2013 Delaware State University and University of Delaware Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

Delaware agriculture increasingly operates in a global economy and we face ongoing challenges in our efforts to contribute to ensuring food security for a growing world population, develop innovative means to improve profitability and productivity, protect environmental quality and heal damaged ecosystems. Emerging issues must also be addressed, including climate change, farmland losses to development, food safety, and social issues for families and youth such as reversing the growing epidemic of childhood obesity. Agriculture and Delaware remains strong today, despite these challenges, and has weathered the recent economic downturn well. The state has 490,000 acres of cropland (25% irrigated) that provide the grain crops needed for a thriving poultry industry, an innovative and profitable vegetable production industry, and a "green industry" that supports horticultural and natural resource interests of its citizens. A 2010 report led by the University of Delaware College of Agriculture & Natural Resources ("The Impact of Agriculture on Delaware's Economy") found that the total economic contribution of all categories of agriculture in Delaware was $7.95 billion in industry output and that the agricultural industry contributed $2.5 billion in value added activity, and $1.6 billion in labor income, supporting 30,000 jobs. Our plan of work has been designed to support the efforts of Delaware agriculture to remain competitive, to meets its environmental challenges, sustain the state's natural resources and support our rural and urban families and communities. We focus on the following eight programs intended to provide research-based solutions to the complex, global challenges facing Delaware today. It is important to note that divisions between these programmatic efforts are artificial. Our research and extension efforts are most commonly conducted by multi-disciplinary teams working across programs, in collaboration with colleagues in other disciplines. We also regularly plan and work with stakeholders in other University departments, other governmental agencies, foundations, community groups, universities, and political or policy-making positions.

(1) Global Food Security and Hunger: Delaware agriculture is fully integrated into the global economy and driven by the need to produce a safe and secure food supply for a growing world population. Longstanding components of agriculture in Delaware are animal production,, grain crops and vegetables, aquaculture, soil management and watershed protection, and agricultural and natural resource economics. Animal-based agriculture is one of the largest and most profitable enterprises in Delaware with poultry production and processing activities accounting for over $3.2 billion dollars in industry output, 13,437 jobs, and $911.6 million in value added, according to the 2010 report. Livestock industries ($32M farm sales from dairy, beef cattle, swine) are important with dairy production leading the way, producing $73.3 million in industry output and providing 260 jobs, according to the UD study. Aquaculture has emerged as a new sector, in freshwaters and coastal areas with shellfish. For poultry, diagnosis and control of infectious avian diseases is a high research priority, while for all of animal agriculture, research and extension programs focus on key issues such nutrient management and water quality, air quality, food safety, labor, animal welfare, and community relations. Grain crops, vegetable crops for processing and fresh markets, and a growing horticultural industry dominate Delaware agriculture. Most cropland is used for corn, soybean, and small grains, mainly for animal feed, but interest grows in producing energy crops (barley, soybeans). Crop management depends more than ever on fundamental research on plant genomes and using genomic information to solve production problems. We address advances in field-scale crop management and farm marketing skills to ensure that farmers and the "green industry" remain

profitable. Basic studies on plant adaptation to the environment and biotic and abiotic stress are priorities, as are studies on soil microbe-plant relationships and plant/soil interfacial reactions key to plant nutrient use and plant adaptation to contaminated soils. Environmentally sound management of soil resources requires that we address a range of issues impacting air, soil, surface and ground water quality such as efficient use of nutrients in animal and crop production; fate, mobility, speciation, and bioavailability of metals and organic chemicals in soil and water environments; efficient use of ground water for irrigation; safe use of pesticides and herbicides;, and emission of gases and particulates from soils and wastes that can affect air quality, climate change, and human and ecosystem health. We conduct basic research to increase our fundamental understanding of soil processes and applied research and extension programs to develop and implement management strategies that sustain agriculture and other land uses while protecting the quality of our air, soil, and water. Integrating economics with basic and applied research is a key aspect of this planned program. Our economics research foci are international trade and policy, with an emphasis on energy economics and economic development, and natural resource economics, particularly as this relates to land use change, such as conversion of farmland and forests to developed land uses and formulation of sound policies to preserve agricultural land for future generations;

(2) Biotechnology and Biotechnology-Based Agribusinesses: The University of Delaware, in conjunction with the state and private industry, has devoted nearly 25 years to developing research capacity and expertise in basic and applied biotechnology. Areas of existing strength are avian virology, physiology, and genomics and plant molecular biology and plant breeding. In our avian programs, biotechnology is used at the basic level to improve poultry health and immune competence and to understand fundamental mechanisms of avian diseases. At the applied level, biotechnology efforts focus on improving diagnostic testing methods, developing vaccines and other disease control methodologies, surveying for emerging avian disease causing agents, and developing disease resistant breeds of chickens. For plants, basic biotechnology efforts include understanding gene regulation in plants, particularly those associated with RNA turnover or small RNA-mediated gene regulation. Other efforts include understanding disease resistance and signal transduction pathways in plants, understanding nitrogen fixation via the application of molecular and proteomics approaches, and understanding, at the molecular and atomic levels, plant-soil interfacial relations important to nutrient and heavy metal uptake. Key elements of this program include: expanding fundamental, cross-disciplinary research in the avian and plant/soil research areas; applying basic biotechnology research to the development of diagnostic methodologies for plants and animals; investigating new opportunities to apply biotechnology knowledge, such as alternate, bio-based energy sources that make economic sense for Delaware; producing pharmaceuticals, vaccines, nutriceuticals and other products from plants; and a new, high priority - developing biotechnology-based agribusinesses by financial planning, risk management analysis, and evaluation of the marketability and consumer acceptance of biotechnology based products;

(3) Natural Systems, Biodiversity, and Wildlife Ecology: Maintaining and restoring renewable natural resources and the vital services provided by healthy ecosystems in Delaware after 400 years of urban and agricultural land use is our focus in this planned program. The impact of past and current land use changes, such as agricultural/forestry practices and encroachment of urban/suburban populations on native landscapes, is not fully understood but is thought to be contributing to the loss of many plant and animal species. Perturbation of ecosystems, such as by fragmentation of wildlife habitats due to development and nutrient enrichment of aquatic resources caused by greater runoff as impervious surface increases, are key areas where the interface between terrestrial and aquatic ecosystems is in need of more research and extension programming. New technologies in agricultural production that include control of insects, weeds, filamentous algae, and plant pathogens are needed to ensure sustainability of agriculture in Delaware while restoring and maintaining biodiversity and natural ecosystems located on farms. Finding ways to replace and sustain biodiversity in suburban landscapes, which today comprise 54% of Delaware, is another priority and is vital to future efforts to sustain natural resources in the face of increasingly rapid land use change from agriculture to more developed land uses;

(4) Family and Youth Development: The rapid economic and social changes occurring in Delaware today place high demands on families and communities. These problems are not only confined to rural areas where development and urbanization of farmland are changing the nature of communities and the opportunities for youth, but also are found in our towns and cities. Strong families are the basic building unit for our future citizens, yet those charged with this important responsibility often do not have the time, money, or skills to carry out their family roles in a positive, productive manner. Preparing citizens to take prominent roles in shaping their future and the future of their communities is the fundamental goal of this planned program. Cooperative Extension activities are the major component of this program and focus on: helping Delaware youth develop the leadership and life skills needed to become productive, independent, contributors to our society; increasing educational opportunities in science, engineering, and technology for youth; providing guidance and training in areas important to financial security of families and to family well-being across the generations; safe community programs on drug and alcohol prevention and safety training for vehicles, bicycles, pedestrians, farm families, and businesses;

(5) Food Safety: The American food system provides consumers with an abundant supply of convenient, economical, high-quality, nutritious, and safe food products. However, foodborne illnesses still occur in the U.S. Outbreaks of foodborne illness due to microbial contamination continue to be a major but preventable public health problem. While advances in understanding and controlling foodborne pathogens have been significant, new pathogens, new food products, increases in imported foods, and increasing anti-microbial resistance present new challenges to the nation's food safety programs. Our research programs focus on understanding foodborne pathogens and reducing the occurrence of these microbes during pre- and post-harvest by intervention strategies (e.g., high pressure, ultraviolet light, antimicrobial packaging). Extension activities center on food safety education of food handlers and youth; emerging food safety and nutrition issues; and public education about how to respond to outbreaks of foodborne diseases;

(6) Childhood Obesity: This program revolves around development of healthy eating and physical activity patterns. These programs will be delivered by family and consumer science educators, youth agents, paraprofessionals, and trained volunteers. Special emphasis will be placed on minority, low-income and educationally disadvantaged individuals since nationwide data indicate these individuals have a disproportionate share of diet-related diseases, including being overweight. Although many diseases occur more frequently with advancing age, dietary practices in young people significantly affect the occurrence and onset of these diseases. Extension activities center on selecting foods from My Plate, meal planning, and food preparation to lose or maintain weight and increasing physical activity;

(7) Climate Change: Climate change will create major challenges for Delaware's agriculture and natural resource areas, due to a transition to a warmer climate, characterized by hotter summers and warmer winters, greater annual rainfall, and more extreme weather events. Predicted problems include prolonged droughts, disruptions of key farming operations such as planting and harvesting due to heavy spring and fall rains, higher incidences and more diversity in the types of animal and plant pests (insects, diseases), greater potential for water quality degradation as nutrients move more rapidly and more often to waters via leaching and runoff, and losses of biodiversity in forests, wetlands, and other areas as plants now native to Delaware become stressed and more susceptible to invasions by alien plants and gradually replaced by those more suited to a warmer climate. Sea level rise will lead to problems with salt water intrusion into ground waters used for irrigation, inundation of wetlands and other low-lying natural areas, and intensified flooding, particularly problematic for cropland near the coast that is only productive because of an extensive network of drainage ditches. Our research and extension focus in this planned program will be: (i) improving fundamental understanding of why and how a changing climate affects animal and plant physiological processes related to health and productivity, the transformations of carbon, nutrients, organic chemicals, and toxins in soils, and biodiversity of plants and wildlife in natural ecosystems; (ii) developing cost-effective management strategies to help animal and crop producers and natural resource managers respond to weather extremes, greater pressures from insects and diseases, and sea level rise; and (iii) contributing to the development of climate change policies (e.g., carbon trading) that provide farmers and

others with resources needed to adopt practices to mitigate climate change problems.

(8) Sustainable Energy: Energyremains a primary concern of all stakeholders involved in agriculture and natural resources management. Research and extension programs related to bioenergy will include those focused on (i) Biomass crops: genetics and basic plant biology studies, plant-microbe interactions that enhance growth and water use efficiency of biomass crops; production and agronomic management practices for current (corn, soy) and innovative new cropping systems (e.g., sweet sorghum, switchgrass, poplars); equipment changes and needs for new biomass crops, especially related to planting and harvesting; improving nutrient management BMPs mitigating potential environmental impacts of biomass energy crops and assessing their impacts on water quality relative to current cropping systems; and addressing economic, social and cultural issues related to changing from long-standing to new cropping systems; (ii) Bioenergy production systems and re-use of byproducts: evaluation of farm-scale anaerobic digestion for bioenergy production, using animal manures, cover crops (e.g., forage radishes), and other by-products; evaluation of gasification/pyrolysis technologies, especially those using poultry litter. Finding beneficial agricultural uses for the by-products of energy production such as distillers' grains; (iii)Water supply: managing regional water supplies to produce biomass energy crops, including better understanding of the impacts of climatic extremes, improving drought tolerance, increasing irrigation use efficiency, use of wastewaters, and developing cropping systems that foster efficient water use by crops; and (iv) Education and outreach: development of bioenergy and climate change curricula for youth (e.g., K-12, 4-H programs, Master Gardeners).

Total Actual Amount of professional FTEs/SYs for this State

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	59.0	18.8	116.0	14.5
Actual	53.7	14.4	115.8	6.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Internal University Panel
- Combined External and Internal University Panel
- Combined External and Internal University External Non-University Panel
- Expert Peer Review
- Other (Northeast Cooperative Extension Directors)

2. Brief Explanation

Scientific 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 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 funding agencies. 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 state plans and ways that we can collaborate across state lines.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey specifically with non-traditional groups
- Survey of selected individuals from the general public
- Other (Permanent advisory committees for extension programs and researc)

Brief explanation.

In the State of Delaware, the University of Delaware and Delaware State University use a multi-faceted approach to secure stakeholder input. We believe in direct contact with people and actively solicit input from a wide variety of clientele, users and stakeholders. College administrators, faculty working on research funded by state and federal agencies or industry, and Cooperative Extension staff regularly request input on the relevance of our research and extension priorities to state and regional problems. Numerous formal opportunities for input also exist and include, but are not limited to, the following: 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, agribusinesses, 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 meet with these groups on a regular basis and request their input on our programs and encourage their involvement in all of our planning efforts.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments

Brief explanation.

Stakeholders are identified by a combined effort of college administrators, research and teaching faculty, and cooperative extension staff. We are very familiar with our traditional agricultural stakeholders and have established a number of advisory committees, at the county and state levels, to provide input on our research and extension programs. Similarly, we have long-standing contacts and good relations with many individuals, organizations, and agencies involved in the natural resource and environmental matters important to our research and extension programs. We work hard to ensure that these committees represent the range of agricultural production systems present in the state, the interests of those concerned about natural resources and the environment, and the social and economic issues related to communities, families, and youth development. We also take proactive steps to ensure that our advisory committees encompass the increasing diversity (age, gender, background, ethnic group) of our stakeholders. When new issues come forth, or a need for re-organization and re-direction of an existing program arises, we often establish focus groups composed of a mix of individuals internal and external to our universities to help guide our planning and to ensure that all interested parties are contacted for input. As appropriate, we also will use surveys and open listening sessions to solicit input from the public.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Meeting specifically with non-traditional groups
- Meeting with invited selected individuals from the general public
- Other (Meetings with permanent advisory committees)

Brief explanation.

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: 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. For the Plan of Work, specific stakeholder input was obtained via a committee assembled by the Delaware Secretary of Agriculture to participate in the develop of a statewide plan for

agricultural research. This committee consisted of leaders in agriculture as well as faculty and administrators from the University of Delaware and Delaware State University. All of 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.

3. A statement of how the input will be considered

- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- To Set Priorities

Brief explanation.

We value all input from our stakeholders and use it to guide a number of our applied research and extension programs. It is particularly valuable in our efforts to make sure that any new and emerging agricultural, environmental, and social issues are identified early and that programs are developed to address them effectively. We carefully consider stakeholder input in our periodic reviews of extension programs to ensure that our goals are up-to-date and that we have the appropriately trained staff in place to meet these goals. We also use stakeholder input to identify areas where research is perceived to be needed. In some cases, where an adequate research base is already available, we respond through an increased extension effort to communicate research findings to end-users. However, if stakeholders identify areas where new or expanded research is needed, we use their input to strengthen our requests for research support from funding agencies and to identify partners that can collaborate in research projects.

