PLAN OF WORK

Annual Report of Accomplishments and Results

Iowa State University

Iowa Agriculture and Home Economics Experiment Station

Iowa State University Cooperative Extension Service

Federal Fiscal Year 2002
(October 1–September 30)

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A. Planned Programs:

1862 Research

Goal 1: An agricultural system that is highly competitive in the global economy.

Overview

The Iowa Agriculture and Home Economics Experiment Station has made progress against all the impacts identified in the plan of work for Goal 1. Research outputs take a number of forms, including:

- 254 Refereed Publications, Research Papers, Manuscripts
- 228 Non-refereed Publications, Reports, Technical Papers
- 330 Proceedings, Published Abstracts
- 72 Extension Publications
- 447 Invited Presentations
- 300 Education Programs, Field Days, Tours
- 40 Books & Chapters
- 5 Patents
- 123 web pages supported
- 70 Theses, MS/Ph.D Programs Completed

Outputs, outcomes and impacts: Highlights of research at Iowa State University:

① Two genes that regulate hormone synthesis and control plant growth in potatoes have been identified, and are currently being characterized. When over-expressed in transgenic potato plants, these genes increase the rate of tuber formation and yield. Using protein/DNA binding experiments, the mechanism that mediates this change in growth appears to have been identified. The significance of these genes and their interaction in controlling potato tuber growth may potentially lead to enhance yields and could shorten the time necessary for field cultivation of potatoes.

② It has been found that *Colletotrichum acutatum*, the fungus that causes anthracnose fruit rot, can multiply and spread in a strawberry field, without showing symptoms, before fruit are formed. This insight focuses new attention on the controlling the pathogen during this "hidden" period, with the potential to enhance the effectiveness of managing the disease.

③ A method was developed for measuring fluid properties (yield stress) in foods, especially thick viscous foods such as catsup. The Brookfield Company is now marketing a Rheometer for quality control in food plants based upon these achievements.

④ Several microbial bioconversion strategies for solid-state fermentation of agro-industrial byproducts into value-added products were developed, including corn masa, spent fermentation bacteria, and biconversion of corn stover for energy, industrial chemicals and fiber. Spent microbial biomass was successfully incorporated into a biocomposite adhesive system. This protein adhesive produced good internal bonding, excellent resistance to wet

swelling, and significantly reduced formaldehyde emissions in medium density fiberboard. This application provides a high-value use for a common industrial byproduct, while achieving several important performance properties for the biocomposite industry.

⑤ The development of new germplasm, genetic information and techniques were reported for maize, soybean, alfalfa and forage grasses. Soybean germplasm included 1 genotype with resistance to nematode, 7 food-grade types, and 26 with desired levels of fatty acids in seed oil. Maize germplasm development included the increase of seed supplies needed for distribution of 2 popcorn inbreds and 9 dentcorn inbreds and the delivery of seed of 300 inbreds from the IBM mapping population to the USDA-ARS. Maize inbreds with novel starch properties and improved resistance to economically important insects were also identified.

⑥ Work was done on the precision application of anhydrous ammonia. Several commercial and experimental manifolds were tested and several were shown to dramatically improve the uniformity of application across the machine. If the new manifolds are accepted by farmers, it may reduce the application of nitrogen fertilizer in Iowa by millions of pounds while maintaining crop yields.

⑦ Feeding supraphysiological levels of pantothenic acid to pigs reduced accretion of subcutaneous and abdominal fat depots but increased accretion of proteineous tissues. These differences could be measured with techniques used in commercial processing plants. The technology that is being adopted by swine producers is estimated to return up to $15 per $1 investment based on improvements in carcass lean.

⑧ In beef cattle, models were developed to predict intra-muscular fat and body composition on the live animal by real-time ultrasound. Genetic evaluations for body composition derived from ultrasound data on 222,164 Angus cattle are now available to producers. Selection on ultra-sound data in an experimental herd resulted in the production of the leading sire in the breed for ultrasound intramuscular fat. This technology enables producers to use selection combined with management to reduce subcutaneous fat by 0.1 inches and/or increase marbling score one degree per generation. This results in savings of $2.75 billion per year for the US industry.

⑨ Crop and livestock producers that make capital investments do not have the opportunity to manage financial risk over the life of the capital investment. Existing futures and options markets simply do not trade much beyond one year. Researchers discovered that when there exists mean reversion in the underlying commodity futures markets, there exists a mechanism to calculate the relationship between the degree of price volatility and the time to maturity for a multi-year option. This discovery will soon allow for the development of multi-year crop and livestock insurance contracts.

⑩ Effective pest management practices will be necessary for continued viability of organic agriculture. Kaolin clay products were effective in controlling grape leafhoppers in organic grapes. Pest insects were controlled in organic squash, destined for the organic baby food market, through the use of floating row covers. Alternative woolen mat, flax straw mat, and oat straw mulch treatments for organic herb production (St. John's Wort and catnip)

controlled weed populations below hand-weeded plots. Catnip yields were enhanced with mulch treatments and bioactive constituents (nepetalactone and hypericin) remained high.

❶ ISU participation in the following multistate research projects also contribute to goal 1: NC007, NC100, NC107, NC113, NC119, NC129, NC131, NC140, NC142, NC168, NC185, NC189, NC205, NC209, NC210, NC213, NC215, NC220, NC224, NC225, NC228, NC229, NC1003, NE060, NE112, NE127, NE144, NE162, NE165, NE185, S276, S281, S284, S291, S292, S294, S1000, S1004, S1005, W168, W171, and W173.

Assessment of accomplishments as measured against POW:

Greater profitability and competitiveness through the development and dissemination of information on new or improved methods, practices, and products that will result in

- reduced crop and postharvest product losses, ②
- more efficient use of agricultural chemicals, ⑤⑥⑩
- yield gains through genetic improvements, ①⑤⑧
- new products and applications, ④
- improved quality and consistency of products, and ③⑦⑧
- a better understanding and adoption of appropriate risk management practices. ⑨

New contributions to the understanding of agriculturally important plants and animals and the applications of scientific advances promote greater utilization of Iowa agricultural products for the continuing competitiveness of Iowa and U.S. producers.

State and Hatch Funds $ 10,780,645

FTEs 75.1

Key Theme – Adding Value to New and Old Agricultural Products

Program 1: Food Crops

a. Description of activity

This program has focused on three major issues: (1) better adapted fruit and vegetable cultivars, (2) a greater understanding of basic plant biological processes, and (3) more efficient cultural practices.

The production, marketing, and selling of fruit and vegetable crops provides a primary or secondary income for many Iowans. To remain competitive in our rapidly changing global economy, these commercial food crop producers must adopt new cultivars that are more tolerant to abiotic and biotic stresses affecting plants, cultural systems that improve production efficiency and promote sustainability, and postharvest handling practices that improve crop utilization and product safety. Before new cultivars, production systems, or postharvest practices can be recommended, they must be thoroughly evaluated under Iowa environmental conditions, and the results made available to stakeholders. In keeping the industry competitive, we also need to understand the basic processes associated with these applied problems.

b. Impact/accomplishment –

Short-term:

- The demand for locally grown sweet bell peppers has been high, but production has been erratic under Iowa summer growing conditions. A cultivar by planting time trial was established to identify more heat tolerant cultivars. First year results identified two cultivars that produced high, consistent yields throughout the growing season. Planting these cultivars will allow growers to maintain their markets and increase their cash flow.

- Strawberry production experiments evaluating corn gluten meal as a natural weed control product and the evaluation of cover crop rotations were concluded. Recommendations for grower use of corn gluten meal were developed. Alternative weed management strategies may be used to improve sustainability of matted-row production systems.

- In 1995, a trial evaluating 18 new asparagus cultivars was established at four locations representing different climatic and soil conditions found in Iowa. Based upon five years of production, 'Jersey Supreme' and 'Jersey Giant' have consistently produced high yields and maintained good quality. These cultivars have the potential to produce an additional 400 to 600 lbs annual marketable yield per acre over older cultivars such as 'Jersey Knight'. At an average price of $1.76 per pound, this would mean an additional gross return of $704.00 to $1,056.00 per acre per year to growers who plant the best performing cultivars.

Long-term:

- To identify grape cultivars that have adapted to Iowa's climatic conditions, a cultivar by management system trial evaluating 15 cultivars was established at two locations in 2002, and a second trial evaluating 20 additional cultivars at four locations is being planned for 2003. With vineyard establishment costs in excess of $4,000 per acre, the identification of adapted grape cultivars will allow growers to avoid significant losses associated with planting non-adapted cultivars.

- Two genes that regulate hormone synthesis and control plant growth in potatoes have been identified, and are currently being characterized. When over-expressed in transgenic potato plants, these genes increase the rate of tuber formation and yield. Using protein/DNA binding experiments, the mechanism that mediates this change in growth appears to have been identified. The significance of these genes and their interaction in controlling potato tuber growth may potentially lead to enhance yields and could shorten the time necessary for field cultivation of potatoes.

- Twenty-five previously unrecognized genera or species of fungi within the sooty blotch/flyspeck (SBFS) complex in the Upper Midwest have been identified using tools of molecular genetics. This discovery will trigger a complete re-evaluation of this economically important complex and points the way toward less costly and more effective management strategies for Iowa's commercial apple growers.

- Anthracnose fruit rot is a devastating disease for strawberry growers worldwide. It has been found that *Colletotrichum acutatum*, the fungus that causes anthracnose fruit rot, can multiply and spread in a strawberry field, without showing symptoms, before fruit are formed. This insight focuses new attention on the controlling the pathogen during this "hidden" period, with the potential to enhance the effectiveness of managing the disease.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Program 29: Value Added Agriculture

a. Description of activity

This program focuses on developing technologies that add value to agricultural products produced in Iowa. Where possible our efforts strive to increase demand and prices farmers receive and contribute to rural economic development by creating new businesses and job opportunities in rural areas. Many of these activities are coordinated by the Center for Crops Utilization Research (CCUR) and the NASA Food Technology Commercial Space Center (NASA FTCSC) in partnership with faculty in the departments of Food Science & Human Nutrition and Agricultural & Biosystems Engineering. Both centers are involved with seed research and commercialization programs that develop products and processes that add value to Iowa agriculture, especially corn and soybeans. The centers' staffs assist ISU scientists, emerging and established private companies, and producers of grain, food and materials for bio-based products in developing new technologies as well as in helping ISU scientists find companies interested in commercializing new technologies developed at ISU.

This program has the following goals: 1) developing food and bio-based, value-added products from agricultural materials, including low-value commodities and waste streams; 2) improving the quality, safety, and efficiency of producing these commodities and processing them to improve their values in the marketplace; and 3) conducting technology transfer activities that, ultimately, increase rural development, employment, and the profitability of growers.

b. Impact/accomplishment –

Short-term:

- Pyrolysis is a process for converting corn stover and other lignocellulosic wastes into potentially fermentable feedstocks to produce industrial chemicals and fuel ethanol. However, the pyrolysis liquor that is produced is toxic to most microorganisms impeding further utilization. An environmentally friendly biological process was developed to detoxify this material rendering it potentially fermentable.

- ISU research on apple cider has improved the quality and safety of products produced in Iowa, and large numbers of producers have been retained in this important rural industry. Outreach efforts to cider producers have assisted them in implementing good manufacturing practices (GMP), standard operating procedures (SOP), and hazard

analysis critical control points (HACCP) plans. Cider safety information was posted on the ISU Food Safety Website. No apple cider food-borne illness outbreaks occurred in Iowa last year. Research on the effects of irradiation on cider safety and quality could lead to the development of an alternative processing method for cider.

- In cooperation with Genencor (Palo Alto, CA), technologies were developed to utilize enzymes to enhance soy protein products. An enzymatic soy hydrolysis was shown to produce a protein hydrolysate, which conferred improved adhesive properties. This hydrolysis procedure is much more environmentally friendly than the traditional alkaline hydrolysis method. Various carbohydrases were shown to enhance protein recovery from soybean meal. Both proteases and pectinases were shown to improve the functionality (performance properties) in foods.

- A method was developed for measuring fluid properties (yield stress) in foods, especially thick viscous foods such as catsup. The Brookfield Company is now marketing a Rheometer for quality control in food plants based upon these achievements.

- A new antioxidant for use in industrial products was discovered, which gives about ten-fold improved stability to lipid oxidation. This antioxidant has been shown to be quite effective in various industrial lubricant applications.

- Meadowfoam is a crop that produces unique oil comprised of long-chain fatty acids that is useful in many industrial applications (lubricants, cosmetics, etc.). Unfortunately, the high-protein meal is not utilized well as livestock feed due to high levels of glucosinolates. A water extraction procedure was shown to efficiently remove these compounds and produce a meal in high yield that can be fed to livestock. The glucosinolates have valuable insect and weed control properties, which may make this water extract a valuable co-product.

- Nanocomposite plastics in which soy protein is the major component were developed with improved water resistance and mechanical properties. These products should be suitable for high-performance plastic products such as computer cases and other durable goods). SoyWorks, Woodridge, IL, has commercialized several ISU soy protein plastics.

- Low-dose irradiation has been shown to significantly reduce populations of *Salmonella* on the outer rind surfaces of melons, which improves the microbiological safety of fresh-cut produce.

- Several microbial bioconversion strategies for solid-state fermentation of agro-industrial byproducts into value-added products were developed, including corn masa, spent fermentation bacteria, and biconversion of corn stover for energy, industrial chemicals and fiber. Spent microbial biomass was successfully incorporated into a biocomposite adhesive system. This protein adhesive produced good internal bonding, excellent resistance to wet swelling, and significantly reduced formaldehyde emissions in medium density fiberboard. This application provides a high-value use for a common industrial byproduct, while achieving several important performance properties for the biocomposite industry.

- Technology was developed to significantly improve the performance of wood and wood fiber based composite adhesives with soy protein. This technology is based on the reaction of soy protein with the petroleum-based resin, phenol formaldehyde. The soy-based product can replace up to 70% of the petroleum-based components of current adhesives and reduce the exposure of workers to hazardous phenol and formaldehyde. This adhesive was shown to work well on wood fiber, corn stalks, wheat straw, switchgrass, recycled wood and even livestock manure fiber. The soy-based adhesives are equivalent in strength to current petroleum-based adhesives, superior in water resistance to interior-grade adhesives, and nearly equal in water resistance to exterior-grade adhesives. Soy protein adhesives are more environmentally friendly and cost less than most traditional adhesives.

- Hypothermophilic bacteria are potential sources on unique enzymes having high stability to and activity under extreme heat and cold. These enzymes may have very desirable traits for use in converting agricultural materials into useful products. Two new hypothermopiles were discovered during the past year.

Long-term:

- Chicken feathers were found to be a suitable protein for plastic applications due to its improved water resistance properties. Sara Lee (Chicago, IL) has partnered with ISU faculty to develop this technology so as to alleviate a major waste problem in chicken production.

- Several cornstarch structures were identified as having better enzyme digestibilities. This is important in improving efficiency of converting corn to fuel ethanol and industrial chemicals via fermentation. More digestible starches are also important to improved feed digestibility and utilization, and reduced waste. Considerable understanding of starch granule development was elucidated, which is fundamentally important to achieving new starch variants and understanding starch structure function relationships. Several corn lines possessing starches with improved cooking properties, such as low gelatinization temperatures, were discovered. Various exotic corn lines are being explored for other unique starch properties.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Key Theme – Plant Germplasm

Program 4: Plant Germplasm

a. Description of activity

This program focuses on germplasm, the basic resource for plant improvement. Major objectives are to: 1) increase the genetic diversity available for basic and applied plant science research, 2) increase the germplasm base of the major U.S. crop species to reduce the chances of devastating crop losses due to either biotic or abiotic stresses, 3) develop and

enhance elite germplasm resources to provide private and public breeding programs a greater array of elite germplasm for cultivar development, 4) improve germplasm to ensure systematic genetic advances of newly developed cultivars, 5) enhance specific plant and seed traits to permit alternative uses of the major crop species, and 6) provide unbiased data of corn hybrids available to Iowa producers.

b. Impact/accomplishment -

The development of new germplasm, genetic information and techniques were reported for maize, soybean, alfalfa and forage grasses. Soybean germplasm included 1 genotype with resistance to nematode, 7 food-grade types, and 26 with desired levels of fatty acids in seed oil. Maize germplasm development included the increase of seed supplies needed for distribution of 2 popcorn inbreds and 9 dentcorn inbreds and the delivery of seed of 300 inbreds from the IBM mapping population to the USDA-ARS. Maize inbreds with novel starch properties and improved resistance to economically important insects were also identified. Maize population development included cycle 9 of S1 recurrent selection in populations, cycle 15 of the long-term selection program in BSSS(R) and BSCB1(R) and selections in 231 experimental lines of popcorn. Tropical maize germplasm was introgressed into temperate germplasm and evaluated for yield potential and value-added traits. Switchgrass cultivars with superior adaptation for biofuel production in Iowa were identified. Sources of new alleles for increasing heterosis and forage yield in alfalfa were detected in matings with exotic germplasm. Replicated evaluations of commercial varieties were conducted. In maize, 520 hybrids from 61 companies were evaluated in experiments in 7 districts throughout Iowa (http://www.agron.iastate.edu/icia). A hybrid selection program was made available in the Iowa Crop Management Database (http://www.extension.agron.iastate.edu/cmd). Similar evaluations and reports were made for dozens of varieties of soybean, alfalfa, forage grasses and small grains developed by the private and public sectors. Soybean genetic research established locations of genes for resistance to iron chlorosis, nematodes, Phytophthora, photoperiod response, assigned linkage groups 6 and 8 to a common chromosome, integrated the soybean genetic map with that of Arabidopsis, identified a new source of resistance to cyst nematode (PI268916), three genes with high identity to the coiled-coil nucleotide-binding site leucine-rich repeat-type disease resistance gene from the soybean Rps1-k locus improved resistance to Phytophthora in transgenic soybean plants, and that degeneration of tapetal cells was associated with cytoplasmic male sterility. Maize genetic research established the sequences of 35,000 ESTs, deposited that information in GenBank, determined that they represent at least 12,000 unique genes, genetically mapped 2,500 of them, improved the resolution of the genetic map by 3.5 fold, established the IBM mapping population as a new tool for all maize researchers, identified genetic locations of genes for insect resistance and photoperiod response and discovered a DNA sequence that blocks pollen transmission of linked transgenes. New techniques were developed for screening soybeans for brown stem rot, high throughput methods of amino acid analysis of maize endosperm and Agrobacterium-mediated transformation of maize.

Germplasm reduces losses in productivity of soybean and maize due to pests and stress and improves the persistence of forage species so that more stable and economical yields are realized, minimizes the use of chemicals to control pests and lowers the risk of genetic

uniformity by incorporating genes from exotic germplasm in alfalfa, maize and soybean and by making the germplasm available for use by companies and other public agencies. The improved pest resistance also makes the germplasm better adapted to reduced tillage management, a practice that conserves soil and energy. The varietal trials provide unbiased information used to purchase maize and soybean seed planted on approximately 20 million acres in Iowa each year and seed of forage species planted on nearly 10 million acres. The value of the raw grain and forage exceeds several billion dollars and the refined products are worth much more. The quality of the grain harvested from those acres may be varied by planting varieties bred with novel grain properties for new products. Genetic information and techniques expedite creation of new varieties and enable development of varieties with traits that cannot be achieved through other methods.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Key Theme – Agricultural Profitability

Program 5: Crop Production and Management Strategies for Iowa

a. Description of activity

Research under this program strives to 1) Improve understanding of the biology and ecology of weeds in the agroecosystem; 2) Identify genetic material or biochemical pathways that help crops maintain dry matter production or limit loses when growing under stressful environmental conditions; 3) Conduct field experimentation of basic production research using modern varieties or cultivars growing in different environments and soils; 4) Alter seed chemical composition to increase marketability; 5) Identify and characterize factors that limit the nutritive value of forage grasses and legume; 6) Develop systems and strategies for improving the seasonal distribution and utilization of forages; and 7) Understand the influence of the seed production environment on seed quality and dormancy in a range of crop and forage species important to Iowa.

b. Impact/accomplishment –

Short-term:

- Earlier planting of soybean increases producer options for managing spring planting. But greater insect and virus pressure, which limit yield and marketability, must be overcome to ensure early planting remains a viable option for producers.

- Research trials indicated optimum forms and application times for swine manure had species-specific impacts on weeds, positive effects on soil physical and chemical properties, and positive effects on corn and soybean growth and yield. To control the size of the weed seed bank and to protect crops from the competitive effects of weeds, effective weed management strategies should be in place when composted swine manure is used as a soil amendment. Insights provided by this project into soil-crop-weed relationships will enhance the evolution of farming practices, decision-making tools, and

management systems that increase crop production efficiency while improving protection of soil and water resources.

- Forage producers can use slope and soil EC data to create management zones that can be used to optimize production and quality of forage spatially and temporally in pastures. Multivariate approach with vegetation indices such as NDVI may be useful in predicting biomass potential and species composition in defined management zones.

Long-term:

- Research is underway to establish rational screening protocols for characterizing responses to low temperature stress using unique maize genotypes tolerant to low temperature stress. Treatments include temperature/duration variables, recovery from stress, and acclimation capability. Understanding the basis for effects of low temperature stress on maize stand establishment forms the basis for ameliorating these problems, improving planting management including expanding the use of reduced tillage systems, and in conjunction with plant signaling systems, forms the basis for improving yield stability.

- Seed dormancy and associated germination expression impacts everything from the nature and composition of weed seed banks to the management and usage of warm-season grass species. Eastern gamagrass has tremendous potential for wildlife habitat, forage, biomass production, and other agronomic uses. Managing of dormancy is critical to expanded use of this species.

- Near isogenic lines of soybeans varying in seed protein content by as much as 12% have been developed for biochemical and molecular studies. A metabolic flux model has been developed for soybean seeds that can define changes in metabolic pathways required to increase seed protein content. Identifying genes controlling seed composition will speed the development of soybean genotypes with valuable seed components. Such genotypes are essential as soybean markets shift to trait based pricing.

- Anaerobic digestion of baled corn stover, sweet sorghum and sugars is being used to produce ethanol. Yield of ethanol from sorghum was about 5000 L/ha, and about 3500 L/ha from sugar beets. More efficient methods of producing chemicals from agricultural biomass will increase the value of farm products.

- Morphological, phenological, and disease susceptibility data were collected on maize accessions native to the arid and semiarid US Southwest, and seed increased for future studies. Capacity to emerge from extraordinary depths and seedling characteristics associated with emergence were documented. Documentation of the characteristics of maize germplasm will expand the utility of these genetic resources for crop improvement. Enhanced fundamental understanding of the attributes of maize adapted to stress environments will contribute to improved yield stability under adverse conditions.

- A greenhouse study revealed substantial competitive effects of smooth bromegrass on growth of switchgrass and big bluestem, which was greater under cooler temperatures.

These results suggest that management practices that reduce smooth bromegrass biomass in spring and/or early summer are likely to suppress its dominance over the warm-season species.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Key Theme – Precision Agriculture

Program 6: Precision Agriculture

a. Description of activity

Over the last decade, technological advances and GPS have led to increased interest and adoption of the concept of precision agriculture, which holds the promise of both economic and environmental benefit. Although precision agriculture has tremendous potential, there are two major barriers preventing the full benefit of precision agriculture being realized. The first being the interpretation of spatial variability and the lack of decision support systems based on sound agronomic principals to assist in the development of management strategies to account for spatial and temporal variation within the field. The second major impediment to widespread implementation of precision agriculture is gathering the requisite information to adequately describe the spatial and temporal variation of important factors.

This project has been addressing these critical needs through the development of sensor technologies for the measurement of spatially and temporally varying crop production factors so that variability can be effectively quantified in crop fields. Significant progress has been made in the development of decision support systems and crop production models to further understanding on the effects of in-field variability on crop yield variability and the effects of production practices on the environment. As the causes of variability are better understood, this understanding will lead to advances in farming management systems to protect the environment while increasing production efficiency.

b. Impact/accomplishment –

Short-term:

- Work was done on the precision application of anhydrous ammonia. Several commercial and experimental manifolds were tested and several were shown to dramatically improve the uniformity of application across the machine. If the new manifolds are accepted by farmers, it may reduce the application of nitrogen fertilizer in Iowa by millions of pounds, while maintaining crop yields.

Long-term:

- A machine vision early growth stage population measurement system has been developed for automatically estimating the variability corn plant population across crop field. This system has potential to enable better diagnoses of spatial variability in crop yield. An

important part of this project was the transfer of the knowledge, equipment and procedures to an industrial partner for evaluation and possible integration in their business. The economic benefit could be large, but difficult to estimate at this time.

- Spatial yield variability is a complex interaction of many factors including water stress, rooting depth, soil and drainage properties, weather, pests, fertility, and management. Crop models have been used to identify yield loss due to interacting factors and evaluate the consequences of different spatial management strategies, including the forecasting of spatial yields during the season. This work includes a multi-state cooperative project investigating the interaction between the different yield limiting factors and development of decision support systems to maximize return. This project provides the producers valuable tools for the development of improved management strategies to optimize economic returns and minimize environmental effects.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific

Key Theme – Ornamental/Green Agriculture

Program 7: Green Industry

a. Description of activity

Poa pratensis plants were regenerated from inflorescence-derived and embryo-derived callus cultures. Flow cytometric (FCM) analysis and randomly amplified polymorphic DNA (RAPD) analysis showed genotypic integrity was best preserved by using inflorescence-derived cultures for regeneration.

Research focused on risk assessment of Roundup Ready creeping bentgass, genetic characterization of turfgrass germplasm using both conventional and molecular tools, and research on genetic transformation to improve biotic and abiotic stress with desirable gene construct.

A cleated traffic simulator was used to identify traffic tolerant seedling grass species for use on intensely trafficked sports fields.

b. Impact/accomplishment –

Short-term:

- Traffic tolerance evaluation concluded that perennial ryegrass is by far the most traffic tolerant species in the seedling stage and that this grass should be used for these situations to promote safer fields. Tall fescue had intermediate traffic tolerance and Kentucky bluegrass had poor establishment and traffic tolerance under athletic field traffic conditions. Many sporting facilities (city parks and recreation, high schools, youth leagues) will use this information to select grass establishment strategies to specifically

improve “worn out” and dangerous areas of their playing fields. This will provide a safer playing surface for athletes.

Long-term:

- Regenerating Poa pratensis from inflorescence-derived cultures allowed transgenic improvement of existing cultivars without risking loss of important traits contained within these existing cultivars.

- Roundup Ready creeping bentgrass is currently under USDA-APHIS review for deregulation. Our research on characterization of turfgrass germplasm provided valuable information for long-term germplasm enhancement using both conventional and molecular biology tools. Roundup ready creeping bentgrass will allow golf courses to finally control “Annual bluegrass”, the most prolific weed in the history of cool season golf course turf. Exclusive use of Roundup on these areas will reduce the variety of pesticides currently needed to manage creeping bentgrass golf surfaces.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Key Theme – Animal Production Efficiency

Program 9: Understanding the Physiological Basis of Animal Reproduction, Growth and Well Being

a. Description of activity

This program focuses on increasing efficiencies of producing food from animals. Key areas of research within this objective were to improve scientific understanding of physiologic mechanisms affecting reproduction, growth and performance.

b. Impact/accomplishment –

Short-term:

- Fifty percent of all mastitis in dairy animals occurs during the dry period with 90% in the first and last week. Our continued work in developing novel teat synthetic skins or sealants resulted in 3 new formulations that are almost twice the persistency of current commercial products. Also our worked has stemmed others to conduct and complete international research, publications, presentations, and implementation of this technology globally.

- Healthy teats are important and many factors affect them. The ability to define uniform guidelines for research and field investigation and a pictorial display of pathological conditions was needed. Teat Club International was formed (10 experts from around the world including ISU). In the past 2 years, uniform international standards and forms for teat evaluation have been developed with 6 reference papers completed and a CD-ROM

on teat conditions. These have been incorporated into field training and implemented by ag-professionals on farm (particularly veterinarians). They have also been integrated into invited talks and provided the framework for 4 international short courses.

- Despite the relatively widespread usage of biotechnology-derived crops, we continue to receive calls and questions about the effects of these crops for cows and consumers. We evaluated a new Bt corn variety containing a unique Bt gene (Cry1F). Results from this study indicate that new corn hybrids containing the Cry1F Bt gene are as wholesome and nutritious for high producing dairy cows as are genetic counterpart hybrids that do not contain the novel Bt gene. Results from this and previous studies have been used extensively for educational presentations to Iowa, U.S., and international audiences. This work can impact the value and marketability of Iowa-produced crops and animal products for domestic and international markets by documenting the safety and nutritional value of these products.

Long-term:

- Molecular characteristics and interactions of synemin, a novel protein discovered to form heteropolymeric intermediate filaments with desmin, has been shown to also interact directly with the universal cytoskeletal linking protein plectin. Significant progress has been achieved in demonstrating how virtually all important structural components within growing, developing muscle cells are linked, and thereby involved in overall muscle growth. This will permit improvement in efficiency of muscle growth in meat animals.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Program 11: Develop and Integrate Nutritional Knowledge to Enhance Animal Production

a. Description of activity

The objective of this program is to increase the biological capacity and efficiency of animals to produce food, pharmaceuticals, clothing, and pleasure. The primary areas of research are elucidation of factors regulating key biological processes, quantification of the nutrients required to support these processes, development and evaluation of novel feedstuffs, greater awareness of the impact of animal production on the environment, and the quality and wholesomeness of animal-derived foods.

b. Impact/accomplishment –

Short-term:

- Feeding supraphysiological levels of pantothenic acid to pigs reduced accretion of subcutaneous and abdominal fat depots but increased accretion of proteineous tissues. These differences could be measured with techniques used in commercial processing

plants. The technology that is being adopted by swine producers is estimated to return up to $15 per $1 investment based on improvements in carcass lean.

- Phase feeding protein to feedlot cattle (reducing supplemental protein as cattle mature) did not affect performance or carcass value. Replacing soybean meal with urea during the last two periods reduced supplemental nitrogen requirement 3.3 lbs/head ($15.80). Reducing urea in the last period saved another 2.9 lbs of nitrogen/head ($0.93).

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific

Key Theme – Animal Genomics

Program 10: Genetic Enhancement of Agriculturally Important Animals

a. Description of activity

Ongoing activities focus on comprehensive research to enhance the genetic ability of livestock for the efficient and sustainable production of food for human consumption and on the transfer of results to stakeholders. Emphasis is on traits related to product quality, disease, and production efficiency in the main livestock of dairy cattle, beef cattle, poultry, and swine. Research efforts range from quantitative analyses of phenotype using comprehensive data bases from experimental and producer herds, to development and use of genomic tools to discover the genetic control of traits. Substantial focus is on the integration of phenotypic and genomic methods and data for genetic analysis and genetic selection. Education and outreach activities focus on the transfer of research results by assisting stakeholders in the livestock industry—including producer organizations, individual producers, and genetics companies—with the design and implementation of genetic systems that will enhance genetic progress for important traits.

b. Impact/accomplishment –

Short-term:

- Genetic selection to improve economic traits requires the ability to record data on live animals in commercial herds and estimates of the associated genetic parameters. In pigs, breed-specific heritabilities and genetic correlations were estimated for lean growth rate and litter traits based on large numbers of records from commercial farms. These provide the most precise estimates for these important traits and are crucial for the design of genetic improvement programs. Procedures for across genetic evaluation were developed and are currently being used as the basis for national across herd genetic evaluations. This program directly impacts 40,000 purebred breeding stock that have the potential to control the genetic improvement for 1 million parent sows producing 16% of the market pigs in the USA. This directly influences pigs marketed at an annual income of more than $2 billion/year in the USA with a multiplier effect for their total impact on rural communities.

- In beef cattle, models were developed to predict intra-muscular fat and body composition on the live animal by real-time ultrasound. This technology has been transferred to the beef cattle industry through the concept of a centralized processing laboratory and the training of 86 field technicians. Genetic evaluations for body composition derived from ultrasound data on 222,164 Angus cattle are now available to producers. Selection on ultra-sound data in an experimental herd resulted in the production of the leading sire in the breed for ultrasound intramuscular fat. This technology enables producers to use selection combined with management to reduce subcutaneous fat by 0.1 inches and/or increase marbling score one degree per generation. This results in savings of $2.75 billion per year for the US industry.

