c. Source of Funds - Federal, State

d. Scope of Impact – National

Uncompensated Health Services

a. Access to health care is an important issue for community residents, particularly in rural areas. A related issue is the amount of uncompensated or under-compensated care and services provided by health professionals. When providers donate significant services and products for charity cases, the entire community is impacted.

A survey of dentists, mental health professionals and pharmacists in West Central Illinois found that providers contributed to charity cases at an average cost of about $10,000 annually. Providers that supply services and products out of their own pockets may become discouraged if they perceive that state, community and other providers are not making an effort to rectify the situation. As a result, they may be forced to relocate and local residents will have limited access to health care and loss of services. Additionally, fewer new providers will be recruited to the area as the need increases for providers to offer uncompensated services.

Even when providers are able to donate services and stay in business, the lost revenues may represent the share of income that might otherwise go to upgrading equipment, upgrading their own skills or other investments in their practice.

b. Impact - An outcome of the survey is a number of recommendations for public policy to reduce expenses from uncompensated services. Recommendations might include increasing Medicaid reimbursements for various services and examining the potential for partnerships across rural counties in order to have the critical mass of providers and funding to overcome access barriers in the dental and mental health areas.

c. Source of Funds - Federal, State

d. Scope of Impact - National

Key Theme: Human Health

How Natural Environments Enhance Human Functioning – Identifying the Mechanism

a. A study of two public housing complexes in Chicago found that people who lived in buildings near trees, grass and other "green spaces" were more likely to feel up to confronting life's challenges. Professor Frances Kuo found that green spaces, even in small doses, appear to allow people to rest their minds, recharging their mental batteries for dealing with tasks that require concentration or "directed attention." Similar results were found in a University of Michigan study performed by Professor Rachel Kaplan.

b. Impact – Previous research has shown that regular contact with natural settings supports healthy human functioning. By identifying the mechanism underlying these impacts, this work should provide guidelines as to how often an individual should have contact with nature, the duration of exposure and the forms of nature that would be optimal or sufficient for enhanced functioning.

c. Source of Funds – Hatch, State

d. Scope of Impact – National

Green Play Areas Help AD/HD Children

a. University of Illinois research continues to find a positive connection between the human condition and green space in urban areas. A study, published in "Environment and Behavior" in 2001, shows that greener play settings reduced symptoms of children with Attention-Deficit/Hyperactivity Disorder (AD/HD). Children who played in windowless indoor settings had significantly more severe symptoms than children who played in outdoor spaces with trees and grass.

b. More than two million children in the United States suffer from AD/HD. These findings suggest that these children could benefit from simply spending time in green areas. Also, because the research is based on the theory that contact with nature supports attentional functioning, all children may benefit from spending time in green areas.

c. Source of Funds – State, Federal
mailto:kuo@uiuc.edu

d. Scope of Impact - National

Phytochemicals and Cancer Prevention

a. Select phytochemicals have been screened to determine their antiproliferative effect on metastatic mouse mammary cancer cells. Particularly potent were specific isothiocyanates found in vegetables. This cell growth inhibitory action was associated

with alterations in cellular proteins controlling cell cycle progression and programmed cell death (apoptosis). Studies are in progress to characterize these cancer inhibitory effects.

b. Impact - Increased fruit and vegetable consumption is associated with reduced risk for numerous cancers. This project will examine the effectiveness of selected phytochemicals as suppressors of breast and colon cancer in cell culture and animal models

c. Source of Funds – Hatch, State

d. Scope of Impact – National

Soy Estrogen Stimulates Human Breast Cancer Cells: Animal Model

a. Many soy isoflavone-containing products are marketed to women over age 50 for the relief of menopausal symptoms. Yet pre-clinical animal data suggest that caution is warranted regarding the use of such products for women with breast cancer, particularly if they are menopausal.

A University of Illinois researcher found that dietary estrogen (soy isoflavones) in a variety of forms can stimulate estrogen-dependent breast tumor growth in animal studies. When isoflavones are fed to young animals, the soy product may protect against the development of many types of cancers. But fed at a later age in the absence or low levels of estrogen, such as the case with many menopausal women, the soy estrogens can stimulate estrogen-dependent cancer-cell proliferation.

b. Impact - The study findings suggest that women with estrogen-dependent breast cancer or a predisposition to the disease may want to reduce their consumption of soy products with a high isoflavone content.

c. Source of Funds – State, Federal
mailto:helferic@uiuc.edu
d. Scope of Impact – National

Key Theme: Human Nutrition

Osteoporosis Prevention and Treatment

a. Dietary calcium is one of the few controllable factors known to contribute to the development of osteoporosis. While the need for adequate calcium intake during adolescence has been well recognized, adequate calcium intake during adulthood is also vitally important. The objectives of this project are to develop and implement a behaviorally-based education program which targets osteoporosis prevention through increased calcium intake and increased physical activity. The program lessons have been developed and peer-reviewed for content validity. The evaluation tools have been developed and are being tested for reliability. The program will be pilot-tested again in the spring.

b. Impact - The result of this project is an educational model which can be implemented in a broad range of settings. Such a program could be implemented in clinical or community settings, or adapted for at-home learning experiences. This project could improve the quality of life for older persons by being replicated and distributed after validation.

c. Source of Funds – Hatch, State

d. Scope of Impact – National

Benefits of a High-Protein Diet

a. For 30 years, the government has touted a diet based on 60 percent carbohydrates, 30 percent fat, and 10 percent protein. Yet, more Americans are overweight than ever before. As people look for alternatives to the Food Guide Pyramid program, they often turn to fad diets that go to extremes and may be unhealthy or hard to maintain.

A University of Illinois researcher studied the outcomes of a moderate diet which increased the servings of the meat or protein group to six daily servings, compared with the government recommended amount of three servings, and decreased foods in the bread, rice and pasta group from seven daily servings to four. Half of the study participants followed the Food Guide Pyramid recommendations, and half ate the alternative, higher protein diet. Both groups consumed the same number of calories.

After ten weeks, both groups lost about 16 pounds. But the group that consumed more protein said they had more energy and felt more satisfied between meals. This group also lost more fat and less muscle mass, so they increased their capability to burn calories by the end of the study.

b. Impact - This research project highlights the benefits of consuming a higher protein diet for losing or maintaining weight. People who feel less hungry between meals are more likely to avoid snacking and stick to a diet plan, as shown in the study. Since obesity is

the #1 health concern in the U.S., a diet plan that increases satiety and energy would be a more effective alternative and could have a tremendous impact on the nation's health.

c. Source of Funds - State, Federal

mailto:d-layman@uiuc.edu

d. Scope of Impact – National

Key Theme: Infant Mortality

Dietary Fiber and Gastrointestinal Function

a. The incidence and mortality rates of diarrhea and dehydration in children younger than five years of age is significant. In comparison to formula-fed infants, breast-fed infants have fewer episodes of acute diarrhea and intestinal infections. Despite this and many other advantages of breast-feeding, only about 55% of American mothers nurse their infants in the hospital, and at six months only 20% are still breast-feeding their infants. Because of the prevalence of formula-fed infants, efforts to optimize the composition of infant formula are being made to infer some of the advantages of breast milk to these infants, such as increasing immune responses to invading pathogens.

Impact - Current infant formulas may be optimized by the addition of fermentable substrate, thereby increasing the defensive mechanisms against intestinal infections and diarrhea in formula-fed infants.