Brief Explanation of what you learned from your Stakeholders

The areas of highest immediate importance to our stakeholders are similar to those reported last year:

1) Economic uncertainty: Agriculture has remained strong economically throughout the recent US economic downturn, but concerns persist about the national and local economies and their impact on our farm communities, agribusiness, natural resource management, our water and air quality, and families and youth. For example, one of the longest operating poultry integrating companies recently went out of business, due to a range of financial problems, creating widespread concern in Delaware. Fortunately, an international poultry company (from Korea) purchased most of the local integrating company and has begun to develop and expand the business, keeping most of the employees and facilities. The 2012 USl drought, coupled with national commitments to divert corn for bioenergy uses, reduced grain supplies to Delaware's poultry industry, increasing costs of production, and challenging the state's largely poultry-grain agricultural system economically. Farmers also worry about the growing economic costs associated with meeting the requirements of new environmental policies (USEPA Watershed Implementation Plans) driven by concerns about the Chesapeake Bay (e.g., TMDLs). Funds for farmland preservation were reduced due to state budget concerns and then partially restored. Farm families, as with many others today, are facing stresses and challenges related to the economy and seeking advice from research and extension programs at UD and DSU on more cost-effective production practices and environmental "BMPs", energy saving options, and financial planning for their businesses and families.
2) Energy- has major and ongoing impacts on the costs of producing poultry and livestock, agricultural crops and the future of nature and management of cropping systems. The impact of

energy use and costs on farm finances, and the economic volatility associated with energy supply, on agriculture remains a high priority area today. How will the poultry industry, poultry growers, vegetable and crop farmers adapt to the competing demands from food and energy markets for their products in a manner that sustains profitability and protects the environment? Can biofuel crops become an economically viable option for Delaware farmers in the future, given our smaller and more fragmented landscape? On a more positive note, stakeholders and private companies have engaged with the College regarding biogas generation from manure, as well as other biodigestion products that can provide an alternative to land application of fertilizer.

3) Land use change and farmland preservation- as the economic pressure to convert farmland to suburban and urban uses grows ever-greater, how will we sustain our agricultural land base to produce food, energy, fiber, and other products? How will the ecological and environmental benefits associated with agriculture be provided if crop land is converted to development? For the past 5 years, the pace of development has slowed markedly making this less of an issue. At the same time, funds for farmland preservation have been reduced in the state budget due to economic challenges facing the state of Delaware. However, increasing signs of economic growth in the housing industry are bringing this issue to the forefront again, pointing to the need for guidance on how to balance land use change in a way that sustains agriculture.

4) Water and air quality- despite intensive efforts to develop agricultural management practices that protect water quality, nonpoint pollution of ground and surface waters remains a serious problem. Recent changes at the federal level, particularly the now adopted TMDL for the Chesapeake Bay and the newly required (for each Bay state) Watershed Implementation Plans are creating even greater pressures for farmers and others to efficiently manage fertilizer and manure nutrients. Development is competing with agriculture for ground and surface water raising concerns about water supply in the future, a serious concern given the importance of irrigation to crop production on the sandy, drought-prone soils of Delaware. Air quality concerns are growing, particularly for animal agriculture. Our stakeholders see a pressing need for an integrated approach to the water and air quality problems facing agriculture today, one that will provide reliable, consistent funding support for multi-year, multi-disciplinary research and extension programs and guide policies that enhance agriculture in the future.

5) Integrated Pest Management: Insects, weeds, and plant diseases continue to create serious problems for Delaware farmers and consumers increasingly concerned about the need for alternative control strategies other than pesticides. Delaware extension is responding to stakeholders - and learning more about their needs - through state and regional strategies and programs focused on IPM.

6) Farm labor- demands and opportunities in other sectors increasingly make it difficult for farmers and other sectors of the agricultural community to hire and retain qualified labor. Many farmers are also concerned about the future of agriculture due to the major economic hurdles faced by young men and women who wish to pursue agriculture as a career. As noted above, these challenges are directly linked to the need for policies that can preserve farmland, resolve complex immigration issues, and more rapidly advance the mechanization of agriculture. How will national policies affect our ability to sustain a viable population of farmers, maintain a stable farm labor base, and increase investments in the innovative technologies needed to increase agricultural productivity in the face of all these challenges?

7) Irrigation- major droughts continue to plague Delaware farmers, emphasizing the need for a statewide, long-term strategy to increase the amount of irrigated acreage and be more efficient in our irrigation practices. The state has responded by launching the DRIP program ("Delaware Rural Irrigation Program") to help farmers invest in new irrigation systems. Delaware extension continues to view this as an area of increased need for an integrated research/extension program that will focus on farmers to improve the efficiency of irrigation which can both increase agricultural profitability and help protect water quality by increasing nutrient utilization efficiency by irrigated crops, particularly with respect to corn and nitrogen management. Extension education programs on the latest advances in irrigation technology and research on nutrient management for irrigated

grain and vegetable crops remain priority areas for the next decade.

8) Food safety - Seemingly constant outbreaks of food-borne illnesses and the growing demand for "local" foods due to their presumed greater safety and nutritional value are areas of increasing importance for Delaware's poultry and vegetable industries in particular. Research on the causes of foodborne illness is growing rapidly, from the molecular to applied scales. At the same time, growing pressures for new food processing technologies have led to increased research in areas such as non-thermal food processing. Extension is now focusing a major effort on food safety of produce to help growers meet buyer demands for food safety.

9) Family and Youth Development - Delaware Extension, particularly through its outstanding 4-H program, continues to address many economic and social challenges facing families and youth today, particularly in underserved communities. Programs are wide-ranging, well-received, and supported by competitive grants, addressing issues such as family financial planning; youth leadership programs focused on preparing for careers and avoiding peer pressures that lead to substance abuse problems; education about health, exercise, nutrition, and obesity, especially for youth; after-school programs in schools at State Housing Authority complexes continue to reach hundreds of youth each day with programming designed to improve grades and reading skills particularly in STEM (Science, Technology, Engineering and Mathematics) areas; and the "Operation Military Kids Program", which continues to meet the complex challenges faced by youth and their families from all branches of the military both active and reserve. Emerging is the issue of human health in six primary areas: one health-the integration of agriculture, environment and nutrition, health insurance literacy, health literacy, chronic disease prevention and management, and health policy education. Delaware families, state and local government agencies, not-for-profit groups, and the public in general are very supportive of these efforts to support families and youth and we expect the demand for this program

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1188045	1115017	1486512	1170883

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1484640	1114926	1383103	1170883
Actual Matching	908787	1114926	908815	1170883
Actual All Other	5939390	710295	12095255	1551475
Total Actual Expended	8332817	2940147	14387173	3893241

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

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	20%	20%	10%	10%
112	Watershed Protection and Management	10%	10%	5%	5%
201	Plant Genome, Genetics, and Genetic Mechanisms	0%	0%	15%	15%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%	0%	5%	5%
205	Plant Management Systems	15%	15%	10%	10%
304	Animal Genome	0%	0%	10%	10%
305	Animal Physiological Processes	0%	0%	5%	5%
307	Animal Management Systems	15%	15%	5%	5%
311	Animal Diseases	10%	10%	15%	15%
601	Economics of Agricultural Production and Farm Management	5%	5%	5%	5%
605	Natural Resource and Environmental Economics	5%	5%	10%	10%
903	Communication, Education, and Information Delivery	20%	20%	5%	5%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	17.5	4.3	66.0	2.0
Actual Paid Professional	19.1	5.1	63.9	1.5
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
804703	356640	515468	256577
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
152546	356640	291676	256577
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
2190048	362803	1605375	356538

V(D). Planned Program (Activity)

1. Brief description of the Activity

For animal agriculture, research and extension programs will target: (1) Poultry Health and Disease Prevention and Control - mechanisms of disease induction, host genetic resistance and immune responses in poultry with a focus on diagnostic surveillance methodology, vaccination and biocontainment; (2) Poultry Growth and Development - basic molecular and cellular mechanisms regulating poultry growth, development and meat yield;(3) Avian Genomics - development and application of avian microarrays for: disease diagnosis, resistance, and control; growth and development; and optimization of desired production traits; (4) Alternative Production Systems - alternative production systems to reduce disease, mortality, and waste production, minimize antibiotic use, integrate alternative energy into production systems and foster compatibility between animal production, environmental quality, and urban populations; (5)Nutrient Utilization in Poultry and Ruminants - increased nutrient utilization and reduced nutrient excretion via improved understanding of animal biology; (6) Comparative Pathology Laboratory. This laboratory supports the efforts of poultry diagnostic laboratories in Delaware and Maryland and features collaborative research on histopathologic analysis for researchers engaged in studies related to animal disease and animal models of human disease, and consultation regarding tissue dissection, collection, trimming, fixation, image capture, and techniques in immune-histochemistry. For crop production, key activities are: (1) Agronomic, Vegetable and Horticultural Crop Production - improving varietal selection, disease and pest resistance, seed technology, cultural and marketing practices; (2) New Crops - financial and environmental impacts of new crops or new varieties of existing crops, (3) Integrated Pest Management - control of insect pests, weeds, and plant pathogens via biological and chemical methods; (4) Engineering Technologies - improvements in harvesting and guidance systems and expanded research and extension programs on irrigation management; implementing recent advances in remote sensing, tillage, and pesticide application; (5) Plant Breeding, Crop Genomics, Proteomics, and Bioinformatics - basic research on how plants adapt to their environments and manage stress and the nature of soil microorganism-plant symbiotic relationships and plant/soil interfacial reactions affecting crop growth and quality; (6) Pasture and Forage Management - research on pasture-based animal production systems and forage research on improving biological control systems for alfalfa. Soil science programs focus on: (1) Fate, Transport, and Reaction Mechanisms - fate, transport and reaction mechanisms of plant nutrients, wastes, and organic chemicals in soils, and their effects on soil, air and water pollution (2) Cost-Effective, In-Situ Remediation - cost-effective, in-situ methods for the remediation and speciation of contaminated soils; (3) Nutrient Management for Water and Quality - fertilizer and waste management programs to ensure economic and environmental sustainability while considering crop needs, nutrient reactions in soils, alternative fertilizer sources, and government policies. Resource and international economics activity areas include: (1) Protection and Preservation of Agricultural Land - current strategies to protect and preserve agricultural land will be evaluated and promising new approaches will be investigated; (2)

International Economics and Trade: improved understanding of factors controlling export-import markets, particularly poultry.

2. Brief description of the target audience

For animal agriculture, primarily poultry integrators, growers, breeders, trade groups and allied industries; dairy and beef producers; livestock commodity groups; forage producers, equine owners, producers and interest groups; state and federal agencies; federal research laboratories; peer scientists in the U.S. and international colleagues, K12 teachers, and environmental and community groups.. For our resource economic programs the audience includes farmers, landowners, state agencies (Delaware Development Office; Land Use Planning and Preservation; Department of Agriculture; Department of Health and Human Services; Department of Natural Resources & Environmental Control; Department of Transportation; Economic Development Office), federal agencies (USDA, NRCS, USEPA), land use organizations (Conservation Districts, AFT), environmental organizations, business and community leaders, families, students, and the general public.

3. How was eXtension used?

In 2013 UD and DSU eXtension Institutional Team comprised of faculty and staff from across all planned program areas completed the following:

· Training on how to incorporate eXtension into grants
· Connected the Extension website with eXtension.org
· Implemented Ask an Expert throughout the state. Staff and faculty engaged in the eXtension Learn feature
· Faculty and staff increased participation in the Communities of Practice (COP)-DE is represented by 81 eXtension members in 43 of the 73 approved CoP
·

We trained 40 "experts" to use the Ask an Expert system and have fielded over 295 questions in the past 9 months. (84% of those questions were answered by Delaware experts).

For planned program #1, UD's Dr. Carissa Wickens, assistant professor of animal sciences and Extension equine specialist is an active member of the My Horse university and the related COP. She integrates eXtension Horse Quest with her program offerings including a 3 week adobe connect Horse Behavior shortcourse. She incorporates honors students in the implementation of this program who are also introduced to eXtension as a result. Additionally, Delaware has multiple membership with active involvement in the following Communities of Practice: Corn and Soybean production, eOrganic, HorseQuest,Land Use Planning, Livestock and Poultry Environmental Learning centers,Goat Industry,Small and backyard flocks, Niche meat processor network, Farm Safety and health and Pesticide Environmental Stewardship.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	23804	52645	8605	350

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	4	36	40

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2013	65

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2013	28

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2013	83

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual

2013	45

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2013	32

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2013	18

Output #7

Output Measure

- Number of Post-Doctoral Research Associates

Year	Actual
2013	9

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2013	40

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2013	4

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2013	23

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2013	26

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2013	99

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2013	101

Output #14

Output Measure

- Number of Websites Established

Year	Actual
2013	14

Output #15

Output Measure

- Number of Workshops Conducted

Year	Actual
2013	265

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased number of poultry producers participating in surveillance, diagnostic testing, and vaccination programs for infectious avian diseases. Implementation of statewide plans to address major outbreaks of avian diseases and an increase in the number of diagnostic laboratories using advances in avian genomics to rapidly diagnose infectious diseases.
2	Sustainable production practices for the dairy and beef industries that link forage and pasture production practices with animal health, performance, and meat and milk quality.
3	Increased number of poultry and dairy farmers using feed management practices that increase nutrient utilization and feeding diets with lower concentrations of nitrogen and phosphorus.
4	Increased use of air quality best management practices that prevent odor, ammonia, and particulate emissions from poultry farms.
5	Cost-effective solar power technology to heat and cool poultry houses will allow farmers to reduce their reliance on natural gas, oil, and purchased electricity, increasing the energy efficiency of poultry production.
6	Increased number of farmers adopting new crop varieties and high value, niche market crops, (culinary herbs, spices and essential oils). Integrating innovations in cultural practices, biological and chemical pest management, harvesting equipment, and irrigation management into these systems, including feasibility studies of greenhouses to produce high value plants, such as those intended for pharmaceutical or nutriceutical uses.
7	Increase in the number of farmers and others (e.g., the "Green Industry" - greenhouses, nurseries, landscapers) implementing comprehensive nutrient management and conservation plans that are profitable and protective of ground and surface water quality, build soil quality, prevent soil erosion, and protect natural resource areas.
8	Increased use of soil management programs and best management practices for agricultural, natural, suburban/urban, and disturbed or contaminated settings that incorporate latest advances in research and greater adoption of watershed scale modeling to predict changes in the functions and environmental impacts of soils in mixed-used watersheds (agriculture, suburban, urban, forests) as land use changes from agricultural to suburban and urban uses.
9	Improved economic competitiveness of Delaware agriculture relative to other regions in the U.S. and global competitors with an emphasis on greater adoption of new innovations in marketing and risk management for farmers who must increasingly compete globally.
10	Increased interactions and long-range strategic planning efforts between research and extension staff and the diverse stakeholders (state and federal agencies, community groups, not-for-profit organizations, developers, farmers, etc.) involved in farmland preservation and land use conversion from agriculture to suburban and urban uses.
11	Disease Prevention and Control: basic and applied research on mechanisms of poultry disease will translate into useable tools and strategies for improved disease surveillance, diagnosis, prevention, and control in broiler chicken production. Knowledge will be extended to commercial poultry and allied industries.
12	Animal Genomics: increased understanding of gene function and expression and targeting of candidate genes affecting economically important traits in broiler chicken growth and production, disease resistance and immunity. Improvements in classical poultry breeding programs by use of marker assisted selection (MAS) and technology transfer.
13	Animal Nutrition: research will lead to improved understanding of nutritional requirements for poultry and ruminants and adoption of recommended dietary strategies by practicing