- In dairy cattle, ease of calving and calf livability are important traits. Several factors influencing dairy calf livability at birth have been identified. These results can be used by dairy producers to minimize factors that increase difficulty at calving and calf losses, which will increase the number of available herd replacements and profitability for dairy farms.

- It was demonstrated that long-term selection for milk composition is possible by selection of sires for fat plus protein, and average producing cows grow faster than high producing cows. These results demonstrate the opportunities and consequences of selection for production traits.

- Substantial effort has been directed toward identifying genes or linked genetic markers that are associated with economic traits. In beef cattle, polymorphisms have been identified in four genes that are differentially expressed in double muscle cattle, on chromosomes that harbor genes that interact with the myostatin gene. In poultry, polymorphisms in nine candidate genes showed associations with one or more traits related to growth, body composition, antibody production, and resistance to *Salmonella enteritidis*, while a genomic scan identified genomic regions associated with breast meat percentage. In the pig, two genes were discovered and validated that are associated with growth and meat quality, and a genome-wide scan identified several regions with effects on growth and meat quality for which expression of the gene depends on parental origin. The use of these identified genes and markers in selection can enhance production efficiency, animal health, food safety, and food quality, thereby enhancing profitability of producers while providing safe, economical, and desirable products to consumers. The economic impact for genes identified in the pig could range from $.25 to $.50 per pig marketed and thus may be worth over $20 million in the US annually.

Long-term:

- A collaborative project to identify partial genomic sequences of genes that are expressed in six tissues has been completed. A database and a search tool have been developed to identify which genes have homology to the 97,000 mapped human gene clusters. A total of 703 of these genes have been mapped onto the pig RH map. These genomic and bioinformatic tools are extremely valuable for identifying genes that affect important traits and for understanding their function and will greatly improve

the efficiency of comparative mapping by capitalizing on the wealth of genomic data that is available from human and model species.

- Improved statistical methods were developed, including a method for the analysis of selective DNA pooling data, which provides for a tremendous savings in genotyping costs. A new approach was developed for controlling false positives in genome scans, which also has the potential of being used in large-scale gene expression experiments (micro-arrays). The use of these analysis methods results in higher statistical power and thus discovery of important genes that would otherwise be missed. The use of gene or marker tests in genetic selection requires integration of this technology in existing selection programs through marker-assisted selection. Alternative selection strategies were developed, which demonstrated the benefits that can be gained and the potential consequences for long-term selection response. These strategies will enable optimal and cost-effective implementation of molecular genetic technologies in the industry.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Key Theme – Diversified/Alternative Agriculture

Program 12: Potential of Alternative Livestock for Iowa's Economic Enhancement

a. Description of activity

This program has focused on alternative types of animal production in Iowa. Aquaculture has been the fastest growing sector of American agriculture for the past two decades. A growing number of Iowans are engaged in aquaculture (fish farming) and "game ranching" as a primary or supplemental income source. Game farming is an equally rapidly growing industry, which today includes native animals, e.g., bison, elk, quail, and waterfowl, plus exotic species, e.g., llama, ostrich, fallow deer, and pheasant. Commodity organizations exist in Iowa for the fish, bison, elk, and ratite production industries, and there are cottage industries that use the bones, hides, feathers, and egg shells of such animals. This program provides basic information on cultural and husbandry principles and techniques, pertinent regulations, and marketing that producers require, as well as new research-based knowledge to maximize production efficiency, enhance profits, and ensure that operations comply with environmental and health (animal and human) standards. State and federal agencies with responsibilities in these areas are also stakeholders in the program.

b. Impact/accomplishment –

Short-term:

- In 2002, the annual conference of the Iowa Aquaculture Association (IAA) was hosted on Iowa State University campus. We continued to support the IAA, assisting it in developing a membership directory, producing newsletters and an information display.

Application packet was developed to assist in the recruitment of additional members to this association.

- An invertebrate identification guide has been developed using CD-ROM format. Using numerous pictures and diagrams, the fish culturists will be able to easily identify invertebrates important to fish culture.

Long-term:

- In an earlier ISU study, it was determined that nutrient ratios are important to fish culture in earthen and plastic-line ponds. Information garnered thus far also indicates the importance of organic fertilizers to the establishment of invertebrate organisms that serve as food for the young fish and provides guidelines for fish stocking densities.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Key Theme – Agricultural Competitiveness

Program 13: International Economic Competitiveness

a. Description of activity

Researchers developed economic models to analyze policy questions related to the production and distribution of agricultural products. Models of individual firms and models with various levels of aggregation were created and utilized to investigate a large number of current economic questions. Researchers also used experimental survey methods to ascertain consumer attitudes toward various types of products and policies.

b. Impact/accomplishment –

Short-term:

- Resistance to foods containing or produced with genetically modified organisms (GMO) is beginning to have significant negative impacts on the export of some US products abroad.

    - Research on consumer acceptance of GM-foods found that verifiable information moderates the impacts of anti-biotech and pro-biotech information on consumers' willing to pay for vegetable oil, tortilla chips, and Russet potatoes. Results indicate that consumers would pay significantly less for foods that have 1- or 5-percent impurity than for zero GM-content foods, but they discount 1-percent and 5-percent impurity similarly. Although verifiable information is worth only a small amount per consumer, its public good nature leads to a large projected social value in the U.S. of $2.5 billion annually.

    - Some southern Africa countries have rejected food aid containing GMOs in the face of starvation due to concern about losing their export market to Europe. Research shows that information from environmental groups creates resistance to GM-foods in developed country consumers and that third-party or verifiable information dissipates part of this resistance. An important finding is that high-income consumers in Europe are having negative impacts on nutrition and health in southern Africa, and new information polices could improve the situation.

- Inputs produced using biotechnology may substitute for other inputs (Bt corn for insecticide) or complement other inputs (Roundup Ready seed and Roundup herbicide). An economic model was developed to analyze pricing in a market where a new technology allowing substitution away from a traditional input was either monopolized (a single firm controls both the old and new technology) or where the new and old technologies were controlled by different firms. With monopoly the price premium for the new technology will be too small (encouraging adoption of the new technology) and total production of the product using the technology will also be too small relative to socially optimal amounts that would be generated by a more competitive framework. With a duopoly in the market for the two technologies, there will be more use of the traditional technology and more overall production of the product.

- Researchers continued research on the profitability and environmental impacts of alternative methods of hog production, particularly the use of hoop structures in comparison with more traditional confinement operations. Researchers found little difference in cost of production or animal health expenditures between the systems with higher production costs in hoop systems in the winter and in traditional confinement systems in the summer.

- A new study investigated the use of subtherapeutic antibiotics in swine production. Results show that production costs will increase by about $2.20 per hundredweight or $5.00 per market pig if subtherapeutic antibiotics are discontinued.

- Researchers evaluated the costs of organic pork production and the issue of producing a uniform supply of organic pork during the year. Systems of organic pork production exhibit seasonality because it is difficult to farrow sows during the winter months. Production costs are uniformly higher for organic pork, but especially so for winter-farrowed pigs. Production costs were about $6.00 per pig higher for winter-farrowed pigs.

- Researchers analyzed the benefits and costs of various procurement arrangements in the cattle and pork industries, including packer ownership or contracting of supplies, problems of price reporting in markets where most animals are sold on contract, and the impact of contract restrictions or regulations across states. The general conclusion of this research is that contracting facilitates improved product quality, procurement and processing efficiency, improved returns and reduced risk for producers, and increased industry competitiveness. Congressional action to eliminate or restrict market contracts would hurt many producers involved in contracts and slow industry progress.

Long-term:

- Researchers evaluated the costs of ethanol production and the issue of the appropriate size of dry mills. Typical ethanol cash operating expenses are about $1.09/gal for a small plant, and $0.89/gal in a large plant. Similarly, annual capital expense for a new plant can be $0.15/gal for a small plant and fall to $0.09/gallon for a large plant. Plant size and type have a major impact of costs of production.

- Researchers worked with a group of three Iowa cooperatives to investigate possible joint ventures to reduce feed production and distribution costs in order to make Iowa livestock production more competitive with other states and countries. Analysis showed several ownership arrangements that could enhance efficiency and profitability.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Key Theme – Risk Management

Program 14: Agricultural Risk Management

a. Description of activity

The overall thrust of this area of work is to better understand the role of financial markets and financial products in determining the level of economic activity and economic growth. Emphasis was given to studying agricultural futures and options markets and on understanding how new derivative markets can be traded that enhance financial risk sharing. Transfer of research findings is accomplished via design of new products that can be used by independent crop and livestock producers to optimally control their risk exposure.

b. Impact/accomplishment –

Short-term:

- Researchers analyzed USDA crop insurance rates for actuarial fairness. Results indicated that high risk producers were being charged too much for low deductible policies. Based in part on this analysis, USDA will lower insurance rates for Crop Revenue Coverage on corn and soybeans for the 2003 crop year. USDA is looking to revamp its crop insurance rates for corn and soybeans for crop year 2004, with other crops following.

- Congress passed legislation allowing livestock to be insured under the crop insurance program. Researchers developed a new method for rating an insurance product that insures hog producers' gross margin (hog revenue less feed costs). The resulting product-Livestock Gross Margin Insurance-is now available to all Iowa hog producers. This tool gives hog producers a risk management tool that can serve as an alternative to a packer contract.

- Crop and livestock producers that make capital investments do not have the opportunity to manage financial risk over the life of the capital investment. Existing futures and options markets simply do not trade much beyond one year. Researchers discovered that when there exists mean reversion in the underlying commodity futures markets, there exists a mechanism to calculate the relationship between the degree of price volatility and the time to maturity for a multi-year option. This discovery will soon allow for the development of multi-year crop and livestock insurance contracts.

- Ever since the U.S. government ended its stock holding policy, world stocks of agricultural commodities have dropped significantly. Researchers developed a model of private stockholding activities that was used to estimate the impacts on price volatility of the change in government policy. This model has been used to simulate expected price volatilities under alternative weather scenarios to estimate the world's vulnerability to a severe supply shortage.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Key Theme – Organic Agriculture

Program 20: Sustainable/Organic Agriculture

a. Description of activity

This project investigates new sustainable production and postharvest practices, which include grain, vegetable, fruit, turfgrass, and greenhouse crops. It has focused on four major issues: (1) development of sustainable/organic horticultural and agronomic systems; (2) development of improved nutrient management and soil building systems; (3) development of value-added industry products through improved sustainable/organic production and postharvest techniques; and (4) development of research-based information in sustainable/organic systems for public training and advancement.

b. Impact/accomplishment –

Short-term:

In fifteen grain, vegetable, fruit, and turfgrass research projects across Iowa, results included the following:

- Organic rotations, which included corn-soybean-oats-alfalfa, produced equivalent yields to conventional corn/soybean rotations, and organic yields exceeded conventional when corn and soybean crops followed two years of alfalfa.

- In an evaluation of the effect of plowing on soil quality in organic systems, soil quality (in terms of organic matter carbon) remained high in the organic system after plowing and secondary tillage events.

- Economic analysis determined a greater return with organic crops that utilize less off-farm inputs, even when organic premium prices were excluded.

- Effective pest management practices will be necessary for continued viability of organic agriculture. Kaolin clay products were effective in controlling grape leafhoppers in organic grapes. Pest insects were controlled in organic squash, destined for the organic baby food market, through the use of floating row covers.

- Alternative woolen mat, flax straw mat, and oat straw mulch treatments for organic herb production (St. John's Wort and catnip) controlled weed populations below hand-weeded plots. Catnip yields were enhanced with mulch treatments and bioactive constituents (nepetalactone and hypericin) remained high.

Efforts have resulted in a significant increase in agronomic and horticultural operations farmed or maintained without potentially polluting levels of nitrates and synthetic pesticides. Premium prices for certified organic crops, averaging 200% above conventional prices, have increased the economic base of Iowa's farm families.

Long-term:

- Interest in commercial grape plantings, including organic grapes, continues to increase in Iowa. Experiments were established in 2002 to identify which grape cultivars and management system (using various weed management options) will provide the most optimum yield and quality. With vineyard establishment costs in excess of $4,000 per acre, the identification of adapted grape cultivars will allow growers to avoid significant losses associated with planting non-adapted cultivars.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific

Goal 2: A safe and secure food and fiber system.

Overview

The Iowa Agriculture and Home Economics Experiment Station has made progress against all the impacts identified in the plan of work for Goal 2. Research outputs take a number of forms, including:

- 30 Refereed Publications, Research Papers, Manuscripts
- 26 Non-refereed Publications, Reports, Technical Papers
- 76 Proceedings, Published Abstracts
- 4 Extension Publications
- 27 Invited Presentations
- 43 Education Programs, Field Days, Tours
- 6 Book/Chapter
- 3 web pages supported

- 2 Patents
- 6 Theses, MS/PhD Programs Completed

Outputs, outcomes and impacts: Highlights of research at Iowa State University:

① A study of postmortem pork muscle pH in relation to quality showed that a 22-hour postmortem pH provided a good prediction of pork quality for export markets. This information is being used by a major Midwest packing facility to increase pork exports to Japan.

② Additional research has documented the survival of a serious food borne pathogen, Listeria monocytogenes, in a food processing plant environment. A more comprehensive understanding of the contamination issue will lead to research on more successful interventions.

③ A Culinary Arts seminar was designed and presented for restaurant and food service operators, specifically on better use of pork purchase specifications. It is estimated that the seminar has stimulated additional purchases of $7,000,000 of pork. Center of the Plate training has been devised for improved utilization of meat purchase specifications. Attendees represented over 100 million pounds of fresh meat purchases per year. Four Processed Meat Short Courses drew 230 attendees from companies producing over 600 million pounds of processed meats per year.

④ Calpastatin genetic markers in pork have been discovered. These markers have a significant effect on pork tenderness and offer the potential for improved genetic control of pork quality.

⑤ ISU participation in the following multistate research projects also contribute to goal 2: NC100, NC136, S292, and S295.

Assessment of accomplishments as measured against POW:

A more safe and secure food and fiber system due through the development and dissemination of information on new or improved methods, practices, and products that will result in

- improved quality of fresh and processed meat products,①④
- greater public understanding of the principles of food safety and quality, and ③
- greater understanding of chemical, physical, and biological hazards to food safety. ②

New contributions to the understanding of the hazards to a safe food supply and the applications of scientific advances promote enhanced food safety and consumer confidence in the food supply in Iowa, the United States, and the world. ①②③④

State and Hatch Funds	$ 1,179,266
FTEs	5.7

Key Themes – Food Safety and Food Quality

Program 16: Improving the Quality and Safety of Muscle Foods

Program 17: Reduction of Physical, Chemical, and Biological Hazards Introduced into Foods

a. Description of activity

This program is designed to improve the quality of muscle foods by studying the fundamentals of animal growth, protein deposition, and postmortem changes in muscle proteins. The properties of muscle proteins are being studied to determine how to best improve meat qualities such as tenderness and moisture retention during subsequent processing. Processing technologies are being studied to determine effects on quality and for determining the most effective means to assure safety of muscle food products for consumers throughout the storage and distribution system. Information is being disseminated to producers and consumers by a wide variety of publications, extension programs and special consultations.

b. Impact/accomplishment –

Short-term:

- A study of postmortem pork muscle pH in relation to quality showed that a 22-hour postmortem pH provided a good prediction of pork quality for export markets. This information is being used by a major Midwest packing facility to increase pork exports to Japan.

- Carbon monoxide packaging has been determined to provide a highly acceptable color for irradiated meat products and permits production of a very attractive product with extended shelf life and assured safety.

- A Culinary Arts seminar was designed and presented for restaurant and food service operators, specifically on better use of pork purchase specifications. It is estimated that the seminar has stimulated additional purchases of $7,000,000 of pork.

- Center of the Plate training has been devised for improved utilization of meat purchase specifications. Attendees represented over 100 million pounds of fresh meat purchases per year.

- Four Processed Meat Short Courses drew 230 attendees from companies producing over 600 million pounds of processed meats per year.

Long-term:

- The muscle protein, synemin, has been found to be an important structural link in muscle between the contractile myofibrils in muscle cells. Synemin forms heteropolymeric structures called intermediate filaments with other proteins such as desmin. Such

interaction between these proteins and the crosslinking protein plectin is important in maintaining muscle cell structure during growth and also affects meat quality due to the degree of degradation that occurs postmortem.

- The postmortem degradation of desmin has been found to be related to the water holding capacity of pork. This information will lead to improved uniformity in moisture retention of pork products.

- Calpastatin genetic markers in pork have been discovered. These markers have a significant effect on pork tenderness and offer the potential for improved genetic control of pork quality.

- Glycogen pools in pork muscle have been found to influence the pH decline in pork muscle. The type of glycogen may be more important than total glycogen for affecting muscle pH changes. This information offers a means to reduce quality variation in pork.

- It has been discovered that muscle oxidation – reduction state can have a large influence on calpain activity and subsequent meat tenderness. This means that oxidative conditions will favor muscle toughness, which may explain some of the toughness increases observed in irradiated fresh meat.

- Mechanisms and sources of off-odor and color changes in irradiated meat products have been partially identified. This information is being used to study the means by which quality changes in meat from irradiation may be minimized or eliminated. Control of unusual odor, flavor or color in irradiated meat products is important to gaining consumer acceptance and realizing the full safety advantages of the irradiation process.

- Microorganisms exposed to stress, such as starvation, have been found to demonstrate increased resistance to irradiation. This has important implications for irradiation processing of meat products to achieve an adequate margin of safety.

- A study was conducted to culture the pooled pen feces of market weight pigs to determine the most common *Salmonella* serotypes being shed and to see if farms positive by culture were also positive by serology. Administration of Bacteriophage (phage) lysate lowered the numbers of *Salmonella* by 2 logs compared with controls in the colon and cecum contents. It suggests that use of phage could be considered as an alternative intervention strategy against *Salmonella* in pigs at the preharvest stage with further studies.

- Additional research has documented the survival of a serious food borne pathogen, Listeria monocytogenes, in a food processing plant environment. A more comprehensive understanding of the contamination issue will lead to research on more successful interventions.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific

Goal 3: A healthy, well-nourished population.

Overview

The Iowa Agriculture and Home Economics Experiment Station has made progress against all the impacts identified in the plan of work for Goal 3. Research outputs take a number of forms, including:

- 28 Refereed Publications, Research Papers, Manuscripts
- 2 Non-refereed Publications, Reports, Technical Papers
- 20 Proceedings, Published Abstracts
- 17 Invited Presentations
- 2 Education Programs, Field Days, Tours
- 1 web page supported
- 1 Book/Chapter
- 4 Theses, MS/PhD Programs Completed

Outputs, outcomes and impacts: Highlights of research at Iowa State University:

① Research on this project determined the impact of plant chemicals and nutrients on food quality and health promoting effects of food. Research directed at understanding the interactions between dietary constituents will influence dietary recommendations directed at maintaining optimum health and preventing disease. Moreover, it will aid in the development of new food products and therapeutic dietary strategies. The outcomes of this research will benefit all people by improving dietary selections and health benefits of food.

② ISU participation in the following multistate research projects also contribute to goal 3: NC100, NC167, NC170, NC219, NC1001, S278, and W181.

Assessment of accomplishments as measured against POW:

A healthy and well-nourished population through the development and dissemination of information on new or improved methods, practices, and products that will result in

- increase in the availability of health promoting foods for consumers, ①
- increase in risk-taking by food companies in developing improved foods, and ①
- increase in the public's awareness of health promoting dietary and feeding behaviors. ①

New contributions to the understanding of the hazards to a safe food supply and the applications of scientific advances promote an improved nutritional status of the general population of Iowa, the United States, and the world. ①

State and Hatch Funds $ 577,624

FTEs 5.5

Key Theme – Human Nutrition

Program 18: Improving Human Foods: Functionality, Selection and Nutrition

a. Description of activity

This project focuses on improving the foods people consume. The scope of the research is all consumer aspects of foods include functional, sensory, economic, nutritional, and selection criteria. Research spans from developing more effective nutrition education tools to understanding fundamental principles of food ingredients, nutritive value and bioavailability. The overarching objective of this project is to improve human food consumption patterns to provide for a healthy, well-nourished population. An additional objective is to support the development of a reliable food industry that can sustain this population.

b. Impact/accomplishment –

Short-term:

- Nutrition-related studies among the HIV-infected population have focused mainly on adults and problems of wasting while little is know about the adolescent population. This study documented a high prevalence of obesity and low intake of specific anti-oxidants among a US HIV-infected adolescent population. Given the increasing survival rate of patients and the increased prevalence of chronic diseases among overweight young adults, these results demonstrate the need for health professionals to address health risks of obesity in addition to infection-related issues with HIV-infected youth to improve the quality of life of patients and reduce health costs.

- Poor complementary feeding practices are a primary cause of malnutrition in young children in low-income countries. This study documented the practices of child feeding in Ghanaian and Peruvian communities that have similar breastfeeding practices but access to different foods. Energy from human milk and complementary foods was similar between the two communities; however, feeding styles (feeding frequency, use of snacks, and use of nutrient-rich foods) differed and may have important consequences for micronutrient status and growth. Results may assist health professionals in making culturally appropriate recommendations to improve child health and growth.

Long-term:

- A human study examined the effects of estrogen-like substances (isoflavones from soy protein) on bone loss and cardiovascular disease risk in mid-life women. Results have shown that soy protein with isoflavones had a modest beneficial effect on the lumbar spine bone in these women, but had no beneficial effect on the proximal femur (hip) bone mineral density or on the lipid profile of these women. However, protein treatment (isoflavone-rich soy vs isoflavone-poor soy versus whey control) did not adversely affect coagulation/fibrinolytic factors, which are typically adversely affected by estrogen replacement therapy, but soy did exert a beneficial effect on total antioxidant status, considered to be protective for cardiovascular disease. Based on these results, future

research is designed to provide an alternative to traditional hormone therapy in preventing and treating osteoporosis as a long-term consequence of menopause without producing side effects.

- The relatively constant carotenoid composition of leaves in higher plants suggests *Arabidopsis* leaves could model interactions of β-carotene and lutein ingested in vegetable leaves. Studies compared liver vitamin A stores in gerbils that consumed β-carotene in lutein-free (*lut2*) mutant or wild-type (WT) *Arabidopsis* leaves. Liver vitamin A stores were 47% higher in gerbils fed *lut2* leaves than in those fed WT leaves. These results predict substantial improvements in the bioefficacy of β-carotene in leafy vegetables could be achieved through modification of lutein contents by plant breeding or biotechnology.

- Biosynthesis and deposition of the very important long chain polyunsaturated fatty acid, docosahexaenoic acid (DHA), from dietary essential alpha-linolenic acid was examined in farmed walleye pike. This farmed freshwater fish might serve as a potential source of DHA for human diets. Fish fed diets that contained flax oil, algal oil and menhaden oil all increased DHA content in the fish fillets to 30% of the total acids present. It appears the pike can be manipulated to increase muscle DHA content. Elongation and desaturation of the high linolenic acid content of flax oil is most important because this could provide DHA in a common farmed food from a non-marine source.

- There has been considerable interest in the role of consuming isoflavones in improving health (reduced heart disease and cancer and improved bone density). A simplified method to synthesize glycitein, an understudied soy isoflavone, was developed. This method will expand research on this isoflavone.

- Several strains of propionibacteria have been demonstrated to form conjugated linoleic acids (CLA) in yogurt model systems containing hydrolyzed fatty acids. The development of processed foods with increased CLA contents has important implications for human health as we learn more about the nutritional benefits associated with CLA.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Goal 4: An agricultural system which protects natural resources and the environment.

Overview

The Iowa Agriculture and Home Economics Experiment Station has made progress against all the impacts identified in the plan of work for Goal 4. Research outputs take a number of forms, including:

- 151 Refereed Publications, Research Papers, Manuscripts
- 174 Non-refereed Publications, Reports, Technical Papers

- 106 Proceedings, Published Abstracts
- 96 Extension Publications
- 115 Invited Presentations
- 250 Education Programs, Field Days, Tours
- 17 Books & Chapters
- 98 Web Sites, Multi-Media
- 2 Patents
- 22 Theses, MS/PhD Programs Completed

Outputs, outcomes and impacts: Highlights of research at Iowa State University:

① Area-wide management of the corn rootworm resulted in similar root protection as soil-applied insecticides; however, the range in root protection was wider for area-wide management than soil insecticides. Area-wide management of corn rootworms can be conducted at a similar cost and with similar efficacy as the use of preventive applications of soil insecticides, while the application of insecticides to fields is reduced by more than 20-fold.

② A major area of emphasis this year was on the continued research and reporting results of alternative treatment system research for handling open feedlot runoff. We have shown that systems such as vegetative filter strips and/or wetlands can significantly reduce the pollution potential of the runoff. Such systems have the potential of saving the Iowa beef cattle industry millions of dollars annually while still protecting water quality. If only 100 feedlots of 1000 head each used the systems and saved $50 per head compared to complete containment the savings would be 100,000 × $50 = $5,000,000 for the industry.

③ The balance of food supply and demand for game fish in Spirit Lake, one of Iowa's most important fisheries was studied. The number of native species present in Spirit Lake was found to have declined by approximately 25% over the last 70 years. Roughly 90% of the consumption of fish in Spirit Lake is attributable to stocked walleye, which in some years results in considerable cannibalism of newly stocked walleye by larger walleye stocked in previous years. We developed simple regression models allowing fishery managers to estimate annual population consumption from readily available population size and mean fish weight data.

④ Seven-meter wide switchgrass riparian buffers remove 95% of the sediment, 80% of the total N and 78% of total P. With the addition of 9 meters of woody buffer removal rates increase to 97, 94, and 91% respectively.

⑤ ISU participation in the following multistate research projects also contribute to goal 4: NC094, NC100, NC125, NC174, NC202, NC205, NC218, NC230, W128, W170, W187, and W188.

Assessment of accomplishments as measured against POW:

An agricultural system which protects natural resources and the environment through the development and dissemination of information on new or improved methods, practices, and products that will result in

- enhanced soil and water quality, ②
- increased utilization of integrated pest management, sustainable, and organic agricultural practices, ①
- adoption of better manure management practices, ②
- increased wetland restoration and improved riparian management on public and private lands, ③
- greater societal recreational and economic benefits from surface water uses, and ④
- Iowa's agriculture being highly productive, economically profitable, environmentally friendly, and socially responsible. ①②③④

New contributions to the understanding of the impact of agriculture on the environment and the applications of scientific advances promote protection of the environment and natural resources of Iowa, the United States, and the world.

State and Hatch Funds $ 2,455,801

FTEs 28.4

Key Theme – Forest Resource Management

Program 2: Forest Resource Enhancement

a. Description –

The overarching objective of the research conducted as part of this project is to use forests, woodlands, trees, shrubs, perennial grasses, and forbs to improve environmental quality and to create value-added products. To assure an adequate research base and high impact products, available resources are focused on five broadly based performance objectives: 1) protect the soil resource, improve water quality, increase crop yield, and enhance biological diversity; 2) enhance and restore naturally occurring ecological communities; 3) meet the growing demand for wood fiber based products and biofuels through the development of fast growing disease and insect resistant plantation grown trees that require minimal chemical inputs; 4) provide a low cost means of saving energy, improving the aesthetics and livability of populated areas, and protecting air and water quality in both urban and rural areas; and 5) further the development of bio-based materials that utilize agricultural fibers and commodities to create new materials that add value and diversify income potential.

b. Impact/accomplishment –

Use of forests, woodlands, trees, shrubs, perennial grasses, and forbs to improve environmental quality:

- Shelterbelt model simulation has been improved through the development of new equations to simulate windspeed and temperature across a sheltered field.

- Growth performance of urban trees as affected by population levels and landuse indicated that number of nearby trees, insect and disease impacts, and human-induced mechanical injuries correlated negatively with tree growth.

- Analysis of sediment content, nitrogen, and phosphorus in stream water from developing sites is being used to evaluate the impacts of residential development and to develop best practice recommendations.

- Seven-meter wide switchgrass riparian buffers remove 95% of the sediment, 80% of the total N and 78% of total P. With the addition of 9 meters of woody buffer removal rates increase to 97, 94, and 91% respectively.

- Estimates of uptake by a mechanistic nutrient uptake model were improved by coupling information on soil nutrient supply and optimum plant nutrient ratios.

- Genetically improved clones of poplar exhibit a 50% increase in growth potential and a substantial reduction in the risk of loss to pest problems. New clones will be available to the public in 2003.

Use of forests, woodlands, trees, shrubs, perennial grasses, and forbs to create value-added products:

- Mill trials of soy-based resin at several oriented strand board production facilities have generated considerable manufacturer interest.

- Successful mill trials have been run for a compression molded wood product using powdered soy-based adhesive.

c. Source of Federal Funds—McIntire-Stennis

d. Scope of Impact—State Specific

Key Theme – Soil Quality

Program 21: Sustainable and Environmentally Safe Management of Soil Resources

a. Description of activity

This program is focused on four major issues: (1) management of crop nutrients in soils, (2) how microorganisms and their products function in soils, (3) the assessment and sustainable management of soil resources, and (4) the fate and transport of chemicals in soils.

b. Impact/accomplishment –

Short-term:

- Assistance to the Dallas County Board of Supervisors in revising their zoning ordinance to accommodate local concerns about environmental impacts of sand and gravel mining

GIS site suitability modeling was completed for future sand and gravel operations in Dallas County, Iowa. Modeling results were largely based on soil survey data and showed that there are locations in Dallas County where all participating stakeholders agreed there is high suitability for surface mining. The work in Dallas County is a model for other counties in Iowa that are facing similar resource planning and management issues.

- A 10-year study on the efficacy of nitrapyrin applied in the spring in anhydrous ammonia to increase corn grain yields in continuous corn and corn-soybean crop rotations was completed. There was no response to nitrapyrin in any year in the corn-soybean crop rotation and only one response in ten years in the continuous corn. The data strongly suggest that Iowa farmers should not be spending money on nitrapyrin.

- A 12-year study was completed that explored the potential of using the late-spring test for soil nitrate and the end-of-season test for cornstalk nitrate in watershed-scale programs to evaluate and improve nitrogen management during corn production. March through May rainfall and the associated losses of nitrate from fields to rivers were identified as the most important factors affecting nitrogen-sufficiency levels found in Iowa cornfields. The results demonstrate a need for nitrogen fertilizer recommendations that acknowledge the importance of time of fertilization as well as the economic and environmental benefits of delaying nitrogen applications until plants are growing.

Long-term:

- A novel site-specific recombination-based genetic system for detecting transient or low-level gene expression was developed and tested. We demonstrated the utility of this system to detect the availability of arabinose to bacteria on plant roots. This biosensor system provides a new tool for assessing nutrient availability or gene expression even if the target signal (nutrient) is ephemeral (transiently available).

- A heat-pulse method was developed for measuring soil water flux and soil water velocity. We developed a mathematical analysis that provides a linear relationship between soil water velocity and the ratio of downstream to upstream temperature increases from a pulsed heat source. This approach will lead to new monitoring of soil water velocity in numerous saturated and unsaturated soil conditions.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Key Theme – Integrated Pest Management

Program 22: Integrated Pest Management

a. Description of activity

Integrated Pest Management (IPM) promotes minimized pesticide use, enhanced environmental stewardship, and sustainable systems. This is achieved by protection of

commodities, homes, and communities with environmentally- and economically-sound practices that result in abundant, high quality supplies of food and fiber products and improved quality of life. Research at Iowa State University has produced monitoring tools and developed prediction models to forecast the need for control action, identified optimum management strategies to achieve acceptable control while minimizing environmental impact, and quantified the impact of control action on target and non-target organisms. Soybean disease research focused on the analysis of emerging pathogen problems in association with changes in agricultural systems, the interaction between fungi and transgenic plants and its consequences to Roundup Ready soybean, and the study of how farming practices and use of disease resistant cultivars affect pathogen growth and survival.

b. Impact/accomplishment –

- Research was conducted to determine the agronomic, environmental and physiological variables influencing seed germination from the soil seed pool. An algorithm called FoxPatch was produced that allows the prediction of foxtail seedling emergence. The decision support system will provide real-time information about the appearance of this major US weed in agricultural, homeowner, right-of-way, and other managed systems. FoxPatch is under development and funding is being sought to implement it. FoxPatch will be a logical module addition to existing decision support systems currently being used by midwestern growers such as WeedSoft and WeedCast. Informational weed management is a new strategy; FoxPatch is one such effort.

