STATE OF DELAWARE
PLAN OF WORK

Annual Report
Fiscal Year 2006

University of Delaware
College of Agriculture and Natural Resources

Delaware State University
College of Agriculture and Related Sciences

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The Annual Report on the Comprehensive
Plan of Work for the
1890 and 1862 Land Grant University
Research and Extension Programs
Serving the Citizens of the State of Delaware

INTRODUCTION

This is the annual report on the Plan of Work for Delaware's research and extension activities, as required by the Agricultural Research, Extension, and Education Reform Act of 1998 (AREERA), and follows the USDA "Guidelines for Land Grant Institution Plan of Work." This report includes the research and extension activities supported by USDA at Delaware State University and the University of Delaware.

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A. PLANNED PROGRAMS

NATIONAL GOAL 1. AN AGRICULTURAL SYSTEM THAT IS HIGHLY COMPETITIVE IN A GLOBAL ENVIRONMENT

Delaware's economy is highly dependent on the Delmarva Peninsula's $1.6 billion broiler chicken industry. Areas that are currently vital to enable the poultry industry to remain competitive include minimizing production losses due to infectious diseases, developing effective strategies to address urban encroachment in rural poultry production areas, and ensuring poultry production practices, from the farmstead to cropland, are compatible with Delaware's environment, particularly our ground and surface waters.

In the infectious disease area, University of Delaware (UD) researchers employ biotechnology techniques and animal genomics research to unravel the fundamental mechanisms of poultry diseases. This information is used to develop recombinant vaccines that combat current and emerging infectious poultry diseases. Optimizing poultry health is paramount to profit in the poultry industry. Genomic research at UD improves production, maximizes poultry health and targets broiler growth to correspond with consumer preferences. University of Delaware researchers have created normalized cDNA libraries from tissues of economic importance to the poultry industry, including those related to innate and acquired immunity, growth, and reproduction. The database and clones are used by poultry science laboratories worldwide. The information from these studies is extremely useful to breeders focused on optimizing vaccine responsiveness and other desirable production characteristics.

In 2006, UD scientists conducted basic and applied research investigating many economically important poultry diseases. These included the following:

Avian Influenza (AI) is a potentially devastating disease for the broiler industry in Delmarva. An AI outbreak would have severe economic consequences by disrupting overseas exports from the region, causing widespread, massive losses of poultry flocks, and posing a potential human health concern. Rapid and effective eradication of AI is critical in minimizing the economic impact to the poultry industry and potential public health risk. Consequently, UD scientists and Cooperative Extension personnel actively participated in the research and educational programs of the USDA-CREES sponsored Avian Influenza Coordinated Agricultural Project (AI CAP). The overall goals of these efforts are to: (i) improve the diagnostic tools needed to rapidly identify and respond to an AI outbreak; (ii) develop depopulation techniques to deal with poultry mortality caused by AI; and (iii) educate the poultry industry, other industries associated with poultry production, state and federal agencies, and the public about preventing and controlling this disease. The University's AI team also worked with the Delaware Department of Agriculture and the Delaware Department of Health and Social Services to coordinate response plans in the event of an avian influenza situation.

From these coordinated efforts, it has become apparent that there are two keys to successfully addressing the AI problem. First, the disease must be rapidly detected and diagnosed. In 2006, UD scientists worked in cooperation with USDA-ARS scientists at the Southeast Regional Poultry Laboratory in Athens Georgia to develop sophisticated, rapid diagnostic methods for AI using real time RT-PCR, mircroarrays, and antigen capture technologies. Findings from these studies are now being implemented at the University of Delaware's Hiram Lasher Laboratory, located in the heart of Delmarva's poultry industry. In the past year alone, scientists at the Lasher Lab evaluated ~10,000 accessions representing disease cases and active and passive surveillance testing for AI of commercial broilers prior to slaughter as part of USDA's APHIS National Poultry Improvement Program. The University also tested wild aquatic birds for AI as part of USDA APHIS Wildlife Services surveillance program and backyard flocks as part of USDA APHIS Live Bird Market surveillance program.

The second requirement to containing AI is rapid response by quick, safe and humane depopulation of poultry followed immediately by on-farm composting of the affected flock. Until recently, there were few practical methods available to efficiently and humanely depopulate large flocks of commercial birds. Beginning in 2004, a team of researchers at the University of Delaware began to develop an alternative mass emergency depopulation procedure using water-based fire fighting foam for broilers. The technique was developed in small scale, and through cooperation with industry, has been developed into a practical, cost-effective, and humane system. The procedure has been tested with broiler chickens, turkeys and ducks. Foam requires fewer personnel than the current alternatives and reduces the amount and nature of the physical tasks associated with depopulation. Foam is more biosecure than the alternatives and helps to trap dust and other particles within the foam. The foam process is also faster than alternative depopulation methods. Fire fighting foam has been shown to have no negative impact on in-house composting and helps to supply some of the additional water required for composting. The water-based foam procedure was conditionally approved by the USDA in 2006 for use in emergency situations where there are potential zoonotic agents and a rapidly spreading outbreak of AI poses a human health risk. This new technology is receiving worldwide attention; in 2007, a patent on the foam depopulation procedure was applied for by UD.

Marek's disease results in the formation of lymphomas (cancers) in susceptible chickens. While vaccines for this disease exist, the virus readily mutates, finding new ways to trigger cancer even in vaccinated birds. University of Delaware researchers are engaged in a chicken genomics project, the goal of which is to identify expressed genes critical to the immune response to Marek's. Biological clues revealed by the genomics studies will serve as a bridge to new strategies for producing chickens with resistance to Marek's. Examining the function of genes directly related to infection by the Marek's disease virus may eventually lead to prevention of this disease.

Stunting Runting Syndrome (Cystic Enteritis) is an enteric disease that was reported in the Southeast US in 2005 and is economically important because it significantly slows weight gain in affected broiler flocks. Several cases of the disease have been reported in broilers in Delaware. Consequently, University of Delaware nutritionists and virologists studied the disease in 2006. Baby broiler chicks were found to be highly susceptible to SRS in laboratory studies that mimicked the field conditions associated with SRS. Research suggests the SRS has a viral cause but other factors are also thought to contribute to the disease. Work continues on the physiological factors and environmental conditions that may combine to cause an SRS outbreak.

Infectious Laryngotracheitis (ILT) is an important respiratory viral disease of chickens. In 2006, several commercial broiler production regions in the US including Delmarva had outbreaks of ILT. University of Delaware scientists played a vital role in diagnosing the disease so that control measures could be implemented.

In addition to disease concerns, one of the major challenges facing Delaware's poultry industry has been rapidly escalating energy costs. In 2006, research was initiated on the potential to install solar power generators on existing and new poultry houses. This is a joint project between UD's College of Agriculture and Natural Resources, the UD Center for Energy and Environmental Policy, the Delaware Biotechnology Institute, Allen Family Foods (a major poultry integrating company), General Electric Energy and World Water Power Corporation and USDA Rural Development. Solar panels have recently been installed on an existing poultry house and will soon be used in research and demonstration projects that will evaluate the feasibility of using solar power for a variety of poultry house applications.

Dairy nutrition studies at UD have led to the development and application of a novel PCR method for quantifying the numbers of the anaerobic bacterium *Lactobacllus buchneri* in silages. This beneficial microbe is added to forage to stabilize and prolong the quality of silage during fermentation, thereby improving dairy nutrition. Using the PCR technology, the first study of growth and metabolism of this organism in silages was performed by UD dairy scientists.

A UD researcher with colleagues at University of Maryland and in the private sector has developed a novel lameness detection system for dairy cattle. The technology detects lameness at an earlier stage than is possible by use of the naked eye. Farmers will now be able to initiate treatment for lameness earlier which should allow dairy cows to recover faster and return to maximum productivity.

Corn is the mainstay of Delaware's agronomic cropping systems and is used extensively by the poultry industry in feed rations. The potential for farmers to use corn for bioenergy (e.g., ethanol) has recently resulted in increased interest in expanding corn acreage in the state. One of the major factors limiting corn production in Delaware has always been plant disease, such as anthracnose stalk rot (ASR). This disease affects more than 37.5 million of the 75 to 80 million corn acres in the U.S. Annual yield loss is around 7%. Increased incidence of ASR is thought to be associated with expanded use of no-till agricultural practices that are utilized to reduce soil erosion and fuel costs. ASR causes reduced ear size, premature plant death and stalk breakage of the plant below the ear. The disease can also kill the plant from the top down, a trait called top dieback. In a major research breakthrough, UD researchers, using genetic mapping and long-term field studies, have completed the difficult and painstaking process of identifying the genes that can provide corn with much-needed resistance to the fungus *Colletotrichum graminicola*, which causes ASR. This disease costs American farmers an estimated $750 million per year. Professor James Hawk, a UD corn breeder, and colleagues in industry, conducted these studies on corn research plots on the College of Agriculture and Natural Resources Agricultural Experiment Station Farm on the UD campus in Newark. The research used ASR-resistant corn seed found in Mississippi, which was not adapted to growing in more northern regions. Through inoculation with the fungus that causes ASR and successive backcrossing, researchers were able to move the gene for resistance from the Mississippi line into an adapted but ASR-susceptible Delaware line. After five backcrosses, they developed a nearly identical version of the original, susceptible Delaware line that is highly resistant to ASR. This research provides the basis for high-resolution genetic mapping and the investigation of ASR resistance. UD researchers also used the near-isogenic lines to determine how the ASR resistance would hold up in a number of corn hybrids and have found that it works well in every hybrid they have tried, with up to a 90% reduction in top dieback in tested hybrids.