	nutritionists and producers. Specifically, results of poultry directed research aim to minimize nutrient contamination of the environment from manure. Results from ruminant based research will lead to improved management of forages to maximize nutritional value, safe use, and minimize spoilage during storage. Nutritional effects on dairy cattle health and immune function including factors impacting white blood cell gene expression will be studied. Research will also lead to improved understanding of the molecular and cellular mechanisms associated with bovine lameness and early detection of the disease
14	Environmental Compatibility of Animal Agriculture: In addition to addressing nutrient related problems, research and extension programs will develop long-term strategies and management practices for other environmental issues related to animal agriculture such as the fate and transport of trace elements; concerns about air quality with ammonia, hydrogen sulfide, volatile organic compounds, and fine particulates originating from poultry houses; environmental and human health impacts of endocrine disruptors (estrogen, testosterone) found in manures; fate and transport of viruses and other pathogens during disease outbreaks and subsequent disposal of poultry mortality, and potential environmental and human health effects of antibiotics.
15	Plant Biology and Crop Production: basic research will lead to improved understanding of plant molecular biology and allow genetic manipulation of physiological processes important to increasing crop yields and quality and crop resistance to biotic and abiotic stresses. Applied research and extension programs on cultural practices, crop varieties, fertilizer and manure use, precision agriculture, and integrated pest management will increase crop yields, minimize costs, and protect environmental quality. Extension programs will guide management practices for horticultural plants for the "Green Industry" and for homeowners, important because of the rapid conversion of farmland to urban and suburban uses.
16	New Markets: advances in plant molecular biology and genomics will provide new markets for farmers and commercial-scale horticulture, such as plants for bioenergy, pharmaceutical and nutriceutical uses. New and creative marketing programs will stimulate diversification and growth in the production of value-added and niche market crops, such as culinary herbs, spices, essential oil plants, and specialty vegetables for urban and suburban markets.
17	Land Use Change: research will identify strategies needed to manage land use change in a state where preserving farmland is a major goal, but economic and social forces are resulting in steady conversion of agricultural lands to suburban and urban uses. The economic, social, and cultural impacts of land fragmentation, suburban sprawl, and the "critical mass" of land and businesses needed to sustain agriculture in the long-term will be determined. Research knowledge and extension programs will guide long-term land use planning in cooperation with state and local agencies and governments, community groups, and other stakeholders
18	International Economics and Trade: research will provide strategies to foster international trade and economic growth in developed and developing countries, with an emphasis on policy issues related to agricultural and energy markets and climate change, particularly those related to poultry production and bioenergy crops. Extension programs will educate agricultural producers on international marketing strategies for traditional agricultural products (e.g., poultry, grain crops) as well as new cropping systems, such as organic agriculture and genetically modified crops.
19	Educational programs for K-12 teachers and youth on: (i) advances in animal and plant molecular biology and applications of the basic animal and plant sciences to the production of animals and of plants used for food, fiber, landscaping, timber, bioenergy, and pharmaceutical and nutriceutical purposes; (ii) value of soils as a critical natural resource vital to civilization, including the many functions of soils in agricultural and natural ecosystems, the importance of soil management to environmental quality, and the role of soils in sustaining aesthetically pleasing managed landscapes in suburban and urban settings; and (iii) the relationship between land use and major societal issues, such as economic development, community and family adaptation to changing social and political conditions, and the value of

	sustaining ecosystems and protecting environmental quality.
20	Soils and Environment: basic research will increase understanding of physical, chemical, and biological factors influencing the fate and transport of nutrients, metals, organics, and pathogens in soils. Applied research will lead to development of nutrient management strategies and recommendations that minimize nonpoint nutrient pollution from all land uses. Remediation practices for soils contaminated by metals, organics, and nutrients will use innovative, research-based measures to prioritize risk to the environment and human health based on the speciation, mobility, and bioavailability of contaminants in soils. Mitigation approaches for polluted soils will combine soil chemistry, physics, and soil/plant molecular biology to enhance removal or in-situ degradation or stabilization of pollutants in soils.
21	Irrigation management for crop production, water resource sustainability, and environmental protection
22	Integrated Pest Management for Ornamental Plants in Urban and Suburban Landscapes

Outcome #1

1. Outcome Measures

Increased number of poultry producers participating in surveillance, diagnostic testing, and vaccination programs for infectious avian diseases. Implementation of statewide plans to address major outbreaks of avian diseases and an increase in the number of diagnostic laboratories using advances in avian genomics to rapidly diagnose infectious diseases.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Sustainable production practices for the dairy and beef industries that link forage and pasture production practices with animal health, performance, and meat and milk quality.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

During the 2014 program year 4 (Kent/Sussex) Master Food Educators volunteered to support workshops and public events giving just over 132 hours to Cooperative Extension?s outreach efforts. This has an approximate economic value of $3037.00 (based on $23.01/hour 2014 values from Independent Sector.org).

The Master Food Educators conducted a variety of outreach programs including:

?Staffing Displays at 8 Public Events including at 4-H Favorite Foods, Milton Elementary School back to school night, events at Fifer Orchards, Frederica Senior Center, Sussex County Farm Tour.

?Assisting Extension Agents with over programs such as Dining with Diabetes, ServSafe and DineSafe, Food Safety for Entrepreneurs and Food Preservation 101 by conducting demonstrations, preparing food for taste testing and assisting with the program implementation. Created factsheets that addressed different fruits providing basic nutrition and handling information as well as 2 low cost simple recipes.

What has been done

A pasture management short course was held over the time period of three nights at the Kent County Extension Office in March 2013. Susan Garey, Extension Animal Science Agent, and Phillip Sylvester, Extension Agriculture Agent in Kent County, facilitated the educational series. Expert guest speakers presented on topics including fertility management, pasture establishment and species selection, weed control, and grazing management.

Results

Participants were asked to complete a pre-knowledge assessment at the beginning of the course and an evaluation at the conclusion of the course to determine knowledge or skills gained by participating. A highlight of the results is listed below:

?88% of the participants had more confidence in interpreting a soil test report.

?88% of the participants had more confidence in ability to select appropriate forage species.

?38% of the participants indicated that the information gained from the short course was valued between $5-30/acre and an additional 32% of the participants indicated that it was valued at over $30/acre.

?100% of the participants indicated they are going to change at least one pasture management practice based on the knowledge gained at the short course. The top four indicated management practice changes were.

?69% will rotationally graze pasture

?56% will stockpile tall fescue

?50% will evaluate and renovate a pasture in Fall 2013

?50% will utilize the UD Pasture and Hay Weed Management guide for herbicide selections

As a direct result, several on farm follow up visits occurred to further discuss management practices and evaluate individual pastures. Overall, the program increased the knowledge and skills of producers to enable them to more efficiently manage pastures in Delaware.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #3

1. Outcome Measures

Increased number of poultry and dairy farmers using feed management practices that increase nutrient utilization and feeding diets with lower concentrations of nitrogen and phosphorus.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In the Mid-Atlantic Region, small flock owners do not have many opportunities to learn about good management practices and biosecurity. Additionally, approximately one month before Easter holiday, many people consider starting a flock and need a way to learn how to do so properly.

What has been done
Cooptastic! 2013,a one day conference, sponsored by Delaware State University Cooperative Extension held at the Delaware State Fairgrounds in Harrington, DE, covered mulitple topics related to either starting a flock or maintaining a flock of chickens. Attendees were treated to poultry presentations, a display of chicken breeds for egg laying, vendors selling equipment and feed, and an egg judging contest. Scientists, diagnosticians, extension poultry specialists, and extension agents from across the region spoke on topics including biosecurity, predators, starting a flock, nutrition, marketing eggs and starting an egg business.

Results
Based on the attendance at certain talks and feedback from equipment vendors, attendees were most interested in starting a small flock. The evaluation indicated attendees increased poultry knowledge by 20% after attending Cooptastic! 2013. These parameters indicate that interest remains high in starting a small flock and that research-based education is greatly needed to influence proper care of small flocks. The Cooptastic! conference will continue to be held in odd years; the next is scheduled for 2015.

4. Associated Knowledge Areas

KA Code	Knowledge Area

102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
307	Animal Management Systems
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

Outcome #4

1. Outcome Measures

Increased use of air quality best management practices that prevent odor, ammonia, and particulate emissions from poultry farms.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Cost-effective solar power technology to heat and cool poultry houses will allow farmers to reduce their reliance on natural gas, oil, and purchased electricity, increasing the energy efficiency of poultry production.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Increased number of farmers adopting new crop varieties and high value, niche market crops, (culinary herbs, spices and essential oils). Integrating innovations in cultural practices, biological and chemical pest management, harvesting equipment, and irrigation management into these systems, including feasibility studies of greenhouses to produce high value plants, such as those intended for pharmaceutical or nutriceutical uses.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Delaware producers seek to add ethnic and other specialty or niche crops to their current operations for greater profit.

What has been done
Delaware State University Cooperative Extension?s Small Farms program has held numerous workshops, on and off farm demonstrations, and farm visits regarding high tunnel production, ethnic crop production, alternative crops, and labor saving equipment and techniques that farmers can adapt to their farming operations.

Results
Participants in this program increased their knowledge of subjects covered. Seventeen new growers expressed interest in high tunnel production and requested support from NRCS to purchase them. Completed surveys indicated that program participants would consider adding some of newly introduced techniques to their farming operations during the next growing season. Approximately $25,000 worth of ethnic food crops was produced in Delaware in 2013, either as due to new acreage or increased value of ethnic crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management
903	Communication, Education, and Information Delivery

Outcome #7

1. Outcome Measures

Increase in the number of farmers and others (e.g., the "Green Industry" - greenhouses, nurseries, landscapers) implementing comprehensive nutrient management and conservation plans that are profitable and protective of ground and surface water quality, build soil quality, prevent soil erosion, and protect natural resource areas.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Socially disadvantaged and small farmers in Delaware are looking for new ways to increase production and profitability on their limited acreage.

What has been done
The 2013 Profiting From a Few Acres (PFFA) conference focused on season extension and growing niche crops for small scale and socially disadvantaged farmers. Conference participants heard from other farm owners, and public and private sector educators throughout the Mid-Atlantic region who discussed their successes managing their businesses and mitigating risk.

Results
The conference evaluations reflected a total knowledge gained of 89 percent from both the plenary and breakout sessions. The evaluations also reflected that 96 percent felt the conference was excellent. During the balance of the year, DSU Extension educators have made multiple farm visits with participating farmers who adopted the management practices presented during previous PFFA Conferences.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management
903	Communication, Education, and Information Delivery

Outcome #8

1. Outcome Measures

Increased use of soil management programs and best management practices for agricultural, natural, suburban/urban, and disturbed or contaminated settings that incorporate latest advances in research and greater adoption of watershed scale modeling to predict changes in the functions and environmental impacts of soils in mixed-used watersheds (agriculture, suburban, urban, forests) as land use changes from agricultural to suburban and urban uses.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Chesapeake Bay Program is a partnership made up of representatives from federal, state, and local governments, non-profit organizations, academic institutions, and other groups with the common goal of restoring the health of the Chesapeake Bay and the streams and rivers that drain to it. This group comes together to evaluate data, share best practices, report on progress, and make policy and management decisions intended to help achieve restoration goals. The partnership acknowledges the need to continuously evaluate and update data sources and assumptions.

What has been done
Jennifer Volk, with the UD Cooperative Extension, helped plan and conduct, with other members of the Chesapeake Bay Program?s Agriculture Workgroup, a 2-day ?Building a Better Bay Model? workshop for agricultural partners across the watershed. The workshop, which was held May 22nd and 23rd 2013 at the University of Maryland?s Conference Center, informed participants about current model data inputs, assumptions, and processes. Through facilitated discussions, feedback and suggestions on potential new data sources and approaches that could help the models to better characterize the agricultural sector in the future were also gathered. The workshop provided attendees an opportunity to participate in the continual model evaluation process.

Results
The Agricultural Modeling Subcommittee, where Jennifer Volk represents Delaware, began meeting in mid-2013. This Subcommittee has grouped and prioritized the recommendations and is working with Bay Program modelers to investigate appropriate next steps for updating key areas of the model. After thorough vetting, these new ideas and data sources will replace the outdated data and assumptions utilized today.
Based on a post-conference survey (completed by 59% of attendees), respondents felt the conference was a success. Participants reported they met the objectives of (a) gaining a better understanding of the model (81%) and (b) providing their input (75%) ? which was supported by the large number of innovative ideas supplied. Additionally, 84% of respondents felt that if the recommendations offered are implemented, agriculture would be better represented in the model. This is tightly tied to 85% of those surveyed reporting that they left feeling more optimistic that the needs of agriculture can be balanced with Bay restoration, which are two goals often viewed as being at odds. To secure this balance, an open dialogue must continue between modelers and the agricultural sector and the work of the Ag Modeling Subcommittee hopes to facilitate that process.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

112	Watershed Protection and Management
205	Plant Management Systems
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

Outcome #9

1. **Outcome Measures**

Improved economic competitiveness of Delaware agriculture relative to other regions in the U.S. and global competitors with an emphasis on greater adoption of new innovations in marketing and risk management for farmers who must increasingly compete globally.

Not Reporting on this Outcome Measure

Outcome #10

1. **Outcome Measures**

Increased interactions and long-range strategic planning efforts between research and extension staff and the diverse stakeholders (state and federal agencies, community groups, not-for-profit organizations, developers, farmers, etc.) involved in farmland preservation and land use conversion from agriculture to suburban and urban uses.

Not Reporting on this Outcome Measure

Outcome #11

1. **Outcome Measures**

Disease Prevention and Control: basic and applied research on mechanisms of poultry disease will translate into useable tools and strategies for improved disease surveillance, diagnosis, prevention, and control in broiler chicken production. Knowledge will be extended to commercial poultry and allied industries.

Not Reporting on this Outcome Measure

Outcome #12

1. **Outcome Measures**

Animal Genomics: increased understanding of gene function and expression and targeting of candidate genes affecting economically important traits in broiler chicken growth and production, disease resistance and immunity. Improvements in classical poultry breeding programs by use of marker assisted selection (MAS) and technology transfer.

Not Reporting on this Outcome Measure

Outcome #13

1. Outcome Measures

Animal Nutrition: research will lead to improved understanding of nutritional requirements for poultry and ruminants and adoption of recommended dietary strategies by practicing nutritionists and producers. Specifically, results of poultry directed research aim to minimize nutrient contamination of the environment from manure. Results from ruminant based research will lead to improved management of forages to maximize nutritional value, safe use, and minimize spoilage during storage. Nutritional effects on dairy cattle health and immune function including factors impacting white blood cell gene expression will be studied. Research will also lead to improved understanding of the molecular and cellular mechanisms associated with bovine lameness and early detection of the disease

Not Reporting on this Outcome Measure

Outcome #14

1. Outcome Measures

Environmental Compatibility of Animal Agriculture: In addition to addressing nutrient related problems, research and extension programs will develop long-term strategies and management practices for other environmental issues related to animal agriculture such as the fate and transport of trace elements; concerns about air quality with ammonia, hydrogen sulfide, volatile organic compounds, and fine particulates originating from poultry houses; environmental and human health impacts of endocrine disruptors (estrogen, testosterone) found in manures; fate and transport of viruses and other pathogens during disease outbreaks and subsequent disposal of poultry mortality, and potential environmental and human health effects of antibiotics.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The benefits of Delaware?s nutrient management efforts in our water quality monitoring data is not being captured. Animal based agriculture is a key contributor of nutrients to ground and surface waters and progress in improving nutrient management for animal agriculture needs to be documented.