- The bean leaf beetle has become a significant pest of Iowa soybeans in recent years (1996-2002). In 1999, it was determined that bean pod mottle virus was infecting soybeans and reducing yields in western Iowa and that the bean leaf beetle was the major vector of this soybean pathogen. Research in 2002 focused on validating management strategies for the bean leaf beetle and examining the relationship between bean pod mottle virus and the bean leaf beetle. Research findings suggest that two insecticide treatments, one at plant emergence and the second in early July, are necessary to control beetle populations and reduce the spread of the virus.

- A disease-warning system that uses weather information to improve the timing of fungicide sprays was tested in the orchards of five commercial apple growers in Iowa in 2002. The warning system targeted sooty blotch and flyspeck, a fungal disease that attacks the fruit. On average, growers who used the warning system saved two fungicide sprays, with no additional disease, compared to their standard spray schedule. This result showed that Iowa apple growers could save $50-60 per acre per year using the warning system.

- Area-wide management of the corn rootworm was applied to a 16-square mile area of eastern Iowa for six years. Rootworms were monitored in all cornfields and a prescription application of SLAM (insecticidal bait that is applied at the rate of ½ pound of formulation (one ounce of insecticide) per acre) was made to lower populations throughout the area and reduce pest outbreaks. The pest population was reduced two- to four-fold compared to conventional prophylactic application of soil insecticides and population fluctuations were reduced. On the average, area-wide management resulted in

similar root protection as soil-applied insecticides; however, the range in root protection was wider for area-wide management than soil insecticides. 31,251 acres of corn were scouted in the area-wide management site over the duration of the study and, if 70% had been treated, 21,730 acres would have received 27,164 pounds of active toxicant. In the area-wide study, only 1,467 pounds were used, nearly a 23-fold reduction. At the end of the project, area-wide management cost approximately $17.00 per acre. Area-wide management of corn rootworms can be conducted at a similar cost and with similar efficacy as the use of preventive applications of soil insecticides while the application of insecticides to fields is reduced by more than 20 fold.

- A major cost of prescription management of pests is the cost of sampling to diagnose pest problems. To forecast the need for corn rootworm insecticides, adults are sampled for eight to ten weeks during the summer. A degree-day model was developed that is initiated by the appearance of the first beetle to predict beetle emergence through out the season. The rate of ovary developed was incorporated into the model and the critical time for sampling adults was forecast. The model has good fidelity and allows the critical four-week sampling interval to be identified, reducing sampling costs by half.

- Soybean disease research focused on developing transgenic soybean lines that provide rate-reducing resistance to soybean mosaic virus (SMV) as opposed to the more traditional approach of selecting for extreme resistance. Risk assessment experiments conducted in the field showed that two transgenic lines greatly reduced the temporal rate of plant-to-plant spread and that field spread was highly aggregated as opposed to random in resistant transgenic soybean lines. It is hypothesized that the rate-reducing strategy will not result in the development of resistance-breaking strains of SMV.

- A disease advisory system that predicts the seasonal and site-specific risks for Stewart's disease of corn has been developed and is currently being field-tested. The model predicts the survival of corn flea beetle populations (pathogen vector) and generates risk maps for the state at the county level using GIS software. The disease advisory system allows growers and seed corn companies to select low disease-risk planting sites and alerts growers as to whether or not (and where) seed and foliar insecticides will be needed to reduce the risk of Stewart's disease.

c. Source of Federal Funds—Hatch; Smith-Lever

d. Scope of Impact—State Specific, Integrated Research and Extension

Key Theme – Agricultural Waste Management

Program 23: Animal Waste Management

a. Description of activity

Work in this program has focused on the following activities:

- Reduce odors and unbalanced nutrients in manure through animal feeding and nutrition.

- Improve manure handling, storage, and treatment technologies to minimize odors, recover energy, improve crop utilization potential, and reduce negative environmental impacts.
- Develop innovative manure utilization strategies for soil quality enhancement, crop production, and other value-added opportunities.
- Evaluate the fate of nutrients, pharmaceutically active compounds (e.g., hormones, antibiotics), heavy metals and pathogens in manure management systems and their impact on the environment.
- Evaluate the social and economic impacts of manure management systems.
- Animal mortality composting research and extension.
- Research on use of composted municipal/industrial organic wastes to reduce soil erosion and runoff from large construction sites.

b. Impact/accomplishment –

Short-term:

- Research projects on manure management for deep-bedded swine hoop structures determined that fall applications of fresh manure or compost had equivalent nutrient availability and corn yield, but compost produced a significantly better response than fresh manure in spring applications. Farmers are already implementing these results, with potential savings of over $200,000 in nitrogen fertilizer costs annually in Iowa alone.

- The Federation of Animal Sciences and the ASAE 412 Committee are working together to revise ASAE Standard D384.1 Manure Production and Characteristics such that it more accurately reflects today's animals and management practices. The impact of this is that nutrient management planning will be more site-specific and enable a producer to better visualize where nutrient opportunities and cost savings exist.

- A 3-year study on the effects of using composted organic wastes to control storm water runoff at large construction sites was completed. Research results verified substantial reductions in runoff, interrill erosion, and weed growth. Adoption of project results and recommendations could provide a major new beneficial market for composted organic wastes in Iowa, and will provide Iowa DOT with another valuable tool for reducing erosion at construction sites where conventional erosion control measures are not effective.

- Data on NO_3-N, PO_4-P, and bacteria concentrations in subsurface drains were collected to observe the effects of poultry manure application on water quality. Five-year data (1998-2002) from study has shown that use of poultry manure resulted in significantly higher corn yields in comparison with UAN applications. The N application rate of 336 kg-N/ha from poultry manure resulted in the highest NO_3-N, PO_4-P and bacteria (fecal coliform, fecal streptococcus, and E. coli) concentrations in surface and subsurface drain water in comparison with the N application rates of 168 kg-N/ha either from UAN or poultry manure. This shows that excessive use of poultry manure may increase the pollution potential of water bodies from NO_3-N, PO_4-P, *Escherichia coli*, fecal coliform, and fecal

streptococcus bacteria. Similar results were observed from the swine manure research study conducted at the northeast research center near Nashua, Iowa in 2002.

Long-term:

- A major area of emphasis this year was on the continued research and reporting results of alternative treatment system research for handling open feedlot runoff to IDNR and EPA. We have shown that systems such as vegetative filter strips and/or wetlands can significantly reduce the pollution potential of the runoff. Such systems have the potential of saving the Iowa beef cattle industry millions of dollars annually while still protecting water quality. If only 100 feedlots of 1000 head each used the systems and saved $50 per head compared to complete containment the savings would be 100,000 × $50 = $5,000,000 for the industry.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Key Theme – Water Quality

Program 24: Improving Water Resources Management in an Agroecosystem

a. Description of activity

This program focuses on several issues of importance to understanding the interrelationship between water quality and agriculture: 1) describing water quality problems and the feasibility of remedial measures for lake and watershed restoration; 2) calculating economic and cultural benefits derived from societal uses of the water resources; 3) constructing models of critical habitat for endangered fish and freshwater mussels that allow water resource development but maintain biodiversity; and 4) contributing to environmental databases for improved state and federal water resource management programs. Program stakeholders include the portion of the public and government agencies that monitor, manage, and regulate water resources and their use.

b. Impact/accomplishment –

Short-term:

- The balance of food supply and demand for game fish in Spirit Lake, one of Iowa's most important fisheries was studied. The number of native species present in Spirit Lake was found to have declined by approximately 25% over the last 70 years. Walleye and yellow perch were the dominant species in Spirit Lake, but unlike all previous studies, young-of-year yellow perch escape predation from young-of-year walleye through fast growth. Roughly 90% of the consumption of fish in Spirit Lake is attributable to stocked walleye, which in some years results in considerable cannibalism of newly stocked walleye by larger walleye stocked in previous years. We developed simple regression models allowing fishery managers to estimate annual population consumption from readily available population size and mean fish weight data.

- During warm months of the year, lagoon systems used by small communities for treatment of municipal wastewater are effective for reducing estrogenic compounds that would otherwise have the potential for adverse biological effects on aquatic life in streams receiving the treated effluent. These findings are important to Iowa communities that are responsible for funding the operation of wastewater treatment systems, to civil engineers that design the facilities, and to environmental agencies that monitor and regulate environmental quality. Information on the research has been transmitted to the Iowa Association of Municipal Utilities.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Key Theme – Weather and Climate

Program 25: Interaction of Biosystems with Weather and Climate

a. Description of activity

The climate of the United States has become more extreme in recent decades. Such climate change includes both positive and negative effects upon natural systems and society. As an example, year-to-year variation of corn production (and other crops) throughout the Midwest was large during the last two decades following a relative "benign" period from the fifties through the seventies. Our project addresses issues that relate to weather and climate at regional scales, including observations of present climate as well as projections of future climate and its impacts.

A specific concern is that natural or human-induced climate changes could have marked impact on future crop production. There is a particular need to address climatological trend interpretation and climate change at regional scales, especially warm season rainfall, which is of great importance to agricultural interests.

Improved forecasts of day-to-day and longer-term weather will positively impact agricultural activities including both production and marketing aspects. Much of the recent improvement in weather forecasts has been due to rapid improvements in computer power that have permitted use of much higher spatial resolutions in numerical weather prediction models. Much of our research centers on making more effective use of this computer power in generating weather and climate forecasts, and in the observation and interpretation of current weather. Warm season rainfall, which is of critical importance to agricultural interests, remains a difficult challenge and is specifically addressed in this project.

b. Impact/accomplishment –

Short-term:

- Observing weather at small time and space scales is essential for many applications such as precision farming or emergency response. We have developed the Iowa Environmental Mesonet, a public-private-university partnership that provides a variety of current and

historical data throughout the state. The Mesonet is heavily used by emergency response managers and recently won an award from the National Weather Association (NWA) for improving severe weather warning systems in the region.

- We have begun generating real-time summer rainfall forecasts using a new method called "ensemble forecasting." This method averages together several different forecasts in order to account for the inevitable uncertainty in weather prediction. Our ensemble forecasts are being used at the National Weather Service office in Des Moines.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific

Goal 5: Enhanced economic opportunity and quality of life for Americans.

Overview

The Iowa Agriculture and Home Economics Experiment Station has made progress against all the impacts identified in the plan of work for Goal 5. Research outputs take a number of forms, including:

- 145 Refereed Publications, Research Papers, Manuscripts
- 53 Non-refereed Publications, Reports, Technical Papers
- 50 Proceedings, Published Abstracts
- 41 Extension Publications
- 145 Invited Presentations
- 186 Education Programs, Field Days, Tours
- 38 Books & Chapters
- 21 Theses, MS/PhD Programs Completed
- 5826 web pages supported

Outputs, outcomes and impacts: Highlights of research at Iowa State University:

① To understand the impact of welfare reform on young children and families a qualitative assessment involving 700 interviews was conducted. Major findings identified barriers to successful welfare reform, including lack of transportation in rural areas, lack of childcare subsidies for part-time workers, poor workplace and work-ethic skills, and family resource management difficulties. For infants and toddlers the impacts of welfare reform centered on the lack of affordable, available, high quality child care, especially in rural areas.

② Findings from a project on oldest old populations suggest that a robust personality, acceptance of life circumstances, and religious beliefs were essential for effective survivorship. Identifying these effective survivors should help communities and families maintain assist them in their own homes and the local community, and plan better to care differently for those who are not as effective in meeting their own needs.

③ Results from an Iowa household survey and Census data analysis demonstrate that rental housing promotes vitality, but that growth in the housing stock was negatively related to rural community vitality due to the rise in the number of mobile homes in some communities. Website data for Iowa communities have been used by local groups to support applications for community development grants.

④ ISU participation in the following multistate research projects also contribute to goal 5: NC100, NC221, NC222, NC1001, NC1002, NE162, NE167, NE185, S276, and S296.

Assessment of accomplishments as measured against POW:

Enhanced economic opportunity and quality of life through the development and dissemination of information on new or improved methods, practices, and products that will result in

- increases in employment opportunities, educational attainment, per capita income, housing availability, continuing education, participation in local events, and elements of the environment such as water quality, ③
- communities supporting development projects; increased capacity of communities, families, and individuals to improve their own quality of life, ②
- improved cooperation between the university, state and federal agencies, industries and communities to transfer technology that will lead to industrial growth and rural development, and [see value added program under goal 1]
- enhanced education of decision-makers at local, regional, and state levels; those initiating development projects; and those setting policies. ①

New contributions to the understanding of social and economic factors and the applications of scientific advances promote economic opportunity and quality of life for the populations of Iowa, the United States, and the world.

State and Hatch Funds $ 1,835,376

FTEs 18.1

Key Theme – Impact of Change on Rural Communities

Program 27: Rural Development

a. Description of activity

This program examined how human systems affect and are affected by the structure of agriculture and life in rural communities to address five major issues: (1) enhancing economic opportunities and the quality of life in rural America, (2) building greater harmony between agriculture and the environment, (3) achieving sustained, long-term improvement in the competitive position of U.S. agriculture, (4) developing a safe and secure food system, and (5) encouraging a healthier, more well-nourished population.

b. Impact/accomplishment –

Short-term:

- Evaluated determinants of small business success in rural communities. Small businesses account for the majority of rural employment in most small communities, hence their success is critical to stabilizing the downward spiral that is observed in many communities as small businesses close and main streets are abandoned. Through this research we have discovered that women-owned businesses have generally been neglected and receive less community support than male owned businesses. These findings will be used in small business development seminars, Chamber of Commerce leadership institutes and extension meetings to address the need to support businesses owned and operated by women.

- The completed report on Urban and Agriculture Communities: Opportunities for Common Ground, is a collaborative effort between CAST and ISU. The report identifies areas of opportunity for new markets and value-added agriculture. Farmer groups, commodity organizations, and community groups have used the report to better understand how they work together to develop sustainable food systems, address urban and rural land use issues, and better protect the environment.

- A CD-DIAL survey conducted on behalf of the Carroll County Conservation Board provided justification to the Board of Supervisors for a tax dollar allotment to construct an 8,000 square foot conservation education center. Ground breaking for the $1.7 million Swan Lake Education Center will take place this spring. In Polk County, the Board of Supervisors is currently working with CD-DIAL to conduct a customer satisfaction survey regarding county government services. Polk County Supervisors will use survey results to make future decisions regarding resource allocation and service improvement. The Dickinson County Board of Directors is using results of a recently completed CD-DIAL survey to determine citizens' preferences on a major courthouse renovation program. A countywide referendum is expected this summer that will be based on the results of the survey. Two surveys conducted with the Iowa Early Care and Education Professional Development Project are providing information on Iowa's child care workforce, both in center programs (for example, Head Start and privately operated child care centers) and family home child care.

Long-term:

- Completed a three-year analysis of food systems in Iowa. This research has been used as input into community-level decision making regarding how to design, implement, and maintain farmer's markets, community-supported agriculture, and other locality-based retailing of farm products.

- Research on telecommunications in Iowa highlights the need to extend the electronic age to rural places. Geographic distances and inadequate highways and rail transportation disadvantage many communities. Arguments have been advanced that electronic cottage industries is an alternative form of development, but this research shows that communities that are geographical isolated are also less likely to have access to high speed Internet access. If we are to help these communities become competitive for future employment the extension of broadband Internet access will be imperative.

- Publication of the findings from the Iowa Farm and Rural Life Poll has raised awareness of the importance of long term data collection that monitors trends in rural culture. A major section of the 2002 poll was devoted to collection of benchmark data on nitrogen use. Because Iowa has been identified as having 157 lakes, streams and rivers that are impaired because of excessive nitrogen use, the EPA is targeting agriculture as the major non-point pollution source. Data from the poll indicated that 40 percent of the farmers agreed that farmers generally use too much nitrogen, and 6 out 10 agreed that modern farming relies too heavily upon chemical fertilizers. These data are part of a larger project funded by the Iowa Department of Agriculture and Land Stewardship to assist policy makers in designing policy and education programs to reduce nitrogen fertilizer runoff. Data from the survey have widely disseminated to legislators, congressional members and local policy makers to assess conditions in the state and design intervention programs to assist producers.

- Publications and presentations on consumer risk assessments to groups of scientists and the public have promoted better understandings of how the people view new agricultural technologies. Improved understanding of consumer risk assessments enable scientists to better express to the public the advantages and disadvantages of complex innovations in agricultural production and processing.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Key Theme – Other

Program 28: Fiber-Related Products (Textiles and Apparel) and Businesses for Protection, Social, and Economic Enhancement

a. Description of activity

Research under this project concerned both production and consumption issues concerning textile and apparel fiber products. Surveys investigated consumer attitudes, behavior patterns, preferences, and trade issues in rural communities. Other investigations clarified options and methods open to small businesses and designers for providing necessary and pleasing products to rural consumers.

b. Impact/accomplishment –

Short-term:

- NC-222 findings indicate that hands-on information computer sessions increase consumer willingness to use the Internet to search for product information and to shop for food and fiber products. Findings also indicate that community satisfaction is related to willingness to shop locally, while Internet shoppers were less likely to shop in their local small towns. The findings are useful in developing consumer intervention programs and small business support information. The measure of

motivations to use the Internet and mail catalogs for apparel shopping that were developed will be helpful in further research.

- Factors influencing consumer acceptance of garments produced through mass customization were examined. Consumers preferred mass customization for certain types of products (e.g. jeans) but the product type depends on the particular mass customization process (body scanning for better fit or co-designing for unique design). Consumers also preferred mass customization processes occurring in certain types of retailers (e.g. mall stores). Findings also showed that the mass customization experience had as much impact on consumers as the outcome (better fit or unique design). Knowledge of these findings will help ensure success of apparel firms offering mass customization.

- Work under the NC-170 project on sun safety attitudes found differences that were age related. Another study of the sun protective value of cotton and cotton/polyester blend knit t-shirts showed that their protective value was significantly increased by 5 repeated launderings in household detergents containing optical brighteners. This is an economic benefit to consumers who otherwise might have felt the need to invest in special sun protective clothing. A sun safety exhibit at Farm Progress Show reached over 1800 people with information about clothing for protection from ultraviolet radiation of the sun. Skin cancer is increasing annually and educational messages to the public about sun protection offer the potential to reduce this and other related health problems.

Long-term:

- Studies on the relationship of shopping and rural trade found that 65 percent of the rural retailers said their top strategy business success was developing managerial proficiency. Successful rural businesses attract others, provide employment for families, and aid community development. Small business owners, with <20 employees and yearly sales of <$1 M, in communities of < 50,000 population, feel satisfied with their work, are successful, and are optimistic that their businesses will grow or stay the same in the next five years. But, they also claim to lack knowledge of planning formal business strategies and sources of this essential support. 42% belonged to a network or organization and 83% said it was sometimes or often a resource. A comparison of rural with urban women over age 55 showed no significant differences in apparel shopping enjoyment nor fashion involvement and interest. These findings suggest that operating a family business affects the family, household management flexibility significantly predicted business success, and further educational programs are needed on business management.

- Efforts continue to integrate digital printing into the mass customization and co-design of fashion apparel for the couture market. Digital printing holds promise as a means to enhance design through computer technology.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific; Integrated Research and Extension

Program 30: Quality of Life

a. Description

This program focuses on sustaining and enhancing rural life quality by investing in community and social services and support to families. These investments must be based on scientifically valid research that responds to a variety of challenges: population aging and employment needs, changing family structure, and the devolution of social service policy making to the community level.

b. Impact/accomplishment –

Short-term:

- Findings from a project on oldest old populations suggest that a robust personality, acceptance of life circumstances, and religious beliefs were essential for effective survivorship. Identifying these effective survivors should help communities and families maintain assist them in their own homes and the local community, and plan better to care differently for those who are not as effective in meeting their own needs.

Long-term:

- Results from an Iowa household survey and Census data analysis demonstrate that rental housing promotes vitality, but that growth in the housing stock was negatively related to rural community vitality due to the rise in the number of mobile homes in some communities. Website data for Iowa communities have been used by local groups to support applications for community development grants.

- To understand the impact of welfare reform on young children and families, a qualitative assessment involving 700 interviews was conducted with state level policy makers and a sample of rural and urban participants, including county level policy makers, agency workers serving welfare recipients, Early Head Start staff interacting with agency workers and families, and families with an infant or toddler. Major findings identified barriers to successful welfare reform, including lack of transportation in rural areas, lack of childcare subsidies for part-time workers, poor workplace and work-ethic skills, and family resource management difficulties. For infants and toddlers the impacts of welfare reform centered on the lack of affordable, available, high quality child care, especially in rural areas.

- Little is known about the effect of the family and community of origin on marital stability, satisfaction, and commitment over time. Findings from a study that linked parents to young adults demonstrate that conflict with in-laws is a significant source of marital instability. Potentially, pre-marital counseling and parenting education materials that focus on long-term connections between the generations could have an impact to reduce marital instability and related problems for children of divorce.

c. Source of Federal Funds—Hatch

d. Scope of Impact—State Specific

1862 Extension

Goal 1: An agricultural system that is highly competitive in the global economy.

Overview

Outputs, outcomes and impacts of extension at Iowa State University:

- 23 Refereed Publications, Research Papers, Manuscripts
- 148 Non-refereed Publications, Reports, Technical Papers
- 33 Proceedings, Published Abstracts
- 287 Extension Publications
- 236 Invited Presentations
- 1,527 Education Programs, Field Days, Tours
- 2 Books and chapters
- 1 Patent
- 3 Theses, MS/PhD Programs Completed
- 5 feasibility studies
- 3,420 educational consultations
- 41 web pages supported
- 1,366 volunteers trained
- 1 CD ROM developed
- 49,112 one-on-one consultations

① The 2002 Farm Bill altered the risks and returns from leasing land for both landlords and tenants. In addition, recent changes in the Uniform Commercial Code also change the legal requirements to enforce leasing contracts. Since many landlords in Iowa are elderly men and women, a series of educational programs and one-on-one counseling sessions were offered across the state to help both landlords and tenants reassess leasing rates and provisions. The 2002 Farm Bill has a limited impact on expected returns, but does affect some of the risk sharing features of many lease contracts. This statewide effort played a major role in assisting landlords and tenants with making prudent changes in leasing and other land operating business arrangements.

② The 2002 Commercial Manure Applicator program provided training to 739 commercial applicators. Iowa law requires commercial manure applicators to attend 3 hours of annual training or take and pass an exam annually to maintain certification requirement to land apply manure. Over 92 % of all certified commercial applicators choose to attend the training workshops. As a result of the training provided, 63% of commercial applicators indicated they already implement best management practices when apply manure on sloping ground, an additional 22% said they will implement best management practices on sloping ground as result of information learned in the training workshops. Almost 78% of commercial manure applicators informed us that they are applying manure at rates required by manure

management plans, but an additional 11% of commercial applicators told us they plan to apply manure at rates according to the manure management plan as a result of information learned in the training program.

③ The 2002 Confinement Site Manure Applicator Program provided training to 1,132 confinement site manure applicators. Iowa law requires confinement site applicators to attend 2 hours of annual training to maintain certification requirements to apply manure. As a result of the training provided, 35% of confinement site applicators said they already adjust feeding practices to manage manure nutrients and an additional 27% of attendees reported they plan to adopt feeding strategies to reduce manure nutrient concentrations as a result of materials presented in the training program. Approximately 40% of confinement site applicators plan to adopt manure equipment calibration techniques to determine and adjust manure application rates, and 26 % of confinement site applicators plan to adopt the use of different manure soil injection equipment to meet surface residue requirements.

④ The 2002 Farm Security and Rural Investment Act (FSRIA) was enacted in June. Prior to this time over 1,000 clients attended discussions of alternative components under consideration for the final legislation. Following passage, a massive educational campaign was conducted. As of September 20, 150 educational meetings with a total attendance of 12,998 had been held. Personnel from the Farm Service Agency and the Iowa Farm Bureau Federation collaborated in carrying out these meetings. In addition, a web site with educational materials was established. Extension bulletins were downloaded from the site 3,514 times, and a computer decision aid to analyze alternative program payment choices was downloaded 8,590 times. Using a conservative estimate of a $15 per acre advantage to making the correct program choice, and assuming operators of 10 percent of Iowa's crop acres were reached, the net benefit would approximate $30 billion per year for the next 6 years.

⑤ The aesthetic, environmental, and functional benefits that come from using trees in urban and rural landscapes are well documented, but municipalities and individual homeowners alike frequently run into difficulties when selecting and planting trees, and maintaining this valuable community resource. There are currently 499 graduates of the Iowa Community Tree Steward Program that have turned in 13,596 hours of volunteer service. This small army of trained volunteers has made a positive impact on Iowa's urban and community forest.

⑥ The largest single determinant of profit for beef cow-calf producers is the amount and cost of stored feed fed during winter months. In order to help producers cut costs and become more profitable, the Iowa Beef Center held "Cyclone Beef Days," a series of producer educational meetings across the state focused on management intensive grazing, riparian area management, and extended pasture grazing. The hands-on program included plant identification, pasture fertility evaluation, and forage planning with new software the Iowa Beef Center developed. More than 80 percent of participants surveyed said they planned to apply the new information they learned or change their operation as a result of the program.

⑦ As hog market prices dropped sharply and remained low in summer and early fall 2002, producers, lenders and other pork industry representatives were concerned about the possibility of a repeat of 1998. Through collaboration with IPPA and ISU Extension, the IPIC coordinated and sponsored the two-hour satellite program that focused on challenges of

low market prices and how to meet those challenges. The satellite program was available for downlink in all 100 county ISU Extension offices, and people from at least three states other than Iowa also made plans to view the broadcast in their respective locations.

⑧ Improving milk quality was the focus of three modern dairy milking procedures programs in NW Iowa, and 42 one-on-one farm consultations. One 330-cow herd reduced SCC from 900,000 to 150,000 via targeted problem identification and implementation of control strategies. These changes resulted in > $30,000 in increased milk quality premiums and decreased treatment costs.

⑨ ISU is currently assisting several farmer groups who are considering the ethanol industry as a way to add value to their commodity corn. Currently more than $165 million dollars of investment is planned in these plants. If these proposed plants come to fruition this will represent more than 500 jobs with an economic multiplier in which every dollar in the local economy turns approximately 2.5 times.

⑩ Economically and environmentally sustainable alternatives for disposal of livestock mortalities continue to be a concern in Iowa. Iowa's swine industry alone produces 65,000 tons of mortalities a year. Producers cite reduced availability of rendering service, increasing rendering fees and biosecurity as major issues. As more producers turn to on-farm burial, environmental officials have become concerned about the potential for groundwater degradation, since as much as 40 percent of Iowa has shallow groundwater or bedrock. Iowa farmers need options and assistance in large-scale disposal of animals. Several programs have been started to address this problem. A publication entitled, "Composting Swine Mortalities," has been developed and distributed to more than 3,000 swine producers, as well as in-depth education to more than 250 producers. Additionally a research project to develop composting procedures for cattle has been undertaken.

❶ The Iowa Master Gardener Program is an educational and volunteer service program of Iowa State University Extension and the College of Agriculture. University faculty and staff in the departments of entomology, horticulture, plant pathology, animal ecology and agronomy and Extension field specialists work with County Extension staff to provide unbiased, research-based horticultural information to the citizens of Iowa through the volunteer efforts of trained Master Gardeners. This year 525 adults were trained to become Master Gardeners at 23 locations. Master Gardeners volunteered over 63,500 hours of service to their communities. Valuing volunteer time at the rate of $11.27 per hour means Master Gardeners performed over $716,000 worth of service to the state.

Assessment of accomplishments as measured against the POW:

The Goal 1 impact that "Iowa producers will reduce input costs, adopt new technologies and develop value added enterprises to meet the demands of global markets" was met as shown through the individual Program impact statements.

State and Smith-Lever Funds: $ 7,460,390

FTEs: 122

Key Theme – Managing Change in Agriculture

Program 101: Strategic Advantage: Management Development for Iowa's Farm Businesses

a. Description of activity

This activity offers educational programs, information and direct assistance to farm families in business strategy and organization. In addition, professional development programs in these areas are offered to lenders, attorneys, CPA's and public officials. During FY 2002, primary activities included:

- Adjusting farm business organization in response to increasing domestic and foreign competition and the resulting lower prices and increased price volatility
- Changing leases, custom farming, and other business arrangements in response to the 2002 Farm Bill
- Risks and returns to the farm business from investments in or patronage or value-added businesses
- Transition and succession planning
- Organizational innovations for improving machinery management and services for mid-sized farm businesses

b. Impact/accomplishment –

- A one-day workshop on competitive strategy was offered to the Directors of five coops in Northwest Iowa. Increased competition from subsidized ethanol plants is seen as a competitive threat to established grain marketing businesses. Participants in the workshop were able to assess the risks and returns from value-added business in their trade area and discuss possible competitive responses to increased local demand for grain. This program was requested by and organized in conjunction with the participating cooperatives as well as the Iowa Institute for Cooperation.
- A group of five farmers in North Central Iowa requested assistance in establishing and operating an a business entity that would allow them share the use of a $55,000 sprayer. A farm management field specialist assisted the group with writing articles of incorporation and bylaws for an LLC, establishment of rental rates, spray accounts and other management and governance issues.
- A recently widowed farm wife requested assistance in transition and estate planning. The farm business controlled assets valued at $1 million but was 80% in debt. The family received assistance from a farm management field specialist on year-end tax planning, financial restructuring, estate planning, and ownership transfer options to her children.

- A farm management field specialist provided information to a group of farmers concerned about increased competition from Brazil. The group is pursuing an investment strategy to purchase and manage farmland in Brazil.

- Dairy Producers have a limited understanding and experience personnel management. In dairy farms that have expanded to a point where family labor supplies are inadequate, managing a labor force can become a critical issue to their financial performance. A 5 program series was developed and offered in Northwest and Northeast Iowa. The Northwest Iowa series had 20 participants from 15 farms. The subjects addressed at the meetings included working with Latino employees, development of employee handbooks, communication, and working with difficult employees. One farmer shared that they had struggled with a difficult employee who repeatedly threatened to sue the farm family and shut down their operation. After sharing this with the group, the farmer was able to identify options to release the employee. They did, and the work atmosphere and level of work has improved.

- The 2002 Farm Bill altered the risks and returns from leasing land for both landlords and tenants. In addition, recent changes in the Uniform Commercial Code also change the legal requirements to enforce leasing contracts. Since many landlords in Iowa are elderly men and women, a series of educational programs and one-on-one counseling sessions were offered across the state to help both landlords and tenants reassess leasing rates and provisions. The 2002 Farm Bill has a limited impact on expected returns, but does affect some of the risk sharing features of many lease contracts. This statewide effort played a major role in assisting landlords and tenants with making prudent changes in leasing and other land operating business arrangements.

c. Source of Federal Funds—Smith-Lever

d. Scope of impact—State Specific

Key Theme – Plant Production Efficiency

Program 103: Crop Nutrient Management

a. Description of activity

Having nutrients readily available for plant uptake is essential for crop production. Management of all nutrient sources, including fertilizer and manure, within the constraints of farm production systems and operational goals are prerequisite for both profitable crop production and environmental sustainability. Inappropriate management can lead to lower economic return and potential environmental degradation. Recognizing that fertilizer use is a major input cost for crop production touches on the importance of recognizing and appropriately using alternate sources of nutrients in crop production systems, such as manure. Doing so will help Iowa producers optimize systems for comprehensive farm planning and maintain long-term economic viability and environmental stewardship.

b. Impact/accomplishment –

- Integrated Tillage and Manure Management Demonstration – Hub and Spokes Model

  The Hub and Spokes is a unique approach in addressing issues related to manure management and tillage practices. Through research at the ISU Northeast Research Farm at Nashua, Iowa (the Hub), similar replicated treatments are demonstrated on farmer's fields in the surrounding geographic area (the Spokes). Complimentary field days are held at the research farm and demonstration sites. The outcome of this approach is encouraging. The number of producers involved in the project has increased from 9 in the first year to 17 in 2002, with the number of demonstration sites increasing to 24. Over 800 farmers and agricultural professionals have participated in education programs, field days, and workshops since the initiation of the project. Survey comments from producers include: the results of their on-farm demonstrations are consistent with the Hub research results; optimal yield was achieved by using manure only; commercial nitrogen use was reduced by 50-60 lb N/acre; and manure application equipment was upgraded for improved application and more efficient use of manure nutrients.