Source of Funds – Hatch, State

Scope of Impact – National

CSREES GOAL 4: Greater harmony between agriculture and the environment

The year 2001 marked the 125th anniversary of the University of Illinois "Morrow Plots." A plaque at the site of the plots describes the plots as "America's oldest continuous experimental field." What the plaque fails to emphasize is the plots were developed and instituted to test the idea of "permanent agriculture" – a scientifically based strategy for keeping soils and farms perpetually productive. The plots demonstrate the College's belief that in order for agriculture to remain competitive it must be sustainable. As noted by the Department Head for the College's Department of Crop Science, "There can be little doubt that the Morrow Plots were also the site of the first permanent sustainable agriculture experiments on the American continents.

Indications of the Scope of the Research and Extension Programs under Goal 4 – see Appendix A

Last year the College had 129 research projects related to Goal 4. University of Illinois Extension staff reported 116,000 face-to-face teaching contacts related to Goal 4.

Key Theme: Air Quality

Odor and Dust Control Technologies for Livestock Facilities

a. Studies have been conducted on methods of removing dust and odor from animal buildings. Wet scrubbers for exhaust fans were shown to remove up to 80% of the dust mass while reducing fan performance only 1.5%. Tests for the ability to remove odorous gases from the exhaust airstream were inconclusive. More modifications of the wet scrubber are planned. Some studies were done to develop a biofilter that could be used after the wet scrubber. This should be advantageous since the wet scrubber removes particles and humidifies the air which should reduce the size and cost of the biofilter. Airflow characteristics through corncobs, chipped wood and pine bark nuggets were determined to see if a more economical biofilter media could be used. Corncobs had the lowest static pressure drop as air flowed through that media and may be a good media for biofilters. Two mouse cage bedding types were tested in shoe-box cages at two relative humidities and with two mouse strains to determine the mass generation rate of ammonia emissions. Heat and moisture production were also determined at all of these conditions.

b. Impact – Wet scrubbers could reduce odorous emissions from swine facilities, and when combined with biofilters could also remove odorous gases. Ammonia emissions from mouse cages can be reduced with appropriate selection of bedding. Much needed metabolic data on mice has also been provided.

c. Source of Funds – Hatch, State
d. Scope of Impact – National

Key Themes: Forest Resource Management

Ecosystem-Based Management for Illinois Forests

a. We have previously focused on defining an ecosystem-based framework for the management of forest, natural and agricultural lands in Illinois. A definition and management goal of ecosystem-based management on Illinois lands has been developed along with a conceptual land management scenario. Recent attention has focused on ways to implement these ecosystem-based concepts and goals in Illinois where most land is privately held. Implementation of ecosystem-based goals and strategies on private land is intricately tied to human or social dimensions, which are difficult to define and understand. Understanding the way landowners perceive and identify natural resource problems and solutions and identifying obstacles that may prevent landowners from changing land management practices are essential in developing implementation strategies in states where private land ownership dominates.

b. Impact – Currently, over 100 watershed-based groups have formed in Illinois to address non-point source water quality, flooding, soil erosion and habitat issues. These groups consist of local landowners who determine goals and management strategies for their watershed while agency and academic staff provide data, resources and funding.

c. Source of Funds – McIntire-Stennis, State

d. Scope of Impact - State

Inventory and Analysis of the Mesophytic Forest and Its Western Extensions

a. Data from this study are used to evaluate and analyze changes in species composition and community structure of the western extensions of the Mixed Mesophytic Forest Association. Changes in forest communities in Illinois are being compared with baseline information on the composition and structure of the Mixed-Mesophytic Association. Additional study sites in Indiana and Kentucky are identified; using preliminary data, a principal components analysis indicates species dominance similar to the Appalachian sites. Plots established in two forest communities were sampled for all vegetation in the tree overstory and regeneration layers, the shrub layer and the herbaceous layer. Plots within canopy gaps have also been established at one late-successional site to provide a more detailed analysis of factors influencing differences in regeneration dynamics beneath gaps and beneath closed canopies.

b. Impact - As forest tree species composition changes, there are associated changes in wildlife populations, economic values and many other direct and indirect forest benefits. Management techniques of these forest systems must be adapted or modified to ensure continued production of habitat, desirable species and other forest benefits.

c. Source of Funds – Hatch, State

d. Scope of Impact - Midwest

Key Themes: Integrated Pest Management

Validation of a Regional Weed Management Decision Support System

a. Field studies were conducted in 2000 at three locations in Illinois to validate weed management decisions in corn and in soybeans generated from the WeedSOFTSM decision support system. WeedSOFTSM is a decision support system software that is currently used in Nebraska. Efforts are currently being made to regionalize this software for other corn and soybean producers in the Midwest. After this first year of validation trials, weed scientists in the cornbelt determined that this software will need to be modified for individual states or sectors throughout the North Central Region. Initial data showed that the predicted weed efficacy results were very comparable to the actual outcome. The bioeconomic model used to predict yield loss due to weed competition was fairly accurate in predicting yield loss. However, it was not effective in predicting yield loss after a weed management strategy was implemented. Data from this year's research is currently being used to refine the bioeconomic model that will be used to predict yield reductions from weeds after a weed management strategy is implemented. Another outcome from this study was that narrow row soybeans had a competitive ability over soybeans with wide rows.

b. Impact - This research has the potential to provide a valuable decision support tool to the Illinois producer. Information generated from this software will educate growers on the impact of different weed species, densities and weed management decisions on yield. It will also provide support on whether a weed problem will cause a yield loss and if it is economical to treat with a herbicide. The ultimate goal of this project is to make growers more aware of the impact of weeds and to help optimize their weed management decisions both economically and environmentally.

c. Source of Funds – Hatch, State

d. Scope of Impact - Midwest

Key Theme: Nutrient Management

Nutrient Management Plans—Program Affects 80,000 Acres

a. The livestock industry is experiencing dramatic changes that threaten to drive many Midwestern farmers out of the business. To stay afloat, it is imperative that livestock producers learn to plan and document their manure management system…a skill that few farmers in the past adopted on their own. What's more, new state and federal regulations for livestock confinement operations have increased the importance of planning and documentation. In Illinois, recent amendments to the Illinois Livestock Facilities Management Act require all producers to develop a Comprehensive Nutrient Management Plan (CNMP). Operations with more than 5,000 animals must submit their CNMP to the Illinois Department of Agriculture for approval.

The University of Illinois Extension staff in the Department of Agricultural Engineering has developed and implemented a long-term program to help Illinois farmers write

CNMPs. The plans document practices and performance, helping farmers develop good record keeping skills, and suggest ways to reduce fertilizer usage and balance nutrients for crop production. The plans go farther than the regulations require by helping farmers anticipate and avoid emergency situations such as manure spills and personal injuries.

Essential attributes of the CNMPs include: facets of the plan must be useful to the producer, must meet state and federal compliance, must be upgradable, must be simple enough for anyone to maintain, and must be useful for training farm employees.

University of Illinois Extension Educators see reluctance on the part of producers to begin the plan-writing process, due mostly to the complexity involved. The program offered by U of I Extension simplifies the process through the design of forms and procedures.