What has been done

A seminar entitled ?Monitoring the Results of Investments in Water Quality Improvement: Are we moving the needle?? was held at the Delaware Technical and Community College campus in Dover. The objective of the seminar was to highlight ongoing agricultural management activities from multiple perspectives, discuss how those impacts on water quality are assessed, and review the changes we have observed. In the afternoon, interested attendees were encouraged to participate in a structured discussion about how to better integrate efforts, data, and networks with the goal of building an atmosphere of scientific collaboration. Approximately 88 people were in attendance representing numerous government agencies, academic institutions, environmental organizations, and agricultural businesses. Speakers addressed the relationship between agriculture and nutrient management activities.

Results

Approximately 40% of the attendees completed a conference evaluation form and of those surveyed, the overwhelming majority indicated the event was a success with good (33%) and excellent (61%) ratings.

Based on evaluation results, regardless of affiliation, a good portion of respondents (78%) already felt they were either moderately or considerately aware of Delaware?s nutrient management initiatives prior to the conference, with all falling within these categories after. Similarly, a good portion (58%) of respondents indicated they also had moderate or considerable familiarity with approaches to assess water quality changes prior to the conference; but 97% had a high level of familiarity after the event. The greatest increase in knowledge occurred in regard to awareness of ground and surface water monitoring programs in the state. Prior to the event, only about 50% of respondents felt they were adequately aware of these programs whereas after the event, 97% reported awareness.

When posed with the question if they would support the creation of a formalized collaborative group around water quality monitoring initiatives, 31 of the respondents (86%) replied, ?yes,? while one answered no, and one indicated indifference.

The DGS and UD Cooperative Extension are discussing the possibility of jointly coordinating efforts to identify and invite representatives to a scoping committee in spring 2014.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
205	Plant Management Systems
305	Animal Physiological Processes
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

Outcome #15

1. Outcome Measures

Plant Biology and Crop Production: basic research will lead to improved understanding of plant molecular biology and allow genetic manipulation of physiological processes important to increasing crop yields and quality and crop resistance to biotic and abiotic stresses. Applied research and extension programs on cultural practices, crop varieties, fertilizer and manure use, precision agriculture, and integrated pest management will increase crop yields, minimize costs, and protect environmental quality. Extension programs will guide management practices for horticultural plants for the "Green Industry" and for homeowners, important because of the rapid conversion of farmland to urban and suburban uses.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The National Database Program Area Committee grew from a meeting of National Plant Diagnostic Network (NPDN) diagnosticians and IT personnel across the U.S. in 2007, with the mission of correcting errors in the National Repository Pest Dictionary for the NPDN data upload. The role expanded to create upload guidelines for diagnosticians, and review of requests and valid taxonomic nomenclature. Valid accepted nomenclature is crucial for reporting of new detections, reporting, and epidemiology. The International Code of Nomenclature for Algae, Fungi, and Plants stated that as of Jan 1, 2013, one scientific name for fungi will be required.

What has been done
? Research supported by USDA entitled "Incorporation of the Standard Scientific Name for Fungi into National Regulatory and Extension Databases and other Nomenclature Support for Safeguarding" has been funded through Goal 3 (to Enhance and Strengthen Pest Identification and Technology
?Direct collaboration with the database personnel at CERIS based at Purdue University and the SMML at USDA in Beltsville, MD, to create working files in Excel. Expert review of taxonomic subject matter.
?Broadening of scope to include stakeholders nationwide, including USDA ARS, USDA APHIS NIS (National Identification Service), USDA APHIS CAPS, NAPIS users, Extension personnel, and Federal personnel in new pest identification and safeguarding at the ports.

?Resources Secured - USDA Farm Bill Award of $38,500 in 2012-13 for One Name for Fungi Project to work with Systematic Mycology and Microbiology Laboratory in Beltsville and worldwide experts to review accuracy of nomenclature for fungi. Farm Bill Award for 2013-14, of $125,994 to University of Delaware to continue the project.
?Invited professional presentations were made at the Potomac Division of the American Phytopathological Society, USDA APHIS and ARS SMML labs in Beltsville, MD, and USDA APHIS CPHST Plant Epidemiology and Risk Analysis unit.
?Scholarly Publications- Newsletter articles in the monthly national newsletter of the NPDN
?Method of Program Evaluation to measure impact includes changes to the software and to the Pest Dictionary for pathogen names and synonyms. End result will be incorporation of valid taxonomic name with ability to handle all other names as synonyms. Evaluation by the National Database PAC, University and Extension personnel, diagnosticians, and regulatory personnel across the country is providing feedback.

Results
Knowledge and skills have improved data accuracy dramatically over the past seven years, with approximately 20% fewer errors. Pest code entries have been streamlined in the Pest Dictionary (for example, fungal entries were reduced from 3,400 down to 2,900 more accurate entries). Over 80% of the current 2,900 names have been verified by nomenclature experts, and are now consistent across data systems. Software changes incorporate pest grouping into a relational database that is easily searchable.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management
903	Communication, Education, and Information Delivery

Outcome #16

1. Outcome Measures

New Markets: advances in plant molecular biology and genomics will provide new markets for farmers and commercial-scale horticulture, such as plants for bioenergy, pharmaceutical and nutriceutical uses. New and creative marketing programs will stimulate diversification and growth in the production of value-added and niche market crops, such as culinary herbs, spices, essential oil plants, and specialty vegetables for urban and suburban markets.

Not Reporting on this Outcome Measure

Outcome #17

1. **Outcome Measures**

Land Use Change: research will identify strategies needed to manage land use change in a state where preserving farmland is a major goal, but economic and social forces are resulting in steady conversion of agricultural lands to suburban and urban uses. The economic, social, and cultural impacts of land fragmentation, suburban sprawl, and the "critical mass" of land and businesses needed to sustain agriculture in the long-term will be determined. Research knowledge and extension programs will guide long-term land use planning in cooperation with state and local agencies and governments, community groups, and other stakeholders

Not Reporting on this Outcome Measure

Outcome #18

1. **Outcome Measures**

International Economics and Trade: research will provide strategies to foster international trade and economic growth in developed and developing countries, with an emphasis on policy issues related to agricultural and energy markets and climate change, particularly those related to poultry production and bioenergy crops. Extension programs will educate agricultural producers on international marketing strategies for traditional agricultural products (e.g., poultry, grain crops) as well as new cropping systems, such as organic agriculture and genetically modified crops.

Not Reporting on this Outcome Measure

Outcome #19

1. **Outcome Measures**

Educational programs for K-12 teachers and youth on: (i) advances in animal and plant molecular biology and applications of the basic animal and plant sciences to the production of animals and of plants used for food, fiber, landscaping, timber, bioenergy, and pharmaceutical and nutriceutical purposes; (ii) value of soils as a critical natural resource vital to civilization, including the many functions of soils in agricultural and natural ecosystems, the importance of soil management to environmental quality, and the role of soils in sustaining aesthetically pleasing managed landscapes in suburban and urban settings; and (iii) the relationship between land use and major societal issues, such as economic development, community and family adaptation to changing social and political conditions, and the value of sustaining ecosystems and protecting environmental quality.

2. **Associated Institution Types**

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Animals and humans have the ability to transmit some kinds of illness or disease to each other. Illnesses or diseases that infect livestock but can be passed to humans are called zoonotic diseases. Common causes of zoonotic diseases are viruses, bacteria, and fungi.
In the fall of 2012, a two year old boy died after being infected along with 106 other fairgoers with E. Coli 0157:H7, following a visit to a petting zoo at a North Carolina County. E. Coli 0157:H7 is also a zoonotic disease, caused by a single, specific strain of E. Coli bacteria.

What has been done

The animal science extension agent developed a classroom training for livestock exhibitors, focused on zoonotic diseases and more specifically on the current strain of H3N2v and E. Coli 0157:H7 infection. The training was offered to 75 youth during the Kent County Livestock Overnighter camp, 83 youth and parents during classes offered in New Castle, Kent and Sussex counties in the spring of 2013 and to an additional 45 youth at Cow Camp.

Results

Utilizing a pre/post-test evaluation in the three county based classroom trainings, participants demonstrated increased knowledge about both H3N2v and E. Coli 0157:H7. 65 sets of pre/post-test evaluations were returned. Participants demonstrated knowledge increase in:
?understanding of disease transmission terminology (40% pre vs 92% post)
?recognizing the types of pathogens that cause H3N2v and E. Coli 0157:H7 (48% pre vs 72% post)
?understanding of a variant virus (9% pre vs 79% post)
?identifying a zoonotic disease (74% pre vs. 94% post)
Following completion of the training, 91% of participants were able to correctly identify two ways to keep livestock from getting sick in comparison to only 50% before the training. In questions only asked following the training, 100% of participants were able to name two ways to keep people from getting sick from animals and 98% indicated they learned something new in the class that they planned on using as they raised their project animal.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems

304	Animal Genome
305	Animal Physiological Processes
307	Animal Management Systems
311	Animal Diseases
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

Outcome #20

1. Outcome Measures

Soils and Environment: basic research will increase understanding of physical, chemical, and biological factors influencing the fate and transport of nutrients, metals, organics, and pathogens in soils. Applied research will lead to development of nutrient management strategies and recommendations that minimize nonpoint nutrient pollution from all land uses. Remediation practices for soils contaminated by metals, organics, and nutrients will use innovative, research-based measures to prioritize risk to the environment and human health based on the speciation, mobility, and bioavailability of contaminants in soils. Mitigation approaches for polluted soils will combine soil chemistry, physics, and soil/plant molecular biology to enhance removal or in-situ degradation or stabilization of pollutants in soils.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

More than 90% of Delaware waters do not meet quality standards for designated uses, such as recreation, fishing, or drinking. Water quality problems related to agricultural non-point nutrient losses resulted in the 1999 Delaware Nutrient Management Act, which mandated that individuals who fertilize more than 10 acres of land, own/manage more than eight animal units (1 animal unit = 1000 pounds live animal weight), apply nutrients for a fee (commercial fertilizer handler), or consult in the business of nutrients must become nutrient certified. In addition, the Delaware

Nutrient Management Law set requirements for animal waste management plans and nutrient management plan and sets limits for application of nutrients to agricultural soils.

What has been done

The University of Delaware Cooperative Extension continues to offer initial nutrient management certification training semi-annually to individuals who apply nutrients to ten or more acres of Delaware land or have a commercial livestock operation. These state-wide training sessions are led by University of Delaware Cooperative Extension, with assistance from the Delaware Department of Agriculture. Program oversight is provided by the Delaware

Results

Pre- and post-test evaluations of all attendees of the Delaware Nutrient Management Certification Sessions in 2013 indicated that knowledge of Delaware?s nutrient management issues and certification requirements increased by 19.5%, on average, by those attending sessions I and II. Participant feedback on the educational content quality and value of the Delaware Nutrient Management Sessions was overwhelmingly positive.

In 2013, certified individuals attended a total of 7,331.25 hours of nutrient management continuing education. The combined attendance of certified individuals at the 120 programs approved for Delaware Nutrient Management Continuing Education Credits in 2013 was 3,099.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

Outcome #21

1. Outcome Measures

Irrigation management for crop production, water resource sustainability, and environmental protection

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nearly 30% of crop land in Delaware is under irrigation. Knowing the right time to implement irrigation is key for sustainable yields and profitability. Several technologies are available to growers to quantify soil moisture levels and can be used to trigger irrigation.

What has been done
An irrigation management session was held as part of the Kent County Crop Masters Series in early 2014. Irrigation expert James Adkins discussed soil types and moisture holding capacities, review of available water and managed allowable depletion, soil moisture measurement techniques, and soil infiltration rates. A review of irrigation pumping options, delivery system types, and their ideal applications were also discussed. Phillip Sylvester, Extension Agriculture Agent in Kent County, facilitated the educational event.

Results
Participants were asked to complete a pre-knowledge assessment at the beginning of the course and an evaluation at the conclusion of the course to determine knowledge or skills gained by participating. A highlight of the results is listed below:
?100% indicated they learned a new technique, skill or gained knowledge that will be useful in their operations
?97% indicated they would implement some type of irrigation scheduling
?66% said they would either use the hand-feel method using a soil probe, tensiometers such as Watermark sensors, or the ET scheduling method. The success of this program indicates the need for additional programming on irrigation management.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

Outcome #22

1. Outcome Measures

Integrated Pest Management for Ornamental Plants in Urban and Suburban Landscapes

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Plant disease diagnosis, pest identification and integrated pest management can be overwhelming and confusing to novice Master Gardeners, landscape professionals, and homeowners.

What has been done
A group of Master Gardeners and landscape professionals learned how to scout and examine plants in the landscape for pests, including pathogens and insects, along with beneficial insects at recent pest walks. Pest Walks were held at the UDBG in New Castle County (May 21 and June 19) and at the Carvel Center in Georgetown on June 26, 2013.
Participants learned:
?Awareness and knowledge of plant diseases and insects, as well as beneficial insects, on ornamental plants.
?How to look for and diagnose insects and diseases of plants in landscapes, at low levels best for management and control.
?Knowledge of types of plantings to use in DE, cultural controls, environmentally friendly chemical controls and biological control methods.
Respondents said they will change their landscape management practices by:
?Scouting and examining plantings regularly, and keeping records of plant pests observed on certain dates
?Implementing IPM (integrated pest management) practices before using chemicals

Results
91% of Master Gardeners in training gave the trainings the highest mark on a scale of 1:4. Respondents indicated that the pest walks ?brought all of the things I learned in this class

together?.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation of the Global Food Security and Hunger planned program for FY 13 (66 research FTEs, 24 Extension FTEs) indicates continued strong efforts in basic and applied research and extension activity. Food security and agricultural productivity has long been a primary area of emphasis in the state. Delaware's agricultural systems, particularly poultry, grain, and vegetable crop production, are linked closely with exports to other countries and serve as models for the application of new knowledge, derived from basic research, to challenges in emerging and developed countries worldwide. Research grants (28 awarded) supported the efforts of our faculty who mentored 104 graduate students, post-docs, and undergraduate researchers and collectively published 40 refereed journal articles and book chapters, made200 invited and volunteered presentations, and conducted 265 workshops on improved efforts to contribute to the global need for a safe and secure food supply, increase agricultural profitability, become more competitive in global markets, and ensure the environmental compatibility of all forms of agriculture. Our evaluations have included annual internal administrative reviews, periodic University level Academic Program Reviews, and - for extension - surveys and other evaluations conducted with stakeholders participating in workshops and other extension programs. In general, we have received very positive feedback from the agricultural and natural resource communities about the

programs we conduct related to Global Food Security and Hunger.