- Manure Applicator Certification Program

  This program provides training that is required by state law.

  - Commercial Applicators: The 2002 Commercial Manure Applicator program provided training to 739 commercial applicators. Iowa law requires commercial manure applicators to attend 3 hours of annual training or take and pass an exam annually to maintain certification requirement to land apply manure. Over 92 % of all certified commercial applicators choose to attend the training workshops. As a result of the training provided, 63% of commercial applicators indicated they already implement best management practices when apply manure on sloping ground, an additional 22% said they will implement best management practices on sloping ground as result of information learned in the training workshops. Almost 78% of commercial manure applicators informed us that they are applying manure at rates required by manure management plans, but an additional 11% of commercial applicators told us they plan to apply manure at rates according to the manure management plan as a result of information learned in the training program.

  - Confinement Site Applicators: The 2002 Confinement Site Manure Applicator Program provided training to 1,132 confinement site manure applicators. Iowa law requires confinement site applicators to attend 2 hours of annual training to maintain certification requirements to apply manure. As a result of the training provided, 35% of confinement site applicators said they already adjust feeding practices to manage manure nutrients and an additional 27% of attendees reported they plan to adopt feeding strategies to reduce manure nutrient concentrations as a result of materials presented in the training program. Approximately 40% of confinement site applicators plan to adopt manure equipment calibration techniques to determine and adjust manure application rates, and 26 % of confinement site applicators plan to adopt the use of different manure soil injection equipment to meet surface residue requirements.

- Improving Efficiency of Anhydrous Ammonia Application

  Each year over one billion pounds of nitrogen fertilizer is applied as anhydrous ammonia to Iowa cornfields. Ammonia manifold distribution problems on application equipment cause farmers to slightly over apply to ensure all corn plants receive adequate nitrogen. Newer manifold distribution systems were compared in several field trials. Also, a new manifold was designed and developed at Iowa State University that increases application uniformity. Grower and industry interest has been exceptional. Results of the comparative trials and new manifold design were shared at three field days and five winter schools, with 624 people attending these schools. Interest has grown from across the country regarding the new information and improved manifold designs. National press (through Successful Farming Magazine, with 475,000 paid subscriptions) covered the trial results and development of the improved manifold. One company is considering commercial development of the newly designed manifold, and a patent is pending.

- In-Depth Soil Fertility and Nutrient Management Education Short-Course

  An on-going educational need exists for those individuals involved in advising farmers and developing nutrient management plans to have a deeper understanding of the science and principles of soil fertility and crop nutrient management. This education should build on basic knowledge, and help advisers move beyond baseline programs such as the Certified Crop Adviser. To meet this need, an in-depth educational short-course was delivered to crop advisers, consultants, and agency personnel. The course focused on principles of crop fertilization, soil-fertilizer interactions, nutrient availability and crop uptake, soil test interpretations, nutrient recommendations, site-specific management, nutrient cycling, nitrogen loss pathways, phosphorus and the environment, manure nutrient management, and nutrient management planning. Topics are covered in an intensive two-day program that is limited to 30 participants. The limited enrollment allows for discussion, hands-on participation, and in-depth interchange between participants and instructors. A multiplier effect occurs because individuals attending the course not only directly influence producer clients, but also co-workers and development of policy. Participant surveys indicate the course covers important issues to their business and clients, brings a better understanding of scientific principles and background for nutrient recommendations, and brings together the complex picture of soils, nutrient management, crop production, and the environment. This helps attendees improve nutrient management and ultimately producer economics.

- Iowa Manure Management Action Group (IMMAG)

  A need for a coordinated and comprehensive approach for the sharing of manure management information and education efforts in order to improve manure management in Iowa resulted in the Iowa Manure Management Action Group (IMMAG) being established in the spring of 1997 through the leadership of the Natural Resources Conservation Service. In response to the need for information regarding manure management, IMMAG has established an electronic clearinghouse. The objectives of the clearinghouse are: 1) to provide access to comprehensive information on manure management research and application, 2) identify relevant manure management

publications and educational programs and convert these to electronic form, if needed, 3) solicit needed resources from qualified sources, and 4) maintain the clearinghouse on a web site that is easily accessible. IMMAG members also meet on a quarterly basis. The Iowa Manure Management Action Group (IMMAG) web page celebrated its 5-year anniversary in 2002. In the past 5 years, the web site has achieved over 3.5 million user hits with over 65,000 visitors. Accomplishments of the IMMAG group include the development of two fact sheets for livestock owners in Iowa, " Emergency Action Plans" and "Manure Management Resources for Open Feedlot Operators". In addition the group collected over 200 manure management photos and distributed them on 500 CD copies to various agency staff, extension staff, and media outlets to be used in training events and public press releases and news stories regarding manure management. In addition, IMMAG presented education and information material at 11 trade shows in the past 5 years, authored 7 professional papers about manure management education programs in Iowa, developed a Frequently Asked Questions document for the general public to use regarding manure issues, and sent monthly email updates to over 450 people regarding current manure management issues in Iowa.

c. Source of Federal Funds—Smith-Lever

d. Scope of Impact—State Specific and Multistate (through the Midwest Planning Service) ND, SD, KS, MO, MN, MI, WI, IL, IN, OH, NE

Key Theme – Agricultural Profitability

Program 104: Agricultural Financial Management

a. Description of activity

While producers have many reasons for pursuing farming as a business and career, successful financial performance is essential if other goals are to be reached. Improving financial performance usually involves actions that carry some degree of risk. Farmers and people who work with farmers (lenders, brokers, insurance agents, farm managers, and input suppliers) need to know how to balance risks and rewards, and how to effectively utilize existing financial and risk management tools.

Three specific program areas were emphasized this past year:

- Grain marketing
- Agricultural outlook
- 2002 Farm Security and Rural Investment Act (FSRIA)

b. Impact/accomplishment –

- Advanced Grain Marketing, a web-based home study course, was developed so that clientele could learn at a time and place convenient for them. Approximately 165 on-line learners paid $100 each to participate in the course. Many of them also participated in scheduled on-line chat sessions with Extension specialists.

- Five marketing clubs were formed or continued. Members meet on a regular basis to discuss advanced marketing topics and current market conditions. Extension personnel provide leadership, but club members also researched and led discussion topics.

- Seven crop and livestock outlook meeting were held, targeted to agricultural professionals. Extension specialists presented assessments of current world supply and demand factors and price prospects for major Midwestern commodities. Efforts focused on using options markets, elevator contracts and crop revenue insurance to develop sound marketing plans.

- Cyclone Beef Day was presented at four locations, with 75 producers attending. The central topic for discussion was a comparison of alternative retained ownership strategies for cow-calf producers. Participants estimated that information received at the program improved their net returns by an average value of $487 each.

- The 2002 Farm Security and Rural Investment Act (FSRIA) was enacted in June. Prior to this time over 1,000 clients attended discussions of alternative components under consideration for the final legislation. Following passage, a massive educational campaign was conducted. As of September 20, 150 educational meetings with a total attendance of 12,998 had been held. Personnel from the Farm Service Agency and the Iowa Farm Bureau Federation collaborated in carrying out these meetings. In addition, a web site with educational materials was established. Extension bulletins were downloaded from the site 3,514 times, and a computer decision aid to analyze alternative program payment choices was downloaded 8,590 times. Using a conservative estimate of a $15 per acre advantage to making the correct program choice, and assuming operators of 10 percent of Iowa's crop acres were reached, the net benefit would approximate $30 billion per year for the next 6 years.

c. Source of Federal Funds—Smith-Lever

d. Scope of Impact—State Specific

Program 106: Commercial Greens Industry

a. Description of activity

The production, marketing, installation, and maintenance of horticultural and forestry crops create many jobs for Iowans. Forestry and commercial horticultural enterprises in Iowa include, timber, fruit, nut, herb, flower, and vegetable producers, lawn care companies, golf courses, school and professional sport athletic fields, corporate grounds care, turfgrass sod producers, production wholesale nurseries, landscape design and installation firms, retail garden centers, landscape maintenance companies, arborists, greenhouse crop producers, retail florists, and Christmas tree growers. Other important clients include public utilities, and city, county, and state public lands and private woodland owners. Program 106 has focused on three important issues: (1) increasing the quality and percentage of marketable crop per acre and increasing profitability of businesses without harming the environment; (2) improving and enhancing the quality of life for all Iowans through the use of horticultural

and forestry crops; and (3) insuring the safety of commercial horticulture workers and all users of the cultivated and managed landscapes they design, build, and maintain.

The Commercial Greens Industry group is a multi-disciplinary amalgamation of scientists and Extension professionals dedicated to solving problems faced by producers and end users of horticultural and forestry crops and services. Departments committed to helping Iowa's citizens use horticultural crops to enhance their quality of life include Animal Ecology, Entomology, Forestry, Horticulture and Plant Pathology.

b. Impact/accomplishment –

- *Performance Goal 1.* (see http://www.ag.iastate.edu/iaexp/POW-revised.html#106 for goals)

  - Optimizing Soil Conditions for a Re-emerging Iowa Grape Industry. A statewide workshop in 2001 and five area workshops in 2001/2002 emphasized the soil requirements for grape vineyard establishment. These programming efforts led to 121 soil samples submitted to the ISU Extension Fruit Specialist. Six of the represented sites required no soil amendments, seven were considered unsuitable for grapes. The others were given recommendations to optimize soil conditions and thus hasten production on new grape acres that cost over $6000 each to establish over the first two years.

  - Iowa Turfgrass Assessment Survey. A statewide comprehensive Turfgrass Assessment survey was undertaken by the ISU Extension Horticulture Department, Iowa department of Agriculture and Land Stewardship, and the Iowa Turfgrass Institute. Economic highlights of the survey include the following statistics. There are 1.3 million acres of maintained turfgrass in Iowa that account for 1.07 billion for labor, contract services, equipment, supplies, new turf establishment, and capital improvement. There are 80,860 Iowans employed by the turfgrass industry with a total payroll of $423 million. Turfgrass ranks as the third largest crop in Iowa, behind corn and soybeans, when agricultural cash receipts are compared with turfgrass expenses. Partially as a result of the survey, the Iowa Alliance of environmental Concerns has issued a voluntary reduction in phosphorus use for home lawns. Several high school, parks, and college athletic facilities have realized that they need to allocate more resources for safe maintenance of athletic fields for Iowa's youth. The Iowa Golf course Superintendents Association formed a drought task force to educate those involved in appropriating water for outdoor use.

  - Crown Rot of Hosta. Crown rot of hosta can devastate plantings of this popular herbaceous perennial, and the disease has spread throughout the Midwest during the last decade. An ISU M.S. student has found several cultivars of hosta that appear to be much moiré resistant than others. This finding provides a new tool to help growers fight crown rot by breeding more resistance into popular cultivars.

  - Extension Publication "Using Mulches in Managed Landscapes". The use of organic mulches can dramatically improve tree and shrub health. This use can also create a

value-added product from materials such as wood chips that would otherwise contribute to worsening solid waste disposal problems. Used improperly, however, these organic materials can harm or even kill landscape plants. In response to demand by commercial landscape managers, three ISU Commercial Greens Committee members in association with plant pathologists and entomologists from University of Kentucky and Ohio State University developed the 12-page bulletin "Using Mulches in Managed Landscapes". The bulletin was designed and printed by ISU Extension and distributed in Ohio, Kentucky, and Ohio. A web version is linked by all three states. The comprehensive nature of the bulletin means that it can be used as a "one stop" guide for using organic mulches. The bulletin has met with enthusiastic response from landscape managers in Iowa, Kentucky, and Ohio, and has been ordered by educators from as far away as South Africa and Scandinavia. The short-term outcome from the use of this bulletin is more effective use of organic mulches by commercial landscape managers. This behavioral change will in turn result in improved health of urban trees and shrubs, more profitable and successful mulching by commercial landscape managers, and a significant reduction in the volume of landscape-derived wastes clogging landfills. The bulletin recently (August 2002) received the "Outstanding Extension Publication Award" from the American Society of Horticultural Science, from 31 entries nationwide.

- *Performance Goal 2.*

    - The Iowa Community Tree Steward Program. The aesthetic, environmental, and functional benefits that come from using trees in urban and rural landscapes are well documented, but municipalities and individual homeowners alike frequently run into difficulties when selecting and planting trees, and maintaining this valuable community resource. There are currently 499 graduates of the Iowa Community Tree Steward Program that have turned in 13,596 hours of volunteer service. This small army of trained volunteers has made a positive impact on Iowa's urban and community forest.

- *Performance Goal 3.*

    - Pesticide Applicator Recertification Training. Many of the same professionals that provide the extension outputs in the Commercial Greens Industry provide content and deliver programming for pesticide recertification classes. Approximately 4000 Iowans received this recertification training in the Commercial Greens Area (this is a subtotal from Program 143:Pesticide Applicator Training).

c. Source of funding: Smith-Lever

d. Scope of impact: State specific and Integrated Research Extension

Key Theme – Animal Production Efficiency

Program 107: Iowa Beef Center

a. Description of activity

The Iowa Beef Center is a central contact point for "all things beef" at Iowa State University. Its mission is to enhance the vitality, profitability, and growth of the Iowa beef industry through timely and relevant producer education, applied research, and improved access to information. A core group of campus and field extension specialists and applied researchers from five departments in two colleges work together to deliver statewide conferences, published materials, local meetings, one-on-one consultations and a dynamic user-friendly website. Fundamental program areas were developed with significant input from producers, regulators, USDA agencies, and extension staff. In addition to a formal advisory board that meets annually, the Iowa Beef Center conducts producer listening sessions at several locations across Iowa to identify the priority areas that direct our program.

b. Impact/accomplishment –

- Research has shown that one in four consumers had an unsatisfactory beef eating experience and that consumers are willing to pay a premium for a "guaranteed tender" steak. The third and final year of Iowa Progeny Tenderness Demonstration Project was completed in 2002 with 381 steers from 59 Iowa sires and 17 seedstock producers evaluated for feedlot performance, carcass traits and tenderness. While all progeny were acceptable for tenderness there was a difference in tenderness across sires. Producers now have information to make genetic improvement in eating quality as well as performance and to be ahead of the industry when guaranteed tender branded products are developed. This program has evolved into a Sire Profit Evaluation Progeny Test.

- The largest single determinant of profit for beef cow-calf producers is the amount and cost of stored feed fed during winter months. In order to help producers cut costs and become more profitable, the Iowa Beef Center held "Cyclone Beef Days," a series of producer educational meetings across the state focused on management intensive grazing, riparian area management, and extended pasture grazing. The hands-on program included plant identification, pasture fertility evaluation, and forage planning with new software the Iowa Beef Center developed. More than 80 percent of participants surveyed said they planned to apply the new information they learned or change their operation as a result of the program.

- Ethanol production is increasing rapidly in Iowa, and ethanol co-products are a valuable feed source for cattle. Three meetings and two publications were produced to educate beef feeders on proper management of corn co-products in cattle diets and pricing co-products relative to alternatives. At one of the meetings, less than 30 percent of the 114 attendees had experience in feeding dry-milled corn co-products. Our booth at the Farm Progress Show informed hundreds of beef and corn producers of the importance of co-product use. Decision support software was developed to evaluate co-product price and transportation cost. Additional applied research to evaluate alternative co-product storage

and feeding systems is currently underway. As a result, an increasing number of Iowa producers are including corn co-products in their rations.

- Environmental compliance and improvement continues to be a significant challenge for small feedlots. Twelve feedlot environmental management field days were held in northwest Iowa to provide first hand examples of effective feedlot effluent control. These meetings included staff from USDA Natural Resource Conservation Service, Iowa Department of Natural Resources, and Iowa State University Extension to answer questions for producers on system design and management, environmental regulations, and USDA cost share programs. Two new publications on the practical environmental management for small feedlots were prepared and Department of Natural Resources funded research on alternative technologies for effluent control is underway. Additionally, the Iowa Beef Center is moving ahead on a two-year, multistate cooperative plan to introduce environmental management systems to Iowa and other Midwestern open feedlot producers as a potentially cost-effective environmental compliance tool.

- The Iowa Beef Center again sponsored a successful Feedlot Short Course at the Armstrong Research Farm near Lewis. Thirty people, including producers, veterinarians and feed industry representatives from across the state and South Dakota participated in 2002, with more than 100 on a waiting list for the next session. The short course allowed participants to discuss and determine rations, feedlot management and marketing options for 155 cattle in four pens. Courses were held monthly with different topics within the feeding cycle selected for discussion. More than half of those surveyed said they would make management changes directly resulting from what they learned in the short course.

c. Source of Funding: Smith-Lever

d. Scope of Impact: State Specific, Integrated Research and Extension

Program 108: Iowa Pork Industry Center

a. Description of activity

The Iowa Pork Industry Center is a coordinated effort across the colleges of Agriculture and Veterinary Medicine, and focuses on programs that are integral and complementary to work by ISU Extension and the Iowa Agriculture and Home Economics Experiment Station. Extensive use of traditional as well as emerging technologies from private and public partners enhances the organization and delivery of these programs and improves access to all Iowans.

The IPIC works closely with faculty having responsibilities for teaching, research, and extension in the departments of Agricultural and Biosystems Engineering, Animal Science, and Economics within the College of Agriculture, and the College of Veterinary Medicine. Nearly thirty extension field specialists in swine and other livestock, farm management, and agricultural engineering areas, as well as 100 county extension education directors (CEEDs), work with the IPIC to provide program delivery.

The Iowa Pork Industry Center sponsors educational programs designed to assist all segments of the pork industry. The IPIC demonstrated its commitment to providing timely, accurate and unbiased information to producers through several avenues including producer meetings, research projects and Internet resources.

For example, the IPIC held Iowa Communications Network (ICN) programs on these topics: marketing considerations, new insurance options for Iowa pork producers, Iowa's proposed environmental master matrix, and county youth swine shows. After the 2002 county fair season was complete, the coordinator of the county youth swine shows ICN program initiated a follow-up survey to county ISU Extension staff of any changes made to their swine shows because of program content. Attendance averaged more than 120 at each of the four ICN programs. The IPIC also sponsored a satellite program that focused on addressing low market price challenges and Country of Origin Labeling (COOL).

A five-site series of advanced grow-finish management seminars was held in cooperation with Iowa Pork Producers Association (IPPA.) Nearly 290 people attended, and based on the positive response (more than 85 percent of respondents rated the program superior or excellent), similar series are planned for the future. Two one-day seminars on advanced sow herd management were held in northwest and northeast Iowa, both with excellent attendance. A set of 18 meetings devoted to the Pork Quality Assurance certification program were held in a variety of locations, with an average attendance of more than 20 producers per site. ISU Extension and external partners contributed to the success of this series with financial assistance, publicity efforts, and meeting site arrangements.

In cooperation with ISU Extension field specialists, the IPIC has developed a series of demonstration and applied research programs designed to answer producer questions about costs and benefits of various technologies and to provide information on the financial impacts. Examples include comparison of semen delivery systems, comparison of alternative grain sources and their effects on growth, meat quality and profitability, animal composting, and niche and value-added market and product development.

b. Impact/accomplishment –

- Responding to producer requests for advanced training and education in the area of finishing pig management, the IPIC cooperated with ISU Extension livestock field specialists and Iowa Pork Producers Association (IPPA) to offer the advanced grow-finish management seminars across the state. Experts from ISU, University of Nebraska, Kansas State University and a private marketing company presented information on a variety of topics, including drinker-feeder designs, feed additives, post-weaning nutrition and risk management strategies. This was the first jointly sponsored series of meetings under IPPA's new organizational and geographical structure, and met with resounding success.

- A series of five environmental education meetings over a three-day period helped prepare for pork and other livestock producers for new state livestock regulations, including a master environmental matrix. The meetings were sponsored in collaboration with the IPPA, Iowa Poultry Association, Iowa Turkey Association, Iowa Cattlemen's

Association, Iowa Dairy Products Association and Iowa Farm Bureau Federation. Just prior to the opening of the public comment period for the proposed draft of the matrix, the IPIC held an ICN program with a major portion devoted to the process of writing and content of the document. More than 180 people with backgrounds of livestock production, county government and finance and economics attended at one of the 30 sites.

- As hog market prices dropped sharply and remained low in summer and early fall 2002, producers, lenders and other pork industry representatives were concerned about the possibility of a repeat of 1998. Through collaboration with IPPA and ISU Extension, the IPIC coordinated and sponsored the two-hour satellite program that focused on challenges of low market prices and how to meet those challenges. The satellite program was available for downlink in all 100 county ISU Extension offices, and people from at least three states other than Iowa also made plans to view the broadcast in their respective locations.

c. Source of Federal Funding: Smith-Lever

d. Scope of Impact: State Specific and Mulitstate (through the Pork Industry Handbook) ND, SD, NE, MN, MO, WI, MI, IL, IN, OH, and Integrated Research and Extension

Program 109: Strengthening Iowa's Dairy Industry

a. Description of activity

- Issue 1. Human resource management: Three students from the Christian Agricultural High School (CAH, also referred to as the Professional Agricultural University) in Dronten, Netherlands, were placed on three dairy farms in NE Iowa for a 6 week period in the summer of 2002. Each student worked as a "Student Trainee" on a J-1 visa. This was in part to complete their school requirement of two international experiences during their curriculum. The experience was very beneficial to the students. They learned how to artificially inseminate cows, assisted veterinarians in health practices, feeding and nutrition of the herd, calf care and the economics of the host farms. Host farms were very pleased. One maintains monthly correspondence with their student. Another said, "This has been like having another son—he is a full part of our family". Another said, "We have never had a person work so hard as our student trainee". Further connections have been made at CAH to have more students in Iowa in 2003. They will be involved in agri-business and in dairy farms.

  Sixteen dairy farm owners, who supervise 127 employees, attended a dairy personnel management workshop. One participant reported that changes in personnel and staffing made following the workshop would save $28,000 annually.

- Issue 3. Business planning and arrangements: Dairy management critical control factors and managing dairy farm finances were discussed at seven Dairy Day meetings.

- Issue 4. Improving production practices: Seven county based Dairy Days were conducted and two Four-State (IA, IL, MN, WI) programs, one covering feeding and management practices to maximize profitability and the other dealing with forages, cow health, and longevity were held this past year. 120 individuals from 6 states and 1 foreign country attended an upper mid-west grazing conference.

  A series of 14 low-cost parlors tour were conducted for 295 participants in NE Iowa in an attempt to illustrate ways to increase labor efficiency associated with milking cows, reduce the capital investment required for the milking system, and improve the ergonomics of milking, thereby improving profitability and quality of life. Fifteen producers have worked with ISUE FS to install a low cost parlor in their operation. In addition, one milking equipment dealer who was against the concept of low-cost parlors changed his mind and is now building systems for interested producers.

  Extension View dairy newsletter was developed and expanded over the past three years as a means of distributing timely information to clientele. Currently, approximately 2,500 copies are mailed to producers while uncounted others access it via the ISUE Ag and Natural Resources web site. One-third of the producers responding to a reader survey placed a value between $1 and $50 on each issue, while 52% rated the value > $50.

  Individual topic workshops were held on dairy calves & heifers, pasture fencing, hoof health, calf health, and modern milking procedures. Interest in the production of "organic" milk is growing and this topic was addressed in meetings held in NC, NE, and W Iowa. Pasture walks were conducted in 4 locations.

  Dairy Youth Classic, with 98 youth and their 208 animals, taught dairy youth methods of ranking animals based on productivity, growth, reproduction and genetics. Tri-State Ag and Dairy Expo attracted 478 youth with 6 educational presentations conducted.

  ISUE dairy specialists, along with ISU students who wanted applied dairy experience, worked closely with 15 dairy producers to evaluate the strengths and weaknesses of their operation and to identify opportunities to improve productivity and profitability. The herd owners increased their milk sales an average of $14,856 and 13 of the 15 herds lowered feed costs by an average of $0.13/cow/day. Thus cost savings averaged $4,763 per herd, resulting in average increased profits in excess of $19,600 per herd.

  A survey was conducted in Butler County to assess the impact of individual farm consultations involving ISUE FS. Thirteen respondents who sought ISUE assistance relative to changes in their facilities reported an impact of $16,905 as a result of the visit. In addition, 3 reported reduced cost of building a new facility and 3 reduced their cost of remodeling an existing facility. Others reported improved ventilation (3), improved manure management (5), increased efficiency of animal flow (5), and improved health status (5).

- Issue 5. Environmental quality is being handled by Program 103.

- Issue 6. Food safety and quality: Improving milk quality was the focus of three modern dairy milking procedures programs in NW Iowa, and 42 one-on-one farm consultations. One 330 cow herd reduced SCC from 900,000 to 150,000 via targeted problem identification and implementation of control strategies. These changes resulted in > $30,000 in increased milk quality premiums and decreased treatment costs.

b. Impact/accomplishment –

- 15 dairy producers increased profits in excess of $19,600 per herd by implementing ISUE suggested rations and related recommendations

- Dairy farmers with milk quality problems increased income per cow per year by approximately $190 when they adopted milk quality suggestions made by Extension

- 12 producers installed low-cost milking parlors and increased labor efficiency while minimizing capital investment

c. Source of Federal Funds—Smith-Lever

d. Scope of Impact—State Specific

Key Theme – Adding Value to New and Old Agricultural Products

Program 121: Value-Added Agriculture

a. Description of activity

The ISU Value Added Ag program has worked with producer groups and individual entrepreneurs this past year to build long-term economic, environmental and socially sustainable capacities. Emphasis this year has been with working with existing value added ag groups, development of value chains, and working to develop traceable and quality systems to ensure accountability and safety in the food system. Furthermore, efforts this year have focused on developing resources to provide producers information on-line through the newly established Agricultural Marketing Resource Center.

Agricultural processors are beginning to request products with specific traits and attributes. ISU Extension worked with several projects encouraging Iowa farmers to develop supply chains. One project included facilitating the efforts of producers who are seeking to certify their production practices through ISO quality systems. Other projects include Farnhamville Elevator in West Central Iowa, Mt. Pleasant, Garner, and several livestock supply alliances.

ISU has been a leader in facilitating efforts among states. This past year several events were sponsored in which service providers from more than 22 states convened to discuss value added ag activities, explore ways for collaboration and facilitating efforts so the various groups could work or market collectively.

Some additional programming has included:

- Capacity building and training for producer value added ag groups. An in-depth workshop with follow-up mentoring was held to assist producers in locating sources of capital, such as venture capital funding, grants, and bridge capital, etc. Additionally hands-on media training for producer spokespeople was held.

- Through consultation on feasibility, marketing and business plans, ISU staff worked with groups starting a value added ag business. Extension conducted five in-depth feasibility studies for farmers this year starting value added ag businesses. They included an eco-seeds facility, pork equipment manufacturer, cheese manufacturing, a bio-mass company and an animal processing facility.

- A three-day Hazard Analysis and Critical Control Process (HACCP) workshop was held at the ISU Meat Laboratory. Forty-nine people representing 29 meat and egg product plants participated in the workshop. The objective of the workshop was to provide Iowa meat and egg product plant personnel training in various aspects of the HACCP. As a result of the training, the safety of many of the meat and egg products produced in Iowa was improved.

- Twenty-four producers are seeking to diversify their cropping systems, by planting dry edible beans and Adzuki beans. Having witnessed other alternative crop projects come and go, this group approached the process with a unique attitude of cooperation. The group determined cropping systems that would work for these crops, cooperatively harvested and marketed the beans. When prices are compared to traditional soybeans they are realizing profits of $50 more per acre.

- Development of niche value markets for producers. Working with nine pork marketing groups, ISU Extension has begun to assist the producers in determining the highest market for their products.

- Working with minority producers in Iowa's metropolitan areas. ISU Extension staff have worked with producers to market their unique products in the cities' farmers markets.

b. Impact/accomplishment –

ISU is currently assisting several farmer groups who are considering the ethanol industry as a way to add value to their commodity corn. Currently more than $165 million dollars of investment is planned in these plants. If these proposed plants come to fruition this will represent more than 500 jobs with an economic multiplier in which every dollar in the local economy turns approximately 2.5 times.

This past year we have helped the ethanol groups work to cooperatively market their co-products, conducted several meetings to teach them more about the value of their co-products, develop a trade association to adequately address their legislative, educational and promotional needs.

We have assisted farmer value added ag groups in developing strategic plans for their businesses. Some of the strategic plans have included the development of grant proposals.

Iowa value added ag groups secured 29 USDA grants for, totaling more than $5,609,680 in the past round of funding.

Success Stories:

- *Edamame: New Crop for Iowa.* Many of the 220 producers attending the First Iowa Organic Conference in Ankeny, Iowa on November 27, 2001 requested information on a new vegetable crop, edamame (Japanese soybean). Edamames represent a crop with tremendous potential for Iowa, where organic soybean cultivation has been perfected over the last 15 years. Organic soybeans are produced without the use of petrochemicals, thus reducing potential problems from run-off and herbicide resistance in weeds. ISU Organic Specialist, Assistant Professor Kathleen Delate organized a group of farmers, Extension staff and agronomist to develop a demonstration project investigating edamame production, post-harvest handling and processing. The demonstration of a new mechanical harvester for edamames included the involvement of industry representatives at the Iowa State University Neely-Kinyon Farm Field Day for 275 farmers and agricultural professionals. Three on-farm sites were also selected for edamame demonstrations, increasing the dissemination of information on this new crop to 120 additional farmers through Field Days at the farm sties. Following harvests of up to 10,000 pounds per acre, a marketing specialist and a local Des Moines food manufacturer cooperated with the Organic Edamame Group in developing pilot processing and shipping protocols. Potential revenue from organic edamame sales is Iowa is approximately $150,000 for a single order on the West Coast. Increased markets throughout the country are being investigated for expansion of this crop in 2003.

- *Sausage and Processed Meat Short Course*. Approximately 230 people representing 30 states and eight countries attend one of Iowa State University's four Sausage and Processed Meat Short Courses held at the Iowa State University Meat Laboratory. Topics covered at the short course include meat science, ingredients, processing food safety and microbiology. Attendees of these programs are responsible each year for production of in excess of 600 million pounds of processed meat. Potentially, as a result of their training at one of these short courses, the quality, consistency and safety of the production they supervise were increased.

- *Alternatives for Disposal of Livestock Mortalities*. Economically and environmentally sustainable alternatives for disposal of livestock mortalities continue to be a concern in Iowa. Iowa's swine industry alone produces 65,000 tons of mortalities a year. Producers cite reduced availability of rendering service, increasing rendering fees and biosecurity as major issues. As more producers turn to on-farm burial, environmental officials have become concerned about the potential for groundwater degradation, since as much as 40 percent of Iowa has shallow groundwater or bedrock. Iowa farmers need options and assistance in large-scale disposal of animals. Several programs have been started to address this problem. A publication entitled, "Composting Swine Mortalities," has been developed and distributed to more than 3,000 swine producers, as well as in-depth education to more than 250 producers. Additionally a research project to develop composting procedures for cattle has been undertaken.

- *Ag Marketing Resource Center*. Because of the previous work done in value added agriculture, ISU has established a strong foundation of case studies, feasibilities, outreach, training and experience. ISU Extension received a $5 million federal USDA to develop an electronic center (web site) for farmers to get information about value added ag from the internet. The Center is coordinating those efforts with the University of California, and Kansas State University. The website <www.AgMRC.org> has received more than one million hits since it was launched in August 2002.