Comprehensive Nutrient Management Plan writing workshops have been held across the state in U of I Extension facilities and community colleges and have involved U of I Extension Educators in crop sciences, animal sciences, and farm business management and marketing, plus NRCS staff. Their expertise has proven to be valuable assets to the workshops. The staff of the Agricultural Engineering department has contributed to the program through their broad understanding of nutrient management, mapping technologies and farmstead facilities planning.

Illinois-specific software and computer training have been core components of all workshops. Nutrient management plan information and worksheets are available on the Internet (http://www.livestocktraining.com). Future plan writing workshops will target crop and livestock consultants.

University of Illinois Extension has held 12 Comprehensive Nutrient Management Plan workshops since December 1997. Approximately 75 livestock producers and consultants, representing thousands of acres of Illinois cropland, have attended and completed CNMPs as a result of the workshops.

b. Impact - In a sample of 13 farmers attending the workshops, 14,670 acres of Illinois farmland were put under Comprehensive Nutrient Management Plans, with an average size of more than 1,100 acres per farm. Some of the plans included as many as 34 crop fields for a single producer. Assuming the same average size farms for all participants, including only one farm per consultant, a conservative estimate puts the total Illinois cropland acreage improved by the environmentally sensitive planning process at over 80,000 acres.

c. Source of Funds – Smith-Lever, State

d. Scope of Impact – Illinois

Mason Jar is Key to New Nitrogen Test That Works

a. For more than 100 years, scientists have searched for a test that measures how much nitrogen soils can supply a growing crop. Now University of Illinois researchers, using a standard Mason jar, have developed such a test that can help farmers fine-tune nitrogen applications. It's called the Illinois N Test.

With this test there's a scientific basis for how much nitrogen will be needed for the corn plant. The test measures the fraction of soil organic nitrogen linked to corn yield. This fraction is amino sugar nitrogen, and it is found in microbial cell walls.

The research is ongoing, trying to figure out how many samples are needed per acre, the optimal depth of the soil samples, how samples change over time, and the effect of the weather over different growing seasons.

b. Impact - The Illinois N Test has the potential to revolutionize nitrogen fertilizer recommendations. It could help reduce the amount of fertilizer applied to fields and, at the same time, improve the environment by preventing excess nitrogen application.

c. Source of Funds – Hatch, State

d. Scope of Impact – Illinois

Key Theme: Pesticide Application

Remote Sensing and Variable Rates Reduce the Cost of Fighting Weeds

a. Farmers are in a constant battle to maximize their yields and minimize their costs. One place farmers look is their use of farm chemicals. For weed control, they work to limit damage without using more herbicide than necessary. Concerns about possible runoff make finding the correct application level even more important. Having the ability to apply chemicals only where they are needed in a field benefits both the farmer and the environment.

University of Illinois researchers have been testing the use of remote sensing for variable rate herbicide application on soybean fields. Researchers examined aerial images to determine where weeds were present in a field. When there were no weeds present, herbicide was applied at .75 pints per acre. Where weeds were detected, a 1.5 pint per acre rate was applied. Researchers tested using a "smart sprayer," which varies the application rate across the boom, as well as a full boom sprayer used at varying application rates. Results were compared with a conventional uniform application of 1.5 pints per acre. The tests were carried out in a commercial soybean field and research plots. Variable rate herbicide application based on remote sensing is a promising approach for soybean production. Practical procedures can be developed to reduce herbicide costs and environmental risk.

b Preliminary results showed no difference in weed control but significant economic differences between conventional and variable rate applications. The cost of herbicide applied at the variable rate was $3 an acre less than full application cost.
If the $3 per acre savings could be realized for all 11 million acres of Illinois soybeans, input costs for herbicides would be reduced by $33 million. This benefit would be in addition to the reduction in possible environmental stresses which would be realized from the reduction of overall herbicide use.

b. Source of Funds – Hatch, State

d. Scope of Impact – Illinois, Midwest, National

Key Themes: Soil Erosion

Integration of Wheat Production Into Cropping Systems in Northwestern Illinois

a. Wheat (Triticum aestivum) could become an important addition into the corn/soybean crop rotation commonly grown in Northwestern Illinois, an area which currently grows very little wheat. Adding wheat as an additional crop alternative would offer another means to manage several pests, such as weeds, diseases and insects that are becoming more difficult to manage with the current cropping systems. Little work, however, has been done to determine which cultural practices are suitable for wheat production with the soils and environment found in Northwestern Illinois. A tillage study was conducted that compared planting wheat no-till into soybean stubble, or into tilled stubble. Averaged over three years, the yields were 5,834 and 5,613 kg/ha for no-till and tilled, respectively. A planting date study was also conducted, with the first planting date Sept. 30 to Oct. 1 for three years. Two subsequent planting dates were one and two weeks later. Four varieties of differing maturities were planted no-till into soybean stubble. Averaged over the three years, there was a 53 kg/ha decrease in yield for every day planting was delayed. The ability to successfully grow wheat planted no-till allows growers to save time and expense by not tilling, and also allows for increased residue cover to protect against soil erosion. Additionally, planting no-till wheat allows for an earlier planting date therefore increasing yield potential. The reduced labor and expense requirements of growing wheat without tillage could facilitate the adoption of wheat as a viable crop in Northwestern Illinois.

b. Impacts - This study has shown that it is possible to successfully grow wheat planted no-till in Northwestern Illinois, allowing growers to save time and expense by not tilling while increasing residue cover to protect against soil erosion. Additionally, planting no-till wheat allows for an earlier planting date, increasing yield potential. The reduced labor and expense requirements of growing wheat without tillage could facilitate the adoption of wheat as a viable crop, offering another means to manage several pests, such as weeds, diseases and insects.

c. Source of Funds – Hatch, State

d. Scope of Impact – Illinois, Northern Midwest

Key Theme: Soil Quality

Dependence of Crop Productivity in a Soybean-Winter-Cover Crop Production System on Soil Quality

a. The State of Illinois uses more than 27 million acres of land for agriculture and approximately 88% of that is used for row crop agriculture. Most of that acreage is in a corn-soybean rotation. The problem is that the use of short rotations and intensive and extensive tillage practices in the region has reduced soil quality and thus the agronomic potential and ecosystem services of many fields. Winter cover crops have long been recognized as possible tools for maintaining and improving soil quality and consequently addressing production and environmental concerns in agriculture. Therefore, the objectives of this study were to evaluate how changes in the level of soil quality will benefit production and environmental aspects of Illinois' farming systems and to relate changes in soil quality derived from the use of winter cover crops to crop production and critical soil functions.

b. Impact - The amount and quality of residue decomposition from winter cover crops play a major role in different aspects of soil quality and may improve the long-term performance of cropping systems in Illinois.

c. Source of Funds – Hatch, State

d. Scope of Impact – Multi-State Research with MD

Key Theme: Sustainable Agriculture

Control of Animal Parasites in Sustainable Agricultural Systems

a. Neospora caninum is a protozoan parasite that is an economically important cause of abortion in many parts of the world. In the current project, neosporosis was documented in an outbreak of abortion in a dairy herd in Illinois that caused the loss of 28% of pregnancies and newborn calves. This establishes the occurrence of epidemic neosporosis in Illinois and is an example of the damage that this disease can cause to dairy enterprises. Further studies are characterizing the causative organism.

b. Neospora caninum is a protozoal organism that infects and causes abortions. This project will help determine the long-term reproductive and economic consequences of a naturally-occurring neosporosis abortion outbreak in a beef herd.