Key Items of Evaluation

There are no major items requiring NIFA attention at this time, other than the continued need for more federal funding for research and extension programs that seek to further expand our efforts to address the global challenges related to producing a safe and secure food supply

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Biotechnology and Biotechnology-based Agribusiness

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	25%	25%	25%	25%
304	Animal Genome	25%	25%	25%	25%
601	Economics of Agricultural Production and Farm Management	10%	10%	10%	10%
602	Business Management, Finance, and Taxation	10%	10%	10%	10%
603	Market Economics	10%	10%	10%	10%
604	Marketing and Distribution Practices	10%	10%	10%	10%
903	Communication, Education, and Information Delivery	10%	10%	10%	10%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.5	0.5	20.0	4.5
Actual Paid Professional	0.2	0.0	21.3	0.1
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	129343	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	267042	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
12095	0	4181908	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and Extension programs will target avian and plant biotechnology. In the avian arena, these projects will be aimed at understanding basic mechanisms, including those affected by microRNAs, disease etiology and control and emergence of new disease causing agents. Research will continue and expand on annotating the chicken genome, as well as the genome of many poultry pathogens, to help provide the tools needed to advance our understanding of poultry growth, health and disease. We plan to apply these tools to diagnosis and treatment of disease and screening for desirable production traits. We also seek to develop genome based diagnostic methods, and study the molecular basis of disease resistance and susceptibility. Some specific avian biotechnology research areas planned include: identification of genomic factors influencing pathogenesis of avian herpes viruses and mycoplasmas; evolution of virulence of Marek's Disease virus; interaction of MDV proteins with host cells; regulation of the immune response to avian pathogens; and gene expression profiles in growth-selected chickens. With respect to production-oriented research, a new integrated, multi-disciplinary approach, including collaboration with an international team of scientists, is now underway to help identify genes that explain the differences on fatness between two lines of chickens, the French Fat and Lean chicken lines. This research extends to the implementation of genomics technologies in commercial chicken breeding programs to be done in close collaboration with poultry industry researchers. With regard to plant biotechnology, projects will focus on understanding basic mechanisms of gene control in plants, disease resistance, nitrogen fixation, and plant/environment interactions. Areas of particular interest for basic plant biotechnology research include: RNA turnover or small RNA-mediated gene regulation; understanding disease resistance and signal transduction pathways in plants; understanding and enhancing symbiotic nitrogen fixation via the application of molecular and proteomics approaches; developing biotechnology-based diagnostic methods for major plant diseases; and understanding processes controlling plant/soil interfacial relations at the molecular and atomic levels to enhance crop utilization of nutrients and the effectiveness of plants at remediation of soils contaminated with metals and organics. For both avian and plant biotechnology, findings will be applied as much as possible to existing issues in agriculture with the goal of integrating biotechnology research into new agribusinesses such as those producing plants better adapted to environmental and biological stress, plants used for the production of pharmaceuticals and nutriceuticals, and plant with bioenergy uses.

2. Brief description of the target audience

Farmers, landowners, state agencies (Delaware Development Office, Departments of Agriculture, Health and Human Services, Natural Resources and Environmental Control, Transportation), federal agencies (USDA, USEPA), land use organizations, environmental organizations, business and community leaders, families, students, and the general public.

3. How was eXtension used?

Extension in Delaware has set the following goals for use of eXtension:
1) Incorporating eXtension into grants;
2) Connecting the UD Extension website with eXtension.org;
3) Establishing an Ask an Expert widget for Delaware;
4) Encouraging the use of eXtension's Learn feature;
5) Encouraging a positive culture regarding eXtension;
6) Maintaining an accurate list of institutional members in the eXtension people database; and
7) Encouraging participation in Communities of practice.

For Planned Program #2,

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	30	30

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2013	11

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2013	5

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2013	16

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2013	12

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2013	19

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2013	14

Output #7

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2013	8

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2013	30

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2013	2

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2013	8

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2013	0

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2013	25

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2013	2

Output #14

Output Measure

- Number of Websites Established

Year	Actual
2013	2

Output #15

Output Measure

- Number of Workshops Conducted

Year	Actual
2013	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased awareness by all components of the poultry industry of the opportunities to use biotechnology to prevent, diagnose, and control avian infectious diseases.
2	Increased number of farmers and members of the horticultural industry aware of the opportunities to use advances in plant biotechnology to develop new businesses.
3	Educational programs for K-12 youth and teachers on basic principles and applications of biotechnology to the plant, animal, and environmental sciences.
4	Commercial evaluation in agronomic and horticultural settings of genetically modified plants developed using biotechnology research.
5	Integration of plant and animal biotechnology educational materials developed cooperatively by research and extension staff into K-12 curricula in Delaware schools.
6	Stronger, more formal links between scientists conducting biotechnology research, extension specialists familiar with biotechnology applications, and state and regional economic development agencies and private industry.
7	Avian Biotechnology: basic research will provide an improved understanding of the fundamental causes and modes of action of avian diseases and the factors that influence their potential to spread to other animal species and humans; applied research will provide innovations in surveillance and diagnostic tools that help prevent or contain disease outbreaks and vaccines that prevent or control infectious diseases.
8	Plant Biotechnology: basic research will lead to an improved understanding of the processes by which plants grow, resist or adapt to diseases and other stresses; can be used to produce bio-based products useful for human health and nutrition, and regulate the uptake of plant nutrients in agricultural soils and contaminants (e.g., heavy metals) in polluted soils; applied research will lead to plants that can produce increased yields with lower inputs, resist pest and climatic stresses, and remediate or stabilize polluted soils.
9	Biotechnology-Based Agribusinesses: research and extension programs will link results of biotechnology research to industries interested and capable of marketing advances in animal and plant biotechnology; biotechnology, financial planning, marketing, and risk management will be combined to establish agribusinesses specializing in the diagnosis and control of avian infectious diseases, production of crop varieties that have lower fertilizer requirements and that are more tolerant of climatic stress; utilization of hyper-accumulating plants that can remediate contaminated soils, and the production of high-value plant products useful for human health and nutrition.

Outcome #1

1. **Outcome Measures**

Increased awareness by all components of the poultry industry of the opportunities to use biotechnology to prevent, diagnose, and control avian infectious diseases.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Increased number of farmers and members of the horticultural industry aware of the opportunities to use advances in plant biotechnology to develop new businesses.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Educational programs for K-12 youth and teachers on basic principles and applications of biotechnology to the plant, animal, and environmental sciences.

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Commercial evaluation in agronomic and horticultural settings of genetically modified plants developed using biotechnology research.

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Integration of plant and animal biotechnology educational materials developed cooperatively by research and extension staff into K-12 curricula in Delaware schools.

Not Reporting on this Outcome Measure

Outcome #6

1. **Outcome Measures**

Stronger, more formal links between scientists conducting biotechnology research, extension specialists familiar with biotechnology applications, and state and regional economic development agencies and private industry.

Not Reporting on this Outcome Measure

Outcome #7

1. **Outcome Measures**

Avian Biotechnology: basic research will provide an improved understanding of the fundamental causes and modes of action of avian diseases and the factors that influence their potential to spread to other animal species and humans; applied research will provide innovations in surveillance and diagnostic tools that help prevent or contain disease outbreaks and vaccines that prevent or control infectious diseases.

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

Plant Biotechnology: basic research will lead to an improved understanding of the processes by which plants grow, resist or adapt to diseases and other stresses; can be used to produce bio-based products useful for human health and nutrition, and regulate the uptake of plant nutrients in agricultural soils and contaminants (e.g., heavy metals) in polluted soils; applied research will lead to plants that can produce increased yields with lower inputs, resist pest and climatic stresses, and remediate or stabilize polluted soils.

Not Reporting on this Outcome Measure

Outcome #9

1. **Outcome Measures**

Biotechnology-Based Agribusinesses: research and extension programs will link results of biotechnology research to industries interested and capable of marketing advances in animal and plant biotechnology; biotechnology, financial planning, marketing, and risk management will be combined to establish agribusinesses specializing in the diagnosis and control of avian infectious diseases, production of crop varieties that have lower fertilizer requirements and that are more tolerant of climatic stress; utilization of hyper-accumulating plants that can remediate contaminated soils, and the production of high-value plant products useful for human health and nutrition.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation of the Biotechnology and Biotechnology-Based Agribusiness planned program for FY13 (21.4 Research FTEs) shows continued excellence in basic research and an increasing emphasis on application of results from fundamental studies, particularly in the plant sciences. Plant molecular biology faculty are expanding field studies with soybeans, corn, and rice in a concerted effort to extend findings from basic research to real-world conditions. Evaluations of research productivity showed that 5 major research grants were awarded and that faculty in this program supported the efforts of 53 graduate students, post-docs, and undergraduate researchers, that they published 30 refereed journal articles and book chapters, and made 27 invited and volunteered presentations at national and international meetings. Our evaluations focused on research and included annual internal administrative reviews, periodic University level Academic Program Reviews, and analyses of interactions of faculty with industry and state agencies interested in seeing biotechnology advances adopted by businesses. Feedback from all sources has been positive and we anticipate that expanded efforts in the translation of basic research in this planned program to both applied field studies and industrial applications will continue in the future.

Key Items of Evaluation

There are no major items requiring NIFA attention at this time, other than the continued need for more federal funding for research and extension programs that seek to further expand our efforts to conduct fundamental studies on plant and animal biology and apply the results to global challenges related to producing a safe and secure food supply.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Natural Systems, Biodiversity, and Wildlife Ecology

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management	10%	10%	10%	10%
123	Management and Sustainability of Forest Resources	10%	10%	10%	10%
135	Aquatic and Terrestrial Wildlife	20%	20%	20%	20%
136	Conservation of Biological Diversity	15%	15%	15%	15%
215	Biological Control of Pests Affecting Plants	15%	15%	15%	15%
216	Integrated Pest Management Systems	20%	20%	20%	20%
306	Environmental Stress in Animals	5%	5%	5%	5%
903	Communication, Education, and Information Delivery	5%	5%	5%	5%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	1.5	2.0	3.5	2.5
Actual Paid Professional	1.6	1.5	3.4	1.8
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
51700	116679	70078	286657
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
178983	116679	0	286657
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
200786	0	996286	759160

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and extension programs will target: (1) Integrated Pest Management - developing and delivering integrated pest management (IPM) programs, a "systems" approach using chemical, cultural, mechanical, and biological control to increase profits to producers and protect the environment; (2) Sustainable Agriculture/Forestry - developing and promoting efficient and sustainable agricultural, forestry, and other resource conservation practices and policies that ensure sustained ecosystem function and provide food and habitat for biodiversity, including crop diversification, agroforestry, native windbreaks, cover crops, living mulches, field border systems, and conservation buffers; (3) Wildlife, Woodlands, and Aquatic Resources - understanding and mitigating the impact of agricultural practices and urbanization on biodiversity, woodlands, and aquatic resources. Focus will be on human impacts on the fundamental processes that create and maintain biodiversity, such as atmospheric nitrification of ecosystems, minimal habitat requirements, speciation, predator-prey interactions, community and ecosystem structure, and extinction processes. Approaches to develop and sustain biodiversity in agriculture, suburban landscapes, and natural habitats, will be studied. Nonpoint source nutrient pollution models will assess impacts of land use/cover change from agriculture to urban on water quality and quantity on local ponds and creeks; (4) Wetlands Ecosystems - improve understanding of wetlands restoration, protection, and preservation. Emphasis will be on seasonally saturated and non-seasonally saturated wetlands, the wildlife species that inhabit them, and the importance of sedges in wetland habitats; (5) Protection of Delaware's Native Species - research on non-indigenous invasive species, a leading cause of plant and animal extinction in Delaware, will focus on impacts of invasive species on ecosystem function and on methods of restoration after their removal; (6) Master Gardener Training - Extension programs will be developed and delivered on Wildlife Habitat Gardening, Waterwise Gardening, and use of native landscape plants in suburban gardens; (7) Human Activities and the Natural Environment - coupled environmental and socioeconomic modeling methodologies will highlight interactions between human activities (drivers), environmental impacts from those activities (stressors), potential changes to valued ecosystem components, and feedbacks experienced from the changes; (8) Wildlife Management - effects of human activity on migratory shore birds, box turtles in suburban habitat fragments, neotropical bird migrants in Delaware, Bobwhite quail in warm season grasslands, horseshoe crab ecology in the Delaware Bay, insect biomass production in suburban habitats, habitat restoration for bats and White-tailed deer populations and lead to recommendations for improved habitat management; new research focuses on the ecology and conservation of wild felids, the evaluation of wildlife behavioral response to human recreation, the development of new technologies in wildlife research, the application of hierarchical models, and monitoring bird and bat flight activity near wind turbines; (9) Fisheries - population status, spawning areas, and management of Atlantic sturgeon in the Delaware River.

2. Brief description of the target audience

Farm owners and operators, aquaculture producers, recreational fisheries, seafood consumers, water quality managers, agribusiness and private consultants, horticultural professionals, city land use planners and other policy-makers, home gardeners, childcare providers, environmental educators.

3. How was eXtension used?

In 2013 UD and DSU eXtension Institutional Team comprised of faculty and staff from across all planned program areas completed the following:

· Training on how to incorporate eXtension into grants
· Connected the Extension website with eXtension.org
· Implemented Ask an Expert throughout the state. Staff and faculty engaged in the eXtension Learn feature
· Faculty and staff increased participation in the Communities of Practice (COP)-DE is represented by 81 eXtension members in 43 of the 73 approved CoP
·

We trained 40 "experts" to use the Ask an Expert system and have fielded over 295 questions in the past 9 months. (84% of those questions were answered by Delaware experts).

This planned program area receives the largest percent, 80% of the Ask an Expert questions. Questions ranged from horticulture, pests, lawn and turf, vegetables and weeds. UD and DSU staff answered 84% of all of the questions received. This program area also boasts of the highest number of views on our web presence and is linked to the eXtension resources in these areas.

Also, Delaware provides one Community of practice leader, Dr. Deb Delaney in Bee Health and has multiple members in the Climate, Forests and Woodlands, Invasive species, Freshwater Aquaculture, Forest Farming, Water Conservation for lawn and landscape, and Invasive Species. Deb has integrated web information through eXtension on line presence and provides an online course content for stakeholders.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3967	25233	2018	500

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	3	33	36

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2013	34

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2013	24

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2013	19

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2013	45

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual

2013	33

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2013	9

Output #7

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2013	4

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2013	36

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2013	3

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2013	24

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2013	19

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2013	121

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2013	72

Output #14

Output Measure

- Number of Websites Established

Year	Actual
2013	6

Output #15

Output Measure

- Number of Workshops Conducted

Year	Actual
2013	55

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased number of farmers and other producers aware of the principles of integrated pest management and familiar with the practices and technologies needed for a systems-based approach to prevent and control problems with insects, weeds, and plant pathogens.
2	Educational programs for K-12 youth and teachers on ecosystems and natural resources that emphasize the importance of sustaining biodiversity for natural and managed land uses.
3	Through the Center for Managed Ecosystems, conduct research and outreach programs on restoring and enhancing biodiversity and wildlife habitat in suburbanized landscapes.
4	Increased number of farmers and other land managers adopting integrated approaches to pest management for insects, weeds, alien invasive plants, and plant pathogens in agricultural and natural ecosystems.
5	Increased participation by all stakeholders in educational programs on responsible environmental management of natural resources, nutrients, and pesticides.
6	Increases in the amount of agricultural and suburban land where wildlife habitat has been restored or enhanced.
7	Integrated Pest Management: basic and applied research will increase the effectiveness of a systems-based approach to prevent or control pests (insects, weeds, plant pathogens) that threaten agricultural productivity and damage natural, urban, and suburban landscapes. Extension programs will promote adoption of IPM by farmers and other land managers.
8	Ecosystem restoration: fundamental research on ecosystem processes will provide evidence of the full range of ecological, water quality, and economic benefits associated with sustaining and enhancing natural ecosystems such as wetlands, forests, riparian corridors, and tidal marshes, and lead to greater restoration and expansion of areas important for wildlife habitat and biodiversity.
9	Wildlife habitat and management: research will assess the impacts of human activity on wildlife habitats and develop management practices that can protect threatened or endangered species and lead to policies that protect and enhance wildlife populations.
10	Protection of native species: research and extension programs will quantify the ecological and economic benefits of protecting indigenous plant species and restricting the spread of invasive plants and animals.