- *First Organic Conference*. Retail sales of organic products have grown steadily for the past ten years, showing a compounded annual growth of 22.75 percent. Assuming steady growth at a conservation rate of 20 percent, retail sales of organics in 2001 are projected at $9.3 billion. Iowa farmers have an excellent opportunity to enter the organic food and feed market, but have little access to information to help them make the transition from conventional to organic production. In addition, organic feeds, meats, fruits and vegetables often require different and more complex marketing efforts than for commodities. An Organic Conference targeted to producers, processors and suppliers statewide was organized in November 2001. The conference was a collaborative effort of ISU Extension, USDA, Des Moines Area Community College, among others. Two-hundred fifteen participants heard information about the industry trends, production methods for livestock, agronomic and horticultural crops; marketing methods for meats, dairy products, grains, fruits and vegetables and from chefs and retailers about their needs. Comments included "Thank you for recognizing small producers." "Very essential for the local food movement." "I am the dairy buyer for a food coop. This was a good step-by-step tour of organic diary production."

c. Source of Federal Funds—Smith-Lever

d. Scope of Impact—State Specific

Key Theme – Home Lawn and Gardening

Program 146: Consumer Horticulture

a. Description of activity

The Iowa State University Extension Consumer Horticulture program provides unbiased, research-based education and information about plants and their care in the home lawn and garden. As a result, horticulture consumers are better able to make wise decisions in plant selection and maintenance and pest management.

b. Impact/accomplishment –

- Individual Consultation with Consumers. ISU Extension responds in a timely fashion to consumers seeking answers to their specific, individual home lawn, landscape and garden questions. Campus faculty and staff in horticulture, entomology, plant pathology, forestry, animal ecology and agronomy provide one-on-one consultation service via telephone, email, letter and office visits. Individualized outreach in consumer horticulture

on campus is concentrated in the Hortline, Plant Disease Clinic and the Insect Diagnostic Clinic. County extension staff and Master Gardeners (volunteers providing service to their communities through the local extension office) also inform and educate the public about home horticulture. The estimated total number of individual responses to consumers through phone, email, letter and office visits was 23,777 for the year. The impact of this individualized attention is highly variable. Some clients achieve increased quality of life through better choices in the selection and maintenance of fruits, vegetables, flowers and other ornamental plants. Others avoid costly mistakes such as purchase of plants not adapted to our northern climate.

- Master Gardener Program. The Iowa Master Gardener Program is an educational and volunteer service program of Iowa State University Extension and the College of Agriculture. University faculty and staff in the departments of entomology, horticulture, plant pathology, animal ecology and agronomy and Extension field specialists work with County Extension staff to provide unbiased, research-based horticultural information to the citizens of Iowa through the volunteer efforts of trained Master Gardeners. This year 525 adults were trained to become Master Gardeners at 23 locations. Master Gardeners volunteered over 63,500 hours of service to their communities. Valuing volunteer time at the rate of $11.27 per hour means Master Gardeners performed over $716,000 worth of service to the state.

- Master Gardner students were asked to complete a questionnaire prior to and after completion of the training program. Participant's expectations, knowledge gained and satisfaction with training through different delivery methods were primary concerns. Training increased knowledge in all learners regardless of delivery method. After training, the majority of participants (55%) felt they learned where to go for answers to common extension questions. While expectations did not coincide with knowledge gained, over 90% of participants were satisfied with the current training program.

- ISU Extension, the Research and Demonstration Farms and the Department of Horticulture have supported the Home Demonstration Gardens at several research farms for over 20 years. The objective of the Home Demonstration Gardens is to display new or unusual vegetables, flowers, or cultural practices to homeowners. Field days that showcase the demonstration gardens allow homeowners to visit research farms, see diverse plant materials or practices and to interact with farm and extension staff. Eight ISU Research Farms across the state participated in the 2002 Home Demonstration Gardens and Field Days. Over 500 people attended the Field Days this year. Attendees were asked to complete a brief questionnaire at the end of each field day. Over half (52%) had previously attended a Home Demonstration Garden Field Day. Of those repeat visitors, 60% had attended the Field Day 3 or more times. In addition, 78% of surveyed attendees said they would try at least one plant variety seen at the Field Day in their own garden next year.

c. Source of Federal Funds—Smith-Lever

d. Scope of Impact—State Specific

Goal 2: A safe and secure food and fiber system

Overview

Iowa's Extension Plan of Work, "330 - Nutrition: Choices for Health," speaks to the federal goal 2. Food safety education to Iowa's 99 counties is provided by Nutrition and Health field specialists and paraprofessionals in the Expanded Food and Nutrition Education Program (EFNEP) and the Family Nutrition Program (FNP) with support from a campus team of food safety educators. The field and campus specialists partnered with a variety of agencies at the state and local levels. Field and campus specialists use resources developed by USDA, the Partnership for Food Safety Education's such FightBac® materials, and food safety web-sites, including the ISUE Food Safety Project web-site <http://www.extension.iastate.edu/foodsafety/>, FDA-CFSAN sites <Foodsafety.gov>, and others. Resources in biotechnology, irradiation, and Hazard Analysis Critical Control Points (HACCP), are provided at a companion site maintained by the campus specialist to support food safety <http://www.foodsafety.iastate.edu/>. Food safety rules and regulations specifically for Iowa have been developed with the State of Iowa and Iowa State University and posted at a web-site used by the Iowa food safety educators at <http://www.extension.iastate.edu/Pages/families/hrim/publications.htm>.

a. Output/Impact –

- 62,117 individuals participated in nutrition education, including youth and adults
- 81 food safety programs were done for 3304 consumers including youth and adults
- 195 volunteers were trained in food safety
- 3,304 individuals received food safety education through individual consultations
- 409 participants in ServSafe training programs sponsored or co-sponsored by extension
- 288 managers and lead employees of child nutrition programs attended Extension sponsored short courses. Managers report they are responsible for over 120,000 daily school foodservice meals
- 3 food safety websites were supported and updated daily/weekly:
  - Food Safety Project http://www.extension.iastate.edu/
  - Iowa HACCP http://www.iowahaccp.iastate.edu
  - Consortium Food Safety http://www.foodsafety.iastate.edu

b./c. Outcomes –

① Of 1,524 respondents (n = 2762 response rate 55%) in face-to-face nutrition education programs, 86% reported actually adopting the behavior change, such as increased consumption of fruits and vegetables or increased label reading on food products.

② Ninety-five percent of the food safety program participants (n = 1070, 70% response rate) reported adopting one or more of the recommended food handling practices.

③ One thousand nine hundred and fifty-four teachers downloaded the on-line lesson plans to facilitate the use of the web-based food safety lessons, "Safe Food…It's Your Job Too!" in their classrooms.

④ Of the 409 ServSafe® participants, 352 (86%) successfully passed the certification test.

⑤ One thousand five hundred and seven (80%) graduates of the EFNEP and FNP programs demonstrated acceptable practices in food safety at graduation from the program, as compared to only 1011 (50%) at enrollment.

d. State's Assessment of Accomplishments – Original performance goals were exceeded.

e. Total expenditures by source of funding – State and Federal funds, $1,600,610.

SYs – 20.37.

Key Theme – Food Accessibility and Affordability

a. In the Expanded Food and Nutrition Education Program (EFNEP) and the Family Nutrition Program (FNP), 65 paraprofessionals delivered nutrition education to 3,637 adults and 14,966 youth in either small group settings or individually in the home. Pregnant teens and women at risk of having low birth weight babies are special target audiences of EFNEP/FNP. EFNEP/FNP served 269 pregnant and/or breastfeeding women under the age of 20, or 7% of the total audience. Staff partnered with a variety of agencies at the local level, including WIC, food stamps, Head Start, Promise Jobs, empowerment boards, and others, which resulted in increased funding, more effective audience recruitment, and enhanced program delivery. ISUE has a Memorandum of Understanding between WIC and EFNEP to formalize and expand reciprocal referrals between the two programs. ISUE also partners with the Iowa Department of Human Services to fund the Family Nutrition Program and to provide local EFNEP/FNP units with a monthly list of referrals.

b. Impact/accomplishment -

- A study of the costs and benefits of Iowa EFNEP, published in December 2000, showed that for every $1 spent to deliver nutrition education in Iowa, $8.03 is saved in future health care costs. The $8.03 in health care savings occur because participants: learn safe food handling practices, thus have fewer food-borne illnesses; eat better during pregnancy, resulting in fewer low birth weight babies; are more likely to breastfeed their babies, resulting in fewer childhood diseases; and improve their overall diets, resulting in delay or prevention of chronic diseases.

- Four hundred seventy-six (25%) graduates of the EFNEP/FNP program demonstrated acceptable practices in all three categories of behaviors taught (nutrition, food safety, and food resource management at graduation from the program, as compared to only 124 (7%) at enrollment.

c. Source of Federal Funds – Smith-Lever 3b and c; Food Stamp administrative matching funds

d. Scope of Impact – State Specific

Key Theme – Food Safety

a. Extension Families this past year worked with 2877 food safety program participants including youth and adults with more than 165,000 education contact hours. One hundred ninety-five citizens served as volunteers in Extension food safety programming. Extension field and campus specialists partnered education programs with the Iowa Department of Inspections and Appeals, the Iowa Hospitality Association, the Iowa Bureau of Food and Nutrition, local schools, hospitals, community organizations, the Food Safety Consortium (Iowa, Kansas, Arkansas), WIC, food stamps, Head Start, Promise Jobs, and empowerment boards. Field and campus specialists used resources developed by USDA, the Partnership for Food Safety Education's such FightBac® materials, and food safety web-sites, including the ISU Food Safety Project web-site <http://www.extension.iastate.edu/foodsafety/>, FDA CFSAN site <Foodsafety.gov>, and others. Biotechnology, irradiation, and HACCP resources are provided at <http://www.foodsafety.iastate.edu/> and are maintained by the campus specialist to support food safety. Food safety rules and regulations specifically for Iowa have been developed with the State of Iowa and Iowa State University and posted by the Iowa food safety educators at <http://www.extension.iastate.edu/Pages/families/hrim/publications.htm>. More than 300,000 visitors had 894,438 page views of content on the ISU Food Safety Web-site home page or one of its links; 4,794,660 hits were recorded last year**.** Over 95,000 consumers have accessed and completed one of the four interactive food safety lessons (1997-2002).

b. Impact/accomplishment -

- Eighty-one food safety programs were done for 2877 consumers including youth and adults.
    - Seventeen ServSafe® food safety training programs with 409 participants. Ninety percent of participants received a passing score and were certified.
    - Fifty-seven food safety programs including hand-washing demonstrations and food safety during the RAGBRAI intra-state cycling trek for 2079 participants.
    - Seven HACCP programs done for school foodservice operations with 88 participants.
- Three food safety web-sites were supported and updated daily/weekly*:
    - Food Safety Project http://www.extension.iastate.edu/
    - Iowa HACCP http://www.iowahaccp.iastate.edu
    - Consortium Food Safety http://www.foodsafety.iastate.edu

    *The ISUE Food Safety web sites had 304,124 visitors who had 894,438 page views through the ISU Food Safety Web-site home page or one of its links; 4,794,660 hits were recorded last year.

- One thousand nine hundred fifty-four teachers downloaded the on-line lesson plans to facilitate the use of the web-based food safety lessons, "Safe Food…It's Your Job Too!" in their classrooms.

c. Source of Federal Funds – Smith-Lever 3b and c; Food Stamp administrative matching funds

- HRIM Extension was awarded $494,815 in federal funds for food safety work.

d. Scope of Impact – State Specific; however, ISUE partnered with Kansas State University, University of Missouri at Columbia, University of California-Davis, USDA, Syracuse University, USDA/FDA National Agricultural Library, the FDA Center for Food Safety and Applied Nutrition, and others to design and maintain web-based food safety resources.

Goal 3: A healthy well-nourished population

Overview

Iowa's Extension Plan of Work, "330 - Nutrition: Choices for Health," speaks to federal goal 3. Nutrition education to Iowa's 99 counties is provided by Nutrition and Health field specialists and paraprofessionals in the Expanded Food and Nutrition Education Program (EFNEP) and the Family Nutrition Program (FNP) with support from campus nutrition educators. The field and campus specialists partner with a variety of agencies at the state and local levels. Key collaborations formed include: Iowa Nutrition Network; Iowa Department of Public Health, Iowa Department of Education, Iowa WIC Program, Iowa Department of Human Services, Head Start, University of Iowa, local substance abuse programs, local food pantries, Leopold Center for Sustainable Agriculture, commodity groups, local empowerment boards, TEAM Nutrition schools, and the Iowa Hospitality Association.

a. Output/Impact –

- 62,117 individuals participated in nutrition education, including youth and adults
- 3,637 adults and 14,966 youth participated in EFNEP/FNP
- 968 EFNEP volunteers were recruited and contributed more than 7,344 hours

b./c. Outcomes –

① Of 2,762 participants in face-to-face nutrition education programs who were surveyed, 1,524 returned the written questionnaires, for a response rate of 55%. Of those who responded, 86% (1,323) reported actually adopting the behavior change, such as increased consumption of fruits and vegetables or increased label reading on food products.

② A study of the costs and benefits of Iowa EFNEP published in December 2001 showed that for every $1 spent to deliver nutrition education in Iowa, $8.03 is saved in future health care costs.

③ Six hundred seventy three (36%) graduates of the EFNEP/FNP programs demonstrated acceptable practices in nutrition-at graduation from the program-as compared to only 270 (14%) at enrollment in the program.

d. State's assessment of accomplishments – Original performance goals were exceeded.

e. Total expenditures by source of funding – State and Federal funds, $1,600,610.

SYs, 20.37.

Key Theme – Human Nutrition

a. Description of activity

Nutrition and health programs were offered in 222 communities in 91 counties. Persons served included 2,056 in individual lessons or consultations and 41,458 in-group sessions. Targeted audiences were adults, employees at worksites, older adults, child-care providers, elementary school teachers, and health professionals. The primary focus of nutrition education programs this year was the emerging food supply. Under the title of "What's To Eat In The 21st Century" audiences learned about functional foods, food labeling, farm-to-table food systems, dietary supplements, soy foods, and food regulations. The delivery methods included audiovisual presentations, bulletins, displays, and a national satellite videoconference for health professionals. A second major focus for nutrition education was "Pick A Better Snack," a social marketing campaign aimed at increasing the fruit and vegetable consumption of children and their adult care-givers. The Pick A Better Snack campaign was founded on research conducted by ISUE. Program materials included monthly fact sheets, monthly "bingo" cards, recipe cards, bookmarks, and two web sites. Extension staff actively participated in 74 community coalitions to address local health needs. Development of the intervention session for "WISEwomAN," a community-based intervention designed to reduce prevalence of risk factors for heart disease among middle-aged women who lack health insurance and access to health care, was completed this year. This community based group intervention will begin next year. Both county and campus-based Extension staff wrote successful grant proposals to support key programs. Program collaborations were established with the Iowa Department of Public Health, Department of Education, Department of Elder Affairs, and the University of Iowa, College of Public Health.

In the Expanded Food and Nutrition Education Program (EFNEP) and the Family Nutrition Program (FNP), 65 paraprofessionals delivered nutrition education to 3,637 adults and 14,966 youth in either small group settings or individually in the home. Pregnant teens and women at risk of having low birthweight infants were special target audiences of EFNEPIFNP. EFNEPIFNP served 269 pregnant and/or breastfeeding women under the age of 20, or 7% of the total audience. Staff partnered with a variety of agencies at the local level, including WIC, food stamps, Head Start, Promise Jobs, empowerment boards, and others, which resulted in increased funding, more effective audience recruitment, and enhanced program delivery. ISUE has a Memorandum of Understanding between WIC and EFNEP to formalize and expand reciprocal referrals between the two programs. ISUE also partners with

the Iowa Department of Human Services to fund the FNP and to provide local EFNEPIFNP units with a monthly list of referrals.

b. Impact/accomplishment –

- Eighty-six percent of individuals receiving nutrition education this year actually adopted behavior change, such as increased consumption of fruits and vegetables or increased label reading on food products. (2,762 individuals received mailed surveys; 1,323 returned the written questionnaires, for a response rate of 55%.)

- A study of the costs and benefits of Iowa EFNEP published in December 2000 showed that for every $1 spent to deliver nutrition education in Iowa, $8.03 is saved in future health care costs. The health care savings occur because participants: learn safe food handling practices and thus have fewer food-borne illnesses; eat better during pregnancy, resulting in fewer low birthweight infants; are more likely to breastfeed their babies, resulting in fewer childhood diseases; and improve their overall diets, resulting in delay or prevention of chronic diseases.

- Six hundred seventy-three (36%) graduates of EFNEP/FNP programs demonstrated acceptable practices in nutrition at graduation from the program, as compared to only 270 (14 %) at enrollment.

d. Source of Federal Funds – Smith-Lever 3b & c; WISEWomAN (CDC grant) $111,000

e. Scope of Impact – State Specific

Goal 4: An agricultural system which protects natural resources and the environment

Overview

Outputs, outcomes and impacts of extension at Iowa State University:

- 3 Refereed Publications, Research Papers, Manuscripts
- 4 Non-refereed Publications, Reports, Technical Papers
- 22 Proceedings, Published Abstracts
- 57 Extension Publications
- 19 Invited Presentation
- 184 Education Programs, Field Days, Tours
- 358 cont. instructional course meetings (28,584 participants)
- 5 pilot curriculum initiated in secondary schools
- 2,847 attended meetings and conferences
- 391,993 Web sites hits; 36,409 web site user sessions

① Agricultural IPM program priorities are addressed through seasonal monitoring and forecasting of crop pests throughout the state. Information was disseminated through 63 pest management education programs, ICM Newsletter, regional IPM publications, radio

programs, and the IPM Web site. Targeted pest management programs were developed to address emerging pest issues, such as the soybean aphid. Plant disease clinics, weed identification and herbicide diagnostic services, insect identification clinics and remote diagnostic clinics provided timely information to the growers and industries throughout the state. IPM education is intertwined into the private and commercial pesticide applicator continuing instructional courses that reach more than 28,000 individuals each year. An IPM scout school served more than 130 participants in 2002. Crop Advantage meetings targeted 800 key producers.

② The private pesticide applicator training program conducted 318 meetings with 20,217 participants from December 3, 2001–April 15, 2002. A post-training evaluation indicated that the program was successful. Overall 92% of the respondents indicated that the program was excellent or good. In addition, 92% of the respondents strongly agreed or agreed that the information presented was useful for their farm operations.

③ ISU Extension provided education in sustainable agriculture in 2002 to 2,847 producers and staff through regional workshop participation, special workshops (pork niche production and marketing and dairy), curriculum development for sustainable agriculture, organic workshops, participation at small farm conferences, youth education in sustainable agriculture, and CSA workshops.

④ ISU Extension provided in-service training activities and support in sustainable agriculture to 51 Extension Field Specialists in livestock, farm management, communities, crops, and horticulture.

State and Smith-Lever Funds: $4,782,382

FTEs: 38

Key Theme – Integrated Pest Management (repeat from research program 22)

Program 142: Integrated Pest and Crop Management

a. Description of activity

Insects, weeds, plant-parasitic nematodes, and diseases are a continuing threat to Iowa's crop production. All crop acres in Iowa are subject to yield reduction resulting from these pests. Additionally, costs are incurred when managing these pests, including the costs associated with cultural, mechanical, and chemical controls. Adoption of integrated pest management (IPM) and integrated crop management (ICM) principles results in more efficient use of resources, increased profitability, and enhanced environmental stewardship. The agricultural IPM programs in Iowa focus on field corn, soybean and alfalfa. In addition, an IPM school program was initiated in 2002 to address the increase in stakeholders concerned about the environmental quality in schools.

2002 IPM program priorities:

- To work with producers and agribusiness to increase the number of acres under IPM and ICM practices
- To increase the efficiency of IPM and ICM techniques, particularly those involving pesticides
- To increase awareness of IPM and promote adoption of IPM in schools

Agricultural IPM program priorities are addressed through seasonal monitoring and forecasting of crop pests (i.e., alfalfa weevil, bean leaf beetle, black cutworm, corn rootworm, European corn borer, soybean aphid, western bean cutworm, disease presence, weed emergence, and degree-day accumulations) throughout the state. Information was disseminated through 63 pest management education programs (i.e., crop clinics, short courses, scout schools, field days, and farm meetings), ICM Newsletter, regional IPM publications, radio programs, and the IPM Web site. Targeted pest management programs (educational and applied research trials) were developed to address emerging pest issues, such as the soybean aphid. Plant disease clinics, weed identification and herbicide diagnostic services, insect identification clinics and remote diagnostic clinics provided timely information to the growers and industries throughout the state. IPM education is intertwined into the private and commercial pesticide applicator continuing instructional courses that reach more than 28,000 individuals each year. An IPM scout school served more than 130 participants in 2002. Crop Advantage meetings (12) targeted 800 key producers.

The urban IPM school program addresses the increase in stakeholders concerned about the environmental quality in schools. Iowa public schools depend upon routine pesticide sprays to solve or prevent pest problems. Most schools also rely on commercial services to provide pest control decision-making. An IPM school survey was initiated in 2002 and 80% of the respondents were not familiar with IPM. As a result, this project developed and implemented an educational program in a small number of pilot schools (4), which helped the staff understand why pests become problematic and then how to solve the pest problems following integrated pest management techniques.

b. Impact/accomplishment –

- Agricultural IPM Saves Money. A dealer contacted Iowa State University Extension regarding two fields of corn following soybeans where there were high populations of white grubs. Replanting with an insecticide needed to occur as quickly as possible to maximize yields. The Extension Crops Specialist examined the fields and found only annual white grubs, which do not cause an economic loss, nor was there evidence of the crop injury. It was recommended to leave the fields alone and to observe them in case for possible true white grubs also in the field. The 160 acres of corn were not destroyed and replanted. The total savings that resulted from this consultation were approximately $10,600.

- Agricultural IPM Saves Money. A dealer contacted ISU Extension regarding a field of soybeans that had been physically damaged. The dealer and producer sought an opinion regarding whether or not re-planting was warranted. The Extension Crops Specialist examined the field and determined that the plants had been damaged by both hail and bean leaf beetles. The remaining population was approximately 110,000 plants per acre

and the bean leaf beetle numbers were below the threshold for treatment. It was recommended to leave the stand alone and monitor the bean leaf beetle population. The 120 acres of soybeans were not re-planted. The total savings that resulted from this consultation were approximately $5,800.

- School IPM Changes Behaviors. Four school districts were randomly chosen to participate in the School IPM Program. Joint workshops and training sessions on pesticide safety, IPM techniques, and specific interior pest problems were conducted. Resources prepared for pilot districts included a notebook containing fact sheets and sample documents to assist in implementation, a newsletter addressing pertinent school IPM topics, teacher lesson plans (grades K-12), and a video set "The ABC's of IPM: Integrated Pest Management for Schools" produced by Texas Agricultural Extension Service. The impact of these efforts was assessed. Of 35 persons completing pre- and post-training exams, there was an improvement of concept understanding following training, based on the average pre-training score (54%) and the average post-training score (72%). Exit surveys showed that 62% considered the training helpful and relevant to their job responsibilities and 95% thought the training enabled them to have a good or excellent understanding pesticide safety, IPM, pest biology, and pest control options. 50% of respondents indicated that they would read pesticide disinfectant labels before using them, eliminate clutter in their workspace, and participate in community IPM efforts.

c. Source of Federal Funds—Smith-Lever

d. Scope of Impact—State Specific, Integrated Research and Extension

Key Theme – Pesticide Application

Program 143: Pesticide Applicator Training

a. Description of activity

Federal and State law requires that all people who purchase and apply restricted use pesticides and any applicator who applies pesticides for hire be certified according to established standards. Iowa State University Extension is mandated by the state of Iowa to develop and deliver training programs for all commercial pesticide applicators and private pesticide applicators.

The primary focus for the commercial pesticide applicator was program development and delivery. These activities occurred during January–July and October–December. During these months, 40 programs were provided to 8,367 commercial applicators in 23 certification categories and sub-categories.

The primary focus for the private pesticide applicator was program development and delivery that occurred during January–March and October–December. During January–March, the training season for 2001–2002 was completed, while the new training season for 2002–2003 was developed and implemented in October–December. During the training season (December 2001–April 2002), 318 programs were conducted in all 99 counties in the state.

b. Impact/accomplishment –

- The private pesticide applicator training program conducted 318 meetings with 20,217 participants from December 3, 2001–April 15, 2002. A post-training evaluation indicated that the program was successful. Overall 92% of the respondents indicated that the program was excellent or good. In addition, 92% of the respondents strongly agreed or agreed that the information presented was useful for their farm operations.

- To determine if the private program had an impact on the participants, the evaluation examined specific areas to assess behavioral changes towards more safe practices. After receiving information on the water solubility of herbicides, 42% of the respondents indicated that they would consider the water solubility of the herbicides that they use before making a decision on what products to use during the next growing season.

- In addition, this post-training evaluation examined if participants had indeed successfully implemented new pesticide safety activities, as a result of the previous year of private pesticide applicator training. According to the respondents, 54% now have a spare set of clean personal protective equipment and 47% now have emergency phone numbers posted in areas where pesticides are stored or loaded. These results indicate that this program is positively impacting the private pesticide applicator. The applicator is learning and implementing safe and effective practices while using pesticides.

- The commercial pesticide applicator training program conducted 40 meetings with 8,367 participants. Post-training evaluations indicate that these programs were successful. Overall, 95% of the participants from the Ornamental and Turfgrass Applicators program and 93% of the participants from the Certified Handlers program indicated that the program was excellent or good. After the Certified Handlers program, 62% of the participants indicated that they better understood the basic regulations affecting the transfer of pesticides on public roadways. These applicators also are learning and implementing safer practices.

c. Source of Federal Funds—Smith-Lever

d. Scope of Impact—State Specific

Key Theme – Sustainable Agriculture

Program 147: Sustainable Agriculture

a. Description of activity

Iowa State University research and extension provided a diverse array of educational programs, workshops, field days, and applied research activities to meet the need of Iowans for a more sustainable agriculture in 2002.

ISU participation and progress was enhanced by key working partnerships with The Leopold Center for Sustainable Agriculture, Practical Farmers of Iowa (PFI), The Iowa Network for Community Agriculture (INCA), The Iowa Pork Producers Association, SYSCO, Iowa

Department of Agriculture and Land Stewardship, The Natural Resource Conservation Service (NRCS), The Farm Service Agency, Ag Connect, and stakeholder groups.

ISU Extension provided education in sustainable agriculture in 2002 to 2,847 producers and staff through regional workshop participation, special workshops (pork niche production and marketing and dairy), curriculum development for sustainable agriculture, organic workshops, participation at small farm conferences, youth education in sustainable agriculture, and CSA workshops.

ISU Extension provided in-service training activities and support in sustainable agriculture to 51 Extension Field Specialists in livestock, farm management, communities, crops, and horticulture.

b. Impact/accomplishment –

Diversifying the Local Economy:

- The Lenox, IA community has not had an organized farmer's market. Several stakeholders in the community have indicated a desire to have a local farmer's market; however, no groundwork has been done to initiate or develop a farmer's market.

- Iowa State University (ISU) Extension and Ag Connect collaborated to determine the interest of organizing a local farmer's market in the Lenox community. Several meetings were conducted with local residents, city officials, Master Gardeners and potential vendors. Support was very positive for initiating the Lenox Farmer's Market sponsored by ISU Extension and Ag Connect. Eighteen vendors participated in the Lenox Farmer's Market this year. Created interest and support with the 18 vendors who continually supported the farmer's markets.

Impacts:

- ISU encouraged, recruited, and supported three Hispanic families who sold produce and crafts at the local market.

- Encouraged supporting 18 local producers for obtaining their farm fresh produce.

- Shared information on food safety with 18 producers.

- Shared produce and goods with approximately 75 people per week who attended the Lenox Farmer's Market.

- Initiated a weekly drawing of three produce or food products to help create interest in the farmer market, 173 people have signed up --- many have came from 3 – 6 times throughout the season.

- Purchased ads in newspaper and radio spots promoting the Lenox Farmer's Market.

- Networked with businesses, city of Lenox, Lenox Development Corporation and local citizens

Affecting Policy:

- Organic producers have struggled with lack of information, consistency, awareness, and policy options concerning insurance for organic production. The Extension Sustainable Agriculture and Organic program sponsored a workshop on sustainable ag and organic production in Greenfield, Iowa for producers and agency personnel. Field tours and presentations informed policy makers about organic production practices and management risks. Agency personnel from the Risk management Agency (RMA) in Minnesota were recruited and invited to participate.

- As a result of this session a new policy on insurance options was developed for certified organic growers and was announced in 2003 at a workshop in Calmar IA to 65 producers by RMA personnel. This will allow certified organic growers to reduce risks in organic management and production systems through sound insurance practices.

c. Source of Federal Funds—Smith-Lever

d. Scope of Impact—State Specific

Goal 5: Enhanced economic opportunity and quality of life for Americans

Overview

Several Iowa Plans of work support federal goal 5, including:

145 – Farm Safety (submitted in our federal POW under goal 3, however, instructions are to now report under federal goal 5)
200 – Building Community Capital
300 – Money for Life
310 – Strengthening Family Relationships
320 – Child Care That Works
340 – Family Policy That Works
410 – Youth/Staff Development
420 – Out of School Time
440 – Science and Technology Literacy
450 – Strengthening Volunteer Development
460 – Urban Youth

This overview covers work done for 300-340.

a. Output/Impact-

- 2,655 Iowans participated in aging-related educational events.

- 7,733 individuals received child care training and education.

- 1,163 individuals participated in ROWEL Poverty Simulations.
- 10,306 students in 242 schools enrolled in the High School Financial Planning Program.
- Homebuyer Education Workshops held in two areas of the state addressed the needs of families wanting to purchase a home.
- More than 11,270 Iowans participated in programs that addressed financial management skills.
- 7,752 individuals participated in parenting education programs.

b./c. Outcome/Impact –

- 87% of participants in workshops from the *Adult Children and Aging Parents: Conversations Between Generations* reported they were "much better prepared" to make family decisions related to later-life issues.
- 672 existing childcare programs were strengthened.
- Poverty Simulation participants show increased awareness and sensitivity to needs of families (i.e., reduced requests for donations from students for field trips, more participation in school breakfast programs, learning more about resources and programs within communities to help limited resource families).
- 85% of resource management program respondents improved their financial preparedness for retirement (71% response rate).
- 1,296 parents participating in parenting education programs reported adopting one or more recommended parenting practices.

Overview – 4-H Youth Development Programs

This overview covers work done for 410-460.

a. Output/Impact –

- A total of 124,559 youth were involved in Extension 4-H Youth Development sponsored community clubs, special interest groups, school enrichment programs, overnight camping and other programs. Nearly one in four Iowa school age youth participate in a 4-H Youth program.
- A total of 11,529 youth and adult volunteers contributed their time, energy and expertise to helping youth learn life skills.
- A total of $67,000 dollars of scholarships were given by the Iowa 4-H Foundation to 69 4-H'ers.

- Over 900 high school youth attended State 4-H Youth Conference, held on the campus of Iowa State University and participated in educational seminars and community service opportunities.

- A total of 6500 educators, schoolteachers and school officials participated or were trained in science related extension 4-H sponsored youth curriculum.

- A total of 2,045 youth, 4,548 adult volunteers, and 766 other adults were trained in leadership, parenting and other topics.

- All 100 counties report involvement in out-of-school time programming. 66,056 youth participated in one or more of the out-of- school time offerings.

b./c. Outcome/Impact -

- Youth completing life skill evaluation statements following participation in Extension 4-H Youth Development programs indicate the following:
  82% stated 4-H programs helped them set goals for their future. (46%- reported in 2001)
  96% stated 4-H helped them consider how their actions affect others. (75% reported in 2001)
  80% stated 4-H helped them to volunteer their time for community service. (62% reported in 2001)
  88 % stated 4-H help them value the contributions of others. (59% reported in 2001)
  92% stated 4-H helped them to be friends with people who are different from them. (57% in 2001)
  92% stated 4-H helped them to avoid risky behaviors. (74% reported in 2001)
  75% stated 4-H helped them to feel comfortable saying "no" to things they did not want to do. (87% reported in 2001)

d. State's assessment of accomplishments – Original performance goals were exceeded.

e. Total expenditures by source of funding – State and Federal funds, $3,107,067.

SYs, 39.6.

Key Theme – Aging

a. Description of activity

Adult Children and Aging Parents: Conversations Between Generations, a curriculum addressing family decisions and relationships in later life, reached 585 Iowans with 33 contact hours of sequenced programming and 296 participants in one-topic workshops. Extension specialists created a web version available to partners in other states. Iowa State University Extension and Purdue University Extension trained 19 Purdue field specialists to use the program.

246 Iowans participated in caregiver strength education. 118 persons attended conferences in cooperation with Iowa area agencies on aging. Workshops on transferring property, the

impact of aging on memory, grandparents teaching grandchildren, and understanding aging were taught. 2,655 Iowans participated in aging-related educational events in the FY02 program year. The state aging program committee developed a presentation for Extension staff on *Aging Iowans: Implications for Iowa State University Extension.* Field and campus specialists were part of 26 coalitions related to aging issues at local, regional and state levels. Campus-based extension and county staff participated with faculty and students to develop and carry out *Risk and Resilience of Rural Elderly Iowans,* a pilot study on elders in two Iowa counties.

b. Impact/accomplishment –

- 87% of participants in workshops from the *Adult Children and Aging Parents: Conversations Between Generations*, reported they were "much better prepared" to make family decisions related to later-life issues.