c. Source of Funds – State, Regional Research

d. Scope of Impact – Multi-State Research with CA, GA, KS, LA, MN, MO, MS, MT, UT, TX, VA, WA, USDA/ARS

Key Theme: Water Quality

Pesticide and Other Toxic Organics in Soil and Their Potential for Ground and Surface Water Contamination

a. Pesticides have been detected in tile drain effluent and research was initiated to understand both the hydrology of tiled watersheds and the magnitude of the problem. Specifically, the presence of atrazine in tile flow and runoff from tiled fields in the Little Vermilion River watershed in East Central Illinois was examined from data collected under this and other projects. Results indicate that tile flow contains more atrazine than surface flow in this extremely flat watershed. In addition, the data indicates that the timing and rate of application influences the concentration in the tile flow. Atrazine applied either very early (before weed growth) or very late (after weeds are past their early, very active stage) exhibited higher concentrations in tile flow.

b. Impact – Knowledge of atrazine in tile flow, along with indications of the influence of rates and timing is available for U of I Extension Educators to include in their presentations on pest management to producers. This project contributed to the growing body of knowledge on hydrologic and environmental response of flat, tile drained watersheds and the differences between such response and that attributed to classical hydrology.

c. Source of Funds – Hatch, State, Regional Research

d. Scope of Impact – Multi-State Research with AL, AZ, CA, CTH, CO, DE, FL, HI, IN, IA, LA, KS, MN, MT, PA, SD, WA, USDA/ARS

BeachWatch Provides Water Quality Information

a. In the summer, it is common in the southern Lake Michigan region for swimming beaches to be closed or posted with warnings about potential health risks because of contamination by bacteria and viruses. When the beaches are closed due to high levels of E-coli (a contamination indicator species), it's not just an inconvenience and disappointment for swimmers and boaters, it may also result in a loss of revenue in those areas. The subsequent heightened negative view of the entire area may result in additional economic losses.

Illinois-Indiana Sea Grant and the E-coli Interagency Task Force, which includes representatives from 18 federal, state, county, and local agencies, joined forces to create BeachWatch. This is a series of 16 posters that not only provide critical information about E-coli outbreaks, but also about other beach and water quality issues. The BeachWatch poster series has been distributed to major metropolitan institutions that work closely with teachers, students and the general public, both residents and tourists.

b. Impacts -

• The Peggy Notebaert Nature Museum, which is part of the Chicago Acade
• At the Indiana Dunes National Lakeshore, the poster series is scheduled to be used in their annual Water Safety Expo. The Expo is attended by more than 2,000 students and their teachers.
• The Friends of the Chicago River has 198 schools as part of their network. This e

posters will be available at this hands-on educational learning experience.

c. Sources of Funds – Sea Grant, Smith-Lever, State

d. Scope of Impact – Illinois, Indiana

Teacher Training Fosters Community Stewardship

a. Exotic aquatic invaders are impacting waterways throughout North America. Invasive fauna, which include zebra mussels, green crabs, and nutria have had serious ecological and socio-economic impacts from the Great Lakes to the Gulf of Mexico and from the Atlantic to Pacific Oceans–and rivers and lakes in between. Purple loosestrife, water hyacinth and hydrilla are just a few examples of non-native aquatic plants that are choking waterways, hampering wetlands, and creating great disturbances in the native flora and fauna.

Through interactions with the public at boat shows, fishing events and state and regional meetings, Illinois-Indiana Sea Grant has learned that many people are not well informed about the impacts of invasive species. Citizens are unaware of steps they can take as individuals to prevent further spread of these species into new bodies of water.

Illinois-Indiana Sea Grant, along with five other Sea Grant programs, partnered with the Geographic Alliances of Louisiana, Indiana and Illinois to train 63 teachers at the "Exotic Aquatics on the Move" workshops. The focus was geographic applications with youth education and community awareness as the goal.

b. Impact –
- These teachers went back to their classrooms and education centers to inform over 4200 students about the effects of exotic species on the environment and the economy.
- As a result, students developed and implemented a variety of community stewardship projects designed to engage local citizens into taking action to improve their environment.
- Fifteen of these projects have been compiled in a 36-page booklet, *Community Stewardship Projects on Exotic Aquatic Species*, which is available to teachers and other educators, and can be downloaded from the Web at www.iisgcp.org/edu/br.

c. Source of Funds – Sea Grant, Smith-Lever, State

d. Scope of Impact – Illinois

Buffer Strips Reduce Pathogens in Drinking Water Source

a. In 1993, some 400,000 Milwaukee residents, three out of every four people in the city, experienced acute gastrointestinal problems. At least 47 died. The culprit: a protozoal parasite known as Cryptosporidium parvum, which had found its way into the drinking water.

Cryptosporidium, one of several pathogens that young livestock shed in their waste, is one of the most resistant parasites to water chemical treatment. Infected animals can pass as much as ten billion oocysts per gram of feces, and only a few infected animals can produce enough oocysts to potentially contaminate a large water source.

To control Cryptosporidium at its source, University of Illinois researchers are experimenting with vegetative filter strips (buffer strips) near animal production facilities. Buffer strips are designed to reduce runoff velocity, allowing more water detention on the surface. This promotes more infiltration into the soil, adsorption to the vegetation and sediment, and deposition of suspended solids. Previously, buffer strips have not been designed and used to control microscopic Cryptosporidium. The University of Illinois study has been investigating the effectiveness of buffer strips on the transport of the pathogens in surface runoff and vertical flow through a soil profile under varying slope and rainfall intensities in both vegetated and bare-ground conditions.

The laboratory experiments are being conducted on two different soils and three different vegetation types. Experiments are also being conducted on a 400-foot by 50-foot vegetative filter strip at the University of Illinois research farm.

Laboratory experiments have shown that buffer strips can reduce Cryptosporidium levels in surface water. The amount of Cryptosporidium recovered from the vegetated condition is significantly lower than from the bare-ground condition under all slope, rainfall and soil conditions.

Researchers also are developing a computer simulation model to design and develop buffer strips to control Cryptosporidium effectively. Data collected from laboratory and field experiments are being analyzed and used to define design criteria of buffer strips. The model will be calibrated and validated with the data and then recommended for defining optimum buffer strip design parameters to control microbial pathogens from animal feeding operations.

b. Impact - Research showed that the pathogen adsorbs moderately strongly to sediments. As a result, the buffer strips directly reduce Cryptosporidium by filtering sediments through vegetation. The pathogen was rarely detected in subsurface flow. Researchers found that under normal conditions, Cryptosporidium does not reach three feet below the surface. The results indicate that the buffer strips can effectively reduce Cryptosporidium in surface as well as subsurface water sources. Field experiments are currently being conducted.

c. Source of Funds - NIR Competitive Grant, Federal, State

d. Scope of Impact - National

CSREES GOAL 5: To increase the capacity of communities, families and individuals to improve their own quality of life.
Goal 5 parallels the mission of the College of ACES which is: "To enhance the quality of life for people and communities through teaching, research and outreach programs focused on human activity, food, fiber, and natural resource systems.

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

Last year there were 45 "Goal 5" research projects. Extension workers reported more than 439,000 face-to-face teaching contacts in this area. During the last year 371, 616 youth participated in 4-H Youth development.