Outcome #1

1. Outcome Measures

Increased number of farmers and other producers aware of the principles of integrated pest management and familiar with the practices and technologies needed for a systems-based approach to prevent and control problems with insects, weeds, and plant pathogens.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Educational programs for K-12 youth and teachers on ecosystems and natural resources that emphasize the importance of sustaining biodiversity for natural and managed land uses.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Children in grades K thru 12 need to learn some basic information about fish and the role that aquaculture can play in supplementing natural fisheries.

What has been done
Aquaculture is particularly suited to teaching STEM (Science, Technology, Engineering and Math) to students, as many of the individual disciplines (chemistry, biology, geometry, etc.) can be applied directly and in a meaningful and practical way. In this programing effort, Delaware State University Cooperative Extension?s Aquaculture specialist takes the research that DSU students have been working on and directly implement this in the local K-12 classrooms. In 2013, this program expanded to include a hands-on learning experience on the life cycle for Mrs. Susan Gilmore?s fourth grade class at Clayton Elementary School in Clayton, DE. The subject species, Fundulus heteroclitus, lends itself particularly well to this program, as the eggs can be air-incubated and then hatched on demand. The students were able to see each life stage of the fish and then each received a small container with 3-4 fish eggs inside. Once the specialist added water to each dish, the students watched as their fish hatched before their eyes. Prior to hatching,

students viewed the embryos under the microscope throughout each stage of development.

Results
Collectively, students learned about a local estuarine species, the need to grow bait as a means of offsetting pressure on wild stocks, and about aquaculture and what role aquaculture can play in supplementing natural fisheries.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
136	Conservation of Biological Diversity
903	Communication, Education, and Information Delivery

Outcome #3

1. Outcome Measures

Through the Center for Managed Ecosystems, conduct research and outreach programs on restoring and enhancing biodiversity and wildlife habitat in suburbanized landscapes.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many diverse natural resource groups gather throughout the state to discuss and act upon various environmental educational activities regarding our renewable resource usage and conservation efforts, but lack a connection to the research-based information offered through the University of Delaware.

What has been done
The University of Delaware Cooperative Extension is represented in the following groups: Delaware Forest Stewardship Council, Delaware Urban & Community Forestry Council, Delaware Tree Farm Program Committee (Chair), Delaware Association for Environmental Education (Board of Directors), Delaware Forestry Association (past-chair, current-Newsletter Editor), and

Delaware Clean State Program Stakeholder, along with professional organization involvement with the Society of American Foresters and the Association of Natural Resources Extension Professionals.

Results

Cooperative Extension engages in discussion targeting renewable natural resources and helps direct potential legislative issues and/or develop programs outreach efforts that provide scientific and research-based information. By participating in environmental education and helping to develop the Delaware Children in Nature Initiative, the effort is now connecting to the State Education standards (via. STEM) and expanding towards providing educational opportunities for all grades to participate in outdoor educational experiences as part of their school curriculum.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
903	Communication, Education, and Information Delivery

Outcome #4

1. Outcome Measures

Increased number of farmers and other land managers adopting integrated approaches to pest management for insects, weeds, alien invasive plants, and plant pathogens in agricultural and natural ecosystems.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Increased participation by all stakeholders in educational programs on responsible environmental management of natural resources, nutrients, and pesticides.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
An increasing number of Delawareans are requesting assistance with home horticulture and environmental management needs. The limited number of agents representing Delaware Cooperative Extension require the help of a knowledgeable volunteer corps to meet the are needed to agents available to answer these needs of Delaware residents, Volunteers participating in the Master Gardener program require access to current research-based education in order to best assist Delawareans who request their help.

What has been done
Delaware State University and University of Delaware partnered to deliver the intensive, biannual 16?week Master Gardener training course, which prepares Master Gardener candidates for volunteer service. Beyond the formal training course, each Master Gardener candidate agrees to volunteer 45 hours, 30 of which are spent answering the Garden Helpline. Each day, Helpline volunteers assist a growing number of Delawareans?including those who are either new to the state or new to gardening and landscaping?by answering their production, pest and invasive plant control, and conservation questions.

Results
In November 2013, 23 Master Gardener candidates (10 from Kent County; 13 from Sussex County) completed their formal training. Upon completing the requisite 45 volunteer hours, each candidate will obtain their Delaware Master Gardener title.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
903	Communication, Education, and Information Delivery

Outcome #6

1. Outcome Measures

Increases in the amount of agricultural and suburban land where wildlife habitat has been restored or enhanced.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Natural resource managers,farmers, wildlife groups, state and federal agencies, and public citizens concerned about restoring wildlife habitat in urban areas.

What has been done
New approaches to landscape design have been implemented in an existing suburban community in Wilmington, Delaware to diversity vegetation, increase the percentage of native plants, and reduce inputs of chemicals used for lawn, the prior predominant land use.

Results
Researchers have installed a completely new landscape design, eliminating much of the lawn area, replacing it with mixtures of herbaceous and woody plants installed in a manner to reduce runoff (protect water quality) and provide habitat for wildlife, thus increasing biodiversity in an urban community. Educational programs demonstrating the ecosystem services provided by diverse vegetation are being conducted as well.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
903	Communication, Education, and Information Delivery

Outcome #7

1. Outcome Measures

Integrated Pest Management: basic and applied research will increase the effectiveness of a systems-based approach to prevent or control pests (insects, weeds, plant pathogens) that threaten agricultural productivity and damage natural, urban, and suburban landscapes. Extension programs will promote adoption of IPM by farmers and other land managers.

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Ecosystem restoration: fundamental research on ecosystem processes will provide evidence of the full range of ecological, water quality, and economic benefits associated with sustaining and enhancing natural ecosystems such as wetlands, forests, riparian corridors, and tidal marshes, and lead to greater restoration and expansion of areas important for wildlife habitat and biodiversity.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Opportunities for economic enrichment in forested areas should not rely exclusively on harvest revenues from timber production ? other forest entities combine agriculture systems and food products in a sustainable method through various agroforestry practices (i.e., forest farming, windbreaks, riparian forest buffers, alley cropping, silvopasture, short-rotation woody crop plantations for bioenergy, animal waste and irrigation tailwater disposal, wildlife habitat enhancement, nut & fruit tree orchards and Christmas tree plantations).

What has been done
A regional SAF meeting on Agroforesty was coordinated for 35 local professional foresters, held in Middletown, DE. A tour to three operational New Castle County agroforestry sites was offered: a Black walnut/Christmas tree plantation, forest farming of Shiitake mushrooms enterprise combined with silvopasture for Emu farming and a large-scale family owned Christmas tree farm. A full-day event at the 2013 Delaware AG Week for forest landowners on Agroforestry issues was organized.

Results
As a result of the SAF meeting & tour to the Shiitake mushroom enterprise, marketing outreach for this business expanded from just the areas around Newark, Delaware to others placed in neighboring states ? providing economic gain for that business. Following the 2013 AG Week Agroforestry session, at least five participants noted their intention to begin Agroforestry practices

on their farms beginning the following year. One individual has implemented a Shiitake mushroom production operation on their farm in Greenwood, DE.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
136	Conservation of Biological Diversity
216	Integrated Pest Management Systems
903	Communication, Education, and Information Delivery

Outcome #9

1. Outcome Measures

Wildlife habitat and management: research will assess the impacts of human activity on wildlife habitats and develop management practices that can protect threatened or endangered species and lead to policies that protect and enhance wildlife populations.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Natural resource managers, wildlife conservation groups, agencies responsible for preserving and restoring wildlife habitats, public citizens.

What has been done
Research is underway to assess how powerful storms (e.g., Hurricane Sandy) degrade habitats for tidal marsh birds (saltmarsh sparrows, black ducks, American brants), to provide guidance for the habitat restoration strategies.

Results

A range of field research projects have been established in coastal regions impacted by Hurricane Sandy, where data from past studies on bird populations are available. Current research focuses on developing a platform for tidal marsh bird monitoring, as impacted by sea level rise, and is being used to identify regional population centers of saltmarsh sparrows, in hurricane-impacted areas where habitat restoration is underway. Other studies focus on mapping and predicting food supplies for the Atlantic brant, again in areas damaged by Sandy where restoration strategies are emerging and establishing food supplies for tidal marsh birds is critical

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife
903	Communication, Education, and Information Delivery

Outcome #10

1. Outcome Measures

Protection of native species: research and extension programs will quantify the ecological and economic benefits of protecting indigenous plant species and restricting the spread of invasive plants and animals.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many individuals throughout Delaware lack basic knowledge and current research-based choices for renewable ?natural? resource (i.e., forestry, wildlife, soil & water) stewardship in our rural and urban communities.

What has been done
Critical issues of concern were identified with Delaware residents regarding forestry, wildlife management, water conservation, invasive species management, soil health and recycling of renewable resources. Educational experiences (i.e., workshops, field day events, tours, classrooms, interactive exhibits, trainings and conference sessions) were provided to help

individuals gain awareness and increase their capability to become better environmental stewards within their communities and extend this information to others through their personal interactions.

Results

Fourteen Delaware landowners went further to implement at least one management practice to prevent or control exotic invasive species on their individual property of that in a homeowner association. Twenty-two individuals participating in the New Castle County Master Gardener ?Advanced Training? received not only instruction on proper tree and shrub pruning techniques, but, as a result of this training, were then equipped to provide a similar workshop through the regular New Castle Master Gardener classes

4. Associated Knowledge Areas

KA Code	Knowledge Area
136	Conservation of Biological Diversity
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation of the Natural Systems, Biodiversity, and Wildlife Ecology planned program for FY13 (5.2 Research FTEs, 3.1 Extension FTEs) shows ongoing high quality efforts by research and extension scientists and educators to address the ecological and natural resources problems facing Delaware and of relevance to many other states and countries. Significant advances have been made in our understanding of wildlife ecology and management, the role of migratory birds in the transmission of avian diseases, applications of radar technology to track migratory birds, and the use of biocontrol strategies to manage invasive plants and problem insects. Evaluations of research and extension productivity showed that 24 grants were awarded and that faculty in this program supported the efforts of 101 graduate students, post-docs, and undergraduate researchers, that they published 36 refereed journal articles and book chapters, made 193invited and volunteered presentations at national and international meetings, and conducted 55 workshops. Our evaluations have included annual internal administrative reviews, periodic University level Academic Program Reviews, and - for extension - surveys

and other evaluations conducted with stakeholders participating in workshops and other extension programs. All evaluations and feedback from stakeholders have been positive in terms of the direction of research and extension programs, their relevance to Delaware, and their contributions to basic and applied science.

Key Items of Evaluation

There are no major items requiring NIFA attention at this time, other than the continued need for more federal funding for research and extension programs that seek to further expand our efforts to conduct research and outreach programs that meet the growing need to restore degraded ecosystems, protect biodiversity, and address the growing global problem of invasive species control.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Family and Youth Development

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
801	Individual and Family Resource Management	25%	25%	0%	50%
802	Human Development and Family Well-Being	25%	25%	0%	50%
806	Youth Development	40%	40%	0%	0%
903	Communication, Education, and Information Delivery	10%	10%	0%	0%
	Total	100%	100%	0%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	10.5	4.5	0.5	1.0
Actual Paid Professional	6.9	2.9	0.0	0.3
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
107728	267200	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
225173	267200	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1256688	29114	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and extension programs will target: (1) Volunteer Leadership Development programs will be delivered on public policy education; volunteer leadership development (e.g., 4-H adult and teen volunteers and camp counselors, master gardeners, master food educators; T.R.Y. (Teens reaching youth), middle management volunteers (volunteers managing volunteers); extension advisory committees; and Family and Community Educators. Special attention will be paid to training volunteers in risk management and emergency preparedness issues. (2) Family Well-Being Across the Lifespan Educational Programming, including Just in Time Parenting (Great Beginnings and the Brown Bag program for parents of young children) and Families Matter! (for parents of school-age children), interactive web sites, newsletter series, workshops, worksite seminars and classes focusing on positive parenting and care giving, family stress management, child development, healthy relationships and marriage education, savvy decision-making, anger management and conflict resolution, healthy communication, intergenerational well-being, teamwork, leadership, and community involvement skills; 3) Safe Communities - programs will include drug and alcohol prevention education, bicycle safety education, pedestrian safety education, farm safety, and car seat safety; youth tobacco prevention will also be an area where significant resources are targeted; (4) Family Economic Well-Being and Consumer Decision Making educational programs will be developed and delivered focusing on strategies for effective consumer decision making, financial planning, financial management counselor training, basic budgeting, credit management, and retirement planning; (5) 4-H Youth Development programs will focus on life skills development, positive life choices, leadership development, citizenship and community involvement, and career exploration with emphasis on science, engineering and technology knowledge. Rural communities in southern Delaware will be targeted. The goal is to provide expanded youth opportunities for out-of-school time, develop human and community capital and develop and strengthen youth-adult partnerships. Also, using technology as a tool, significant mentoring to reduce inappropriate behaviors that lead to poor choices by youth will be implemented. Appropriate settings including clubs, camps, school enrichment and after school will use the latest technology to deliver the sustained opportunities.

2. Brief description of the target audience

Youth ages 5-19, 4-H members, 4-H volunteers, new 4-H volunteers, Master Gardeners, Community Leaders, at-risk youth and families, court appointed and incarcerated youth and adults, parents of children (from birth through school-age), families with members in the second ½ of the lifespan, youth agency professionals, key decision-makers, human service professionals, child care/after school providers, family day home providers, social clubs, church groups, private and public school youth and teachers, after school 4-H clubs and school age child care programs.

3. How was eXtension used?

In 2013 UD and DSU eXtension Institutional Team comprised of faculty and staff from across all planned program areas completed the following:

· Training on how to incorporate eXtension into grants
· Connected the Extension website with eXtension.org
· Implemented Ask an Expert throughout the state. Staff and faculty engaged in the eXtension Learn feature
· Faculty and staff increased participation in the Communities of Practice (COP)-DE is represented by 81 eXtension members in 43 of the 73 approved CoP
·

We trained 40 "experts" to use the Ask an Expert system and have fielded over 295 questions in the

past 9 months. (84% of those questions were answered by Delaware experts).