- Collaboration between extension specialists and 3 area agencies on aging provided information about caregiving resources and strategies to over 364 professional and family caregivers. 93% of the participants in one workshop stated it was an important response to the needs of the region's families.

- Iowa State University Extension staff planned a 2003 statewide staff training on family caregiving including financial, emotional and mental health issues.

c. Source of Federal Funds – Smith-Lever 3b & c

d. Scope of Impact – State Specific

Key Theme – Child Care

a. Description of activity

7,733 individuals received child care training and education. 2,261 providers received training through the *Child Care that Works* self study program, reaching individuals in 81 counties, Kansas and Nebraska. Providers participating in this program received Iowa Department of Human Services credit for licensing requirements. Center-based programs accessed 52% of the self study kits; 43% were accessed by family childcare programs. 12,320 study video kits have been checked out since the program's inception in 1997. 5,472 participants received training and education through workshops, onsite training and consultation.

712 (15%) of these individuals attended *Better Kid Care* satellite programs conducted in collaboration with Penn State University. Infant and toddler caregiver training was conducted for 227 individuals. Playground safety training was conducted for 129 individuals. The National Network for Child Care web site (NNCC.org) managed by Iowa State University, received visits averaging 147,755 each month. Iowa State University Extension also provides oversight and management of the Early Childhood Section of the CYFERnet web site for the Children, Youth, and Families, Education and Research Network (CSREES).

b. Impact/accomplishment –

- 129 outdoor environments/ playgrounds were improved with technical assistance/consultation from ISUE.
- 12 new childcare centers or early childhood programs were established with direct Extension involvement increasing childcare availability.
- 82 new family childcare homes / businesses serving 634 children were established with direct Extension involvement.
- 672 existing childcare or early childhood programs were strengthened with extension involvement.

c. Source of Federal Funds – Smith-Lever 3b & c

d. Scope of Impact – State specific, however NNCC is actively sponsored by 37 states, posts information from land grant universities in all 50 states and is accessed by 138 countries.

Key Theme – Children, Youth and Families at Risk

a. Description of activity

The statewide goals for Iowa's Children, Youth, and Families At Risk (CYFAR) project are to improve the ability of families at risk to raise healthy, contributing citizens and to improve the well-being of children, youth, and families and build community capacity to support these families. Iowa's New Community Project (NCP) continues integration and expansion of CYFAR programming into ISU Extension, continues to strengthen collaborations, and supports 3 community projects in Davenport, Perry, and Sioux City. The ISUE CYFAR Web site averages 3,700 visits per month.

The ROWEL Poverty Simulation proves effective in increasing participants' awareness of poverty issues to those living in poverty. From October 2001 through September 2002, ISUE staff conducted 24 simulations for 1,163 participants.

The 1998 Iowa Legislature established the Iowa Community Empowerment initiative to create a partnership between communities and state government with an emphasis on improving the well being of families with children under age five. Extension staff are routinely involved in serving as advisors to local empowerment area projects. A major empowerment effort this past year has been helping communities with evaluation efforts.

Telling Our Story: An Evaluation Training for Empowerment Programs was presented to 6 Empowerment groups representing 5 empowerment areas and 11 counties in southwest Iowa. The 105 participants found this to be one of the most practical trainings they've attended; learned to: to select an indicator and establish baseline data, to make stories short and concise, new useful tools.

Over 2,316 individuals in 29 counties were part of satellite downlinks, interagency coalition planning meetings, etc., related to public issues. Hispanics United for Perry (HUP), was formed in response to focus groups. HUP is a legal, non-profit group with assistance from the mayor and focuses on three priorities: full citizenship participation among Hispanics, more parent involvement with their children, and reducing language barriers. HUP was involved with the July 4 celebration, met with city officials and police to bridge barriers, is establishing a series of intergenerational nights for families and is involved in a leadership training in Spanish.

ISUE is a member of a statewide voluntary coalition, Partners in Learning, organized to promote public deliberation in Iowa, and sponsored two Public Policy Institutes. 74 individuals were trained in deliberation and skills for convening, moderating, recording and reporting deliberative forums. Five individuals moderated and/or recorded at least one forum after training; five are involved in a follow up training to learn how to frame local issues.

b. Impact/accomplishment –

- Poverty Simulation participants show increased awareness and sensitivity to needs of families – (i.e., reduced requests for donations from students for field trips, more participation in school breakfast programs, learning more about resources and programs within communities to help limited resource families, etc.).

- Copin County USA: A Citizen Involvement Simulation was conducted a second time for a graduate class at ISU. The instructor says, "This simulation enhances the course by helping students make the connection between academic coursework and actual policymaking."

c. Source of Federal Funds – Smith-Lever 3b & c

d. Scope of Impact – State Specific

Key Theme – Community Development

a. Description of activity

Organized in-state around Building Social capital – Visioning, planning and organizational capacity building are prerequisites for strong communities. Six separate projects have social capital as a central feature. These include a) *Community Visioning*, changing the landscape and physical entryways to 11 communities; b) *ad hoc planning and visioning*, locally supported efforts to address one or more elements of community capital in 14 communities; c) *Resident-led watershed planning*, facilitation and organizational development support to citizen-based planning in 3 watersheds; d) *Community Outreach Partnership Center (COPC)*, a multi-faceted community capital building project in the Des Moines Enterprise Community; e) *Community Voices*, a program for new Spanish speaking residents to the state in 7 counties; f) *Land use planning*, assistance provided to 20 communities, municipalities and counties.

b. Impact/accomplishment –

- 43 interorganizational collaborations formed
- 49 leadership structures diversified
- 111 organizations assisted and strengthened
- 9 organizations created
- 25 social networks established.

c. Source of Federal Funds – Smith-Lever 3a & c, leveraged with state funds, user fees, DOT, HUD, and not for profit organization contracts

d. Scope of Impact – State Specific

Key Theme – Family Resource Management

a. Description of activity

More than 1,000 Iowans received face-to-face information about the Earned Income Credit and 1,068 learned about the Healthy and Well Kids in Iowa (HAWK-I) program – Iowa's Child Health Insurance Program (CHIP) for uninsured low- and moderate-income children.

3,150 Iowans received information on credit and debt reduction. 288 individuals received a PowerPay debt reduction analysis. 610 clients visited the ISU Financial Counseling Clinic and 69 Iowans received training through the Clinic's financial counselor certification program. 3,631 Iowans participated in classes that presented budgeting and other basic financial management information. Privacy continued to be an area of interest with 1,320 Iowans attending such presentations.

A variety of learning modes were used to educate 641 Iowans on Financial Security in Later Life, including 13 publications, displays, and programs.

10,306 students in 242 schools enrolled in the High School Financial Planning Program; 819 youth participated in Extension programs that focused on credit and budgeting. 22 Iowa high schools participated in the Personal Financial Survey sponsored by the Jump$tart Coalition; 515 students completed the survey. Financial management training was presented to 245 teachers.

b. Impact/accomplishment – The following outcome data are reported from surveys of program participants. Survey response rates are included in parentheses.

- More than 11,270 Iowans participated in programs that addressed financial management skills.

- 90% of resource management program respondents made specific retirement plans (60% response rate).

- 85 % of resource management program respondents improved their financial preparedness for retirement (71% response rate).

c. Source of Federal Funds – Smith-Lever 3b & c

d. Scope of Impact – State specific – "Secure Your Dreams" retirement curriculum and publications are featured on the national initiative website.

Key Theme – Improving Housing in Iowa

a. Description of activity

ISU Extension programs to improve housing in Iowa addressed the needs of families who wanted to purchase a home, families who wanted to build a new home or remodel, and families who wanted to modify their home to improve convenience and accessibility. Methods included meetings, workshops, and one-on-one consultations.

b. Impact/accomplishment –

- A series of Homebuyer Education Workshops were held in two areas of the state. A follow-up survey indicated the following responses from the workshops participants:
  - 25% were better able to manage credit and finances
  - 50% were better able to search for a good home
  - 38% were better able to negotiate effectively for the home they wanted to buy
  - 38% were better able to find the best type of mortgage for their situation
- 13 families modified or adapted their building or remodeling plans after attending Home Planning Workshops.
- 11 families made accessibility improvements in their homes to accommodate a disability.
- 175 individuals toured the Universal Design Learning Laboratory at ISU to learn about housing features, assistive devices, and household equipment that make homes more convenient and comfortable.
- 124 individuals in 9 Iowa counties learned about assistive devices to make a home safer and more convenient for later life at the "Aging in Place" housing meeting series.
- 40 caregivers learned ways to modify the home to make caregiving easier for a family member with Alzheimer's disease.

e. Source of Federal Funds – Smith-Lever 3b & c and grants

f. Scope of Impact – State specific; shared regionally and nationally

Key Theme – Farm Safety

a. Description of activity

The Iowa farm fatality summary for 1988 to 2001 continues to show a decrease in the number of farm fatalities during those years. The number of deaths recorded for 1988 to 2001 were 63, 63, 60, 33, 53, 34, 57, 34, 31, 49, 42, 49, 38, and 22 respectively. A target group

identified in Iowa is farm youth. Farm safety day camps, in-school educational programs and other activities are conducted to reduce the number of injuries and fatalities.

The most effective method of reaching the target audience of youth in Iowa has been the farm safety day camps. Iowa State University Extension staff hosted 31 farm safety day camps and educated over 5,200 youth between 7 to 13 years old. The average attendance for these camps is about 170 youth per camp. Extension participated with external partners to help sponsor or participate in additional camps. A partnership was continued with a national sponsor, Progressive Agriculture Foundation. Iowa State University Extension program provides supporting materials of publications and demonstrations to these camps.

Iowa State University Extension delivered education to public schools with our in-school programs. Extension staff in 25 counties presented in-school farm safety programs that reached about 5,300 students. These in-school programs combined with the tractor and machinery certification programs are structure learning experiences. The Certification program fulfills the youth requirements to operate tractors and machinery that meets the federal guidelines and include 24 hours of training. Eight counties in Iowa sponsored the program with 119 students.

Full-time farmers are most receptive to publications, demonstrations, and mass media events. Safe Farm is an Iowa State University Extension program helping to make Iowa farms a safer place to work and live by the combination of a media campaign and various educational efforts. A structured farm safety media campaign included weekly scheduled radio interviews. The radio interviews provided over 218 minutes of quality radio programming. During National Farm Safety Week, Iowa State University Extension coordinated a multi-organizational promotion to increase awareness. The Safe Farm agricultural health and safety pages on the World Wide Web contribute to the media campaign by providing current and timely information to both the county extension offices and Iowans. The address of the page is <www.abe.iastate.edu/safety.htm>. Items found on these pages include: listing of farm safety day camps, location, date, contact person, listing of tractor and machinery certification classes, county, contact person, links to camera ready printable version of all Safe Farm fact sheets, listing of information about available farm safety displays, and links to other farm safety organizations and their efforts.

Descriptions of Output Performance Measures	**Outputs**
Number of people that received farm safety training	11,947
Number of farm workers that received farm safety training	1,187
Number of youth participating in youth farm safety activity taught by extension	5,396
Number of youth participating in youth safety activities coordination by extension	5,245
Number of youth that received hazardous occupation certification	119
Refereed publications, research papers, and manuscripts	4
Non-refereed publications, reports, and technical papers	2
Proceedings and published abstracts	3
Extension publications	7
Books and chapters	3
Videos	2
radio interviews	74

Media release and popular press articles	8
Safety expert on state, national, CES, and professional societies committees	24

b. Impact/accomplishment –

- 119 youth ages 14 to 16 years of age received federal required certification for being legally eligible for agricultural work opportunities off their parents' or legal guardians' farm. These youth can now enter the agricultural workforce and reduce the potential occurrence of agricultural-related injuries to this age group.

- 5,245 youth ages 8 to 14 years of age received one day of farm safety education from participating in farm safety day camps hosted throughout the state. These camps offer a variety of farm safety messages tailored by local community and stakeholders. These camps create awareness of farm hazards; develop an understanding of safe and unsafe behaviors; create a positive life-long acceptance of safety responsibilities; and decrease the incidence of farm youth injuries and fatalities.

- Safe Farm E-News, an electronic monthly newsletter for extension educators has gain success. Subscriptions requests have grown since 2001 and extension staff from other states are taking advantage of this timely delivery of agricultural safety information at no cost. Recipients include people from Kentucky, Minnesota, Nebraska, Texas, and Wisconsin.

c. Source of Federal Funds—Smith-Lever

d. Scope of Impact—State Specific

Key Theme – Impact of Change on Rural Communities

a. Description of activity

Organized around a new program team, community Policy and Planning – Communities and organizations are supported with objective statistical social and economic data as input to informed decisions. The support is in the form of archived on-line and print data (Office of Social and Economic Trend Analysis), custom designed and localized fact sheets, graphic media, and analysis and interpretation in reports and presentations delivered to audiences. Additionally, support is provided to organizations and communities to generate custom designed data by providing technical services for applied sample surveys and focus groups. In FY2002, these offerings were enhanced with on-line interactive graphics. New geographic information systems support was provided statewide to counties through sponsorship of the state geographic information council coordinator. All data based activities are augmented with group process facilitation to assist local officials in decision making activities.

b. Impact/accomplishment – Four million pages of economic and demographic data were delivered to internet users (up 175% from FY2001), 37 counties were provided GIS consultation services, county-specific fact sheets were published on 4 topics of community change, 7 referenda were initiated and passed, 1 zoning ordinance was passed, 2 watershed plans were developed, and 65 landscape plans were developed. In FY2002, ISU Extension

sought and received federal funding for a state-based community vitality center. The $267,000 of resources have initiated entrepreneurial education and facilitation in 10 counties, provided training on rural development opportunities in the 2002 farm bill to 275 community leaders and sponsored a project to further cluster strategies for community economic development.

c. Source of Federal Funds – Smith-Lever 3b & c

d. Scope of Impact – State specific; geographical contiguous states (Midwest PROfiles)

Key Theme – Leadership Training and Development

a. Description of activity

Organized in-state around Building Human Capital. Iowa citizens were taught leadership skills from a portfolio of six programs. The development of human and social capital is central to the ability of communities to solve their problems. In FY2002, these included a) *Developing Dynamic Leaders*, a six-session skill-building program in group formation, goal setting, group dynamics, decision-making, and assessing community needs and direction; b) *Governing Cities: A Leadership Toolbox*, a six-session program for elected city officials offered in partnership with Iowa League of Cities on communication and building public trust, c) *Citizen Initiated Performance Assessment*, a collaborative project with Iowa League of Cities at the Sloan Foundation that involves citizens in an interactive process that identifies goals and benchmarks for local government services; d) *Nonprofit Management Institutes*, a 13 session (2 days each session) certificate program targeting the special concerns of nonprofit organizations such as governance by volunteer boards, legal and regulatory concerns, and developing diversified revenue sources; e) *Tomorrow's Leaders Today*, a cooperative program on targeting potential leaders from Des Moines' Enterprise Community and focusing on skill building, community projects, and local issues, f) *Municipal Clerks' Institute*, a 3-year tiered program with a curriculum built around budget and finance, communications, city records, ordinance development, community development, intergovernmental relations and technology updates; and g) *election officials training*, 2-level, 3-day workshops for county auditors and staff to better manage Iowa's elections.

b. Impact/accomplishment – Some form of Extension leadership training and development occurred in 67 of Iowa's 100 Extension districts. Ten communities have continued to develop and use benchmarks for municipal budgeting and provision of services, 614 government officials were trained, 305 business entrepreneurs were trained, 2,176 community leaders were trained, 236 service providers were trained, 120 service providers were certified and 685 youth were trained. Using self-assessment tools, skill and aspiration increased among two-thirds of participants. In follow up surveys, 90 percent of participants report taking on new roles in community organizations or changing their roles to be more effective.

c. Source of Federal Funds: Smith Lever 3b&c, leveraged with state funds, user-fees, and not-for-profit organizational contracts

d. Scope of Impact: State specific

Key Theme – Parenting

a. Description of activity

ISU Extension continues to train parents, professionals and volunteers in implementing sequenced parenting education. These programs reached 1,767 Iowans: *The Strengthening Families Program* (for parents and youth 10-14) reached 708 individuals; *Girl Talk/Guy Talk* (designed to increase communication about sexuality issues between parents and youth) reached 515 individuals *Celebrate Families* (program for parents and school-age children)-reached 357 individuals; *Great Beginnings for Families* (program for parents of children 0-5 years) and *The Incredible Years* (for parents of children 2-7 years) reached 164 individuals; and *The Parent Academy* (a series of workshops for parent educators) reached 23 educators.

688 individuals were reached through *Kindermusik*, an educational series promoting parent/child interaction and child socialization; 190 individuals were reached through *Family Storyteller*, a parent/interaction and literacy program designed for parents and preschool-age children; and 250 individuals were reached through workshops focused on fatherhood. An additional 3,057 parents were reached through workshops focused on various parenting topics (managing conflict; learning through play; brain development, parenting teens, etc.). Over 1,800 parents and professionals throughout the nation were reached through the 4-part educational satellite series, *The Impact of Entertainment Media on Children and Families.* In Iowa, this series reached 319 individuals. *Me and My Dad* received up to 1,500 visitors a month, distributed monthly updates to 321 subscribers, and reached individuals in 58 countries.

Iowa State University, in collaboration with Pennsylvania State University, received a $20.7M federal grant from National Institute of Drug Abuse for Promotion School-Community and University Partnerships to Enhance Resiliency (PROSPER). This 5-year research-extension project involves 28 schools, community stakeholders, and more than 10,000 families in sustainable science-based programs to build resiliency among youth and reduce substance abuse.

b. Impact/accomplishment –

- 7,752 individuals (i.e., parents, grandparents, professionals, volunteers) participated in parenting education programs facilitated by ISU Extension.
- 678 professionals and volunteers were trained by ISU Extension staff to deliver parenting education.
- 1,314 individuals received parenting education through individual consultation.
- 1,296 (91%) parents who participated in parenting education programs reported that they adopted one or more recommended parenting practices.

c. Source of Federal Funds – Smith-Lever 3b & c, NIDA

d. Scope of Impact – State specific, PROSPER project includes Pennsylvania

Key Theme – Rural Mental Health

a. Description of activity

During the fist year of the Iowa Rural Mental Health Initiative project year, many activities were implemented: workshops focusing on the changes in rural Iowa and the associated stressors on families were held for clergy, lay ministers, agency staff, childcare workers, mental health counselors, and lenders with over 300 persons attending these workshops. Extension collaborated with Ecumenical Ministries of Iowa (EMI) to promote the Rural Mental Health Initiative through faith-based community partnerships. Congregation members were trained as peer listeners to refer congregation members in need of assistance to appropriate agencies. Over 15,000 people, including 1,200 youth, attended workshops and events at which Extension staff presented mental health information. A video, "Demystifying the Counseling Experience," was produced and 828 copies were distributed through the state. Peer communication and conflict management skills were taught to high school-aged youth in southeast Iowa. In Northwest Iowa, video program kits were used to encourage women to participate in discussion groups and talk about the stresses of living on the farm. "Dealing with Children and Uncertainty" was presented in two northwest Iowa locations by mental health professionals. In one county, Extension sponsored a series of summer day camps for youth funded partially by the mental health initiative. The main focus of the campus was lowering family stress and helping children understand positive ways to deal with stress. The camps were bilingual and children of Spanish-speaking families were encouraged to attend. The day campus reached 148 children: 98 Caucasian, 1 African-American, and 49 Hispanic. Over 393 farm businesses received Farm Business and Financial Analysis through Extension. Ten volunteers were trained to do financial counseling with individuals and families. 175 individuals and families received counseling using PowerPay, a computer program that assists families in making wise financial decisions. A website, <http://www.extension.iastate.edu/iowaconcern/>, was developed for Iowa Concern and promoted through radio interviews and print media. 1,552 individuals and families received one-on-one intervention and counseling services by mental health professionals in Iowa.

b. Impact/accomplishment –

- 15,000 people received information and education on mental health.
- 392 farm businesses received financial analysis.
- 175 individuals and families received family financial counseling.
- 1,552 individuals and families received mental health counseling.

c. Source of Federal Funds – Smith-Lever 3b & c and grants, SAMHSA

d. Scope of Impact – State specific; shared regionally and nationally

Key Theme – Youth Development/4-H

This section is further divided into key themes as named in Iowa's state plan of work.

Key Theme – Youth/Staff Development

a. Description of activity

The mission of the Iowa 4-H Youth Development Program is to create supportive environments for culturally diverse youth and adults to reach their full potential. To fulfill this mission, it is essential that all staff, paid and volunteer, have a sufficient background and knowledge in the research-based foundation of youth development. Having and utilizing this knowledge and related skills will enhance the possibility that all program activities and environments will be designed according to the best practices of youth development. This will then lead to a better opportunity for young people to reach their full potential, both as youth and later as adults. The purpose of this plan of work is to ensure that all 4-H Youth Development Program activities are founded on the science-based principles of youth development.

b. Impact/accomplishment –

- 195 youth development oriented training sessions were conducted
- 65 program assessments were completed using instruments like the PAAT
- 176 Extension paid staff were trained in youth development principles and best practices
- 948 Extension volunteers were trained in youth development principles and best practices
- 514 non-Extension staff and/or volunteers were trained in youth development principles and best practices
- 577 youth are in decision-making roles in the 4-H Youth Development Program or in the community or in other youth-serving organizations as a result of training and consultation efforts
- 400 youth events and activities were co-sponsored with the 4-H Youth Development Program and other youth serving organizations
- 92 counties participated in a county Centennial Conversation on Youth development
- 280 youth and adults participated in the state Centennial Conversation where teams of youth and adults facilitated the small group discussions
- 45 youth who make up the State 4-H Council planned and conducted a three day youth conference for over 900 participants
- 5 teens were hired and trained to coordinate a community-based neighborhood center for after school programming leading to these comments:
  - "I have changed the way I act around younger children because now I know they watch everything you do" age 16

- "I have learned that I can trust the people that work at LeClaire House." age 17
- "Since working at LeClaire House I do what I am asked to do when I am asked to do it instead of waiting around, which gets me in trouble." age 15
- "Since working here I realize that I want to do more community service because it helps so much." age 16
- "My good decision making is rubbing off on my brother and sister." age 16
- "I have learned that you can't make bad decisions and expect a good outcome." age 17

c. Source of Federal Funds – Smith-Lever 3b & c

d. Scope of Impact – State Specific

Key Theme – Out-of-School Time

a. Description of activity

Throughout the state staff are engaged in a number of activities to fulfill these two goals. The types of activities include 4-H clubs, Clover Kids, Day Camps, Summer residential camps, after schools specifically the Governor's AmeriCorps After-School Initiative and special interest activities during non-school days. Specific Iowa 4-H curriculum used includes: Challenge, Growing in the Garden, Boomerang, etc. To provide these efforts, staff are working with community based collaborations, volunteers and various state and local agencies. These programs use 4-H research based curriculum and educator preparation programs to teach life skills to youth.

b. Impact/accomplishment – Iowa State University Extension 4-H manages the Governor's AmeriCorps After-School Initiative in 13 school districts for at-risk middle school youth year-round:

- Governor's Americorps After-School Initiative in 13 school districts for at-risk middle school youth reached 762 middle school students.

- As a result of participation in tutoring services and 4-H educational enrichment programming students' homework completion rates increased 28%; GPA's increased .26 points, school attendance increased 21%; students problem-based school referrals decreased 19%.

- AmeriCorps members and 134 community volunteers provided 445 middle school students tutoring assistance.

- Since the initiative began, an average of 360 middle school students participated in a total of 10,846 hours of community service learning events (1,294 hours this program year).

- 153 middle school students were partnered with 99 mentors spending 677hours of time together. This is a significant increase over last year's reported numbers.

c. Source of Federal Funds – Smith-Lever 3b & c and special grants

d. Scope of Impact – State Specific

Key Theme – Science and Technology Literacy

a. Description of activity

This plan of work focuses on improving science and technology literacy of American students through experiential activities within and outside the school classroom. Performance goals include marketing the ISUE E-SET program to Iowa Educators; helping k-12 youth understand the relationship between science and technology; providing k-8 youth with non-formal, experiential science activities that will develop science life skills; and delivering technical assistance, curricula, kits and professional development workshops to Iowa schools through partnerships with AEA's and LEA's. E-SET has received many positive responses from formal and informal educators across the state. They have commented on the quality of the resources, the responsiveness of the staff, and the breadth and depth of training. The demand for E-SET is high and reflects the effectiveness in teaching Iowa youth life skills.

b. Impact/accomplishment –

- E-SET curriculum presentations were made to Iowa Science Teachers Fall Conference, Iowa Aviation Conference, The Farm Progress Show, NSTA National Convention, 4-H Youth Technology Conference Iowa 4-H Youth Conference, CYFAR National Conference, and area leader trainings. 6500 adults were reached through these efforts.
- Youth Reached through E-SET Educational Programs include: 27,164
- Youth Enrolled in Science and Technology Project Areas: 48,784

c. Source of Federal Funds – Smith-Lever 3b & c

d. Scope of Impact – State Specific

Key Theme – Strengthening Volunteer Development

a. Description of activity

Enhancing and expanding the roles of volunteers to initiate a comprehensive volunteer management system in their counties is the focus of this plan of work. Selected activities include: 1) 526 youth and adults participated in the North Central Region forum in Des Moines, Iowa; 2) 528 4-H club leaders participated in a satellite training series focusing on skills new leaders need; 3) 45 high school age youth from across Iowa serve on the state 4-H council; 4) 194 4-H Horse Project Leaders participated in a ICN training designed to share new educational resources and to strengthen local horse project meetings and workshops; and 5) A club survey designed to strengthen youth as partners programming in Iowa 4-H community clubs was completed by 32 clubs, 491 4-H'ers and 192 adult leaders and parents; and 6) ICN training for 4-H Youth Development Specialists and County Youth Coordinators around the ISOTURE volunteer management model to devise an effective county based annual volunteer training plan.

b. Impact/accomplishment –

- $7,500 was granted by the Iowa Commission on Volunteer Service to ISU Extension 4-H to administer this program to encourage local youth groups to partner with another community group to plan and carry out a community service project. Forty-one grants funded. The original $7,500 grant resulted in projects totaling $29,458 aided by 801 volunteers (youth and adult) working 8,881 volunteer hours.

- Extension supervised AmeriCorps members reported that an average of 284 middle school students provided 1,294 service learning hours. The two most common events were intergenerational learning relationships with elderly nursing home residents and maintaining community and state parks. In addition, 99 mentors spent 677 mentor-mentee hours with 153 middle school students.

- Thousands of 4-H'ers, their families, alumni, and extension staff celebrated the 100th year of 4-H across Iowa. 100 persons were inducted into the Iowa 4-H Hall of Fame (one from each county) to recognize their contribution to what 4-H programs are today. An excerpt of a 4-H memory note shared at a county event said, "I do feel I gained much, not only from what we studied but by gaining courage to stand before an audience and give a report,""I have always been proud of having been a 4-H member and what it stands for. I value the friendships formed during that time in my life."

- From a satellite leader training series on roles and expectation and 4-H clubs, participants shared: 73% believe that the program helped them become more comfortable with their role as a club leader; 79% believe that the program helped them become more comfortable with planning the 4-H club experience.

- North Central Region Volunteer Forum participants reported: (4 = excellent, and 1 = poor) Were you energized as a volunteer/staff? 3.74; Did you learn new skills that you can apply at home? 3.57; Did you learn clues about youth development that will help you as a leader? 3.48; Delegate quotes after 12 months: "Re-energized communication between leaders, parents, staff, etc. within our club and county." "New ideas that work with 4-Her's," "Making us volunteer to help us overcome our fear of volunteering." "Since this is my job, I have a strong desire to work with youth programs. I feel the more opportunities we can give to youth the better futures we will help them shape."

c. Source of Federal Funds – Smith-Lever 3b & c

d. Scope of Impact – State Specific

Key Theme – Urban Youth

a. Description of activity

According to the Iowa Department of Education statistics, 39.7% of the school age youth live in the seven designated urban counties. Urban is considered a setting rather than a program or way of delivering programs. This Plan of Work 1) works to help create a positive

environment where youth (grades K-12) will develop life skills while having a positive relationship with a trained adult volunteer, 2) develops a county wide marketing and recruitment plan that will reach the urban audience for all delivery methods, and 3) provides youth grades 4-8 with out-of-school time science/math activities that will better prepare them for the workplace of the future.

b. Impact/accomplishment – The following outcome data are reported from surveys of program participants.

- 96% of participants are more likely to avoid risky behavior
- 94% of participants are more likely to volunteer for community service
- 94% of participants learned to plan, organize, and make a presentation
- 94% of participants learned the importance of protecting the natural environment
- 94% of participants learned to be responsible for their own actions
- 94% of participants learned to be friends with people different from themselves
- 84% of participants learned to consider the consequences of their decisions

c. Source of Federal Funds – Smith-Lever 3b & c

d. Scope of Impact – State Specific

B. Stakeholder Input Process:

The Iowa Agriculture and Home Economics Experiment Station (IAHEES) and Iowa State University Cooperation Extension Service undertake a wide range of actions to seek stakeholder input and make it an on-going process that encourages participation. These actions occur on many levels and take many forms, both formal and informal. Many of these were listed in the FFY00 report and will not be repeated here. [Incorporated by reference: Plan of Work Annual Report of Accomplishments and Results, Iowa State University, Iowa Agriculture and Home Economics Experiment Station, Iowa State University Cooperative Extension Service, Federal Fiscal Year 2000, Section B. Stakeholder Input Process] Instead, below find examples of how stakeholder input has had programmatic impact.

1862 Research:

- Program 2. Forest Resource Enhancement: Stakeholder input continues to drive the work being conducted. The numerous variations in our buffer system model are the direct result of landowner inputs. Local stakeholders have determined the landscape-level issues the urban forestry activities will address, the types of assessments that will occur, and the development management practices that will be evaluated. Our research program on fiber/plastic composites was initiated as a direct result of farmer-producer group input and has been guided by feedback from producers and industry.

- Program 5. Crop Production and Management Strategies:

    - Members of Practical Farmers of Iowa were instrumental in the design, execution, and assessment of this research. Six PFI members served as cooperators for on-farm

research and many members of that organization provided feedback concerning the results at field days and winter meetings. Production of an extension bulletin summarizing the results of this research is a priority.

- Studies conducted to determine how interactive stresses from soybean cyst nematode, post-emergence herbicides, brown stem rot, and water stress were designed and conducted after consultation with the Iowa Soybean Promotion Board and Illinois Soybean Production Committee. Outcomes from these studies were distributed to Iowa farmers throughout Iowa and Illinois in a special publication by the ISPB.

- Program 9. Understanding the Physiological Basis of Animal Reproduction, Growth and Well Being. Stakeholder input has been critical to project development. Specifically, high prices for dairy replacement heifers prompted dairy industry concern about replacement heifers and premature culling of cows. Also, consumer, producer, and governmental inquiries about biotechnology derived crops for livestock have prompted extension personnel to study the safety and wholesomeness of these crops. Studies and educational presentations were designed to address producer concerns.

- Program 10. Genetic Enhancement of Agriculturally Important Animals: This program addresses stated priorities of stakeholder organizations, which are regularly consulted for input. Faculty meet regularly with genetics companies and industry organizations that supply input on important traits, research priorities, and how gene or marker tests can be incorporated into breeding programs. Research results are frequently validated using their data. Outreach programs on value-added programs in the pig were developed upon request by stakeholders for assistance in evaluating meat quality. Research programs on stillbirth in dairy cattle were developed following industry requests and industry concerns about replacement heifers and premature culling of dairy cows prompted associated research and outreach programs.

- Program 11. Develop and Integrate Nutritional Knowledge to Enhance Animal Production:

  - Based on previous research, a computer program entitled the ISU Forage Planner was developed to integrate forage resources on individual beef cattle farms. This program was the foundation of field days on six farms during June and July to introduce the software to beef producers, attracting 126 cow/calf producers.

  - Producers using the forage budgeting computer program to aid in the establishment of year-round grazing systems raised a question about inclusion of development of replacement heifers. As a result a project was developed to investigate the effects of winter grazing on development of replacement heifers.