Plant molecular biologists at UD and colleagues at Ohio State University are continuing their study of sequencing of the genome for rice. Their work was recently featured in the journal *Nature Biotechnology*. This effort is important because rice is an essential food for much of the world's population. The team used advanced sequencing technologies and high-powered computer-based informatics approaches. They examined both normal gene expression (messenger ribonucleic acids, or mRNAs) as well as small ribonucleic acids (small RNAs) in rice. RNA is the only biological polymer that can both act as a catalyst in the manner of proteins and store key information like deoxyribonecleic acid (DNA). The mRNAs encode proteins, while small RNAs, characterized by a length of just 20 to 25 nucleotides, play a vital role in regulating the plant's genes. Analysis was based on sequences representing nearly 47 million mRNA molecules and three million small RNAs, a substantially larger dataset than has been reported for any other plant species. RNAs are thought to be one of the most important discoveries in biotechnology in the last ten years. They play an important role in gene regulation. Researchers say deficiencies in small RNA production can have a profound effect on development and small RNAs have been associated with other important biological processes, such as responses to stress. "Determining the sequence of the small RNAs of an organism is critical for understanding their overall impact and individual biological roles," said Blake Meyers, Associate Professor of Plant and Soil Sciences and lead investigator on the project.. With the data they have accumulated researchers developed a unique website to access this resource [http:mpss.udel.edu/rice]. The site will serve as starting point for gene expression

analyses, map-based cloning and synteny studies for molecular biology work in many cereals. The general public will also have access to the data. In recent months UD scientists have received four major grants totaling about $4 million for research on small RNAs and published in the journal *Genome Research.* "Research on small RNAs is on the leading edge in plant biotechnology," said Machi Dilworth, director of the National Science Foundation's Division of Biological Infrastructure. "This work will contribute to an understanding of the role of small RNAs in gene expression not only for rice, but in all plants."

University of Delaware plant biology researchers are also investigating the use of small RNA sequencing and analysis techniques for other plant genomes. For example, research in 2006 was directed at an effort to sequence small RNAs in *Medicago*, which is closely related to alfalfa and thus a good model for legumes such as soybeans, an important crop in Delaware, and common beans, such as kidney beans and black beans. Unlike many other plants that require the addition of nitrogen fertilizer, which is becoming more expensive and for which there are environmental issues, legumes have a symbiotic relationship with microorganisms that allow them to fix their own nitrogen. The research will look at small RNAs in the roots of these plants and under conditions in which the interactions are taking place with these microorganisms. The roles of small RNAs in roots and particularly in root "nodules" in which the nitrogen-fixing chemistry occurs are poorly characterized.

Mushroom production in Delaware and nearby Pennsylvania requires manual labor for harvesting. The facilities for growing mushrooms have 6 or 7 levels (beds or shelves) that need to be accessed for harvest. Research on duct design for moving air around the beds has shown that use of a fabric duct rather than polyethylene reduces the workers and significantly reduces slipping and falls. Harvesters are more comfortable and the product quality is better controlled. This duct development produces better harvest effectiveness which helps to keep US growers competitive with countries where labor costs are much lower.

In 2004, downy mildew destroyed 50% of Delaware's cucumber crop, resulting in $3 million loss of cash farm income. In response, UD Extension cooperated with other universities and the pickling industry to develop strategies to combat this extremely damaging disease. Research, demonstrations, and educational programs have helped the industry control the disease in 2005 and 2006 to restore cucumber yields and income to previous levels.

Meat goat is increasingly demanded by U.S. consumers. Much of the goat meat sold here—about 1.5 million pounds of goat meat a week—is imported from New Zealand or Australia. Several major markets are within 4 hours of Delaware, creating a great opportunity for local, small goat producers to increase profits. Researchers at DSU continued work in 2006 on the development of cost-effective management strategies and agribusiness models for Delaware goat producers.

The strong local demand for pole lima beans, and other niche-market vegetables, has created a need to develop best management practices for specialty crop production on small acreages of land. In response, DSU's Small Farms Program has planted educational demonstration plots of heirloom pole lima beans at the Smyrna Outreach and Research Center to teach local farmers how to profit on a few acres.

Educating the next generation of farmers and agribusiness leaders is a critical part of the mission of Cooperative Extension because of the importance of agriculture to Delaware's economy. Many extension programs are designed to educate youth about the challenges and opportunities in agriculture, including courses on agricultural competitiveness and profitability, agronomic crop meetings, farm visits and individual analysis, farm management and business training, estate and succession planning workshops, farm safety assessments. In January 2006, 3,000 growers, processors, and agriculturists attended the first *Delaware Agriculture Week*. The week-long meeting consolidated 15 different topical sessions into one week of educational programs. Over 80% of the audience surveyed indicated the meetings were useful and would likely lead to implementation of a new practice or positive economic impacts. As part of this meeting, the certified crop advisor training program certified 230 people. Also in 2006, a multi-disciplinary extension team visited all dairy farms in New Castle County to assess the range of practices that could be implemented to increase profitability; visits are planned to every dairy farm in the state in the upcoming year.

The total expenditures by source of funds and FTE's for National Goal 1 are:

Hatch Act Funds	$926,297
Smith-Lever Act Funds	$585,277
State Matching Funds	$2,293,236
Full-Time Equivalents	37.7

NATIONAL GOAL 2. A SAFE AND SECURE FOOD AND FIBER SYSTEM

Loss of farmland to suburban and industrial development continues to be one of the major threats to the future of Delaware agriculture. UD Cooperative Extension is working on a number of projects related to land use and economic development. Extension works with a diverse set of private and community leaders to develop and prioritize strategies for Delaware's economic development. Two new initiatives begun in the past year illustrate these efforts:

Coastal Community Enhancement Initiative: In collaboration with the Institute for Public Administration and Sea Grant College programs, Extension is working with Sussex county coastal communities on a Coastal Community Enhancement Initiative. The purpose of this program is to link Extension and other University expertise with Sussex County's communities and citizens in order to develop effective policies and programs that balance the economic impetus for continued suburban growth with consideration for the agricultural cropland and natural resources needed to sustain an area's population.

Comprehensive Economic Development Strategy: Working with the Institute for Public Administration and the Delaware Economic Development Office, UD Extension helped organize the effort to develop a Comprehensive Economic Development Strategy for the state. A diverse set of public and private leaders were brought together to develop local and statewide economic development action steps. These efforts resulted in a document approved by the U.S. Department of Commerce's Economic Development Administration. The completion of this plan established a framework for future economic development activities in Delaware and makes the state eligible for an ongoing federal funding source for economic development planning.

The total expenditures by source of funds and FTE for National Goal 2 are:

Hatch Act Funds	--
Smith-Lever Act Funds	--
State Matching Funds	$312,486
Full-Time Equivalents	21.0

NATIONAL GOAL 3. A HEALTHY, WELL-NOURISHED POPULATION

In the state of Delaware, more than 25% of the population is obese. Studies have found that 77% of youth say they did not participate in sufficient, moderate, physical activity in the last week, and the highest-ranked, extracurricular activity among youth is listening to music and watching TV. Because of this, there is a dire need for increased physical fitness and healthy lifestyles education. Youth in Delaware report watching an average of three hours of television per day, talking on the phone as opposed to taking a walk, spending 6 hours a day being inactive, and spending the bulk of their money on food, candy and soda. More than 60% are not enrolled in a physical education class in school. Youth and adults are flooded with marketing from fast food companies and consume too much high fat and sugar related foods and beverages. Adults in low-income communities are not as aware of programs for learning healthy living tips for themselves and their families and disadvantaged youth are not taking charge of living a healthy lifestyle. Overweight children have become an epidemic in today's culture. In response to this alarming trend, Delaware 4-H has engaged in several efforts in the area of healthy lifestyles to counteract the staggering statistics of obesity and sedentary lifestyles among youth in the state. In addition, Delaware 4-H has developed multiple programs designed to transfer knowledge about proper eating and exercise habits to youth and their families, so that they will all live a more productive and well nourished life.

Extension programs have included a partnership with Nemours Health and Preventions Services to teach their '5-2-1 …Almost None' marketing campaign designed to send the message about eating fruits and vegetables, participating in daily exercise, and limiting the intake of sugary beverages. For example, as part of the 4-H partnership with Nemours Health and Prevention Services participants in the Woodbridge elementary school 4-H After-School Program, participant survey results showed that 23 out 23 youth participants: (i) indicated a decrease in the amount of sugar sweetened beverages consumed; (ii) showed an increase in the intake of fruits and vegetables; (iii) indicated they now eat 5 fruits and vegetables a day; (iv) reported an increase in daily physical activity; (v) reported a decrease in the amount of screen time (TV and computers); (vi) indicated an increase in the amount of physical activity time spent with family members. Additionally all 23 youth turned in pre- and post- surveys prior to the 9-week session, turned in pedometer readings, participated in physical activity at the program, and participated in food and nutrition classes. One youth participant reported losing 26 pounds as a result of participation in the program.

Delaware 4-H staff received extensive training in 4-H curriculum focused on food and nutrition, health and fitness, which has subsequently been taught to 4-H youth in after-school, camp and club settings. Specific training for the food and nutrition judging and the favorite food competition was conducted in 4-H program settings as well. The "Power of Choice" extension curriculum focused on making healthy eating choices has been taught at several after-school programs throughout the state.