Key Theme: Agricultural Financial Management

Farm Decision Outreach Central

a. Agricultural producers increasingly need expert advice on farm management issues, agricultural marketing, agricultural finance, commodity policy, and agricultural law in order to have an integrated view of the challenges and opportunities before them. A suite of decision tools and informational databases can enhance a farmer's ability to make sound management, marketing, financial, and legal decisions. These needs overwhelm the traditional land-grant university approach to Extension.

The faculty and staff of the University of Illinois Department of Agricultural and Consumer Economics developed Farm Decision Outreach Central, farmdoc, an innovative and comprehensive program that encompasses production, outlook, marketing, financial, policy and legal issues in a series of pages entered through http://www.farmdoc.uiuc.edu/ . University of Illinois Extension field personnel, campus-based specialists, faculty and researchers have built programs around farmdoc.

b. Impact – A number of indicators show that the farmdoc program has had a measurable impact on decision-making and economic behavior in its target audience. The increase in the overall use of the website as measured by "hits" is an especially noteworthy indicator. Usage has risen from an initial level of about 10,000 hits per month to nearly 100,000 hits per month. In total, there have been nearly two million hits to the farmdoc site over the last three years. Demand for specific materials also is noteworthy, with nearly 60,000 downloads of research reports on the performance of agricultural market advisory services, nearly 4,000 downloads of the FAST spreadsheet tools and the distribution of more than 2,000 FAST CDs at workshops and meetings. In addition, there are now more than 4,500 e-mail subscribers to farmdoc. The site has also been selected by the USDA to serve as a Satellite Center for the North Central Regional Risk Management Education Project.

c. Source of Funds – Smith-Lever, State

d. Scope of Impact – Illinois, Midwest

Financial Agriculture and Rural America: Issues of Policy, Structure and Technical Change

a. A credit risk valuation model is developed and empirically implemented to estimate the cost of insuring against credit risks in pools of agricultural mortgage loans. Probabilistic information about loss distribution across a broad set of loan-level and pool-level characteristics is used to assess insurance evaluation and solvency likelihood. The effects on the value of credit risk insurance of pool size, deductibles, timing alternatives, premium loadings, adverse loan selection, and changing underwriting standards are also estimated. Results indicate that actuarial insurance costs are initially highly sensitive and then become relatively insensitive as pool size increases. Recent finance studies have considered whether gaps between a firm's costs of internal and external sources of investment funds, arising from capital market imperfections, influence its investment behavior and funding preferences. This analysis tests the applicability of the pecking order and partial adjustment theories of financial structure to farm businesses by fitting a set of simultaneous financial equations with farm panel data from Illinois. Model results indicate that Illinois farms adjust to long-run financial targets for equity, debt and leasing, but that additional financing needs follow a pecking order that is stronger for farms with greater asymmetric information problems.

b. Impact - The results of the valuation of credit risk study are directly applicable to regulatory capital evaluations of major agricultural lenders, and to management and policy issues affecting the consolidation and structure of agricultural credit markets. The pecking order findings of financial structure contribute significantly to understanding farmers' financial behavior under different economic conditions, in which farmers are motivated to increase borrowings when cash flows are lower, and repay indebtedness and build reserves when cash flows are stronger.

c. Source of Funds – Hatch, State, Regional Research

d. Scope of Impact – Multi-State Research with AR, IN, IO, KY, MI, ND, NY, OH, TX, KS, MN

Key Theme: Child Care/Dependent Care

Operation Safe Kids

a. Often school-aged children spend some time home by themselves because of working parents.

University of Illinois Extension's "Operation Safe Kids" curriculum helps school-age children develop the skills they need to care for themselves. The program consists of six lessons and is often delivered in the classroom or as an after-school program. Key topics

include: personal safety, coping with fear, loneliness and boredom, getting along with others, emergency first aid, kitchen safety and nutritious snacks, and building confidence.

To determine the effectiveness of this program, one U of I Extension Educator administered a pre- and post-test to about 100 program participants.

b. Impacts –
- Post-test scores increased substantially in two areas: personal safety and first aid.
- 40 percent of the students improved their scores in dealing safely with strangers.
-Almost 30 percent showed improved knowledge in first aid skills.

c. Source of Funds – Smith-Lever, State

d. Scope of Impact – Illinois

Neighborhood and Community Factors, Social Support Networks and Preschool Children's Socioemotional Development

a. Data were collected on preschool children and their families that parallel data collection efforts over the last three years. Participants were children who were attending the University-affiliated Child Development Lab (CDL) as well as preschools in rural communities. These data included classroom observations of behavior, social network and support interviews, and sociometric interviews. Teachers also rated children's behavior using two standard social behavior rating scales. In addition to classroom data collection, families participated in laboratory procedures and home visits and completed questionnaires regarding parenting beliefs and social resources. The combined dataset is currently being analyzed. Findings reveal that the nature and structure of children's social networks are significantly related to their social adaptation and development. Furthermore, the quality of parent-child interaction and characteristics of the neighborhood/community context in which families reside influence children's socio-emotional development.

b. Impact - These data highlight multiple factors in different developmental contexts (family, community, classroom) that support the healthy development of children and families. The information obtained from this project is valuable for both parent and teacher education programs promoting the well being of children and families.

c. Source of Funding – Hatch, State

d. Scope of Impact – National

Key Theme: Family Resource Management

All My Money

a. Many community social service organizations use money management educational curriculum to teach low-income audiences how to use and manage their resources. Many adults need to learn basic skills in areas such as how to save money and use a checking account.

University of Illinois Extension developed a curriculum, All My Money, for social service organizations in Illinois to use with their clients. The eight lessons included topics on making spending choices, envelope budgeting, planning spending, understanding credit, handling credit problems, building consumer skills, taking consumer action, and checks and checking accounts. The curriculum is available in both English and Spanish. A resource box included in the curriculum contains play money, spending choices game cards, an emergency buying card to carry in your wallet, bank statements, checkbook registers, and other tools for teaching money management.

Program evaluation of social service organizations showed that prior to using the All My Money curriculum, almost half (47 percent) of the clientele respondents reported they "often" or "almost always" run out of money. After the program, only seven percent reported this problem.

b. Impact – Using the conservative assumption that, on average, ten clientele were reached by each trainee (some trainees have reported reaching hundreds), more than 4,000 individuals and families have been impacted by this train-the-trainer program.

c. Source of Funds – Smith-Lever, State

d. Scope of Impact - Illinois

Help for Decatur Families In Economic Difficulty

a. Industrial jobs in the Decatur area are evaporating at an alarming rate as many companies react to a softening U.S. economy. The closure of a Firestone plant, along with the closure or downsizing of many other companies, have pushed the 2001 loss of jobs in Macon County to an estimated 4,000. In response to the community need, the Macon County Office of University of Illinois Extension implemented a linkage and referral network to assist displaced workers and their families to a multitude of services. In collaboration with dozens of community agencies, U of I Extension launched the Displaced Worker program shortly after Labor Day. Workers or family members meet with an intake specialist who helps assesses their opportunities and challenges. Families are asked about retirement plans, financial plans, whether a home-based business may be of interest, and if help is needed with financing, business planning, licensing, etc. From the answers provided by clientele, workshops are held to address many needed topics. CPA's, bankers and other volunteers are enlisted to assist with the follow-up process. Focus groups of displaced workers are being organized to help identify latent personal and family needs. While U of I Extension can help some families with such challenges as anger management and better parenting in hard times, more serious problems are addressed by local family therapists recruited by U of I Extension. University of Illinois Extension's consumer fact sheet series, "*Getting Through Tough Times"* is widely distributed to union halls, grocery stores and social service offices. An Internet link to the series was also established on the Macon Unit website to allow more personalized gleaning of the information. A monthly U of I Extension newsletter is also published to help impacted families. The holistic method by which family problems were being address drew the attention of the Illinois Attorney General, which provided $500,000 to U of I Extension in Macon County from the settlement of a consumer fraud lawsuit with Firestone to help pay for retraining and education, family counseling and financial counseling. University of Illinois Extension is using the money to help affected workers reduce tuition expense to train for new careers, obtain needed family counseling and to find a new light at the end of the tunnel.

b. Impact – Already 200 families have been assisted.