For Planned Program #4, Leadership for the Just in Time Parenting Community of Practice is provided from Delaware. This CoP is integrated into the development and evaluation of the Just in Time parenting program across Delaware impacting over 3500 families each year. Faculty are also involved in the Diabetes, Families, Food and Fitness, Family Caregiving, Alliance for better child care, Financial Security, Food Safety, and For Youth For Life CoP's.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	7058	11810	20968	8114

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2013	15

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2013	13

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2013	0

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2013	6

Output #5

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2013	0

Output #6

Output Measure

- Number of Technical Reports

Year	Actual
2013	1

Output #7

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2013	22

Output #8

Output Measure

- Number of Invited Presentations

Year	Actual
2013	47

Output #9

Output Measure

- Number of Volunteered Presentations

Year	Actual
2013	12

Output #10

Output Measure

- Number of Websites Established

Year	Actual
2013	6

Output #11

Output Measure

- Number of Workshops Conducted

Year	Actual
2013	559

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Leadership development programs for volunteers interested in improving the quality of life for youth, families and communities.
2	Greater knowledge by Delaware youth of the importance of academic performance, social skills, and job preparedness to their future careers.
3	Educational programming for adults and youth emphasizing the development of positive life skills related to parenting, family financial planning, and safe communities.
4	Number of youth adopting behaviors that reduce their risk of using alcohol, tobacco and related substances, and that result in improved academic, social, and job preparedness skills.
5	Number of parents/families participating in extension programming who demonstrate positive parenting skills.
6	Number of youth and adults adopting increased leadership, communication, conflict management and decision-making skills
7	Number of program participants adopting skills for balancing work and family and stress management that promote healthy, well-functioning individuals and families
8	Number of families who adopt best practices in financial management, retirement planning and consumer decision-making.
9	Number of adults adopting best practices in child development, business development, educational program development in child care settings.
10	Number of youth who have increased science, engineering, and technology skills.
11	Number of youth with greater involvement in citizenship and community service programs.
12	An enhanced capacity for families and youth to improve their quality of life because of increased skills in parenting and family relationships, academic preparedness, career development, family financial planning, leadership and volunteerism, and citizenship and community involvement

Outcome #1

1. Outcome Measures

Leadership development programs for volunteers interested in improving the quality of life for youth, families and communities.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As part of this planned program, nine new volunteers were trained to build their skills in understanding how to be prepared to conduct a demonstration, practice their skills and receive feedback and be ?caught up? with the existing group of volunteers. The volunteers, 7 in New Castle County and 2 in Kent County, used Adobe Connect.
Seventeen topics were covered during the training from including Extension 101 (Overview of extension), Chronic Disease/Health, Nutrients in Food, Dietary guidelines, MyPlate, Food/Nutrition Facts Labels, Physical Activity, Food Safety, Food Quality, Preparation of food, MFE Experiences, Diversity Training, Adults as Learners, Demonstrations and Displays, and Extension 102 (Civil Rights Compliance Requirements).

What has been done
When asked, ?As a result of this training, please rate how confident you are in following categories (1 really not confident to 5 very confident)? the average score across all respondents is shown.
ItemAverage Score
Representing UD cooperative Extension in public: Average - 3.875
Knowing where to find research based information: Average -3.5
Answering questions you might get from clientele: Average - 3.25
Conducting a demonstration in front of a group: Average - 3.875

Results
Post program evaluation was conducted to determine personal changes participants may have made as a result of the knowledge they had gained over the 7 weeks. Results from this

evaluation showed:
87.5%__thinking more about what you are eating and drinking
62.5%__eating more vegetables
62.5%__eating more fruits
62.5%__consuming more dairy products
50%_ _incorporating more whole grains in your diet
50%__ reading Nutrition Facts labels
50%__ examining ingredient labels
37.5%__being more physically active

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
806	Youth Development
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Greater knowledge by Delaware youth of the importance of academic performance, social skills, and job preparedness to their future careers.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many children and families who reside in Delaware State Housing Authority (DSH) properties lack sufficient access to educational resources available within their communities. This lack of access can lead to high crime rates, poor academic performance, and a continued cycle of being stuck in a system from which so many want to desperately free themselves.

What has been done

Delaware State University Extension educators implemented several activities throughout the state in this area. The four-week ?Connecting School-aged Students to College? program was designed to educate school-aged students and their parents about the importance of a solid education. The two-week AgDiscovery program, held each summer, educates middle and high school students about college and career options in agriculture. The Ladies and Gentlemen?s Club enrolls middle and high school students in Sussex County who require assistance to improve educational and life skills.

Results

Students who participated in these activities experienced improvement of their educational abilities and attitudes. In total, 481 students realized the importance of academic performance, social skills, and job preparedness for future careers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development
903	Communication, Education, and Information Delivery

Outcome #3

1. Outcome Measures

Educational programming for adults and youth emphasizing the development of positive life skills related to parenting, family financial planning, and safe communities.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Deployment has a major impact on military affiliated youth in Delaware. Many children in Delaware have one and sometimes both parents serving at Dover Air Force Base. These active duty families often experience transfers to other bases nationally and internationally. Therefore, the youth have to make new friends, get used to a new state or country, new school, etc. This move can often happen in the middle of a school year and the youth often experience inconsistency in their lives.

For those geographically dispersed families in Delaware 2012-2013 might be a year of change as well. Guard and Reserve military members hold jobs in their local communities but are part-time service members of the Delaware Air National Guard and Air Force Reserve. These service members are facing one of the largest deployments in many years and can be called to serve for periods of one to eighteen months.

What has been done

The Delaware Military 4-H Club program is funded by a grant supported by 4-H National Headquarters/NIFA/USDA; Army Child, Youth and School Services; Air Force Child and Youth Programs; Navy Child and Youth Programs; and the University of Delaware Cooperative Extension 4-H Program. The Delaware 4-H/Air Force Partnership seeks to expand opportunities for Air Force Youth in Delaware. For those being transferred to Delaware, the Delaware Military 4-H Program offers stability in the youth lives. No matter what base they are transferred to, whether it is in the United States or abroad, 4-H programs provide predictability and stability throughout the lives of the military youth.

Results

Youth in our Soaring Eagles 4-H Program at the Dover Air Force Base youth center spent over 3,635 project hours in their 35 project clubs that met weekly at the Dover Air Force Base. 632 Youth were served at the Dover Air Force Youth Center. Youth had the opportunity to participate in programs which covered mission mandate areas of STEM (Science, Technology, Engineering, and Math), Health and Nutrition, Health and Fitness, Citizenship and Leadership, as well as many other project areas youth indicated an interest in when they were surveyed.
We increased the number of project clubs by 5 as we went from 30 project clubs to 35 project clubs for both the club held at the Dover Air Base Youth Center, as well as the club that meets monthly for geographically dispersed youth.

Military youth participated in informal surveys where 100% of youth participants reported that they experienced increased knowledge of the project club they participated in, as well as 100% indicated that they planned on attending the project clubs the next year and that they would recommend the project clubs and invite their friends to participate in the project clubs in 2014.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
903	Communication, Education, and Information Delivery

Outcome #4

1. Outcome Measures

Number of youth adopting behaviors that reduce their risk of using alcohol, tobacco and related substances, and that result in improved academic, social, and job preparedness skills.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Children need positive mentoring to avoid negative behaviors and better prepare for the future.

What has been done
Two Delaware State University extension educators held activities that focused on reducing the risks of children using drugs, alcohol, and tobacco. Juneteenth, an activity that commemorates the freedom of slaves in Texas, creatively incorporates African American history, current events and life skills training into fun lessons for eight to 19-year-old 4-Hers. The goals of this event include the importance of avoiding illicit substances and preparing for the future. These goals were shared by the Ladies and Gentlemen?s clubs of Delaware.

Results
405 students increased awareness of the dangers presented by drug, alcohol, and tobacco usage. They also gained the confidence required to accept leadership positions within their schools and communities as preparation for future academic and career pursuits.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development
903	Communication, Education, and Information Delivery

Outcome #5

1. Outcome Measures

Number of parents/families participating in extension programming who demonstrate positive parenting skills.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Number of youth and adults adopting increased leadership, communication, conflict management and decision-making skills

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a continual need to develop communication skills and confidence among today?s youth.

What has been done
As a response to the above issue, the Kent County 4-H program organizes a Public Speaking Contest, where 4-H youth ages 9-18, prepare and deliver speeches depending on the age category they fall into; from anywhere between 1 ½ - 10 minutes. Their original presentation is given to an audience and panel of two to three judges. The judges provide constructive feedback in a safe and effective way and youth enjoy participating in this event year after year. The county 4-H office also conducts an annual training for youth members to attend to learn skills and techniques to use with public speaking.

Results
Following the event, each traditional aged youth was mailed a postage paid survey, asking for them to complete and share their thoughts and experiences after having participated. 42% of the surveys were returned and indicate that public speaking does encourage 4-H youth to learn more about specific subject areas (patriotism, hermit crabs, Paris and unicycling), civic engagement (helping others, making a difference), mentoring (safety, qualities of a good leader), school success (educational opportunities, being a band geek) and setting future goals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

806	Youth Development
903	Communication, Education, and Information Delivery

Outcome #7

1. Outcome Measures

Number of program participants adopting skills for balancing work and family and stress management that promote healthy, well-functioning individuals and families

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Number of families who adopt best practices in financial management, retirement planning and consumer decision-making.

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Number of adults adopting best practices in child development, business development, educational program development in child care settings.

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

Number of youth who have increased science, engineering, and technology skills.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Some in the U.S. predict a shortage of future workers in STEM fields. 4-H members, due to their affiliation with land-grant universities throughout the nation, are poised to fulfill this need and require science-based learning opportunities to ignite interest in these fields.

What has been done
In 2013, a Delaware State University educator partnered with the Sussex County Health Promotion Coalition (SCHPC) and the Western Sussex Boys & Girls Club to host a series of five Weird Science workshops for young people in Sussex County, Delaware. This activity was held monthly in conjunction with Family Fun Night at the Western Sussex Boys & Girls Club in Seaford. Additionally, the Blue Jay Educational Learning and Leadership Academy (BELLA) provided after-school programming that integrated science, reading, and the arts to enhance student learning and leadership development

Results
110 youth participants, aged 7-14 years, increased their knowledge of science concepts through hands-on learning. The young people developed skills in problem solving, scientific reasoning, and interest in STEM-based education and careers. Workshops included lessons on the science of weather and/or changes in seasons, aerodynamics, and animal adaptation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development
903	Communication, Education, and Information Delivery

Outcome #11

1. Outcome Measures

Number of youth with greater involvement in citizenship and community service programs.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In 2012-2013, Delaware Reserve and National Guard members are facing one of the largest deployments in many years. Deployment of guard and reserve military members in Delaware often have a major impact on their youth since these youth are not accustomed to their parent working a military job except one weekend a month and one week during the summer. Military youth in Delaware have one and sometimes both parents called into action that can be gone from one to eighteen months.

What has been done

Operation: Military Kids (OMK) is the U.S. Army?s collaborative effort with America?s communities through the Cooperative Extension System, particularly the 4-H youth and development program, to support the children and youth affected by deployment.
Through a grant from the Department of Defense, the Delaware 4-H OMK Program has offered five camps to 169 youth ages 6-17 whose parents are in the Reserve or National Guard in 2013. The purpose of these camps were to teach the military youth life skills and coping skills to assist them as parents or loved ones deployed.

Results

The camps were evaluated by the Virginia Tech Community and Family Research Lab based on surveys developed by the American Camping Association. The results showed that campers perceived improvement for themselves in all five domains measured. All mean scale scores placed well above national normed scores for these scales.
The Five camps were held and evaluated in Delaware. One hundred and sixty-nine (169) campers, ages six to 17, participated and completed a survey at the end of the camp. Depending on the age of the camper, they received one of two age-appropriate surveys developed by the American Camping Association.

4. Associated Knowledge Areas

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

Outcome #12

1. Outcome Measures

An enhanced capacity for families and youth to improve their quality of life because of increased skills in parenting and family relationships, academic preparedness, career development, family financial planning, leadership and volunteerism, and citizenship and community involvement

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation of the Family and Youth Development planned program for FY13 (0.3 Research FTE, 10 Extension FTEs) shows a continued dedication by Extension faculty and professionals to meet the many challenges faced by Delaware families today. Issues where evaluations indicate particular success are those related to family financial planning, youth development and mentoring - particularly on the importance of education, strengthening families and parenting skills, and youth learning to avoid risks related to drugs and alcohol. Evaluations of extension programming showed a continuation of remarkable success in grants (13 of 15 submitted were awarded), the publication of 22 new fact sheets, 59 invited and volunteered presentations in local communities and at regional and national meetings, and the presentation of more than 550 workshops. Our evaluations have included annual internal administrative reviews and numerous surveys and other evaluation methods conducted with stakeholders participating in workshops and other extension programs. Specific examples of stakeholder evaluation of these programs are provided in the "Outcomes" section of the FY13 annual report. The response from our stakeholders and internal reviews has been universally positive and complimentary of the dedicated efforts of Extension professionals to address the very complex challenges faced by Delaware families and youth today.

Key Items of Evaluation

There are no major items requiring NIFA attention at this time, other than the continued need for more federal funding for research and extension programs which seek to develop innovative educational programming that strengthens families, fosters positive youth development and education, and builds stronger communities in the difficult financial times we all face today.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food Safety

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	15%	15%	40%	40%
502	New and Improved Food Products	10%	10%	15%	15%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	60%	60%	40%	40%
903	Communication, Education, and Information Delivery	15%	15%	5%	5%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	1.5	2.5	4.0	1.5
Actual Paid Professional	0.9	1.9	4.9	1.2
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
18176	88197	8418	286657
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
29709	88197	0	286657
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
416568	150496	1327311	145884

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research efforts involve using high pressure processing to reduce bacteria, viruses, protozoan oocysts, and bacterial endospores; inactivation of pathogenicbacterial specieswith high pressure and mild heat; using various antimicrobial films to control bacteria, such as Listeria monocytogenes;physiological and genetic analysis ofpressure-resistant Listeria monocytogenes; testing of activity of antimicrobial films against native and inoculated bacteria on foods and surfaces; effects and mechanisms of non-thermal processes (ozone, UV, oxidative chemicals, iron, and/or high pressure processing) on protozoa, human pathogenic viruses, and bacteriophage, and increase understanding of basic biochemistry of these microorganisms. Extension efforts include conducting DineSafe, ServSafe®, Don't Give Kids a Tummy Ache, Food Safety for Entrepreneurs, GAP/GHP training, Don't Bug Me!, FoodSkills, Expanded Food and Nutrition Education workshops, training volunteers including Master Food Educators, 4-H leaders, agency personnel, and teacher about food safety so that they can educate families, community groups, and institutions (e.g., childcare centers, schools); developing and delivering programs on Kids Cooking (1890 EFNEP), Food Safety for Youth, and Eat Smart, Play Hard; developing web-based information and fact sheets; distributing information to media; developing a marketing campaign to expand program participation; developing a marketing strategy with state and local government partners, faith-based groups, parents, social workers, childcare providers, low income housing managers, and corporate wellness centers to collectively reach a variety of audiences.