Delaware was one of four states chosen to take part in the Community Youth Mapping project. Eleven youth were trained to collect data that helped provide a comprehensive look at existing community resources. The youth represented 4-H, Boys & Girls clubs and youth from the community. Throughout their five week venture, they surveyed 750 individuals about how

marketing influenced their choices for food and beverages. Prevention of childhood diabetes and other early-age health problems are goals of the program. Survey results showed 37% of Sussex county children are overweight, or at risk for being overweight. And only 22% of Sussex county high school students eat five servings of fruits and vegetables each day. Results from the Sussex County Community Youth Mapping Project were presented to the Institute of Medicine in Washington, D.C.

The Cooperative Extension "Favorite Foods" competition engages youth in creating a balanced menu for a day, preparing a dish, and developing them for a proper place setting. Youth also take part in a foods and nutrition judging competition where they demonstrate their knowledge in nutrition facts, consumer education, cooking terminology, and the food pyramid guide and meal comparison. In 2006, 119 youth throughout the state participated in the "Favorite Food" competition and 94 youth participated in the Foods and Nutrition Judging competition.

Another Extension program, "Plant the Seeds for Good Health", involved over 700 youth, including 563 low-income children, who participated in a series of lessons conducted by University of Delaware staff and interns during the summer of 2006. "Plant the Seeds of Good Health" curriculum consisted of five creative lessons that included components of My Pyramid with emphasis on the importance of consuming fruits and vegetables. At the end of each session, participants sampled a new recipe such as Peanut, Pineapple 'N Peaches Wrap. Quizzes administered at the end of the sessions indicated that 65 percent of the youth increased their knowledge about nutrition, health, and improved diets.

Recent outbreaks of *E Coli*. and other food-borne pathogens on agricultural products have pointed to the importance of research on food safety to US agriculture. University of Delaware researchers continued comprehensive, multi-disciplinary programs emphasizing the use of novel non-thermal processing methods, such as high hydrostatic pressure processing to inactivate food borne microorganisms on ready-to-eat foods and fresh produce, while maintaining food quality. For example, a collaborative project between UD researchers and USDA-ARS has evaluated the effectiveness of high-pressure treatment for inactivating food-borne viruses in shellfish and other foods, while preserving the uncooked character and flavor. They are studying ways to use high pressure to eliminate Hepatitis A and Noro virus in shellfish and other foods. The number-one virus of food-borne illness in the United States, Noro virus is common in shellfish. The food-borne virus causes viral gastroenteritis, infecting 20-25 million individuals each year.

The total expenditures by source of funds and FTE's for National Goal 3 are:

Hatch Act Funds	$2,751
Smith-Lever Act Funds	$39,881
State Matching Funds	$335,051
Full-Time Equivalents	7.7

NATIONAL GOAL 4. AN AGRICULTURAL SYSTEM THAT PROTECTS NATURAL RESOURCES AND THE ENVIRONMENT

Environmental and ecological issues remain high priorities for UD research and extension programs because of their importance to the citizens of Delaware. Water, air, and soil quality and the loss of biodiversity and wildlife habitats are key issues of concern today. A number of activities conducted at UD in 2006 focused on the relationship between agriculture, natural resources, and our environment.

In 2006, the University of Delaware established 'The Center for Critical Zone Research" (CCZR), dedicated to multi-disciplinary studies of our environment from the lower atmosphere to water table. Many faculty in the UD College of Agriculture and Natural Resources and at Delaware State University are participating in the center, including the director and two members of the center's advisory board. Management support of the CCZR is provided through the Delaware Biotechnology Institute. It will be an extension of the Delaware Experimental Program to Stimulate Competitive Research, which is funded by NSF and focuses on complex environmental systems and ecosystem health. This University-wide center will develop strong partnerships with government agencies at the local, state and federal levels, with industry and with the public. The primary mission is to better understand the complex chemical, biological and physical processes that occur in the critical zone and thus improve the environmental health of Delaware. Key challenges are water quality, estuarine health, air quality, and biodiversity, all of which impact the state's tourism and agriculture as well as human health. Another goal is to integrate science, ethics and public policy. It is hoped that CCZR will be a portal through which state leaders and policy-makers gain insight into important environmental issues.

Delaware's Nutrient Management Act was passed in 1999 to protect and improve water quality while maintaining agricultural profitability. Delaware Extension specialists and agents led the educational programming necessary for producers to comply with Delaware's Nutrient Management Law over the period of 2003 to 2007. All nutrient handlers had a certification deadline of January, 2003 that resulted in 1,955 certifications. For other nutrient users (e.g., farmers, golf courses, equine, commercial landscapers), the law required 20% increments for implementing mandatory nutrient management standards that started in 2003. Full implementation was mandated by January 1, 2007. To date, 99%, or 453,291 acres of Delaware cropland have been enrolled or mandated into program requirements. Implementation occurred with the relocation of 77,724 tons of poultry litter-manure along with other measurable results.

Multi-disciplinary nutrient management research continued to help develop solutions to Delaware's nonpoint nutrient pollution problems. In 2006, UD researchers completed several years of research on developing strategies for reducing and controlling phosphorus (P) in poultry wastes in order to protect surface and shallow ground waters. The focus of this research was improvement of poultry diets, using phytase and reduced dietary P, to decrease P excretion and thus the P content of manures. Poultry diets developed by UD researchers have helped reduce the amount of manure P generated in Delaware in 2006 by more than 30% compared to 2002. Soil and runoff studies showed conclusively that dietary modification also resulted in reductions in soil P and the loss of P in runoff.

A multi-disciplinary team of UD researchers (food virologist, soil physicist, environmental engineer) collaborated to develop an inexpensive, nonchlorine-based technology that can remove harmful microorganisms, including viruses, from drinking water. The patented process incorporates highly reactive iron in the filtering process to filter a host of pathogens, from *E. coli* to rotavirus from water. Viruses are difficult to eliminate in drinking water using current methods because they are far smaller than bacteria, highly mobile, and resistant to chlorination, which is the dominant disinfection method used in the United States. The elemental or "zero-valent" iron (Fe) used in the technology is widely available as a byproduct of iron and steel production, and it is inexpensive, currently costing less than 40 cents a pound (~$750/ton). Viruses are either chemically inactivated by or irreversibly adsorbed to the iron. Besides helping to safeguard drinking water, the UD technology may have applications in agriculture. Integrated into the wash-water system at a produce-packing house, it could help clean and safeguard fresh and "ready to eat" vegetables, particularly leafy greens like lettuce and spinach, as well as fruit. This is because sometimes on farms, wash-water is recirculated, so incorporating this technology at packing houses could reduce the potential for viruses to contaminate fresh or packaged produce.

Given the national and state interest in renewable energy sources, UD Extension provided educational assistance on the wise use of our renewable natural resources through many activities, including bio-energy/biomass outreach to 57 individuals last year. In addition, Extension recently coordinated arrangements for on-farm energy audits of two farms and one ornamental horticulture facility. Six national issues identified as part of the Renewable Resource Program of Cooperative Extension were used to guide statewide programs based on 1) Diverse Audiences, 2) Economic Opportunities for Individuals and Communities, 3) Forest stewardship and health, 4) Invasive species, 5) Land Conversion, Fragmentation, and Parcelization, and 6) Public Policy. In 2006, 3,423 people participated in a wide range of activities, from the Delaware Envirothon for youth, to the Delmarva Forestry Seminar for landowners, and Earth Day activities. The Delaware Tree Farm/Forestry Association/Urban Forestry Council awarded over $200,000 in grants to communities.

Invasive species are becoming an increasing ecological problem as Delaware's natural areas are fragmented by development. For example, mile-a-minute weed, *Polygonum perfoliatum* was introduced into the US in the late 1930s and has spread to eleven states ranging from Massachusetts to West Virginia. This invasive weed germinates early in the spring, out-competes other plants in a variety of habitats, and seeds itself prolifically. Its exponential growth is assisted by migrating deer populations which eat it, thereby transporting the seeds. Based on the work of UD entomologists, the USDA approved the release of the curculinoid weevil, *Rhinoncomimus latipes korotyaev*, the mile-a-minute weevil, for biological control of this weed in 2004. UD studies have shown that weevil adults feed on mile-a-minute foliage, while the larvae feed within nodes and may cause sufficient damage to reduce seed production. The weevils are active from early spring through multiple hard frosts in the fall and complete at least four generations. Weevils have been released in Delaware, Maryland, New Jersey, Pennsylvania, and West Virginia and have established at every release site. The ability to establish populations, coupled with a high reproductive rate and dispersal capacity, bode well for the potential of the weevil to be an effective biological control agent for mile-a-minute.

Other UD research is investigating alien invasive plants in natural areas and in home gardens and how their presence impacts the terrestrial food chain, especially birds, which rear their young on insects. Insects eat vegetation, and most insects cannot eat these 'alien' plants. Therefore, fewer insects are found in landscapes with 'alien' plants, which ultimately means fewer birds are around to eat them. More than 90% of insect species are 'specialists,' meaning that they focus on a particular plant lineage. This research studied host records of moths, butterflies, and their larvae. There are 3500 moths and butterflies in the Mid-Atlantic and 1385 genera of plants. Findings showed that 29 times more moths and butterflies are supported by native ornamental plants than by alien ornamental plants. On average, native woody ornamental plants support 70 species of moths and butterflies, while alien ornamentals only support 4 species.