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

d. Scope of Impact – Illinois

Key Theme: Farm Safety

Operators and Computers Share the Safety-Watch Duties

a. Farm injuries and fatalities are often the result of the mix of humans and machines. Farm workers and children can be near running equipment without the operator's knowledge. They are at risk of being run over by self-propelled machinery or entangled in high-speed, revolving components such as power take-off shafts, augers, cutters, and pick-up reels. An automated safety watching and warning technology can attract the operator's attention when there is risk of accident and result in a safer farming environment.

University of Illinois researchers have developed an intelligent protection system that can detect people near running equipment and categorize the risk according to the possibilities of injury. The sharing safety protector will generate audible/visual warnings to attract the operator's attention or automatically stop the equipment, depending on how near the person is to the machinery. The technology has been tested on a research platform.

b. Impact - The sharing safety protector will provide farmers with safer machinery and significantly reduce the risk of injury and fatality from equipment operation on the farm. This technology will likely be available to farmers in two-to-five years.

c. Source of Funds - State, Federal
mailto:qinzhang@uiuc.edu
d. Scope of Impact – National

Key Theme: Impact of Change on Rural Communities

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

a. Eleven states are participating in this project, which explores the impact of technology on rural consumer access to food and fiber products. Two phases were accomplished to date in Illinois: a) experiments and b) a panel survey. For the experiments, 46 consumers residing in rural areas who had never made purchases via the Internet were assigned either to sessions in which they had hands-on exposure to electronic shopping sites and television shopping videotapes (treatment groups) or to focus groups that discussed various shopping venues (control groups). Positive changes were found in consumer attitudes toward purchases via Internet shopping after exposure to Web-based commerce; attitudes toward purchases via television remained unchanged after exposure to television shopping videotapes, and attitudes toward shopping via the Internet were more positive than attitudes toward shopping via television. For the survey, 195 respondents contributed data, which is currently being merged with data from other stations.

b. Impact - Eleven states are participating in this regional research project which assesses rural consumer shopping patterns and attitudes toward use of computer and television shopping technologies. The project will facilitate development of programs that

familiarize rural consumers with the broad array of product information and convenient sources of food and fiber goods. The 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 study relevant to all areas of the U.S. In particular, non-metropolitan areas in the U.S., being a growing segment of the U.S. population, will benefit.

c. Source of Funds – Hatch, State, Regional Research

d. Scope of Impact – Multi-State Research with CO, NYC, IA, KY, MN, MS, NE, ND, OH, OK, WI

Key Theme: Jobs/Employment

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

a. The research "A Five Year Study of the Impact of Welfare Reform on African American Families and Children in Chicago" addresses a critical area of policy and research: How will families be affected by the changes in welfare laws? Intensive ethnographic methods are used to understand first-hand how a select group of families are faring, with key topics including daily routines, welfare and work histories, childcare strategies, and other related areas.

b. Impact – Little research exists on the impact of welfare reform on families. The current research addresses this substantive area by using first-hand empirical data from the families who are being affected. Moreover, the ongoing nature of the research provides an opportunity to examine changes in family life over time and can suggest policy recommendations that are grounded in the real-life experiences of families for whom the programs are being designed.

c. Source of Funds – Hatch, State

d. Scope of Impact – National

Key Theme: Parenting

Parenting Newsletters

a. In 1997 more than 119,000 Illinois children were reported as possibly abused or neglected. Children who have been abused or neglected by their caregivers are at greater risk for committing violent crimes, abusing drugs or alcohol, having difficulties in school, and forming poor relationships with others. Parents often do not intend to harm their children, but many have unrealistic expectations about children and parenthood and have difficulty coping with the stress of parenting.

University of Illinois Extension has sought to improve the quality of parenting in Illinois by expanding the range of educational methods that have typically been used. Educators utilized age paced newsletters developed by University of Wisconsin Extension to encourage competent parenting and thereby prevent abusive parenting. The newsletter series *Parenting in the First Year* and *Parenting in the Second Year* consists of 24 eight-page newsletters with research-based information and activities to enhance parent-child relationships.

b. Impact - Since 1998, over 25,000 families and childcare providers have received the ne
friends, doctors, and other written materials.

- 86 percent of parents reported that reading the newsletters led them to involve their ch
- 75 percent said the newsletters led them to talk more with their children
- 55 percent set rules and limits for children
- 55 percent reduced the use of physical punishment
- 52 percent of first-time parents also reported making more safety changes in thei

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

d. Scope of Impact – Illinois

Father Involvement in Early Childhood Education

a. School initiatives that invite parental involvement in early childhood education often overlook fathers as a source of support. Research has shown that male participation accounts for less than five percent of total parent involvement. A lack of opportunities for father involvement is even more prevalent in early childhood programs that target low-income, at-risk households due to the myth that the children have no contact with a father or other adult male. This misperception serves as a barrier used by school staff to keep fathers from participating in programs. When men assume more active roles in raising and educating their children, they may play a critical part in enhancing and facilitating their childrens' growth and development.

Brent McBride and colleagues developed interventions to overcome teacher biases toward men in a large pre-kindergarten "at-risk" program in Illinois. The researchers observed how teachers interacted with men during school events, provided one-on-one counseling and group sessions with teachers on issues related to father/male involvement, and sponsored men's events.

b. Impact - Teacher sensitivity training was labor-intensive, but more effective than simply creating new opportunities for fathers to participate. Results showed that teachers who received the interventions reported a significantly higher proportion of their parent involvement contacts were with fathers/males than teachers at a comparison site.
- The interventions could be used as a model for other early childhood programs to increase father involvement, for the benefit of both fathers and children.

c. Source of Funds - Federal, State

d. Scope of Impact - National

Key Theme: Promoting Business Programs

Legal Issues Affecting Agriculture: Local, State, National and International Perspectives

a. Research focused on the legal regulation of Genetically Modified Organisms in the U.S. and in the European Union (E.U.). This research resulted in two peer-reviewed journal articles, one national conference presentation, and numerous other popular articles and presentations. Research continued on legal issues in livestock waste and odor management. This work resulted in an educational website, as well as an article focused on regulation of nitrates from agriculture in the E.U. Livestock waste research continues, with focus on U.S. and E.U. regulation. Also, research continued on legal aspects of pesticide drift. A paper on this topic was presented at a state conference of specialty crop growers. Further research, supported in part by a Fulbright grant, concerns application of environmental principles (e.g., the polluter pays principle and the precautionary principle) to agriculture in the E.U. Other research focuses on the issue of multi-functionality in agricultural trade, in light of the upcoming WTO negotiations, and on other issues in agricultural law.