  - Stakeholders participated in development of a request for proposals and in the evaluation of the proposals for feeding distillers grains to dairy beef. A feeding trial is in progress evaluating the effects of feeding wet or dry distillers grains on performance and carcass value of Holstein steers.

- A group of Northeast Iowa and Southwest Wisconsin farmers developing organic and direct marketing of dairy and beef products from grazing cattle continue to participate in a USDA SARE funded project to support on the farm research to enhance the conjugated linoleic acid content of milk and beef. Farmers, ISU scientists, staff from an organic cooperative, and the local RC&D Coordinator are participants. ISU scientists assisted another Iowa cattle producer to develop and obtain a grant from the Organic Farming Research Foundation to enhance the production and marketing of beef from his cattle.

- An Iowa cattle producer identified the lack of knowledge on the relationship between grazing management and phosphorus loss from pastures. A team of ISU scientists, Iowa DNR personnel, and staff from Iowa Cattlemen's Association participated in planning and obtaining an EPA 319 grant that is supporting research at an outlying research farm on the effects of grazing cattle and harvesting forage on loss of phosphorus from pastures.

- Program 12. Potential of Alternative Livestock: An invertebrate identification guide has been developed using CD-ROM format. Using numerous pictures and diagrams, the fish culturists will be able to easily identify invertebrates important to fish culture. Stakeholder input was obtained during the review process of the CD-ROM. As a result of this review by industry representatives, selected pictures were either added or removed from this document whereby the final product was greatly improved.

- Program 13. International Economic Competitiveness:

  - Many small and medium size producers have requested research on alternative production systems consistent with their investment ability and environmental concerns. The hoops project was developed in response to these concerns. The work on organic pork was carried out at the request of a group of organic pork producers. In both cases producers provided data and consultation for the projects.

  - Work on GMOs has been stimulated in large part by interactions with major export commodity groups and their concerns about losing markets in Europe, Africa, and in some places in Asia.

  - The work with Iowa cooperatives was instigated at their request, as was the work on ethanol.

- Program 14. Agricultural Risk and Financial Management: Livestock Gross Margin Insurance was developed with substantial input from the Iowa Pork Producers Association and the Iowa Farm Bureau Federation. Both groups felt the need for a new insurance product that would allow Iowa's pork producers to remain independent. Both groups did not want federal premium subsidies on the product, so no federal subsidy was requested.

- Program 16. Improving the Quality and Safety of Muscle Foods:

- Interaction with a major beef packing company resulted in development of purchase and processing specifications for high quality, safe beef. Studies of validation of the processing criteria are being planned.

- Interaction with several major pork processors and the National Pork Board has resulted in a study that is developing complete compositional, functional and nutritional information on individual pork muscles.

- Development of postmortem pH measurements for a major Midwest packer has resulted in increased pork exports to Japan.

- Input from the National Pork Board has resulted in development of a new injection device for swine vaccinations that eliminates needle fragments and abscesses from pork carcasses.

- Program 18. Improving Human Foods: Functionality, Selection and Nutrition.

  - A company selling isoflavone-rich food ingredients and dietary supplements is supporting research to understand of the role of gut microbial degradation of soybean isoflavone in the bioavailability of these compounds.

- Program 20. Sustainable/Organic Agriculture. The Organic Advisory Committee continues to advise the Iowa State University program on research and extension needs in Iowa, along with the Iowa Fruit and Vegetable Association and the Iowa Grape Growers Association. These groups include conventional and organic farmers, industry and Extension stakeholders. At stakeholder meetings, discussions on research to date are followed by input about the organic business climate, concerns, and future research needs. Stakeholders requested that certified organic pest management treatments should be researched and changed the design of several experiments as a result. Based on stakeholder demand, a second Organic Conference was organized for November 2002, which would address key issues of marketing and production. Stakeholder involvement has increased the applicability of research, including the development of an evaluation instrument in 2002.

  In the stakeholder evaluation, 47% of respondents reported a noticeable improvement in soil quality when organic practices were employed on their farm. At least 60% of respondents reported a 5–20% increase in farm income from organic agriculture. All respondents reported that they had participated in an Iowa State University Extension event (field day, workshop, conference) related to organic agriculture, demonstrating a strong partnership with our clientele.

- Program 21. Sustainable and Environmentally Safe Management of Soil Resources. Stakeholders have been directly involved in several research projects of this program. Stakeholders include business corporations (Agribusiness Association of Iowa, Cenex/Land O Lakes, Agrium, Inc., sand and gravel mine operators), public agencies (Iowa Department of Natural Resources, Chariton Valley Resource Conservation and Development District, USDA Natural Resources Conservation Service, Iowa Department

of Agriculture and Land Stewardship, county boards of supervisors), and over 100 farmers on whose farms research trials were conducted. Projects with such direct stakeholder participation included studies of nitrogen application and efficiency of uptake, precision farming technologies (GPS, GIS, soil testing, remote sensing, yield monitors, tissue testing), crop utilization of liquid swine manure, and relationships between soil organic carbon content and land use, soil type, and landscape positions. In many cases, producers helped to identify practices that need to be compared and selected treatment comparisons for their farms.

- Program 23. Animal Waste Management:

    - The hoop research was initiated based on farmer interest, and we had six farm cooperators actively engaged in the research program. Practical Farmers of Iowa and the Iowa Farm Bureau help organize this stakeholder input and involvement. Outcomes include over 3000 hoop structures built in Iowa in the last 5 years.

    - Stakeholder (Iowa Cattleman's Association) input was largely a motivating factor to summarize and submit the research information to EPA. In response to stakeholder input the research was expanded.

    - New extension bulletin on environmentally safe disposal of swine mortalities through composting was initiated at the direct request of the Iowa Pork Producers Association and the Iowa Department of Natural Resources.

    - New research project on the environmental (air and water quality) impacts and biosecurity of using composting to dispose of cattle in the event of an animal disease emergency (caused by foot-and-mouth disease outbreak or bio-terrorism) was initiated at the request of and with the assistance of the Iowa Department of Natural Resources.

    - Research on use of composted organics to control storm water at construction sites was initiated at the request of the Waste Management Assistance Division of the Iowa Department of Natural Resources.

    - Studies on the effects of poultry manure application on water quality are in response to a request by the Iowa Egg Council.

- Program 24. Improving Water Resources Management in an Agroecosystem: Research on lake water quality involved participation by landowners, aquatic recreationists, community organizations and state and federal natural resources management agencies. The Iowa Department of Natural Resources, acting on behalf of the interests of a USDA NRCS Resource Conservation and Development program, requested and funded the low head dam research. The IDNR requested and funded the Spirit Lake research. The U.S. Fish and Wildlife Service and the IDNR requested and funded the Missouri River research and the Topeka shiner research.

- Program 25. Interaction of Biosystems with Weather and Climate: Development of the Iowa Environmental Mesonet was not foreseen in the project as originally proposed, but was initiated and expanded in response to queries from the National Weather Service and private industry (such as KCCI television). As stated above, the Mesonet has had direct impacts with respect to emergency response.

- Program 27. Rural Development.

    - Research on persistently poor rural areas in 28 states to develop place-based policies has changed the instructions for citizen participation in strategic planning for the second round of the Empowerment Zone/Enterprise Community Initiative.

    - Consultation with the Iowa Association of Water Utilities resulted in a training workshop for six water utilities working with local citizens to better understand EPA Source Water Assessment Regulations.

    - Interviews with men and women owners of small businesses helped organize research and extension efforts to improve the success of small businesses in Iowa.

    - Worked with farm leaders, extension staff, legislators, and community representatives to improve the Iowa Farm and Rural Life Poll.

- Program 29. Value-added Agriculture. The work in the project is often influenced by stakeholders, including farmers, entrepreneurs, industry, and consumers. Considerable matching financial support comes from these stakeholders, especially the Iowa Corn Promotion Board and the Iowa Soybean Promotion Board.

Extension:

- Program 103. Crop Nutrient Management. A need for a coordinated and comprehensive approach for the sharing of manure management information and education efforts in order to improve manure management in Iowa resulted in the Iowa Manure Management Action Group (IMMAG) being established in the spring of 1997 through the leadership of the Natural Resources Conservation Service. IMMAG is a state-level committee with representation from the following private and public sector groups: Natural Resource Conservation Service (NRCS), Iowa Environmental Council, Agribusiness Association of Iowa, Iowa Farm Bureau, Iowa Pork Producers Association, Iowa Cattlemen's Association, Iowa Poultry Association, Iowa Turkey Federation, Conservation Districts of Iowa, Farm Credit Services of America, Iowa Department of Natural Resources (IDNR), Division of Soil Conservation of the Iowa Department of Agriculture and Land Stewardship (DSC-DALS), Iowa Beef Center, Iowa Pork Industry Center and Iowa State University Extension, and the College of Agriculture.

- Program 104. Agricultural Risk and Financial Management. All of the educational activities described above were designed taking into account participant evaluations from past programs. In the producer marketing clubs participants take an especially active role in determining the topics and activities to be emphasized each year.

- Program 106. Commercial Greens Industry.

    - Iowa Turfgrass Assessment Survey. A statewide comprehensive Turfgrass Assessment survey was undertaken by the ISU Extension Horticulture Department, Iowa department of Agriculture and Land Stewardship, and the Iowa Turfgrass Institute.

    - In response to demand by commercial landscape managers, three ISU Commercial Greens Committee members in association with plant pathologists and entomologists from University of Kentucky and Ohio State University developed the 12-page bulletin "Using Mulches in Managed Landscapes". The bulletin was designed and printed by ISU Extension and distributed in Ohio, Kentucky, and Ohio. A web version is linked by all three states. The comprehensive nature of the bulletin means that it can be used as a "one stop" guide for using organic mulches. The bulletin has met with enthusiastic response from landscape managers in Iowa, Kentucky, and Ohio, and has been ordered by educators from as far away as South Africa and Scandinavia.

- Program 107. Iowa Beef Center.

    - The program on corn co-product feeding, storage, and pricing was developed at the request of newly built farmer-owned ethanol production cooperatives.

    - Funding was found and research initiated on economically feasible grazing systems that improve wildlife habitat as a way for cattle producers to gain greater access to hunting land.

    - Events or activities were canceled due to low stakeholder interest. Examples include:
        - Three locations of the second Cyclone Beef Days series.
        - The Bull Pen, an electronic bulletin board on our web site for producer discussions. The Bull Pen was, however, replaced by the Iowa Beef Center Question of the Week, which has garnered more interest.

- Program 108. Iowa Pork Industry Center. Implementation of the PQA certification program series was directly influenced by stakeholder input. Although the IPIC initially sponsored PQA certification education opportunities in 1998, the 2002 series was put in place after a request from one Iowa livestock packing company to provide a PQA information and training session to help ensure its producer clients would be certified through the PQA program in time to meet the company-imposed deadline of Jan 1, 2003.

- Program 109. Strengthening Iowa's Dairy Industry. A relief milker program was initiated with the cooperation of the NE Dairy Foundation, Sedona Ag (farm employment agency in Dubuque), and ISU Extension. To date 12 relief milkers and 25 NICC students have received training conducted by ISUE and the NE IA Dairy Foundation. A part-time coordinator has been hired by the Foundation and Sedona Ag to facilitate the program.

- Program 142. Integrated Pest Management and Integrated Crop Management: The Pest Management and the Environment Team at Iowa State University in 2002 conducted a stakeholders' session for 15 producers and industry representatives to provide a vision for

future IPM activities at Iowa State University. This meeting was devoted to a discussion of current and future pest management needs, and how Iowa State University research and Extension can address these needs through program redirection.

- Program 143: Pesticide Applicator Training: Stakeholder input is important for the development of the optional topics presented at the private pesticide applicator training meetings. Each year, the state staff elicits topic ideas from producers and state field crop specialists. The optional programs are directly related to current concerns and emerging issues throughout the state. Last year these concerns included program development on a variety of weed management concerns, namely information on Callisto, brush and non-rowcrop weeds, and drift concerns. In addition, emerging information on the Agricultural Health Study was presented to private pesticide applicators. This long-term study was established to look at the relationship between agricultural exposures and how they affect the health of the farmer and his or her family over time. Last year, information collected from 1994—1999 was presented during the private pesticide applicator training meetings.

- Program 145: Farm Safety:

    - Iowa State University has developed and maintains cooperative relationships with Iowa Center for Agricultural Safety and Health (I-CASH) at the University of Iowa, the National Education Center for Agricultural Safety (NECAS) at the Northeast Iowa Community College, and other farm safety focused organizations. These organizations have input mechanisms for stakeholders that are used in developing the farm safety programming. Iowa State University Extension Farm Safety Leader also uses an advisory group with members consisting of farmers, insurance company representatives, equipment dealers, health departments and health care professionals. This informal group advises the farm safety program leader as to the priority of needs and serves as a transfer mechanism to distribute safety information through their organizations and out to the population they represent.

- Program 147: Sustainable Agriculture: Key stakeholder input on sustainable agriculture priorities and directions was formally solicited through:

    - A written organic farmer survey to 143 Iowa certified organic producers. A 50% response rate was achieved. A multi-state survey with Kansas and Nebraska was developed for approximately 100 additional stakeholders.

    - Through four (4) focus groups of Iowa farmers, landowners, and renters on the implementation of more sustainable practices and leases.

    - An additional input session on organic research priorities for outlying research activities (Neely-Kenyon Farm) was conducted with farmer, researcher, industry, and Extension input.

C. Program Review Process:

There has been no change in the review process.

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

1) Did the planned programs address the critical issues of strategic importance, including those identified by stakeholders?

   The planned programs were based on input from stakeholder groups and scientists who identified the most critical issues. In many cases, stakeholders are involved in the implementation of applied research efforts and educational/demonstration programs. In other situations, stakeholders through their commodity groups, provide additional funding to address issues of strategic importance.

2) Did the planned programs address the needs of under-served and under-represented populations of the state?

   Examples of work with underrepresented and underserved groups: In general, all research programs have a multicultural group of graduate students.

   - Program 2: Input from landowners has been sought in conjunction with all work related to riparian buffers through public listening sessions and surveys. Use has also been made of national surveys that sought input from a much larger and more diverse population base that included minorities. Efforts to develop new bioproducts and niche markets are highly focused on local entrepreneurs, RCND's and co-ops interested in developing alternative sources of income for farmers as well as creating local employment opportunities.

   - Program 9: Presented a Shortcourse in Endocrinology at a historically black institution—Voorhees College, Denmark, South Carolina, April 16-19, 2002. This Endocrinology Shortcourse for minority institutions is administered by The Endocrine Society and supported by a grant from the National Institutes of Health.

   - Program 10: Outreach efforts in developing value-added programs that emphasize superior meat quality in pigs were geared to small farm owners and niche market producers.

   - Program 11: Interacted with six small family farmers in Northeast Iowa while conducting on-farm research funded by a USDA SARE grant.

   - Program 13: The Beginning Farmer Center works with small, disadvantaged, and beginning farmers. Hoop systems for pork production are designed to allow those with limited capital get started in swine production and thus are most applicable to disadvantaged farmers.

   - Program 14: The LGM insurance program was designed to allow small, diversified, and independent hog producers to manage their price risk through an insurance contract rather than through a packer contract. Many under-served farmers were helped indirectly by the offering of new risk management products.

- Program 18:

    - Nutrition-related studies among the HIV-infected population have focused mainly on adults and problems of wasting while little is know about the adolescent population. This study documented a high prevalence of obesity and low intake of specific anti-oxidants among an US HIV-infected adolescent population.

    - Poor complementary feeding practices is a primary cause of malnutrition in young children in low-income countries. This study documented the practices of child feeding in Ghanaian and Peruvian communities.

- Program 20: Research on organic pest management methods for control of chrysomelid beetles in squash and soybean production identified the practicality of cultural controls, such as floating row covers over kaolin clay products. Work continues with the USDA Organic Transition Program Organic Weed Management project with scientists at Tuskegee University. This program involves minority farmers and staff in developing non-toxic weed management strategies in order to sell crops under a certified organic label. The first successful organic sweet potato crop was produced in 2002 at Tuskegee.

- Program 23: A major audience for the hoop manure research is small farm owners and operators. This system is widely recognized as the affordable alternative for beginning farmers and those with limited resources. Outreach through Practical Farmers of Iowa and Leopold Center events provides good access to these audiences.

- Program 27: Meeting with local groups of low-income persons to plan strategies for citizen participation in the EZ/EC initiative. Workshops and training helping low-income persons obtain adequate housing. Research on labor force participation for non-whites and women. Conducting research on women-owned small businesses in rural and urban Iowa. Iowa Community Voices Program directed at helping Hispanic populations in Iowa develop organizational linkages in their communities. Publication of Census data reports on conditions of minority and underserved populations in Iowa. Working with women as underrepresented minorities at Iowa State University. Working with low-income women as they attempt to provide adequate health care for their families.

- Program 28: Older women were surveyed regarding understanding of sun safety and apparel shopping enjoyment and fashion interest. Also, information concerning the needs of the handicapped and elderly was presented at a conference to an international group of educators and researchers.

The following examples provide support to the fact that ISU Extension is committed to working with traditionally under-served and under-represented populations, and in doing that works closely with researchers at ISU and across lines in multi state efforts:

- Program 104. The web-based home study course was designed to serve any client who cannot participate in traditional Extension meetings and workshops due to time or location constraints.

- Program 106. A "Diversity Garden Project" was implemented in three locations in Iowa. The hands on gardens were used to provide training and education to 139 Latinos about commercial horticulture production of vegetable crops. Eleven ISU Extension gardening publications have been translated into Spanish.

- Program 107. Many Iowa Beef Center activities are with limited resource clients, farm couples, and female producers. Chariton Valley Beef, Raccoon Valley Cow Calf Association, and IMBIO programs specifically target smaller cattle operations to help producers effectively combine their animals into large group sizes (e.g., truckload lots) before selling and/or assure greater market access.

- Program 109.

    - An additional Jewish person was assisted in exploring the potential of producing Kosher cheeses for the Jewish communities in the Eastern US. To date this potential Kosher cheese farmer is still in the exploration stages.

    - Two Latino farmers/businessmen were provided a view of small dairy farms and a can delivery creamery. They are working with small dairy farms in Central America. Two farm visits and the creamery visit provided new perspectives to the Latinos on quality milk from small dairies.

    - Six dairy women's peer groups were started in an attempt to bring dairy farm women together to discuss mutual concerns and help relieve some of the stress being experienced by dairy farm families. The effort has received national attention, being featured in the December issue of Hoard's Dairyman magazine.

- Program 146. Ten consumer horticulture extension pamphlets have been translated into Spanish to better serve a growing Latino population within the state. Following consultation with Latino families, the pamphlets selected for translation dealt primarily with vegetable and small fruit production. The ISU Garden Calendar, a full-color calendar of advice and information for the past 25 years was translated into Spanish for the first time in 2002 (for the 2003 calendar).

- Celebrate Families for Spanish-speaking: Spanish-speaking staff from Columbus Junction School were trained by ISU Extension in the Celebrate Families curriculum. Staff then held 4 sessions of Celebrate Families for Spanish-speaking families with 15 parents and 18 children participating in parenting education. Participants report increases in knowing positive character traits in their children, self-esteem and respect among family members, rules and consequences for behavior and regular family meetings.

- Latino Health Fair: At a Healthy Communities meeting, a major employer in Ottumwa (600 Latino workers Latino) expressed the need to reach out to the Latino population with health information and screenings. The committee, representing 8 community groups, including the Extension Family Nutrition and Health and Communities Specialists, made a commitment to meet this need at no cost to participants. 140+ participants attended the 2-phase Health Fair from 5 communities (interpreter provided

each day). 55 children took part in Phase One health screens: 12 blood lead levels completed, one referred for follow-up; 7 of 20 children referred with vision problems; 48 iron counts done and all normal; 20 screened for hearing with 6 referrals; 42 dental screens resulted in 93% referral. Results of adult screens were: 43 cholesterol/blood glucose checks completed with 2 referrals – 17 had elevated cholesterol; 100+ blood pressures checked with 2 referrals; body fat, height and weight were checked; results not available. A 4-H club and the hospital provided snacks; a packing plant provided lunch. Extension had a display of Hispanic nutrition/health related materials. Phase 2, a bus/walking tour (two weeks later), acquainted families with health service locations. 29 participants took part (buses donated by the local transit company). Participants indicated appreciation for having health care service points identified.

- Precious People and Tinker Tots Preschools Sustainability Project: ISU Extension staff and the Taylor County Empowerment Board developed a strategic plan to address sustainability for two preschools on the verge of closing. After consultation, staff and preschool boards implemented almost 100% of the recommendations made by ISU Extension. Preschools adopted a sliding fee scale, resulting in higher tuition; staff evaluation instruments were located; and a computer accounting program purchased. The preschools addressed issues identified in Early Childhood Evaluation Rating System (ECERS) and used it as a step towards accreditation.

- Predatory Lending Town Hall Meeting: A Town Hall Meeting, a series of programs on the City cable station, and radio programming on a minority-owned radio station were delivered to inform citizens in Black Hawk County (Waterloo) of predatory lending and citizen's rights in dealing with predatory lenders. After the ISU Extension programs, respondents reported they could recognize predatory lending practices and know where to go to for help.

- Ways to Work Family Loan Program: 163 working parents with limited resources completed the ISU Extension financial management education class required to participate in the Family Loan Program in the Quad Cities. Participants began savings accounts, paid past bills early, developed budgets, and became aware of how money was being spent. $88,675 was loaned to families to assist them in staying employed and 21 loans were paid off.

- Hispanic Diabetes Awareness: The Winnebago and Franklin County Extension Services received a Department of Public Health grant to provide awareness about Diabetes to Hispanics in Franklin County. Programming focused on locating information in Spanish, translating information, and reaching families, the real challenge. English/Spanish displays on Diabetes were created, a program was given at Casa Maria's restaurant, and Diabetes testing was offered. Information was given to youth in summer Latino youth programs and through the FNP curriculum for Latino mothers. Information was sent home with 58 youth on diabetes and diabetes programs. 6 FNP participants learned about healthy eating to prevent diabetes. 33 family members viewed displays, picked up information, visited with the dietitian, and tried food samples at Casa Maria's. At the Health Fair, 100 participants, mostly Hispanic, visited with staff. 46 people participated in the glucose screening; 5 were referred to a physician.

- Creating Father Friendly Communities: ISU Extension is recognized as a leader in parenting education and fatherhood programs and has begun the "Father Friendly Community" program in eastern Iowa. $52,000 was secured to conduct:

    - "Dads Make a Difference" presentations (250 individuals, community leaders, and professionals attended)
    - "Me & My Dad" Web site (www.extension.iastate.edu/dads) (1,500 visitors from 58 countries per month)/ 321 subscribers receive "Dads" monthly updates
    - D.A.D.'s groups (Dads Assisting Dads community-based fatherhood groups)
    - Cooperative Parenting (fathers and mothers in divorce or separation)
    - Second Step Parenting (court ordered parents)
    - Intergenerational Dialogue on Fatherhood issues (community awareness and input)
    - Academy of Fatherhood (training for professionals working with parenting education groups)

- Dairywomen's Peer Group Introduced: Family Resource Management and Dairy Specialists invited nine dairywomen from Osceola & O'Brien counties to a meeting about starting a Dairywomen's Peer Group, addressing the need for farm women to develop a support system to help manage stress. The program resonated with challenges of concurrently running a dairy, a family, and a personal life. The next meeting will focus on Improving Family Communication.

- E-SET partners with Science Bound. Science Bound is a program that targets under represented youth in the Des Moines School District. E-SET provides teacher in-service for Science Bound teachers as well as kits and curriculum used by the youth. The E-SET Paper Rockets were very popular last year.

- Mundo Mágico de Aventuras (Magical World of Adventures) is a multi-session day camp for English-language learning children in four north Iowa communities who have completed Pre-school (PK) through Fifth Grade. The program offers children a variety of ways to practice their English during the summer months through hands-on, experiential learning and lots of fun. The children also get acquainted with their community through visits to the public library, local businesses, and other places of interest. Mundo Mágico reached 58 Latino children between grades PK -5 in four communities. There were also two adult volunteers (one Caucasian, one Latino). Dulce DeLeón, youth program coordinator, says, "The hardest thing in learning a new language is confidence. If others make fun of you when you mispronounce something you loose that confidence…That's why Mundo Mágico makes a great place to practice your English skills. No one will make fun of the way you pronounce things." Community partners included the public schools, public libraries, and local churches.

- Black Hawk County has been doing after-school programming in Waterloo and Cedar Falls as part of the 21st Century Grant. Programming focuses on the science curriculums such as Rockets Away, Robotix, Wonderwise and Amazing Human Machine. These programs have reached minority youth on the East side of Waterloo an area we have had difficulty getting 4-H clubs started. The programs at Logan Middle School were 86%

African American, in addition we have reached several youth with learning disabilities. The programs have also had high participation by males-approximately 75%.

- Through a BASIC grant, Growing in the Garden and Nutrition education were offered in two low-income schools in Waterloo. A program assistant was hired to help teach lessons in the classroom about the monthly fruit or vegetable of the month as well as gardening. These activities reached over 600 low-income youth with nutrition education on a weekly basis. The one school has well over 50% minority enrollment and also has over 90% of the youth receiving free and reduced lunch.

3) Did the planned programs describe the expected outcomes and impacts?

The planned programs developed specific outcomes that would occur over a period of five years. In some programs, outcomes and impacts have occurred in the first year but many impacts will occur throughout the five-year period and beyond. Under each Goal, specific progress towards the outcomes and impacts are documented.

4) Did the planned programs result in improved program effectiveness and/or efficiency?

At ISU, research and extension programs have had a historic and strong connection that increased the effectiveness of both programs. In most programs, the results of extension education and demonstration activities inform the research agenda while all extension education programs are research-based. Specific examples of the effectiveness of integrated programs are described under section F of this report.

E. Multistate Extension Activities:

1. Midwest Plan Service

The Midwest Plan Service (MWPS) enhances the outreach, research, and teaching programs of the land-grant universities of the 12 states in the North Central Region by preparing and distributing educational materials that are based on the coordinated recommendations of the extension and research units of the participating institutions. These materials include, but are not limited to agricultural engineering and the interaction of engineering with other disciplines. Iowa Extension supported the multi-state work of MWPS through a payment of $22,248 during FY 2002.

2. NELD

The National Extension Leadership Development Program (NELD) was created to enhance leadership in Cooperative Extension at all levels and to provide current and future extension leaders with the vision, courage, and tools to deal with a rapidly changing world. This program is a part of extension's overall national leadership effort. During FY 2002, Iowa Extension supported the National NELD program with a payment of $3,687. There is also a NELD program supported by extension in the North Central Extension region. Iowa Extension has staff currently participating in the North Central NELD Program. Expenses for these staff amounted to $17,457 during FY 2002.

3. North Central Regional Center for Rural Development

   The North Central Regional Center for Rural Development (NCRCRD) is a cooperative program among the 12 states in the North Central Extension region. NCRCRD initiates and facilitates rural development research and education programs in the region. NCRCRD also provides regional and national leadership in rural development by identifying, developing and supporting programs on emerging issues. Iowa Extension supported the multi-state work of NCRCRD through a payment of $2,553 during FY 2002.

4. Pork Industry Handbook

   The Pork Industry Handbook (PIH) is a national project supported by state extension services. The project has published over 125 new and over 125 revised fact sheets using the services of over 800 authors and reviewers from 49 states as well as USDA. Versions of the PIH are available on CD-ROM. Iowa Extension supported the multi-state work of the PIH through a payment of $7,926 during FY 2002.

5. Agriculture and Natural Resources Extension Program Director

   The State Director for Extension Agriculture and Natural Resources (ANR) programs in Iowa spent time during FY 2002 on national and regional programs/activities. These activities included a small farm task force, sustainable agriculture (SARE), integrated pest management, pesticide applicator training, multi-state organic agriculture training, North Central Region pest management center, and general ANR program coordination among the state ANR program directors. This represented about 8.8% of the ANR Director's time, which was equal to $10,900 in alary during FY 2002.

6. Families Extension Program Director

   The State Director for Extension Families programs in Iowa spent time during FY 2002 year on national and regional programs/activities. These activities included service on the national ECOP financial literacy and welfare reform ad hoc committee; work in support of the National Network for Children, Youth and Families; assistance with spreading the Iowa Strengthening Families Program nationwide; support of Building Work Assets efforts; Housing Maintenance Hotline, the Impact of Entertainment Media Violence on Children and Family satellite series and general families program coordination among the state Families program directors. This represented about 7.4% of the Family Director's time, which was equal to $7,982 in salary during FY 2002.

7. 4-H Youth Extension Program Director

   The State Director for Extension 4-H Youth programs in Iowa spent time during FY 2002 on national and regional programs/activities. These activities included national and regional meetings of state directors of 4-H Youth, serving as a member of the National 4-H Council Board of Trustees, serving as a member of the 4-H Name and Emblem Committee, and ongoing efforts with state 4-H Youth staff from Minnesota and Wisconsin to work on tri-state efforts in staff development, volunteer development, and evaluation. This represented about 7.2% of the 4-H Youth Director's time, which was equal to $7,688 during FY 2002.

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: Iowa State University
State: Iowa

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

	Actual Expenditures				
Title of Planned Program/Activity	**FY 2000**	**FY 2001**	**FY 2002**	**FY 2003**	**FY 2004**
Midwest Plan Service	22,248	22,248	22,248		
NELD	10,899	22,034	21,144		
North Central Regional Center for Rural Development	2,553	2,553	2,553		
Pork Industry Handbook	7,926	7,926	7,926		
Ag Prog Director (National & Regional Resp.)	10,500	11,000	10,900		
Families Prog Director (Nat'l & Regional Resp.)		7,892	7,988		
Youth Prog Director (Nat'l & Regional Resp.)		7,519	7,688		
Total	54,126	81,172	80,447		

_____ _____
Director **Date**

Form CSREES-REPT (2/00)

F. Integrated Research and Extension Activities:

Hatch Act Funds:

A significant portion of our integrated activities is determined by participation of faculty with split (research/extension) appointments in multistate activities. Occasional adjustments are made in faculty appointments, and from time to time the Iowa representation on and participation in multistate activities changes. Thus, some unplanned movements in resources have and do occur. While the overall expenditure of resources for integrated activities meets our planned commitment, there is some shifting among the various programs and activities.

Brief statements follow on the integrated activities funded from Hatch funds:

Food Crops (Program 1):

- Variety and cultural techniques remain a priority for growers throughout the state. Field testing of apple scion/rootstock combinations, strawberries, and asparagus continued at several sites. Special emphasis was placed on cultural techniques that would result in uniform bell pepper production throughout the growing season. Results indicated that variety selection, timely planting, and scheduled irrigation management were important to maintain high-quality yields.

Plant Germplasm (Program 4)

- Corn breeding trials and variety demonstrations were conducted throughout Iowa in FY 2001-2002. The Iowa Corn Performance Test was implemented for the 83rd consecutive year. Iowa farmers were provided information about hybrid performance, disease and insect resistance, herbicide resistance and grain quality. Current issues concerning genetically modified traits in corn make these efforts in extension and research very important to Iowa farmers. This information was provided to ISU clientele electronically, verbally, and through publications. Field days were held, and grower meetings conducted. The information disseminated is critical to the economic stability of Iowa corn producers.

Crop Production and Management Strategies (Program 5)

- A number of important programs contributed to this goal including soybean variety tests, specialty corns, weed management, forage production, and fertility tactics. Research continues on investigations about the evolution of herbicide resistant weed populations, and weed population shifts in weed communities. Specifically, the evolution of glyphosate resistance in Iowa weed communities is researched and information developed in to extension programs. Fertilizer research provided Iowa growers with optimum amounts of nutrients to maximize production efficiency and profitability. Evaluations of soybean varieties, particularly genetically modified varieties were conducted across Iowa. Information resulting from the research was used to generate extension publications, production recommendations, and bulletins. Meetings were conducted to provide growers with this information, field days were scheduled across Iowa, and questions answered via the telephone and email.

Green Industry (Program 7)

- Results from turf and ornamental research trials have been demonstrated at the summer Turf and Landscape Field Day in Ames, IA. In addition, the annual winter Iowa Turfgrass Conference and the annual Shade Tree Short Course have been used to disseminate current research findings that are required to update the industry and provide continuing educational units necessary for certification in industry associations. Research and demonstration topics included plant variety selection, pest control, fertility and growth regulation, and environmental impact assessment. Over 550 Iowans participated in the summer field days and over 2000 Iowans participated in the winter education sessions.