Wetlands are vital to the sustainability of the ecosystems on the Delmarva Peninsula. They provide wildlife habitat and act as filters, improving water quality. Although many acres of wetlands have been lost to development and agricultural activities, restoration activities have created more than 250 acres during the last 12 years. Understanding how to build wetlands that replicate natural wetland function and value is critical to the success of wetland restoration efforts. One problem with constructed wetlands is that they typically have lower soil organic matter than natural wetlands, which reduces the biodiversity of these sites. Developers and managers now construct wetlands in Delaware to increase microtopography, adding organic amendments and placing coarse woody debris in, the wetland, so that these "mitigated wetlands" more closely mimic natural ones. Although these techniques clearly increase structural diversity, a paucity of research exists on their effects on subsequent faunal and floral diversity. In response, UD researchers have studied 20 standardized wetlands of which five contained coarse woody debris and microtopography amendments, five had coarse woody debris but no microtopography, five had microtopography but no coarse woody debris, and five had neither coarse woody debris nor microtopography. 12 wetlands also received organic amendments. In 2004 to 2006, frogs, birds, insects, and vegetation were surveyed at the created wetlands. Coarse woody debris had the greatest impact on species diversity, with insects and vegetation most affected. This research supports the contention that future wetland construction should incorporate coarse woody debris to increase the diversity of insects and plants.

Wildlife ecology has been impacted by land use change, creating serious problems for animal populations, biodiversity, and habitat quantity and quality. Many areas in Delaware and neighboring states have experienced increasing deer-human conflicts in the last decade and provide an example of the kinds of challenges facing wildlife managers. Fair Hill nature preserve is one of those areas. Annual managed hunts were initiated in this area to reduce the deer population and minimize problems deer caused in nearby communities. However, in order for controlled hunts to be effective, the deer causing damage in the communities must be vulnerable to harvest. Previous research suggested that deer may alter their use of suburban areas over the course of the day or seasonally; thus, an understanding of the spatial and temporal use of the community by deer is important. Research was conducted to determine the efficacy of a controlled hunt for reducing deer-human conflicts in suburban landscapes by: (1) investigating deer movement patterns and, (2) estimating deer population parameters. In 2006, researchers captured 158 deer and collared 74 deer. Students involved in the project documented 33 mortalities. Telemetry was used to track collared deer which were located 24 times per month in February–July and 48 times per month in August-January. Intensified monitoring occurred

during the harvest season. Deer movement data were used to investigate the effects of human activity, solar phase, and lunar phase on deer activity. Information provided by this research may be used by local and state agencies to understand the efficacy of controlled hunts for reducing deer-human conflicts. Findings to date indicate that controlled hunts can alter deer density. The design of the controlled hunts is closely tied to its success. For example, eliminating refuge areas and short duration hunts will increase the impact of the controlled hunts on the population. Data on the spatial and temporal use of this landscape by deer demonstrated that afternoon hunts should be more successful than morning hunts.

In other deer-related research, researchers worked with white-tailed deer, overabundant in many areas, and often negatively impacting rural, suburban, and urban residents. Overabundant deer populations in rural areas are primarily manifested in damage to agronomic crops. Deer damage in rural areas is managed through the use of a general hunting season. However, hunter efforts and harvest restrictions often prevent reducing the population to levels at which damage would be considered tolerable. New methods are needed to reduce deer damage, but investigations into non-lethal methods to augment lethal control have been limited. Although repellents have shown promise for reducing yield losses, more research is needed to elucidate the importance of timing of applications and the amount of a field that must be treated. Repellents have proven cost-effective for forestry, orchard, and landscaping plant damage; however, only a single application appears to be economically feasible for large-scale agronomic crops. Identifying the time when deer damage has the greatest impact on yield will allow repellent application to be timed for maximum benefit. Reduction in the application cost of repellents can also be achieved by only treating the parts of the fields (i.e., borders near wooded areas) with the greatest damage. UD researchers conducted studies using enclosures in soybean fields to investigate when damage has the greatest impact on yield and what part of field borders receive the most damage. Results showed that deer browse on soybeans had limited impact on yield; in fact, it increased yield one year; further the impact on yield was limited to the first 20 m adjacent to the woods. Repellents are not necessary to reduce deer, nor would they be cost-effective. More education is needed to teach agricultural producers that deer browse does not necessarily translate into reduced yield.

Invasive plants can also be a serious problem in rural and suburban areas, such as state and national parks, developments, roadsides, and municipal recreational areas. To educate homeowners and land managers about problems with invasive plants – and the value of native plants - the *Plants for a Livable Delaware* initiative began in 2003; in 2005, the program was launched in local nurseries, public gardens, and natural area, and has continued to make an impact throughout the state in this past year. The *Plants for a Livable Delaware* campaign was created to educate the gardening public on invasive plants. As part of this effort, UD Cooperative Extension, Delaware Center for Horticulture, Delaware Nature Society, and the Delaware Department of Agriculture created a program to assist the community in making sound choices as they purchase plants for home landscapes. By using colorful, easy to understand signage, the *Plants for a Livable Delaware* campaign promotes and identifies sustainable alternatives to invasive plants through cooperation with landscape organizations and the nursery and garden center industry. This initiative resulted in two well-received brochures, “Plants for a Livable Delaware” and “Controlling Backyard Invaders”. These colorful and easy-to-read educational brochures explain the invasive plant problem, contain lists of invasive plants in Delaware with suggested alternatives, and offer methods to control invasive plants; they are distributed by

several organizations including University of Delaware Cooperative Extension and Master Gardeners, Delaware state parks, and the Delaware Nursery and Landscape Association. Landscapers and garden centers received an overview of the program, and supplies to set up displays promoting *Plants for a Livable Delaware* in 2005. The campaign continues into 2006 and is planned for several years to come. The 2006 Delaware Ornamental and Turf Workshop featured a panel of land managers who discussed latest strategies in invasive plant control. This initiative continues to work towards a 'healthier, more diverse vegetation habitat compatible with natural plant and animal communities in local watershed". By encouraging the use of plants that require less fertilizer and pesticides this initiative will also help to improve local water quality.

The total expenditures by source of funds and FTE's for National Goal 4 are:

Hatch Act Funds	$407,639
Smith-Lever Act Funds	$506,031
State Matching Funds	$779,808
Full-Time Equivalents	16.5

NATIONAL GOAL 5. ENHANCED ECONOMIC OPPORTUNITY AND QUALITY OF LIFE FOR AMERICANS

Cooperative Extension leads the University of Delaware and Delaware State University efforts to improve the quality of life of Delaware's youth and their families. Key activities include the nationally recognized Delaware 4-H program; family and consumer science programs related to nutrition and healthy living; food skills, food safety, child care, parenting skills, and financial literacy; science engineering and technology education; leadership and citizenship programs and innovative activities for women in agriculture and home horticulture ("Master Gardeners").

Delaware 4-H:

More than 65,000 Delaware youth are involved in 143 4-H clubs in Delaware, almost 45 percent of all of Delaware's young people! The majority of youth (63%) are K-3 with more than 50% living in rural areas or towns with less than 10,000 people. The focus of 4-H is leadership, citizenship and life skills. Delaware 4-H's innovative programs include service-learning camps, science, engineering and technology camps and projects, after-school programs, and obesity prevention projects. There is an international component as well. In 2006, Delaware 4-H hosted the U.S. State Department's Bosnia Youth Leadership Program. It was the first time a Delaware organization was selected to manage the program.

Delaware 4-H is involved in a number of activities that are providing Delaware's youth with the opportunity to develop the skills they need to be marketable in tomorrow's workplace.
A number of high-paying industries in Delaware that are rapidly growing require outstanding science, engineering, technology and math skills. 4-H excels at exposing young people to all areas of science, engineering and technology (SET) as well as developing knowledge and skills in these areas. An example of this is the 'biotechnology camp' at the University of Delaware. Young people ages 8-19 participate in hands-on experiences, exposing them to computer science, DNA mapping, the use of GPS instruments, and how to manipulate GIS data. Other programs expose youth to the latest in environmental and biotechnology education. Community 4-H clubs, 4-H after-school programs, summer camps and school enrichment programs are all delivery modes designed to educate young people about the opportunities in SET.

Delaware 4-H also offers a variety of programs to assist Delaware-based military members and their families. 4-H workshops held at the Youth Center on the Dover Air Force Base draw more than 100 youth, once a week from September to June. Workshop topics include science, history, photography, food and nutrition, recycling, technology and agriculture.

The need for after-school programs is important, especially in low-income communities with populations of at-risk youth. Parents and/or grandparents can't afford even modest charges for after-school enrichment programs, struggle with the completion of daily homework assignments, have limited transportation and limited access to quality academic enrichment programs for their children. Without these services, low income families are unable to support their children academically and developmentally, which ultimately affects their future success. 4-H After-school has met these needs by establishing nine quality after-school programs throughout the state that serve some of the lowest income youth. 4-H After-school Curricula activities cover a wide range of topics in Science and Technology, Healthy Lifestyles and Nutrition, Community

Service, leadership, Arts and Crafts, Aerospace, Woodworking and Public Speaking. In addition all the programs offer nutritious snacks and/or hot dinners in collaboration with the Food Bank of Delaware. On any given day approximately 700 youth are having fun, learning and developing life skills in the 4-H After-school program. In most cases, these children are the lowest performing students in their schools having difficulty passing the state DSTP test and/or getting passing grades in reading and math. Through these programs community partnerships have been established with organizations such as school districts, day cares, Boys and Girls Clubs, YMCA, Delaware Cooperative Extension, parents/guardians, teachers/counselors, and elected officials. The programs are offered in school-based and community settings year round with daily after school programming and summer camps. 4-H After-school provides a quality experience focusing on homework help and individualized tutoring as well as quality 4-H experimental based learning activities utilizing the most up-to-date, *Engineering and Technology* techniques.