b. Regarding biotechnology, thousands of Illinois citizens better understand the strengths of the U.S. system of regulating biotechnology. Policy makers can better understand how the regulatory system in the U.S. differs from the European system, and can better understand ways in which the U.S. system can be improved. Regarding legal issues in livestock waste, farmers across the nation better understand their responsibilities under the regulatory system for livestock waste. Generally farmers, their legal advisors and policy makers are better equipped to address various legal issues in agriculture.

c. Source of Funds – Hatch, State

d. Scope of Impact – National

Key Theme: Workforce Safety

Occupational Safety and Health Through the Use of Protective Clothing

a. Illinois is continuing laboratory work on characterizing protective clothing materials for their barrier characteristics. Fabrics have been characterized for their physical characteristics and liquid retention, penetration, transport, as well as vapor transport properties. Laboratory experiments on the effects of chemical, sunlight, heat, and cold temperature exposure on barrier properties and structural integrity of protective gloves have been completed. Interlab tests on developing a standard method for contamination of protective clothing materials are ongoing in collaboration with New York and Maryland researchers.

b. Impact - Work done at Illinois provides systematic and critical knowledge about the protective efficacy of various textile and polymeric film systems used in the making of protective clothing. Also, fundamental research is generated to understand the barrier potential, physical integrity and useful life of various protective clothing systems. This knowledge is important in making recommendations for appropriate selection, use and care of protective clothing. Also, the proposed ASTM Standard test method, when approved, will be a major contribution of the NC 170 research group to the International

Standards Development, and industry-wide use of standard procedures for screening protective clothing and materials.

c. Source of Funds – Hatch, State, Regional Research

d. Scope of Impact – Multi-State Research with CA, GA, IA, MD, MI, NE, NY, OK

Key Theme: Youth Development/4-H

4-H Conversation

a. Youth often have ideas on how to make improvements in their communities and policy changes at the state level, but they lack an arena for making their suggestions known to implement these suggestions. This year, Illinois 4-H organized county-level conversations where youth could meet with other youth and interested adults from youth development organizations to discuss specific action-oriented steps in areas including life skills education, jobs/careers, youth activities, schools, youth leadership, and others. Nearly 70 Illinois counties held conversations to discuss issues that concern youth and to develop recommendations. The local recommendations were compiled and used at a state conversation to develop state action plans. State recommendations were forwarded to the national level and combined with other states to create a national report that will be presented to the President and Congress. This is the first time an organization has developed a series of recommendations starting in local communities and working its way up to one national report. Participants in the conversations will use many of the suggestions at the local level to address.

b. Impact – More than 700 youth involved in program development improvement.

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

d. Scope of Impact – Illinois, National

4-H Camp Clover

a. Not every youth can be reached through the traditional community club approach. To reach audiences that have not been served by 4-H, Illinois launched the "Camp Clover" program. During the past year 69 counties (compared to 43 the previous year) offered Camp Clover. The number of you served doubled to 4,340 with most being from “underserved” communities.

b. Impact –
Adventures in Our Community (729 Campers) - 97% identified a community strength

- 97% identified a community need
- 96% could name a good citizen deed
- 100% completed a community service project

WOW! Wild Over Work (1719 Campers)

- 42% improved their awareness of available jobs

Food Pyramid Revisited (2097 Campers)

- 71% could name all 5 food groups at the end of day 1
- 87% demonstrated the proper way to use kitchen knives
- 85% named correct serving sizes in fruit and vegetable and milk groups
- 74% correctly answered 7 of 10 food safety questions

Aerospace Adventures (1224 Campers)

- 98% designed & tested an airplane &/or rocket
- 73% modified their airplane design
- 67% modified their rocket design

Science Can Do That? (634 Campers)

- 76% correctly tested one acid/base substance
- 72% correctly completed 5 of 5 acid/base tests
- 87% recognized way to increase dissolution speed
- 84% correctly identified a mystery powder

Polish 4-H Adventures (942 Campers)

- 100% completed a Polish paper-cutting
- 98% sampled a Polish food
- 85% wrote letters to Polish friends
- Identified new learnings about Poland equal to nearly one per camper

Adventures with Plants and Soils (1309 Campers)

- 52% identified correct order of six or all seven seed development steps
- 95% completed tree root measurements
- 64% correctly matched 70% or more of flower parts with their functions

Science You Can Eat (1080 Campers)

- 86% identified a good carbohydrate source
- 82% identified a high fat source
- 72% identified three or four causes of bacterial growth
- 52% identified a factor that slows bacterial growth

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 the last year more than 7,800 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 underserved 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. In FY01, the program planning process focused on programming needs in 4-H youth development. All local units were asked to identify local programming needs and to involve a diverse group of people in identifying local youth development issues.

C. Program Review Process

No significant changes have been made in the program review process.

D. Evaluation of the Success of Multi- and Joint Activities

Throughout we have reported consistently on integrated Extension and research activities in terms of programming and in terms of outcomes.

Multi-State Activities

The following multi-state activities have both an Extension and Research component: Midwest Plan Service; Illinois-Indiana Sea Grant Program; North Central Regional Center for Rural Development (NCRCRD); the Agri-Ecology/Sustainable Agriculture Program; the National Needs Assessment for Agricultural Safety and Health; and the FSNEP National Program Coordinators Team. 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. Specific impacts from Sea Grant efforts are reported under Goal 4 of the programs section of this report.

The collaboration between the University of Illinois and Purdue University in terms of producing the grain and livestock marketing newsletters (Ag Outlook Guide) has been a very successful ongoing activity. The collaboration has allowed both states to provide useful and timely information to producers in areas in which they may not have sufficient research and outreach strength to carry out this activity independently. A similar collaboration exists to produce the National Pork Industry Handbook – a resource with a national reputation.

E. Multi-State Activities

E. Multi-State Activities

U.S. Department of Agriculture

Cooperative State Research, Education, and Extension Service

Supplement to the Annual Report of Accomplishments and Results

Multi-state Extension Activities and Integrated Activities

(Attach Brief Summaries)

Institution University of Illinois

State Illinois

Check one: X Multistate Extension Activities

____ Integrated Activities (Hatch Act Funds)

____ Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Midwest Plan Service	23,112	22,896			
Illinois-Indiana Sea Grant Program	31,190	70,509			
NCRC for Rural Development	2,684	2,684			
Part-time Farming/Sustainable Agriculture	37,903	33,311			
Farm Progress Show	12,709				
Il-Missouri Strategies & Opportunities Conf.	22,600				
Illinois Outlook Guide	4,275	5,000			
National Needs Assessment	11,000	11,000			
FSNEP Nat'l. Prog. Coordinators Team	8,684	7,845			
National Pork Industry Handbook		2,932			
Total	154,157	156,177			

Director Date

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Multi-State Extension Activities

Midwest Plan Service - Midwest Plan Service provides a regional opportunity to publish research-based Extension publications of use to the North Central Region. All states in the North Central Region participate financially in Midwest Plan Service and are users of the publications. The base of publications for Midwest Plan Service has been in agricultural engineering, but more recently farm management and agricultural production areas have been added to the publications of Midwest Plan Service.

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, aquaculture and seafood safety, biological resources, sustainable coastal development, and coastal processes. It is funded by NOAA, University of Illinois, and Purdue University.

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. One of the current activities of the NCR CRD is the preparation and publication of "Take Charge," a research-based guide to community-based development activities. Funding is provided to Iowa State for coordinating programs.