Physiological Basis of Animal Reproduction (Program 9)

- Provided extensive technical and educational support on the issue of jejunal hemorrhagic bowel syndrome in dairy animals statewide, regionally, and nationally. Co-organized and conducted the first regional Dairy Reproduction Symposium as part of the NCR Bovine Reproduction Extension Consortium.

Genetic Enhancement of Agriculturally Important Animals (Program 10)

- Integrated activities included research with swine to determine the genes associated with important economic traits. Stakeholder input came primarily from the swine breeding companies, which would be the facet of agribusiness to implement the major findings of the research, and from popular consumer preferences to move towards production of animal products that meet specific organoleptic properties desired by consumers. The inputs from these stakeholders helped to shape the goals of the specific research projects and the materials used in the research. Studies were conducted to identify specific DNA markers that could be used by the breeding industry to utilize existing, natural genetic variation to improve pork meat quality. Outputs included many invited national and international presentations to transfer information to target audiences of agribusiness and university scientists, and publications on the research results in trade journals and scientific journals.

Develop and Integrate Nutritional Knowledge to Enhance Animal Production (Program 11)

- Integrated activities included studies with monogastric farm animals on the role of nutrition in regulation of animal production traits. Stakeholder input was primarily in the form of popular consumer preferences expressed for natural products, for foods with enhanced qualities, and for systems of environmentally sustainable animal agriculture. Advice and counsel from state agribusiness scientists were also received. This input influenced choices of specific research questions addressed in research. Bio-active compounds, several diet formulations, and feed additives were examined for their effects on functions of cells and tissues, and on metabolic pathways. Natural compounds were studied for their ability to enhance characteristics of animal-derived food products. Outputs included the additional knowledge gained from the research and the distribution of that new information to producers and other scientists via oral presentations and publications.

Potential of Alternative Livestock (Program 12)

- This program provides basic information on cultural and husbandry principles and techniques to Iowans engaged in aquaculture (fish farming) and game ranching as a primary or supplemental income source. Pertinent regulations, marketing information, as well as new research-based knowledge to maximize production efficiency, enhance profits, and ensure operations comply with environmental and health (animal and human) standards are communicated. Because of limited resources information and publications are exchanged with similar programs in the region in order to serve such a diverse clientele base. Stakeholders of this program include Iowa fish farmers and game ranchers and state and federal agencies that have regulatory authority in the alternative livestock industry.

International Economic Competitiveness and (Program 13)

- Uncertainty caused by consideration of the new farm bill increased the demands by commodity groups, House and Senate agriculture committees, and the press for analysis and interpretation. One example of such analysis is that CARD helped the Senate Ag Committee understand that their farm bill commodity title had a high likelihood of exceeding WTO spending guidelines. Subsequently, they modified their final farm bill language to require spending cuts if WTO limits are exceeded.

- The new Doha round of international trade negotiations has increased the need for knowledge of the effects of trade liberalization. CARD's FAPRI group analyzed the effects on prices and production of complete removal of domestic subsidies in the United States and other countries as well as the removal of all tariffs and import quotas. The results indicate that such liberalization would simultaneously increase the prices received by farmers and reduce the prices paid by consumers.

- The Center for Agricultural and Rural Development published the results of its econometric research and policy analysis projects in 42 CARD Series papers in the 2002 federal fiscal year. The quarterly outreach newsletter, *Iowa Ag Review*, synthesized a portion of this research and analysis, targeting food, farm and environmental issues of interest to Iowans.

- The *FAPRI U.S. and World Agricultural Outlook* is available via the FAPRI website in several formats, and data is now available for specific commodities, countries, and activities. It is hoped that easy access to this information and the full body of CARD and FAPRI content will further inform future debate on policy that affects agriculture, trade, food, and the environment.

- CARD's website continues to receive a high volume of traffic to its loan deficiency payment (LDP) tool, where producers can find daily LDP rate information, along with an explanation of the program.

Agricultural Risk Management (Program 14)

- Congress passed legislation in 2000 that increased subsidies to encourage farmer purchase of lower-deductible policies. In response to requests for information from Midwest crop insurance companies and USDA's Risk Management Agency, CARD researchers analyzed the appropriateness of USDA crop insurance rates for low deductible policies. Results

indicated that most farmers are being charged rates for low-deductible policies that are too high. These results gave impetus to an overhaul of USDA's crop insurance rates, resulting in a lowering of rates for many farmers for the 2003 crop year.

- Iowa hog producers had the opportunity to buy federally reinsured livestock insurance for the first time in 2002. Livestock Gross Margin insurance offers independent hog producers the opportunity to insure the difference between the market value of their hogs and the cost of feed. This insurance program was jointly developed by CARD, the Iowa Department of Economic Development, the Iowa Farm Bureau Federation, and three Iowa-based crop insurance companies.

Agricultural Information Technology (Program 15)

- Many consumers express concern about consuming products produced using biotechnology. In some countries there are restrictions on import and sale of such products. Producers of these products, companies in the agro-biotechnology industry such as Monsanto and Syngenta have engaged in information wars with consumer and environmental advocacy groups such as Greenpeace and Friends of the Earth. So that we might better understand the impact of information (and misinformation) on consumer choices, a project was developed to analyze consumer willingness to pay for products with different characteristics and different labels. The project focused specifically on assessing the effects of GM food labels on consumers' willing to pay for foods that might be genetically modified. Results showed that consumers are willing to pay about 14 percent more to consume foods that they perceive as being non-GM. Hence, mandatory GM food labels are not in the best interest of the biotechnology industry, but may make consumers better off. Results of this work are being distributed to consumer and industry groups.

Food Safety (Program 17)

- Dong Ahn (faculty member in Animal Science on joint appointment between research and extension): The information generated from the S-292 research project has been transferred to producers, processors, consumers by answering questions, radio and newspaper interviews, and presenting seminars.

Improving Human Foods (Program 18)

- A method was developed for measuring fluid properties (yield stress) in foods, especially thick viscous foods such as catsup. The Brookfield Company is now marketing a Rheometer for quality control in food plants based upon these achievements.

- Nationally, the food safety of apple cider has come into serious question because of *E. coli* outbreaks. ISU research on apple cider has improved the quality and safety of products produced in Iowa as well as large numbers of producers have been retained in this important rural industry. Outreach efforts to cider producers have assisted them in implementing good manufacturing practices (GMP), standard operating procedures (SOP), and hazard analysis critical control points (HACCP) plans. Cider safety information was posted on the ISU Food Safety Website. No apple cider food-borne illness outbreaks occurred in Iowa last year.

Research on the effects of irradiation on cider safety and quality could lead to the development of an alternative processing method for cider.

Soil Resources Management (Program 21) and Sustainable Agriculture

- Integration continues through cooperative research/extension planning and execution, field days, resource sharing and participation in cooperative trainings and publications.

    - Sustainable and organic agriculture are important areas in Agronomy research and extension programs. Research was conducted on the improving the sustainability of crop production. Specific research on organic tactics for soybean production and weed management was developed. Information from this program is disseminated in meetings, extension brochures, workshops, conferences, and one-on-one discussions.

- The efficient use of fertilizers, including manures, continues to be a significant issue in Iowa crop production. Research was developed to describe the inappropriate use of these inputs thus avoiding unneeded expenditures for Iowa farmers and minimizing the negative contributions of these inputs to the Iowa environment. Research and extension programs in soil resource management provide Iowa with the latest and most objective information to a number of clients including Iowa farmers, the agrochemical industry, and water quality professionals. Specifically, phosphorus, potassium and nitrogen uses were investigated and innovative ways to improve use efficiency were researched. The efficiency of using animal wastes in Iowa agriculture in an effort to minimize environmental contamination while increasing crop production was investigated and reported. This program is critical given the importance of pork and poultry production in Iowa. Strip tillage research was conducted in an effort to minimize soil erosion while improving water quality and crop production. Information was disseminated in extension programs via all forms of media, field days, and personal visitations.

Integrated Pest Management (Program 22)

- Public and private soybean varieties were evaluated for resistance to sudden death syndrome and to the soybean cyst nematode. Results of these trials were made available to seed companies and the public through publications and on the ISU extension web site.

- Fields experiments on controlling soybean bean pod mottle virus were conducted. Results were disseminated to producers through extension meetings and extension publications.

- Numerous soil amendments that are being sold in Iowa for use in managing the soybean cyst nematode were tested in a field experiment and in controlled greenhouse experiments for effects on soybean cyst nematode and soybean growth and yield. The results of these experiments were presented to growers at Extension and agribusiness meetings conducted throughout Iowa.

- Studies were also conducted in assessing and managing the risk of soybean rust, a potential threat to U.S. soybean industry. Information was made available to the soybean industry nationwide.

Animal Waste Management (Program 23): Funds set aside for integrated activities provide support for faculty in the Department of Agricultural and Biosystems Engineering.

- Jeff Lorimor has been concentrating on evaluating alternative technologies for treating open feedlot runoff, and conveying that information to the Iowa Cattle producers and governmental agencies such as IDNR, NRCS, and EPA. He has been developing models to characterize the effectiveness of total containments as well as alternative technologies at protecting water quality. This project involves direct participation of producers, and including field days and the development of Extension publications detailing the operation and effectiveness of the alternative technologies demonstrated and researched. Other water quality research has related to impairment caused by stockpiled poultry manure. Results from this project have been presented at state and regional meetings of poultry producers.

- Stu Melvin conducts research to determine the potential for new technologies to assist with animal waste management. One project, funded by NRCS in Washington DC, looks at the cost of various technologies that are expected to be used for various animal species in the next 10 years, and to determine if there are any regional differences in costs for these technologies. NRCS needs to know what expected costs are associated with the imposition of a phosphorus standard for land application. This information is delivered through extension outlets to assist Iowa animal producers with evaluation of new technologies for animal waste management.

Improving Water Resources Management in an Agroecosystem (Program 24)

- This program focuses on several issues of importance to understanding the interrelationship between water quality and agriculture: 1) describing the sources of water quality problems and the feasibility of remedial measures for lake and watershed restoration; 2) calculating economic and cultural benefits derived from societal uses of the water resources; 3) constructing models of critical habitat for endangered fish and freshwater mussels that allow water resource development but maintain biodiversity; and 4) contributing to environmental databases for improved state and federal water resource management programs. Many of the activities identified above are conducted in concert with North Central Regional Project NC-230 (Integrating Biophysical Functions of Riparian Systems with Management Practices and Policies) as a means to both regionalize the research and facilitate communications across the region. Stakeholders of this program include Iowans as well as residents of adjacent states that utilize the water resources of the upper Mississippi River Drainage, state and federal agencies that manage those resources, and environmental NGOs.

Improving Environmental Quality in a Changing Landscape (Program 26)

- This program focuses on basic research on evaluating agricultural landscapes and several forms of habitat manipulations and restorations within such landscapes that will help policy makers and resource managers to better understand the implications of agricultural policy on Iowa's wildlife populations. Stakeholders of this program include Iowans who utilize the state's natural areas and wildlife, and state and federal natural resources agencies. Focus continues to revolve around water quality issues in the immediate vicinity of Clear Lake. Researchers from Iowa State continue to work with community leaders on site to do focus

group work and to better understand the value that people place on the lake. Community leaders and state government officials are using this information to develop plans for improving water quality in the lake. The water quality sampling conducted as a part of this program is also a component of North Central Regional Project NC-230 (Integrating Biophysical Functions of Riparian Systems with Management Practices and Policies).

Rural Development (Program 27)

- Implications of Changing Rural Populations: Demographic analysis on major population shifts in the state and North Central Region is critical to understanding the changing nature of rural communities. In response to shrinking employment opportunities in farming, communities that traditionally were dependent upon farming have sought to create new jobs in value added agriculture or light industry. Secondary data analyses on population changes, employment trends, housing stock, etc. are critical pieces of information for community development specialists. The establishment of the Office of Social and Economic Trend Analysis (SETA) between the Department of Sociology and Department of Economics demonstrates how large scale data systems can benefit rural development efforts. Analysis of census data and making it available on the web, through the printing of brochures, data books and power point presentations to extension field specialists and county extension directors provides strong link between demographic research and extension.

- Implications of Changes in Agriculture on Rural Communities and the Environment: Integrated funds have supported the ongoing Iowa Farm and Rural Life Poll, a longitudinal panel study of Iowa farm families. Through a collaborative agreement with the Iowa Department of Agriculture and Land Stewardship, Division of Statistics, the project uses state of the art survey research methods to address important issues associated with changes in agriculture. In response to a request from the Iowa Department of Agriculture and Land Stewardship, data were collected on the 2002 poll that assesses producer attitudes and behaviors concerning nitrogen fertilizer management. As part of a statewide evaluation process of local demonstration projects, the IDALS requested assistance from the Sociology Department to include some benchmark data collection on the poll. It is increasingly recognized that protecting the environment, cleaning up the 157 lakes, streams and rivers in the state that exceed the EPA guidelines is critical for rural community vitality. Environmental quality is a key component of the rural development agenda in the state, and through systematic data collection we are able to assist in program efforts to improve environmental quality and strengthen rural communities.

  One significant shift in Iowa agriculture is related to landownership. Increasingly women own more land in the state as a result of being widowed or through inheritance. The Women, Food, and Agriculture Network is an important partner in designing research that is relevant to the increased incidence of women landowners in the state. Research on women landowners is being widely disseminated though extension and the grassroots effort.

- Rural Development Leadership: Strong rural communities generally rely upon local volunteers. Integrated research and extension funds have been used to support the collection of data, alterative models and methods of rural leadership training guides. Local extension councils, extension field staff and local officials continue to request assistance in identifying

and nurturing new emerging leaders. Local leadership is critical to rural development initiatives, but unfortunately in too many cases there are not a critical mass of competent leaders. Leadership training institutes organized through local service clubs, community betterment associations draws heavily from the research the Sociology conducts on principles and practices of leadership.

Fiber Related Products (Program 28)

- NC-170: Attitude data from the Polk County survey of 1999 was used to study differences between older and younger aged groups. The mean age was 53, so the sample was divided at age 50. Younger respondents were more likely to agree sunscreen helps reduce and combat the signs of aging, that suntans helped them feel sexier and show off their physique. Older respondents were more likely to agree they cover up with light-colored clothing 'to prevent sunburn' and that they 'use an umbrella for sun protection'. In general, younger respondents were more concerned about appearance, whereas older people were more concerned about protection. A major educational exhibit on use of apparel for sun protection at the Farm Progress Show included skin cancer screening conducted by volunteer physicians for 294 people. It also included a survey to verify Polk County findings. Over 1400 respondents completed the survey; data are being coded and analyzed.

Value Added Agriculture (Program 29)

- In cooperation with Genencor (Palo Alto, CA), technologies were developed to utilize enzymes to enhance soy protein products. An enzymatic soy hydrolysis was shown to produce a protein hydrolysate that conferred improved adhesive properties. This hydrolysis procedure is much more environmentally friendly than the traditional alkaline hydrolysis method. Various carbohydrases were shown to enhance protein recovery from soybean meal. Both proteases and pectinases were shown to improve the functionality (performance properties) in foods.

- Nanocomposite plastics in which soy protein is the major component were developed with improved water resistance and mechanical properties. These products should be suitable for high-performance plastic products such as computer cases and other durable goods). SoyWorks, Woodridge, IL, has commercialized several ISU soy protein plastics. Chicken feathers were also found to be a suitable protein for plastic applications due to its improved water resistance properties. Sara Lee (Chicago, IL) has partnered with ISU faculty to develop this technology so as to alleviate a major waste problem in chicken production.

- Several microbial bioconversion strategies for solid-state fermentation of agro-industrial byproducts into value-added products were developed, including corn masa, spent fermentation bacteria, and biconversion of corn stover for energy, industrial chemicals and fiber. Spent microbial biomass was successfully incorporated into a biocomposite adhesive system. This protein adhesive produced good internal bonding, excellent resistance to wet swelling, and significantly reduced formaldehyde emissions in medium density fiberboard. This application provides a high-value use for a common industrial byproduct, while achieving several important performance properties for the biocomposite industry.

- Technology was developed to significantly improve the performance of wood and wood fiber based composite adhesives with soy protein. This technology is based on the reaction of soy protein with the petroleum-based resin, phenol formaldehyde. The soy-based product can replace up to 70% of the petroleum-based components of current adhesives and reduce the exposure of workers to hazardous phenol and formaldehyde. This adhesive was shown to work well on wood fiber, corn stalks, wheat straw, switchgrass, recycled wood and even livestock manure fiber. The soy-based adhesives are equivalent in strength to current petroleum-based adhesives, superior in water resistance to interior-grade adhesives, and nearly equal in water resistance to exterior-grade adhesives. Soy protein adhesives are more environmentally friendly and cost less than most traditional adhesives.

- The Small Business and Industry Incubator program coordinated by CCUR has had several resident companies during the past year. These include Proliant, Ames, IA; Ajinomoto, Eddyville, IA; and Kemin Americas, Des Moines, IA. Ajinomoto relocated the CCUR portion of their program to the ISU Research Park during the year. Over 15 different companies used the pilot-plant crops-processing facilities of CCUR during the past year in developing their own proprietary technologies. The NASA FTCSC has 17 commercial partners and is very close to getting three food products onto the Astronauts' Menu List. This center also has over $1.7 million in in-kind activities through its commercial partners.

- An internet website (www.ag.iastate.edu/centers/ccur) was maintained and a quarterly newsletter was published to disseminate advances made in developing value-added products to corn and soybeans. Approximately 50 different economic development groups, industry client groups and international visitor groups were hosted to educate them on opportunities to add value to agricultural products. Processing sample cards were produced to assist with a variety of educational programs for students, extension personnel, and other interested parties to enhance their understanding of processing technologies to add value.

Activities:
Poultry Production Systems (faculty in the Department of Agricultural and Biosystems Engineering are supported by funds set aside for integrated activities):

Jeff Lorimor is a participant in the development of an Air Quality Initiative to quantify and mitigate air emissions from CAFOs, and is a partner in the IFAFS air quality project on ammonia emissions from commercial poultry houses. Results are used to develop programs to present to livestock producers and others across the state as part of his extension appointment.

Honwei Xin contributes to the development and implementation of the ABE Air Quality Initiative to quantify and mitigate emissions (gases and odor) from CAFO. He conducted statewide educational workshops among swine and poultry producers concerning air quality issues relative to CAFO and provided a progress update on our ammonia emission project to state and regional poultry producers.

Grain Quality

- NC-213: The largest producer-owned grain-handling firm in Iowa, Farmers Cooperative Elevator Company, Farnhamville, instituted a complete quality management system at one of

its 35 grain elevators, located in Odebolt, Iowa. Iowa State University (Dr. Hurburgh) was the trainer. The company is now expanding the program to four other elevators, plus its feed business. The format of Quality Systems Evaluation (American Institute of Baking) was used, but the Odebolt system is now being converted to ISO 9000-2000. The company is generating at least $2 in annual profits for every $1 invested in the system. A Pioneer Hi-Bred International, Inc.-Iowa State University (ISU) team produced a 20-minute video, Planter Clean-Out Procedures for Corn and Soybeans (VID 41) and companion publications (Pm 1902-1908), that illustrate the clean-out procedures for seven different planters. An ISU Extension team produced a 20-minute video (EDC 41) Combine Clean-Out Procedures for Identity Preserved Grain and a companion publication (Pm 1923) that illustrate the clean-out procedures for a conventional threshing system combine. In 2002, the corn channeling poster project was expanded from Iowa to include Illinois and Indiana.

Seed Science

- Funds are utilized for travel expenses for the Seed Science Center external advisory board members. The input of the advisory board members is a key consideration on program initiation and implementation on seed quality issues.

- Research results are shared with academic and industry professionals to answer inquiries on seed quality. An annual conference is held to report the findings of recent research in all phases of seed science. The Seed Science Center conducted a number of short courses to train industry employees on methods to evaluate and improve germination, seed health, and genetic purity. Research-based information was disseminated via workshops on how to use sophisticated seed conditioning equipment to obtain the best results in cleaning, sorting and grading of seeds.

Smith-Lever Act Funds:

Goal 1: An agricultural system that is highly competitive in the global economy

Program 106. Commercial Greens Industry (Consumer Horticulture)

Jeff Iles: Research projects have led to improved methods of landscape plant installation, enhanced awareness of adapted landscape plant species, varieties, and cultivars, and the development of efficient and cost-effective management techniques that sustain landscape plants and reduce their need for fertilizers and pesticides. Integration between research and extension was achieved by rapidly disseminating this information to industry professionals during Iowa Nursery & Landscape Association functions, Iowa Turfgrass Field Day, Iowa Turfgrass Conference, and the ISU Shade Tree Short Course.

Mark Gleason: conducted research and extension on crown rot (pathogen: *Sclerotium rolfsii* var. *delphinii*), an important disease of hosta, which is the leading herbaceous perennial in the U.S. and is widely grown in Iowa. The research field-tested practical ways to suppress the disease by manipulation of organic mulches, and lab-tested techniques to make breeding for crown rot resistance cheaper and faster. This research will be completed in 2003. It has involved significant collaboration with the hosta nursery industry regionally.

Turfgrass research consisted of fungicide trials on both golf course turf and lawn-type turf. Diseases targeted in these field trials in 2002 included brown patch (pathogen: *Rhizoctonia solani*) and dollar spot (pathogen: *Sclerotinia homoeocarpa*). Results were shared with turfgrass management professionals at the ISU Turfgrass Field Day in July 2002.

Program 107. Iowa Beef Center

Dan Loy and Dan Morrical (faculty members in Animal Science on joint appointments between research and extension and participate in the Iowa Beef Center): The Iowa Beef Research Report details comprehensive results on research in nutrition, breeding, economics, health and other areas. During FY 2002, these reports were made available to producers and others through extension's publication system, and they were also sent to other universities. Recent research reports were also posted on the Web sites of Iowa State's Iowa Beef Center.

Dan Morrical: Efforts in research and extension are focused primarily on the technology transfer of best management practices in forage grazing interface, specifically around the further development and refinement of forage planner software for extended grazing. Much of the components of this decision/planning aid have been developed by Dr. Jim Russell as part of the Leopold Center Animal Issue Team. Several beef cow producers have served on this advisor group over the last ten years. Feed costs and winter grazing management has always been expressed as a priority area to strengthen the Iowa Cow Calf Industry.

Two major extension programs were conducted in 2002. The Cyclone Beef Days in June utilized the Forage Planner as the core subject matter for an all day program on forage utilization. Six programs were conducted through out the state with over 150 cow calf and agriculture industry personnel trained and provided with a copy of the forage planner. Morrical participated in two different regional research committees, which provided him with annual subject matter updates and also identified potential speakers for programs held in Iowa. The second major effort was the four Multi-state programs that were co-sponsored by the NC225 Forage Research Committee and the IRM Committee of NCBA. This program highlighted the efforts of the NC225 committee and was attended by over 500 cow calf operations. And finally, research and extension programs are integrated through the Iowa Forage Conference. This program is co-sponsored by Iowa Forage and Grassland Council, Iowa State University, USDA Natural Resources Conservation Service and the Iowa Grassland Alliance. This two day annual program is focused on improving the utilization of Iowa's grassland in a sustainable and environmentally enhancing way. Not all groups share the same ideology on how this goal should be accomplished but it is hoped that by meeting as one large group the over all health and vitality of Iowa' grasslands will be improved and stature elevated.

Dan Loy: Research on ethanol co-products in cattle finishing rations was expanded through the establishment of demonstration storage trials in cooperation with the ethanol plant in Sioux center. In addition educational meetings have been conducted in coordination with new plants Sioux Center, Galva and Lakota. A display was developed for the Farm Progress Show on this topic. These efforts have been coordinated with on campus research activities evaluating the feeding value of ethanol coproducts to beef cattle, let by Allen Trenkle.

A cattle feeders shortcourse was conducted through the summer at the Armstrong Farm in Lewis Iowa. Participants met approximately monthly to learn topics related to efficient feedlot beef production by following pens of cattle thought a feeding cycle. A demonstration trial was developed with input from shortcourse participants.

Program 108. Iowa Pork Industry Center

Tom Baas: The changing structure of the pork industry has created opportunities and a great deal of interest in niche or value-added markets for specialized pork products. Meat quality research conducted by National Pork Board, National Barrow Show, and Iowa State University has identified breeds and lines that excel in important meat quality traits that are preferred by consumers. Duroc breeders in Iowa recognized the superiority of purebred Durocs in these tests and sought assistance in marketing Duroc pork to meet a value-added niche. Five Star Premium Pork, a value-added cooperative, was formed by a group of small to mid-size producers with the goal to market and promote the Duroc pork they produce. Research results have been used to develop promotional information that is presented to potential buyers. Dr. Baas has provided the group with expertise on business plan development, business structure, programs, and market development.

Paylean® is an approved beta-agonist that increases average daily gain, feed efficiency, and carcass traits in swine. An important question that producers asked is the potential effect of this feed additive on meat quality traits and consumer acceptance of pork. In cooperation with Dr. Steve Moeller, Ohio State University, Dr. Baas secured funding from Elanco Animal Health to conduct a study at ISU to evaluate the effect of Paylean® on meat quality traits in three genetic lines of pigs. The results proved that Paylean® could be used with no detrimental effects on meat and eating quality of pork. These results were presented at the Iowa Pork Congress and producer seminars around the state of Iowa. PowerPoint presentations based on these research results are available for Field Livestock Specialists to use in their programming efforts.

Goal 4: An agricultural system that protects natural resources and the environment

Program 142. Integrated Pest and Crop Management (IPM/ICM)

Robert Hartzler: The primary delivery of research results for Dr. Hartzler during FY 2002 was through the extension weed science webpage. This provided a direct conduit to deliver field research results to producers and agribusinesses. The webpage also provided updates on research in progress that pertained to specific problems during the growing season. The webpage was also used to deliver research results from beyond Iowa State. Many of the articles were reviews of papers from journals such as Weed Science or Weed Technology. This proved to be a useful link to transmit research results from a larger body of researchers back to producers who can utilize the information in actual production.

A recent research focus has been to identify biological characteristics of weeds that favor their survival in agricultural habitat. Most persons involved in weed control assume weed survival is directly related to the species tolerance to herbicides that dominate row-crop production. Our research has documented that other factors are as important as herbicide tolerance to a successful weed. One characteristic found to be critically important to the success of a weed is a prolonged

emergence pattern. A cooperative three-state project has documented that emergence patterns in giant ragweed vary across the corn belt, and in eastern states where giant ragweed is considered the worst weed the species has a long emergence duration. This research indicates the need to develop weed management programs that provide an extended length of control to minimize problems with late-emerging weeds.

Interactions with growers and agribusiness through grower meetings, field days, and field/office calls emphasized many current topics, which were of concern to these groups. An increasing number of questions concerning common waterhemp control influenced research to focus on studies that could aid in developing better ways of managing this late emerging weed. In response to new management practices influenced by precision farming, research has also explored many common questions about the use of precision farming for weed control.

Stephen Barnhart (faculty member in Agronomy on joint appointment between research and extension): Dr. Barnhart is a Forage Production and Management Specialist. Forages are integral to crop, livestock and conservation enterprises in Iowa. During FY 2001 he contributed forage species and management recommendations and experimental treatment suggestions in several on-going, cooperative research projects. He also served as Principal Investigator on applied research projects. Input for many of the treatments and research problems came from interaction with extension clientele. Extension clientele were included in research planning discussions, cooperated with on-farm research and demonstration activity, and served an important role in advising during the development of educational materials and university outreach programs. One example of stakeholder involvement is the on-going research and demonstration work at the Neeley-Kinyon Research Farm near Greenfield, Iowa. A local stakeholder organization, the Henry A. Wallace Foundation, made up of producers, the business community, and local citizens, provides input into the kinds of research being done on the farm. Dr. Barnhart participates as a member of the Foundation's Forage and Livestock Advisory Committee and uses this involvement and input when planning and evaluating his research, demonstration and Extension activities on the farm. A second example is the cooperation provided by the stakeholder group overseeing the Chariton Valley Biomass Project in southcentral Iowa. The stakeholders in this project, include local producers, USDA agency representatives, and the local business community. Dr. Barnhart works with this stakeholder group, most recently in revision of two Extension publications that reflect producer experience in producing switchgrass biomass for electricity generation.

Program 147. Sustainable Agriculture

Kathleen Delate: Integrated research and extension activities for Program 147 during FY 2002 included several activities oriented towards producers and agricultural professionals, including Extension, USDA-Natural Resources Conservation Service (NRCS), Risk Management Agency (RMA) and Farm Services Agency (FSA). Five meetings with organic advisory committee and producer groups helped focus research and extension plans for FY 2002. Three intensive one-day workshops in sustainable/organic agriculture: "Toolbox Training for Organic Weed Management," "Toolbox Training for Organic Agriculture," and "Organic Grape Production" and a 15-session "Iowa Organic Conference" reached 795 persons. Extension presentations at meetings and field days reached an additional 1,809 agricultural professionals. In a producer survey, 96% of respondents (n = 269) had participated in an ISU organic Extension event.

Participants surveyed for impact of ISU training and adoption of organic practices reported an overall increase in soil quality parameters (15%) and an increase in crop performance (12%), among other factors which led to an increase in farm income (79%).

The completion of the ISU Organic Ag webpage in FY2002 led to an explosive interest of 3,600 "hits" in 10 months of operation. The webpage is used to post research results and notify the public of upcoming Extension events. In addition, efforts with the national USDA-Organic Ag. Consortium (OAC) webpage, OrganicAgInfo, included reviewing and posting research articles and reports.

Research under this program has focused on methods of improving soil quality and pest management in organic and transitioning systems. A new effort in "Organic Integrated Weed Management" has led to the establishment of organic research at Tuskegee University, establishing a partnership between ISU and this Historically Black Land Grant University, to assist limited resource farmers in their transition to organic farming.

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: Iowa State University
State: Iowa

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

	Actual Expenditures				
Title of Planned Program/Activity	**FY 2000**	**FY 2001**	**FY 2002**	**FY 2003**	**FY 2004**
Food Crops	26,852	23,793	26,771		
Plant Germplasm	627	1,534	1,627		
Crop Production and Management	20,009	28,538	2,172		
Green Industry	4,000	1,640	1,341		
Improved Grazing Systems	43,868	56,223	56,600		
Animal Physiology	6,589	9,385	9,842		
Animal Genetics	92,036	88,147	92,949		
Alternative Livestock	6,400	1,099	2,563		
International Economic Competitiveness	31,864	16,474	33,011		
Agricultural Risk Management	33,477	16,474	33,011		
Agricultural Information Technology	3,770	71	0		
Food Safety	3,830	5,781	5,893		
Improving Human Foods	17,575	22,526	23,152		

	Actual Expenditures				
Title of Planned Program/Activity	**FY 2000**	**FY 2001**	**FY 2002**	**FY 2003**	**FY 2004**
Soil Resources Management	21,518	28,233	28,535		
Integrated Pest Management	30,635	40,655	45,650		
Animal Waste Management	4,339	20,599	20,758		
Water Resources Management	6,650	5,229	8,421		
Environmental Quality	6,750	9,182	4,544		
Rural Development	47,444	36,247	35,301		
Fiber-Related Products (Textiles and Apparel)	16,266	15,046	17,160		
Value Added Agriculture	7,330	9,441	10,206		
Quality of Life	587	0	0		
Grain Quality: Marketing & Delivery	25,760	25,760	22,382		
Poultry Production Systems	7,750	10,955	9,706		
Seed Science	22,555	27,491	20,267		
Total	489,481	500,523	511,862		

Director **Date**

Form CSREES-REPT (2/00)

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Multistate Extension Activities and Integrated Activities
(Attach Brief Summaries)

Institution: Iowa State University
State: Iowa

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

	Actual Expenditures				
Title of Planned Program/Activity	**FY 2000**	**FY 2001**	**FY 2002**	**FY 2003**	**FY 2004**
Beef Center	49,000	96,029	127,646		
IPM/ICM	40,000	171,784	206,151		
Pork Center		40,310	56,549		
Consumer Horticulture		62,692	79,705		
Sustainable Agriculture			23,706		
Total	89,000	370,815	493,757		

Director **Date**

Form CSREES-REPT (2/00)