The Delaware 4-H After-school program is having measurable impacts on Delaware youth, such as: (1) at Bayard Intermediate School, 69% of the participants scored at or above the standard on the state proficiency test with teachers reporting significant improvement in participating in class and completing homework; (2) at Eastside Charter School where over 90% are low-income families, 75% of the students met or exceeded the state proficiency test in reading and 50% met or exceeded the standards in math. The largest behavioral change reported by teachers was an increase in turning in homework, academic performance, and coming to school motivated to learn; (3) academically the attendees at Talley Middle School tend to be very poor performers on the state DSTP test. Classroom teachers and after-school staff struggled over the past year in a temporary building to offer quality after school programs to meet the needs of academically challenged participants, resulting in 40% of the participants meeting the math standard and 51% meeting the reading standards on the state proficiency test; (4) Woodbridge Starz on Track participants recorded a 69% increase in Reading and a 36% increase in Math on their Delaware State Test Scores. Woodbridge participant attendance records indicate a 50% decrease in absenteeism from school; (5) Hickory Tree participants scored a three or higher on the Delaware State Test with increases of 62% in Reading, 77% in Math, and 67% in Writing. There was an 86% increase in school attendance and a 73% increase in completion of homework; (6) 74% of the Clark's Corner youth scored and maintained their reading grades from average to excellent in the four benchmarks of the school year and 26% increased their reading grades one or two grade levels during the year. More than half of the Clarks Corner children achieved good to excellent grades in math, 53% scored and maintained their grades at the excellent level in the four benchmarks; 16% of students increased their math grades one or two levels during the school year. (7) 53% of Knollwood children scored and maintained their reading grades below average to excellent in three benchmarks and 26% increased their reading grades one or two levels during the school year; Also 53% of the children achieved and maintained satisfactory to excellent scores in math during their three benchmarks; and 13% of students increased their math grades one level from the first benchmark to the third benchmark; (8) the Sparrow Run program had no youth suspended from school through the end of January 2007 and no participants were involved in out-of-school altercations with New Castle County Police. In addition, several teens have enrolled as volunteers and regularly mentor younger youth. This is a significant addition to the After-school program and allows staff to spend more individual time with students on homework. Parents have been very supportive which has resulted in excellent attachment to this 4-H program and to the school.

Teens in leadership roles play an active part in Delaware's 4-H program. Providing an environment for teens to grow in their knowledge and experience in leadership positions is one of the tenents of the 4-H program in Delaware. There are a number of opportunities for teen focused leadership programming during the course of the 4-H year. Examples include 11 camps and 27 weeks of 4-H summer Day Camps, 720 youth camp participants, 77 teen camp counselors and counselors-in-training, and nine 4-H after-school sites. During the past year, the following 4-H teen leadership opportunities were made available in Delaware: (1) Delaware State 4-H Camp; (2) Delaware 4-H Leader Forum; (3) County Summer Day Camps; (4) Delaware State Teen Councils; (5) County Junior and Teen Councils; (6) 4-H National Congress; (7) 4-H National Conference; and (8) State Teen Conference -A statewide leadership conference for 4-H teens in Delaware ages 13-19 was held on the campus of the University of Delaware in Newark. The theme of the conference was, "Leadership in Action." It was the largest group of Delaware 4-H teens attending a state teen conference. Workshops included: Dining etiquette, Accountability in Leadership, 5-2-1 Almost None, Healthy Lifestyles and a session on higher educational opportunities. There was time allotted for team building and other social activities as well. The State Teen Conference had a significant, positive impact, with 85 teens from Kent, Sussex and New Castle Counties attending the program. It was the largest group of students in attendance since the event's inception. Follow-up data along with debriefings of those in attendance were positive regarding the event. The exposure to the University of Delaware campus was one that proved to be invaluable to teens as they spent time in academic, theatre and student centers during their time on campus. Also, teens made connections with faculty, administrators and undergraduate students. It has been decided that the event may permanently return to Newark due to the success of this program. It should also be noted that feedback from parents whose children attended this program was extremely positive.

Delaware 4-H has an outstanding Volunteer Adult and Teen Development program designed to provide leadership training for adult and teen volunteers that provide the 4-H member education programs in Delaware. There are a total of 3,379 adult and teen volunteer leaders in Delaware according to the most recent ES237 report. These Leaders provide support for clubs, camps and competitions. They also work with youth to design and implement county wide programs. During the past year, the following 4-H volunteer adult and teen leadership training opportunities were provided in Delaware: (1) *Delaware 4-H Leader Forum*-A statewide 4-H adult volunteer leader forum was conducted to provide training in those areas that the leaders themselves selected and requested more guidance. There were 20 workshops among those included: Container Gardens, Woodworking, Livestock Judging, Wildlife Habitat, Effective Business Meeting, and Computer Science; (2) *State 4-H Teen conference*- This educational and enrichment event was widely attended (see above); (3) *County leader Training* - The county Extension 4-H staff provided various leader training opportunities in their counties for teens and adults. These trainings included CPR, Younger Member Weekends, Reporter Workshop and Project Record Book Training among others. Many positive impacts have resulted from this leadership development program. Evaluations from the Delaware 4-H Leader forum indicated that the event was well-planed and well received. In that the attendance was higher than in previous years and the workshops more diverse, it came as no surprise to see the survey results were highly positive. On a scale of 1 to 6, with six being the highest, only two workshops fell below the 5 range. The majority were close to 6. Only the photography workshop registered a low 2.8. Steps are already being made to ensure that the Photography session is brought up to

the same superior level as the other workshops for next year. While the feedback from the survey was encouraging, the fact that leaders who attended the forum took what they learned back to their local clubs made the event even more worthwhile. Some direct comments from volunteers written on surveys include - "Great idea to use young leaders as presenters in the various workshops"; "liked the idea of bringing a future 4-H leader to the forum free of charge. What a great way to introduce them to the world of 4-H"; "Helped me learn and be able to teach more about food nutrition"; "Very knowledgeable instructors with great ideas";

Family and Consumer Sciences: this program within University of Delaware's Cooperative Extension provides After-school program outreach, healthy lifestyles training, and teen development workshops. Educators also say they see increased interest in interior decorating courses and workshops on how to make fashion accessories.

Concerns about the relationship between diet, obesity, and health have led to renewed interest in healthy lifestyles workshops focused on food and nutrition. Research has clearly documented the relationship between food intake and a number of chronic diseases. As a result of this relationship, health care costs can be controlled by improving diet quality. The food safety and nutrition program that Cooperative Extension offers focuses on the Expanded Food and Nutrition Education Program (EFNEP) and FoodSkills, which targets low-income audiences in Delaware. EFNEP is a federally funded nutrition education program for limited-resource families with young children educating families since 1969. FoodSkills is a part of Delaware's Food Stamp Nutrition Education Program. It reaches individuals and families without young children and is funded by federal money matched with state dollars. UD Cooperative Extension offers a variety of nutrition education programs to help the community stay healthy. There are five nutrition assistants who conduct FoodSkills and EFNEP. Delaware State University has one specialist in nutrition and 1.5 specialists for family and consumer science. Paraprofessionals teach low income-families how to improve their health by eating a variety of foods, planning healthy meals, developing food-buying and preparation skills, stretching the food dollar, being physically active and fit, and how to handle food safely. This program also runs a very successful summer camp for low-income youth and 4-Hers, where we rotate curriculum offered to youth.

Extension's food and nutrition programs are having an impact in Delaware and are targeting the at risk populations of greatest concern. Of the 457 Delaware families participating in EFNEP in 2006: (1) 74% of enrolled families had incomes at 100% or below poverty, including 44% with incomes 50% below poverty level; (2) 89% had children under the age of 12 with 56% of the children under age five; (3) 69% were enrolled in one or more food assistance programs; 14% enrolled in one or more food assistance programs as a result of EFNEP assistance.

Participation in EFNEP helped Delaware families improve their food choices. Before participating in the EFNEP program the percentage of graduates consuming the recommended amount of grains, vegetables, fruits, milks, and meat/meat alternatives was 31, 12, 27, 5, and 58%, respectively. After completing EFNEP, these percentages increased to 64, 52, 62, 27, and 86%. Cost-Benefit studies have shown that for every dollar invested in EFNEP, health care costs can be expected to decline by more than 10 dollars.

Similar successes have been obtained with the FoodSkills program. Of the 240 individuals or families participating in FoodSkills in 2006, (1) 91% were female; (2) 10,13,16,14 and 41% were between the ages of 21-29, 30-39, 40-49, 50-59, and over 60 respectively; (3) 70% were from minority groups. As a result of participating in the FoodSkills program: 80% of the participants improved one or more food resource management practices (i.e., planning meals, comparing prices, does not run out of food, or uses grocery lists); 91% improved one or more nutrition practice (plan meals, makes healthy food choices, prepares foods without adding salt, reads nutrition labels, or eats breakfast.); 59% improved safe food handling practices (not letting food sit out or defrosting at room temperature). Food choices improved with the most increase in consumption of vegetables followed closely by increased fruit consumption; individuals were more likely to get at least 30 minutes of physical activity each day at the end of the program.