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 through the University of Nebraska. SARE offers competitive grants related to applied research and extension pertaining to sustainable agriculture.

Ag Outlook Guide - This is a collaborative effort of Illinois, Purdue and Indiana to produce grain and livestock price newsletters.

National Needs Assessment for Ag Safety and Health - Three year project to convene a consensus-building process that would host a conference and publish a document on ag safety and health to serve as a resource in national policy discussions. Representatives from eight universities including Colorado State, Purdue and University of California are included on the planning committee.

FSNEP National Program Coordinators Team - The Food Stamp Nutrition Education Program National Program Coordinators Team is funded by the North Central Region to facilitate communication between FNS and CSREES and to build state capacities for effective program delivery and evaluation to ensure the quality of the nutrition education programming associated with FSNEP.

National Pork Industry Handbook - This is a collaborative effort of Illinois and Purdue.

F. Integrated Activities (Smith-Lever Act)

F. Integrated Activities

U.S. Department of Agriculture

Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multistate Extension Activities and Integrated Activities
(Attach Brief Summaries)

Institution University of Illinois
State Illinois

Check one: ____ Multistate Extension Activities
____ Integrated Activities (Hatch Act Funds)
X Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Illinois-Indiana Sea Grant Program	31,190				
Part-Time Farming	37,903	33,311			
Farm Progress Show	12,709				
Pest Management Program	4,500				
Illinois Environmental Policy Review	2,500				
Program Support for New Faculty	58,131	107,429			
Program Support for Joint Research/Ext	175,355	195,874			
Ag Entrepreneur Dev Initiative		60,085			
Conferences and Field Days	35,400				
Integrated Swine Program		9,319			
Information Technology Support		85,000			
Total	422,288	527,138			

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Director Date

Form CSREES-REPT (2/00)

Integrated Activities (Smith-Lever Act Funds)

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.

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. SARE offers competitive grants related to applied research and extension pertaining to sustainable agriculture.

Farm Progress Show - The Farm Progress Show is one of the premier opportunities in the Midwest for producers and others associated with agriculture to learn about current innovative technology. The show rotates between Illinois, Iowa, and Indiana. When the Farm Progress Show is located in Illinois, the College of Agricultural, Consumer and Environmental Sciences puts together a major display that integrates the education research and Extension functions of the College.

Pest Management Program - On-farm applied research and extension efforts in fruit and vegetable entomology.

IL Environmental Policy Review - Newsletter articles written by researchers that educate city and county officials and citizens of Illinois about state, regional and federal policies and issues concerning the environment including safe food and the quality of air and water.

Program Support - Program support for new faculty and faculty who have joint research/extension appointments.

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.

Conferences - Various beef, dairy, sheep, swine and grazing meetings and conferences as well as Agronomy Days, Corn/Soybean Classics, Field Days and the Livestock Waste Management Conference showcasing current research and extension initiatives.

Integrated Swine Program - This is a multi-discipline applied research project involving Extension and research to investigate approaches to improving physical and financial performance of Illinois swine farms. The research will be carried out on producer units and data will be collected that will allow full economic evaluation of management changes.

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.

G. Integrated Activities (Hatch Act Funds)

G. Integrated Activities (Hatch Act Funds)

U.S. Department of Agriculture

Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multistate Extension Activities and Integrated Activities
(Attach Brief Summaries)

Institution: University of Illinois
State: Illinois

Check one: ____Multistate Extension Activities
X Integrated Activities (Hatch Act Funds)
____ Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Illinois-Indiana Sea Grant Program	24,952				
Sustainable Agriculture/Part-Time Farming	163,767	167,720			
Farm Progress Show			13,474		
Pest Management Program	6,200				
Illinois Environmental Policy Review					6,808
	124,040	177,268			
		208,481			
		17,593			
		86,867			
		40,016			
Total	339,241	697,945			

_____ _____
Director Date

Form CSREES-REPT (2/00)

Integrated Activities (Hatch Act Funds)

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.

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Pest Management Program - On-farm applied research and extension efforts in fruit and vegetable entomology.

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Program Support - Program support for new faculty and faculty who have joint research/extension appointments.

Conferences - Various beef, dairy, sheep, swine and grazing meetings and conferences as well as Agronomy Days, Corn/Soybean Classics, Field Days and the Livestock Waste Management Conference showcasing current research and extension initiatives.

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 will be carried out on producer units and data will be collected that will allow full economic evaluation of management changes.
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.

Appendix A: FY2001 Annual Report Statistical Tables

Table 1 - College of ACES: Research Funding and Staff Support

	FUNDING AND STAFF SUPPORT (FY 2001)						
	GOAL I	*GOAL II*	*GOAL III*	*GOAL IV*	*GOAL V*	*Total*	*Multi-State*
Total CSREES Research	**4,317,461**	**343,790**	**315,690**	**1,531,938**	**562,458**	**7,071,337**	**1,509,449**
Total Other Federal Research Funds	**3,210,371**	**242,745**	**263,445**	**549,369**	**411,866**	**4,677,796**	**156,007**
Total Non-Federal Funds	**26,128,730**	**3,510,135**	**2,669,603**	**5,553,828**	**2,985,919**	**40,848,215**	**6,112,012**
Total All Research Funds	**33,656,562**	**4,096,670**	**3,248,738**	**7,635,135**	**3,960,243**	**52,597,348**	**7,777,468**
Total Number of Research Projects	**347**	**38**	**46**	**129**	**54**	**614**	**50**
Scientist Years	**84.6**	**10**	**9.6**	**33.1**	**15.7**	**153**	**20**
Professional and Technical Support	**244.8**	**28.7**	**30.2**	**62.7**	**26.2**	**393**	**50**
Total Staff Support	**329.4**	**38.7**	**39.8**	**95.8**	**41.9**	**545.6**	**70**

*** $78,734 in CSREES Dollars were "Unassigned" by USDA**

*** $101,514 in Total Dollars were "Unassigned" by USDA**

*** In previous years, projects were coded internally. This year's numbers are from USDA-CSREES.**

*** Projects may be counted under more that one goal for project count.**

Table 2 - 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	**2,893,687**	**712,848**	**1,427,445**	**368,423**	**6,360,760**	**11,763,162**
State Funding	**8,174,984**	**2,013,873**	**4,032,689**	**1,040,834**	**17,969,845**	**33,232,225**
Local Funding	**2,712,699**	**668,262**	**1,338,164**	**345,379**	**5,962,920**	**11,027,424**
Other Funding	**378,814**	**93,319**	**186,867**	**48,230**	**832,689**	**1,539,920**
Total Estimated Expenditures by GPRA Goal	**14,160,184**	**3,488,301**	**6,985,166**	**1,802,866**	**31,126,214**	**57,562,731**
Total Estimated Face-to-Face						
Teaching Contacts by Goal	**339,929**	**189,876**	**379,745**	**116,164**	**878,591**	**1,904,305**
Estimated Knowledge/Practice Changes using the conservative assumption that 50% participants achieve some level of change						
	169,964	**94,938**	**189,873**	**58,082**	**439,295**	**952,153**
Total 4-H Youth as indicated by the 4-H enrollment system						
					371,616	

Note: Values were extrapolated from the Extension reporting system used to meet U of I positive time reporting requirements and monitor U of I Extension's affirmative action program. Reported values are approximations.