Cooperative Extension also conducted "FoodSafe", a food safety training for on-farm food entrepreneurs This program emphasizes safe food handling techniques and targets growers, processors, retail food establishments, and the consumer. Cost of microbial food-borne illness varies depending on the specific pathogen. However, overall costs as estimated at $80 billion in medical costs and lost productivity. This does not include costs for food that must be destroyed or lost wages of employees due to temporary or permanent closing of the food establishment. In January 2006, Delaware's new regulations governing "On-Farm Home processing of Non-Potentially Hazardous Foods" were adopted. Farmers who wish to process non-potentially hazardous foods in their home kitchens for sale to the public at farmers' markets, on-farm markets, or roadside stands must abide by these regulations. The regulations established standards of practice for on-farm home food processing operations that safeguard public health and provide consumers with food that is safe, unadulterated, and honestly presented. The regulations define operator qualifications, establish operation food safety and physical facility requirements, and require potential on-farm food entrepreneurs to have eight hours of food safety training and have their farm kitchens inspected. Non-potentially hazardous foods include baked breads, cakes muffins or cookies, candy (non-chocolate), jellies, jams, preserves, marmalades, and fruit butters, fruit pies, honey and herb mixtures, dried fruit and vegetables, spices or herbs, maple syrup and sorghum, and snack items such as popcorn, caramel corn, and peanut brittle. Two eight hour workshops are now being offered for potential on-farm food entrepreneurs. Goals include: (1) appreciate food-borne pathogens and understand ways to control them; (2) apply the basic health principles to reduce the risk of food borne illness; (3) evaluate the basic principles to reduce the risk of food borne illness; (4) understand requirements of the new regulations for farm produced food items. This Extension program has been quite successful, with over 100 businesses that impact more than 200,000 citizens each year attending FoodSafe classes. More than 20 church and fire hall volunteers received training reaching 40,000 citizens. Extension also trains hundreds of foodservice workers throughout the state, using the National Restaurant Association's ServSafe Manager Certification course.

Child care provider workshops are being conducted by Extension for family day care providers who are small business owners with a unique service. They need assistance in managing their business so that they can stay in business and provide financial security for their families. They are often a major breadwinner in the family. Providers are the keepers of the future. Research shows that the first few years of life are often the most important for a child's development. Providers need the foundational background in early childhood development and continual

updates in order to provide quality care. In New Castle County there are over 1500 child care providers who are licensed to provide care. These are primarily family day care providers. Office of Child Care Licensing requires these providers to have 12 or more hours per year of in-service. County staff have been working with state daycare staff, teaching them about the importance of food and nutrition and food safety. Training sessions are one or two hours. They are advertised at the county office and usually have good attendance (50 people each session). Some seminar titles include: 'Don't give your kids a tummy-ache,' 'Kid-Friendly snacks', 'Boning up on health' (prevention of osteoporosis), and 'Dining with Diabetes'. Building the professional skills of child care providers helps them meet their certification requirements, builds their financial security and helps improve the quality of child care throughout the state of Delaware. Child care providers also received training in business management, health and safety, child development. Over 50 people attended a workshop outlining how to balance work and family, and over 75 people attended a workshop on how to manage stress. Some newsletters designed for child care providers are "Great Beginnings" (2000 subscribers) and "Family Matters: (200 subscribers). Specific activities in the child care area include monthly 2 hour educational programs for child care providers. Many of the topics focus on early childhood education and the educational program efforts providers can conduct to assist children in their development. Topics during this program year focused on business development, child development, nutrition, and educational program development. Examples included: "Parents: Friends or Foes?", "Let's Talk Discipline", "Fighting Children's Obesity through Active Play", "Managing Credit in a Child Care Setting", "Take a Look at Dramatic Play", "How to Work with Active Children", and "Boning Up on Health". Each quarter a flyer is developed advertising the programs. In Delaware, there are 1786 licensed child care centers, family day care and large family day care businesses. During the 2006 program year, 429 child care providers (unduplicated) attended University of Delaware Child care workshops. This shows that 25% of all providers are attending workshops offered by Cooperative Extension. In addition to those workshops that are held at the county offices, the New Castle County educator provided 10 workshops for child care provider support. An additional 150 providers (unduplicated) are reached via this avenue. Each session includes lectured/video information, hands on activities, strategies for involving parents and an evaluation. Evaluations show that providers intend to adopt at least one new practice as a result of attending the program. For example, the "Behavior is Contagious" program focused on preventing and managing behavior problems that arise. Providers learn skills that they can use to teach kids how to manage conflict and talk about problems. Ninety-two percent of providers said they learned something new and 84% said they'd apply something they learned in their setting. They indicated they would use job charts, use positive re-enforcement and positive talking, ask the children what is the problem and solve it together, use a timer to manage sharing of a toy, and use positive examples. The "Managing Your Money in a Child Care Setting" program focused on the basics of developing budgets that interweave family and business finances and strategies for recordkeeping as well as balancing the budget. Seventy-six percent learned new things and 86% indicated they would implement something they learned. They indicated they would start saving, prioritize expenses, develop better record keeping systems, use the forms provided in the packet, communicate with their family members about money and set financial goals. The "Label Lingo" program helps child care providers decode nutrition facts panels and make healthy food choices for the children they feed. Seventy two percent of participates said they learned something new and the same number of individuals will use information they learned in the workshop in the future.

Comments regarding new practices that the childcare providers will follow as a result of the program included that they would be more aware of serving sizes on labels, read more labels in general and purchase products with less saturated and trans fat.

Parents need research-based information to help raise their children. And they need that information at the right time, at a 'teachable moment', when it can be most useful and make the biggest difference in their lives and the lives of their children. *eXtension Just in Time Parenting* (JITP) pulls together information for parents to help children thrive – and arrive in school healthy and ready for success. This program offers developmental milestones, learning games and positive parenting tips, key messages for preventing childhood obesity are highlighted throughout the series. Later this year you will be to find more information on eXtension Just in Time Parenting, by logging onto http://www.extension.org/. The site will be expanding. There you can also find eXtension information on personal finance, horses and wildlife damage management. The *eXtension Just in Time Parenting* site will include newsletters that can be downloaded and printed, facts sheets, and "how-to" modules. It also features a "Frequently Asked Questions/Ask the Expert" system. Although the JITP materials currently focus on children from infancy through the toddler years, eventually the information will extend through the teen years and into young adulthood. About 3,500 Delaware families receive *Great Beginnings* in the mail each month. Newsletters are also available at http://ag.udel.edu/extension/fam/gb/gb-list.htm in English and Spanish. The *eXtension Just in Time Parenting* project is already benefiting Delaware families in updated versions of *Great Beginnings*. When *eXtension Just in Time Parenting* is launched, interested Delaware parents will be able to sign up for electronic newsletters, ask questions and tap into resources being compiled by Extension child development/family life specialists and Extension county educators. Parents can also find local Delaware resources at http://ag.udel.edu/extension/fam/Help.htm. In evaluations of printed, mailed issues nearly all parents report that Extension's age-paced newsletters increase their parenting confidence and competence. Those who say that the newsletters have the biggest impact on their lives are youngest, poorest and least educated – a group that does not have dependable Internet access. Evaluations of the online *eXtension Just in Time Parenting* series will reveal whether we can sustain the high level of impacts demonstrated with monthly print copies delivered by mail. We will be working to maximize the use of the electronic version by families with Internet access, which will allow us to become ever more cost effective in targeting the mailed, print copies to those parents who need it most. Extension staff will continue to work with community partners to identify funding so these valuable resources can be delivered in print form (via mail or home visitor) to families with limited resources. By encouraging and reinforcing family strengths – gently encouraging healthy, vital families – fewer families will need costly social services.

Helping others with their money management practices can be a challenge. That's why Delaware Cooperative Extension designed the Financial Management Education Training Program, to provide agency personnel with the background and tools needed to help their clients or customers build financial security and improve self sufficiency. This training was specifically designed for those who work with low to middle income families. Subjects included: money management, credit, saving and budgeting. The program trained 65 professionals and helped 1000 families. During 2006, three, fifteen hour trainings were provided across the state of Delaware. Trainings were offered over three weeks. The first training was open to any

organization or agency that wanted to strengthen the skills of their employees. Organizations such as Delaware State Housing Authority, Aids Delaware, Neighborhood House Community Center, credit unions and housing counseling agencies participated. The last two trainings were designed for the Delaware Division of Emergency Services whose employees conduct assessments and provide needed emergency financial assistance for rental, utility and other emergency needed resources for eligible Delaware residents. The training provided a reference manual, lecture, activities, role play and case studies to assist participants in increasing their skills and confidence. The three-part series covered such topics as diagnosing problems and motivating action, financial goal setting, building budgets that work, stretching dollars, identifying the families impact on financial decision making, understanding credit, reducing debt, protecting privacy, bankruptcy, avoiding scams and building a secure financial future. Participants were encouraged to network in an effort to learn about each other's organizations and thus build their referral resource base. State employees were assigned community based organizations to research and report on in an effort to identify and share additional resources. Sixty seven individuals participated. Immediate post program evaluation was completed and participants indicated that 78% felt more confident in working with others on financial management issues, 83% would use the budgeting and record keeping strategies to assist others, 79% would use the strategies learned to help clients to reduce their debt, 93% would use the strategies learned to help clients increase their savings, 91% learned techniques that would help them better work with clientele, 86% better understand the individual & family characteristics that influence their decision making. Follow up evaluation was conducted a few months after the training program. Program participants indicated that the manual/clientele handouts were used immediately in their work. Some used them immediately in their work place. Ninety percent indicated that they referred to the manual at least twice since the training for either back ground information or client resources. Many indicated that they wanted to come together again for additional training. Almost 90% of participants indicated that the learned something new that they applied to their own financial decision making.

Women in agriculture face a unique set of challenges and Extension has developed programs to support them in their careers and with their families. The participants in the regional "Women in Agriculture Program" (WIA) include women who are involved with a diverse agricultural industry. Participants may be partners on their farm or they may be the primary operator. They will have a variety of agricultural interests and/or they may be involved in specific production agriculture areas; for example, grain, organic, livestock, or horticulture. They may be established farmers/growers or they may be new to the industry. Participants attend the Women in Agriculture Conference with the intention of increasing their understanding of a range of issues including risk management practices, new technology, alternative agriculture and personal health. In addition, conference participants have the opportunity to interact with agricultural and health agency professionals. Conference participants interact with each other – this a key opportunity for women to build relationships, to learn from each other, support each other, and support agriculture. This WIA program recognizes women as critical to the future of agriculture, and thus intentionally focuses educational opportunities geared toward them, where they can learn among other women in various settings. The annual WIA provides women with opportunities to learn about relevant and up-to-date risk management tools which can enhance and improve their farm management and family management skills. During the conference, women learn about risk management tools from subject matter experts by attending interactive

educational workshops. Past conference evaluations indicate that women take home new ideas and skills to put into practice immediately. Some of these skills include an improved understanding of grain marketing, the potential benefits of high tunnel production, improved financial record keeping and increased awareness of alternative agriculture opportunities. More than 130 participants attended the 2006 two-day conference. As a result of attending the conference, participants responded they had made changes to their operation as follows: "I got rid of a lot of junk after last year's session on Trash or Treasures (organizing records)"; "Financial planning - big changes!"; "Updated our insurance liability policies"; "Improved farming techniques"; "I have taken a more active part in planning crops and harvesting and contracting"; "Built a high tunnel as a result of seeing the quality of salad greens at the workshop"; "Improved marketing and expanded farm products"

Cooperative Extension has developed an extensive series of programs in the area of home and landscape horticulture. These programs support the growing interest of Delawareans, and Delaware's "Green Industry", in education on the latest advances in landscape design, native plants, and environmentally sound horticultural practices. Vital to the success of this program are Delaware's "Master Gardeners", volunteers trained by Extension personnel, who are tireless in their dedication to educating Delawareans about horticulture and the environment. All volunteers receive 40 hours of training and contribute at least that much in donated time on projects. Master Gardeners work with people of all ages, teaching by example, demonstrations, and hands-on activities. These extensively trained volunteers are a vital link between Extension specialists, educators and citizens. Nearly 150 volunteers across the state made these programs possible. The year 2006 marked Delaware Master Gardener's 20th anniversary (1986-2006). To commemorate this event, New Castle County Master Gardeners worked with Kent and Sussex County Master Gardeners to organize two statewide events: the 20th Anniversary Garden Tours and the 20th Anniversary Luncheon Celebration. In late spring the Master Gardeners of all three counties hosted garden tours. This gave the Master Gardeners an opportunity to open their beautiful homes and gardens to each other for enjoyment and display. The garden tours were a great success! Following the garden tours, Delaware Master Gardeners attended a 20th Anniversary Luncheon featuring guest speaker and renowned horticulturist, Rick Darke. At this fall luncheon, volunteers were commended for 10, 15 and 20 years of service with Cooperative Extension. In 2006, New Castle County Master Gardeners continued to reach thousands of residents. Through the following committees: Workshops and Speakers Bureau, Master Gardener Programs, Youth Programs, Telephone and Diagnostics, and Demonstration and Display Gardens, NCC Master Gardeners made a tremendous impact in the county. The Junior Gardener program reached 36 schools and 206 class rooms. They worked with approximately 4000 children between ages 5 and 10 years old, and offered nine different programs including the perennial favorites, *The Life Cycle of Butterflies, Trees* and *Composting: Give it to the Worms*.

The telephone and Diagnostics Committee handled 1,727 gardening questions by way of the Garden Line and diagnosed 247 specimens through submitted samples. The Demonstration and Display Gardens Committee eagerly awaits the installation of their new teaching and display garden, and compost demonstration site, at the new office of New Castle County Extension. Master Gardeners have designed a new teaching garden at this location to incorporate appealing, environmentally conscious plant selections. In addition to the new teaching garden, a Master Gardener designed a new compost demonstration to complement the garden. There are 54

volunteers in Sussex County's Master Gardener program and 62 volunteers in Kent County's Master Gardener program. Sussex county volunteers donated more than 2600 hours. Kent county volunteers donated more than 4,000 hours. Sussex County Master Gardeners offered the public 41 workshops. The total number of attendees at the Sussex County Workshops was 1,001. Kent County Master Gardeners offered 25 workshops to the public. Total number of attendees at the Kent County Workshops was 874. Total number of calls and/or diagnostic samples answered at the Sussex County Garden Helpline was 574. Total number of calls and/or diagnostic samples answered at the Kent County Garden Helpline was 839.

The total expenditures by source of funds and FTE's for National Goal 5 are:

Hatch Act Funds	$1045
Smith-Lever Act Funds	$411,200
State Matching Funds	$1,076,317
Full-Time Equivalents	16.9

B. STAKEHOLDER INPUT PROCESS

In the State of Delaware, the University of Delaware and Delaware State University continue to use a multi-faceted approach to securing stakeholder input for the original Plan of Work. We believe in direct contact with people and attempt to solicit input from a wide variety of clientele, users, and stakeholders. Opportunities for input include, but are not limited to, the following groups: extension overall advisory committees, extension issue-based advisory committees, strengthening families statewide advisory committee, 4-H volunteers, 4-H Foundation, LINKS, agriculture commodity groups, environmental interests, the green industry, agri-businesses, agriculture associations (i.e., Farm Bureau, Grange, Pork Producers Association, Delmarva Poultry Industry, Soybean Board, Sheep Producers Association, etc.), Master Gardeners, Master Food Educators, and Master Financial Planners. We hold a variety of regular meetings across the state, which include a diverse mix of clientele, users, and stakeholders. These meetings include such things as: Delaware Herb Growers Association (DHGA), American Herbal Products Association (AHPA) and American Botanical Council (ABC), Agriculture Visiting Committee, State Chamber of Commerce, Kids County Advisory Council, Delaware Public Policy Institute Task Force, Friends of Agriculture Breakfast series, Council of Farm Organizations, USDA Food and Agricultural Council, State Agriculture Technical Committee, and user groups like 4-H regular and day camp parents. Students enrolled in our colleges, faculty, professionals, and salaried staff, are all encouraged to provide input on program priorities. We have conducted random surveys of users and non-users of the programs and activities on a variety of issues including land use and economic development. Other tools that we use to get input include visioning processes and focus groups.

These efforts have been focused on both building commitment and getting input from stakeholders such as, government agencies, industry partners, and regulatory agencies. Our programs have expanded, and input continues to increase. We are recognized as a source of not only useful but also reliable information. We will continue to seek input in a variety of ways. These methods will change as the issues themselves change.

C. PROGRAM REVIEW PROCESS

Peer Review of Research Programs

We adopt by reference the National Standards for Peer Review.

Merit Review of Extension Programs

Merit review for Delaware Cooperative Extension consists of five levels of peer and stakeholder review. Extension professionals submit county plans that have been reviewed by their peers within the county and by county stakeholder advisory groups. These stakeholder groups provide input on critical needs and issues within their communities, which is used to develop the county plans. After county plans are complete, stakeholders review them for inclusion of the previously identified needs and issues as well as program delivery and evaluation methodologies. Each of these plans includes specific objectives that are examined for relevance, usefulness, and potential impact of the programs. This feedback is used to refine county plans and develop future plans.

The second level of review is by college-wide issue teams that are cross-functional and multi-disciplinary. From this review, county plans are combined into a college-wide five-year plan. The third level of review is both within and outside the university community. Copies of the plan are submitted to university administrators and related agency personnel who function as both present and future partners. These individuals are invited to comment on the objectives identified, areas of collaboration, and potential impacts. University administrators are also asked to comment on ways in which we might work across colleges and schools to increase our outreach efforts. A fourth level is with statewide stakeholder groups, including advisory groups, commodity organizations, volunteers, research partners, and state and local funders. These groups are asked to provide feedback regarding objectives, potential impacts, and how it meets their specific needs. The final level is the Northeast Extension directors, who have agreed to share all state plans among each other. This peer review helps states advise each other on opportunities to strengthen individual plans and ways that we can collaborate across state lines.

D. EVALUATION OF THE SUCCESS OF MULTI AND JOINT ACTIVITIES

Delaware State University and the University of Delaware have participated in numerous programs and projects that are multi-state, multi-institutional, multi-disciplinary, and joint research and extension programs. Sections E, F, and G highlight a few of the successful programs. All twelve program areas in the Delaware Plan of Work involve some multi-state and joint activities. The planned programs were identified through the stakeholder input process as described in section B. Program evaluations and surveys are being used annually to ensure that the planned programs are still on track and relevant to the needs of the state and region. Attracting underserved and underrepresented populations is a continuing challenge. During the civil rights audit of the Extension programs in Delaware, several suggestions were made on how to attract more underrepresented groups. The response to the civil rights audit has been submitted to CSREES and the report emphasizes the steps being taken to ensure that we exercise “all reasonable efforts.”

In sections E, F, and G the outcomes and impacts of joint and multi programs are described. These outcomes and impacts are consistent with the description in the Plan of Work. Delaware State University and the University of Delaware have a tradition of multi-state, multi-institutional, and joint activities. These programs have been effective and efficient in the past and continue to accomplish their goals. We share faculty with the University of Maryland, combined the dairy herds of Rutgers and Delaware, and participate in region-wide crisis management programs for beekeepers and stone fruit growers. Further evaluation of planned programs including outcomes and impacts are presented in Sections E, F. and G.

E. INTEGRATED EXTENSION AND RESEARCH

At UD, research and Extension are closely aligned in efforts to provide Delaware producers with information they can put to use. The following examples are highlights of this collaboration, which also can be found in other goal sections of this report.

For Delaware's billion-dollar poultry industry, the economic damage caused by infectious poultry diseases could be devastating. Using biotechnology techniques and animal genomics research to unravel the fundamental mechanisms of poultry diseases, UD researchers develop recombinant vaccines that combat current and emerging infectious diseases in poultry, thus preventing catastrophic losses. In an outreach effort, the UD poultry diagnostic laboratory (Lasher Laboratory) monitors for diseases in poultry and assesses the effectiveness of vaccination programs.

UD researchers have conducted workshops on the application of foam depopulation of broiler flocks to regional and national poultry producers. They have also continued to offer workshops on in-poultry house composting as a method for pathogen inactivation as a key to avian influenza eradication.

Plant health is critical to soybean growers, and two new potentially yield-reducing plant diseases have been identified in Delaware: sudden death syndrome in soybeans and wheat streak mosaic virus. Knowing that these diseases are present allows UD scientists and Extension to mount research and educational efforts to prevent these plant diseases from becoming serious problems for Delaware growers.

UD researchers conducted field trials on farms throughout Delaware to demonstrate the value of "starter" fertilizer on corn across soils with a wide range of initial soil test phosphorus levels, to show the value of poultry litter applied at various rates, and to demonstrate the value of diagnostic tools for better nutrient management during crop production. UD Extension's long-term goal is to increase Delaware farmers' awareness of the economic value of poultry litter as a source of nutrients in crop production, thus minimizing the environmental problems associated with over-application of poultry litter to cropland.

F. MULTI-STATE EXTENSION ACTIVITIES

University of Delaware Extension often reaches across state lines to Extension staff at other universities throughout the US for a wider distribution of information. The following examples of multi-state Extension activities touch on some of these programs:

Farm business management skills are taught through programs of the Northeast Center for Risk Management Education (serving New England states, New York, New Jersey, Pennsylvania, Maryland, West Virginia, and Delaware). This center was established at the University of Delaware to educate producers of agricultural products about the range of risk management opportunities available to them in order to maintain profitable businesses.

MAAREC (Mid-Atlantic Apiculture Research & Extension Consortium) is a five-state consortium (DE, MD, NJ, PA, and WV) of university research/Extension, state regulatory and beekeeper associations, charged with keeping bee colonies healthy, thus meeting regional pollination demands, and ensuring agricultural profitability.

Coordinated research and data gathering by the Southeast Pennsylvania IPM group (which UD Extension participates in) has allowed Extension specialists to pinpoint proper monitoring windows for a number of ornamental insect pests.

To reduce loss from crop insects, weeds and diseases, Extension and researchers from the University of Delaware, the University of Maryland/College Park, Rutgers University, and Virginia Tech collaborate each year on comprehensive Pest Management Recommendation Guides for regional field crops and for vegetable crops. Based on data derived from university trials, the information is specific to local climate, soils and conditions, comparing the effectiveness of treatments for specific weed, insect, and crop diseases.

The University of Delaware soil testing program participates actively in three regional soil testing committees (NEC-67, NCR-13, and the Mid-Atlantic Soil Testing and Plant Analysis Work Group). These regional committees review research findings annually and cooperatively revise soil test based nutrient lime and fertilizer recommendations for agronomic, vegetable, and home landscape plants.

The Mid-Atlantic Crop Management School is an excellent example of a multi-state (Delaware, Maryland, Pennsylvania and West Virginia) and multi-agency (university, NRCS, and Department of Agriculture) program that provides new educational information. Designed to provide continuing educational opportunities for Certified Crop Advisers, Nutrient Management Consultants, agency personnel (NRCS, Conservation Districts, and Cooperative Extension), independent consultants, and growers, the school provides valuable, applied information to improve incomes in farm and rural communities.

UD Extension and Rutgers University share a herd of 300 cows: 200 heifers and 100 milking cows. UD maintains a milking herd and heifers are raised at Rutgers until just before first calving. The reason for combining the herds is better and more efficient use for teaching, Extension outreach and ruminant nutrition studies.

G. MULTI-STATE RESEARCH

University of Delaware and DSU faculty participate in numerous multi-state research projects in support of our State Plan of Work; Control of Emerging and Re-emerging Poultry Respiratory Diseases in the United States; Avian Genomics and Gene Mapping, and Genetic Bases for Disease Resistance in Poultry; the Claude E. Phillips Herbarium and NC228, Avian Respiratory Diseases: Pathogenesis, Surveillance, Diagnosis and Control.

The Claude E. Phillips Herbarium has a 110,000-specimen vascular plant collection from around the world, some of which date back to 1799, 2500 volumes dating back to 1737, and numerous periodicals and photographic slides. The herbarium cooperates with many federal, state, and private institutions, including the Natural Resource Conservation Service, the Delaware Department of Natural Resources and Environmental Control, the Delaware Nature Society, the Herb Society of America, and The International Herb Association. This resource is available to students, farmers, public service agents, members of the scientific community, and the public.

The goals of NC228 are to determine the pathogenesis and interactions of specific avian respiratory disease agents, determine the occurrence and consequences of agent and host variation on disease susceptibility, and develop new and improved methods for the diagnosis, prevention, and control of avian respiratory agents. Delaware scientists are sequencing the *Mycoplasma synoviae* genome and studying the relationship between attenuation and intracellular invasiveness for mycoplasma species. In addition, Delaware scientists have examined differences among infectious bronchitis isolates and have been able to better understand the derivation of emerging isolates of this important and costly pathogen.

Participants in NC228 are located in Alabama, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Maryland, Minnesota, North Carolina, and Ohio.

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multi-state Extension Activities and Integrated Activities

Institution: University of Delaware
State: Delaware

Check one: __x_ Multi-state Extension Activities
____ Integrated Activities (Hatch Act Funds)
____ Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures					
	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
Goal 1: An agricultural system that is highly competitive in a global environment	**149,977**	**238,720**	**168,383**	**175,270**	**180,528**	**295,475**
Goal 2: A safe and secure food and fiber system	**11,044**	**17,578**	**12,399**	**13,999**	**14,418**	**23,598**
Goal 3: A healthy, well-nourished population						
Goal 4: An agricultural system that protects natural resources and the environment	**85,605**	**136,258**	**96,111**	**101,000**	**99,910**	**163,525**
Goal 5: Enhanced economic opportunity and quality of life for Americans	**68,465**	**108,977**	**76,868**	**77,149**	**79,310**	**129,809**
Total	**315,091**	**501,533**	**353,761**	**367,418**	**374,166**	**612,407**

Robin W. Morgan **May 1, 2007**
Director **Date**

Form CSREES-REPT (2/00)

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
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Multi-state Extension Activities and Integrated Activities

Institution: University of Delaware
State: Delaware

Check one: ____ Multi-state Extension Activities
__x__ Integrated Activities (Hatch Act Funds)
____ Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures					
	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
Goal 1: An agricultural system that is highly competitive in a global environment	**305,551**	**314,717**		**379,770**	**324,158**	**145,291**
Goal 2: A safe and secure food and fiber system						
Goal 3: A healthy, well-nourished population						
Goal 4: An agricultural system that protects natural resources and the environment	**19,162**	**20,736**	**465,264**	**20,143**	**20,747**	**64,765**
Goal 5: Enhanced economic opportunity and quality of life for Americans						
Total	**324,713**	**335,453**	**465,264**	**399,913**	**344,905**	**210,056**

Robin W. Morgan **May 1, 2007**
Director **Date**

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Institution: University of Delaware
State: Delaware

Check one: ____ Multi-state Extension Activities
____ Integrated Activities (Hatch Act Funds)
__x_ Integrated Activities (Smith-Lever Act Funds)

Title of Planned Program/Activity	Actual Expenditures					
	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
Goal 1: An agricultural system that is highly competitive in a global environment	**141,684**	**215,065**	**218,520**	**250,479**	**145,934**	**285,025**
Goal 2: A safe and secure food and fiber system	**10,321**	**15,665**	**83,548**	**70,002**	**10,630**	**20,762**
Goal 3: A healthy, well-nourished population						
Goal 4: An agricultural system that protects natural resources and the environment	**80,002**	**121,434**	**68,020**	**79,168**	**82,402**	**160,940**
Goal 5: Enhanced economic opportunity and quality of life for Americans	**72,417**	**109,924**	**150,074**	**146,913**	**74,589**	**145,680**
Total	**304,424**	**462,088**	**520,162**	**546,562**	**313,555**	**612,407**

Robin W. Morgan **May 1, 2007**
Director **Date**

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