2. Brief description of the target audience

Restaurant workers, volunteer food handlers, delicatessen workers, day care providers, institutional foodservice workers, school foodservice personnel, caterers/private chefs, food entrepreneurs, retail food owners/managers, food producers, youth ages 5 to 18, parents and caregivers of children from birth to 18, limited-resource individuals and families, 4-H leaders and clubs, Boys and Girls clubs, teachers and other school personnel, youth in low-income schools, policy makers, and media.

3. How was eXtension used?

In 2013 UD and DSU eXtension Institutional Team comprised of faculty and staff from across all planned program areas completed the following:

· Training on how to incorporate eXtension into grants
· Connected the Extension website with eXtension.org
· Implemented Ask an Expert throughout the state. Staff and faculty engaged in the eXtension Learn feature
· Faculty and staff increased participation in the Communities of Practice (COP)-DE is represented by 81 eXtension members in 43 of the 73 approved CoP
·

We trained 40 "experts" to use the Ask an Expert system and have fielded over 295 questions in the past 9 months. (84% of those questions were answered by Delaware experts). For Planned Program #5, , eXtension "Ask an Expert" t serves as a great connector to public requests for information. Over 5% of the Ask an Expert questions received in Delaware are related to food and food safety.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3854	858	3522	0

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	1	24	25

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2013	25

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2013	9

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual

2013	10

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2013	13

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2013	8

Output #6

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2013	2

Output #7

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2013	25

Output #8

Output Measure

- Number of Books and Book Chapters

Year	Actual
2013	3

Output #9

Output Measure

- Number of Technical Reports

Year	Actual
2013	4

Output #10

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2013	16

Output #11

Output Measure

- Number of Invited Presentations

Year	Actual
2013	32

Output #12

Output Measure

- Number of Volunteered Presentations

Year	Actual
2013	26

Output #13

Output Measure

- Number of Websites Established

Year	Actual
2013	2

Output #14

Output Measure

- Number of Workshops Conducted

Year	Actual
2013	432

Output #15

Output Measure

- Number of Newsletters

Year	Actual
2013	0

Output #16

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2013	8

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased number of farmers, processors, food handlers, and families who are aware of food safety and nutrition issues that can lead to illness and long-term health problems and of the practices and technologies needed to ensure a safe and healthy food supply.
2	Educational programs for K-12 youth and teachers on food safety that will help reduce the likelihood of food-borne illness.
3	Increased number of farmers and food processors adopting research-based advances in food science technology that will prevent the incidence and spread of foodborne illnesses.
4	Safe, new food products that are preserved using innovative technologies designed to maintain food quality and nutrient content.
5	Increased number of program participants improving in one or more safe handling practices.
6	Increased number of participating youth increasing understanding of safe food handling procedures.
7	Food science and technology: basic and applied research will lead to optimization of intervention strategies incorporating high hydrostatic pressure processing, ultraviolet light, ozone treatment, active packaging and low-temperature storage to eliminate or significantly reduce the source of foodborne disease in food products. Applied food science research and extension programs in these areas will increase awareness to food producers and consumers of the most effective strategies for food product safety.
8	Food safety: research and extension programs will lead to enhanced safety and wholesomeness of foods as a result of improved understanding of the mechanisms whereby food pathogens exist, enter, survive, propagate and actuate disease syndromes in individuals who consume contaminated products. Gene-based methods to rapidly and accurately identify food-borne pathogens will increase the safety of food products.

Outcome #1

1. Outcome Measures

Increased number of farmers, processors, food handlers, and families who are aware of food safety and nutrition issues that can lead to illness and long-term health problems and of the practices and technologies needed to ensure a safe and healthy food supply.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Delaware Farmers want to increase income by marketing and selling wholesome, value-added products that meet the recommended food safety guidelines.

What has been done
A value-added session was held to inform producers of the licensing, procedures and requirements for marketing value-added food products and produce (e.g. through canning). Producers learned the importance of selling products that are safe for consumers and they were introduced to the Food Business Incubator Center at Delaware State University. The Center provided producers with a licensed facility at low cost to make value-added products for commercial production. Producers also attended the SERVSAFE course, which certifies food handlers for five years to process and handle food in a food production facility.

Results
Participants expanded their knowledge of additional resources available through Delaware Department of Agriculture, USDA, and FDA, such as requirements for licenses and permits which authorize the production and selling of value-added products. This acquired knowledge helped producers increase the quantity of value-added products for available markets. More value-added workshops and practical sessions are planned for 2014.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies

712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Educational programs for K-12 youth and teachers on food safety that will help reduce the likelihood of food-borne illness.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many youths lack knowledge of proper nutritional information and proper food safety skills.

What has been done
Kitchen Physics After-School Program at William Henry Middle School was designed by DSU Extension educators, in collaboration with the Capital school District, to reinforce nutrition and food safety education in a fun and experiential manner. USDA?s MyPlate curriculum was used to reach 122 children who successfully completed the program. Students participated in six workshops and received nutritional information to share with their families at home. In all, 188 factsheets were distributed.

Results
A post survey was conducted and the results suggest that 95 percent of youths were able to identify meals and snacks that fit the MyPlate guidelines, and 90 percent of youths were able to correctly identify six out of six food safety mistakes on a sheet provided. Additionally, 85 percent of youths could identify at least four whole grains; more than 75 percent of youths knew the correct method of hand washing for safe food handling; and 95 percent of youths were willing to try unfamiliar foods and expressed delight at finding they liked them.

4. Associated Knowledge Areas

KA Code	Knowledge Area

712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
903	Communication, Education, and Information Delivery

Outcome #3

1. Outcome Measures

Increased number of farmers and food processors adopting research-based advances in food science technology that will prevent the incidence and spread of foodborne illnesses.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food workers must be aware that their food handling practices can reduce the risk of developing a foodborne illness. An estimated 48 million Americans experience foodborne illness each year. In addition, about 2 to 3 percent develop some type of long-term health consequence such as Guillain-Barré syndrome, reactive arthritis, or renal problems and about 3,000 die due to food contaminated with harmful microorganisms. The Centers for Disease Control suggests that 70 percent of these outbreaks are due to mishandling in a quantity foodservice establishment.

What has been done
University of Delaware Cooperative Extension has two programs that target quantity food handlers. The ServSafe® program from by the National Restaurant Association Educational Foundation is for managers of foodservice operations. Successful completion of the certification examination helps in meeting Delaware Food Code requirements. DineSafe is for quantity food preparers working in a variety of settings. They learn skills and strategies required to keep food safe regardless of their specific job.

Results
During 2013, 54 quantity foodservice workers were reached in both the ServSafe® and DineSafe programs. These individuals worked in a variety of settings including restaurants, delis, schools, day care, hospital/nursing homes, and volunteer operations such as fire halls and churches. Because of the programs, participants in these two programs indicated that they would improve food safety practices with:
?88 percent reporting the intent to wash hands more frequently;

?68 percent keeping foods hot;
?69 percent cooling food rapidly;
?74 percent using sanitizer correctly, including checking the concentration; and
?81 percent thoroughly washing and sanitizing work surfaces before preparing a different food.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
903	Communication, Education, and Information Delivery

Outcome #4

1. Outcome Measures

Safe, new food products that are preserved using innovative technologies designed to maintain food quality and nutrient content.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Increased number of program participants improving in one or more safe handling practices.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Increased number of participating youth increasing understanding of safe food handling procedures.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In Delaware over the past 30 years, the prevalence of overweight and obesity has increased sharply for both adults and children. According to the CDC report about Delaware, in 2007, 65% of adults in Delaware were overweight or obese and 18 percent of high schools students were overweight, based on self-reported height and weight.
These figures show a great need for the nutrition programs that UD Cooperative Extension has to offer. But with few full-time staff to address the nutrition and wellness concerns of clientele, Cooperative Extension needed to increase its capacity to reach citizens of Delaware.

What has been done
To expand Cooperative Extension?s reach, the Master Food Educators program started a trained volunteer program. This year?s Master Food Educator Training Program was a 42-hour professional development curriculum offered in Kent and New Castle County via Adobe Connect. The program helps volunteers increase knowledge and confidence about nutrition, food science, wellness, food preparation, and food safety. Community nutrition students and volunteer Dietetic Interns assist in the development of resources to support this.

Results
During the 2013-14 program year, 24 Master Food Educators volunteered to support 17 workshops, 7 public events and assisted in judging 2 events giving just over 800 hours to Cooperative Extensions outreach efforts.
The Master Food Educators reached 1,282 individuals through their workshops and public events appearances.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
903	Communication, Education, and Information Delivery

Outcome #7

1. Outcome Measures

Food science and technology: basic and applied research will lead to optimization of intervention strategies incorporating high hydrostatic pressure processing, ultraviolet light, ozone treatment, active packaging and low-temperature storage to eliminate or significantly reduce the source of foodborne disease in food products. Applied food science research and extension programs in these areas will increase awareness to food producers and consumers of the most effective

strategies for food product safety.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Produce growers, food distribution and sales industries, consumers, state and federal agencies responsible for food safety for fresh market vegetables

What has been done
Research has been conducted on to assess the influence of irrigation water and soil-borne contaminants as a source of food-borne pathogens for leafy greens and tomatoes grown under field conditions.

Results
Field studies have been established to provide data on the presence, viability,and surviability of food-borne pathogens of concern for human health in various irrigation waters, as impacted by the types of soil amendments (e.g., manures, fertilizers, other organic fertilizers) used to grow leafy greens and tomatoes. Results will be used to provide information as new rules are developed for vegetable produces as part of the Food Safety Modernization Act.

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

Food safety: research and extension programs will lead to enhanced safety and wholesomeness of foods as a result of improved understanding of the mechanisms whereby food pathogens exist, enter, survive, propagate and actuate disease syndromes in individuals who consume contaminated products. Gene-based methods to rapidly and accurately identify food-borne pathogens will increase the safety of food products.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nationwide, there are 16 mobile processing units currently in service?eight dedicated to processing poultry and eight for red meat. Only a few of these are USDA certified, and most are not designed for use with more than one type of animal, which means operators must process only poultry or red meat. Prime markets for value-added meat products made in Delaware are Washington D.C., Baltimore, MD, Philadelphia, PA, and New York, NY. In order to market and transport Delaware meat products across state lines, USDA inspection is required.

What has been done
Delaware State University Cooperative Extension?s Mobil Meat Processing Lab was designed as a USDA certified unit to process red meat, poultry and aquacultured fish, making it unique among the 16 mobile processing units currently in operation. To publicize this initiative with clientele and Cooperative Extension peers across the country, the lab was presented during Delaware?s Ag Week 2013 and a poster was created for the Small Farms Conference.
Both activities generated a lot of interest in our project.

Results
By working closely with the vendor and in conjunction with the Nomad engineers, the final designs for the MMPL were completed. The unit was delivered to DSU Extension in August 2013.

Now that minor warranty issues have been resolved, a vendor is being selected to provide the processing equipment necessary to render the MMPL usable.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation of the Food Safety planned program for FY13 (6.1 Research FTEs, 2.8 Extension FTEs) shows that an active research program focused on food safety and innovative food processing technologies is well-linked with our extension programs, particularly in food safety and human nutrition. Areas of strength are on the biology of food pathogens, management strategies to prevent contamination of fresh produce by viruses and bacteria, food processing technologies that can ensure food safety, and a wide range of extension programs for families, youth, food handlers, and the food service industry. Evaluations of research and extension productivity showed that 9 grants were awarded, that faculty in this program supported the efforts of 31 graduate students, post-docs, and undergraduate researchers, that they published 25 refereed journal articles and book chapters, made 58 invited and volunteered presentations at national and international meetings, and conducted 432 workshops. Our evaluations have included annual internal administrative reviews and numerous surveys and other evaluation methods conducted with stakeholders participating in workshops and other extension programs. Specific examples of stakeholder evaluation of these programs, particularly by our extension professionals, are provided in the "Outcomes" section of the FY13 annual report. Internal and external reviews of research quality and feedback from stakeholders have been positive and

complimentary of the dedicated efforts of our food safety research and extension team to provide science-based solutions to the many challenging problems related to providing a safe and secure food supply today.

Key Items of Evaluation

There are no major items requiring NIFA attention at this time, other than the continued need for more federal funding for research and extension programs which, while productive, are only addressing a fraction of the growing and very complex problems related to food safety today.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Childhood Obesity

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
702	Requirements and Function of Nutrients and Other Food Components	10%	10%	10%	10%
703	Nutrition Education and Behavior	20%	20%	20%	20%
724	Healthy Lifestyle	60%	60%	60%	60%
903	Communication, Education, and Information Delivery	10%	10%	10%	10%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	17.0	3.0	0.5	1.0
Actual Paid Professional	17.2	2.2	0.0	0.1
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
81342	144016	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
35711	144016	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
841581	156684	8205	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Extension efforts include, but are not limited to, conducting Healthy Habits, Healthy Start - a 6 hour program on healthy eating and physical activity for child care workers, Family Meals Workshops - a series of three, three-hour programs for families with young children, FoodSkills - an eight part workshop for low-income adults without children; Expanded Food and Nutrition Education Program - a series of eight lessons for low-income adults with children; Expanded Food and Nutrition Education Program for low-income youth; training volunteers including Master Food Educators, 4-H leaders, agency personnel, and teachers; providing Just In Time parenting newsletters; incorporating physical activity and healthy foods/snacks in all 4-H camps and after-school programs; providing special educational programs at the 4-H Military Program; and conducting favorite foods contests and CATCH programs for youth. In addition, using videography and other tools, youth will document both the healthy and unhealthy aspects of their communities. This includes those areas involving food, food choices, food safety, food security and other healthy/unhealthy lifestyle aspects of their communities.

2. Brief description of the target audience

Day care workers, parents, low-income adults and youth, 4-H youth, Master Food Educators, 4-H leaders, teachers

3. How was eXtension used?

In 2013 UD and DSU eXtension Institutional Team comprised of faculty and staff from across all planned program areas completed the following:

· Training on how to incorporate eXtension into grants
· Connected the Extension website with eXtension.org
· Implemented Ask an Expert throughout the state. Staff and faculty engaged in the eXtension Learn feature
· Faculty and staff increased participation in the Communities of Practice (COP)-DE is represented by 81 eXtension members in 43 of the 73 approved CoP
·

We trained 40 "experts" to use the Ask an Expert system and have fielded over 295 questions in the past 9 months. (84% of those questions were answered by Delaware experts). For Planned Program #6, Delaware eXtension is actively involved with Creating Healthy Communities and Diabetes CoP's informs program development and delivery of program with shared expertise from across the national system.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	8346	69636	12189	1200

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	1	0	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2013	7

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2013	4

Output #3

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2013	30

Output #4

Output Measure

- Number of Invited Presentations

Year	Actual

2013	35

Output #5

Output Measure

- Number of Volunteered Presentations

Year	Actual
2013	15

Output #6

Output Measure

- Number of Websites Established

Year	Actual
2013	5

Output #7

Output Measure

- Number of Workshops Conducted

Year	Actual
2013	503

Output #8

Output Measure

- Number of Research Projects Completed

Year	Actual
2013	0

Output #9

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2013	2

Output #10

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2013	5

Output #11

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2013	1

Output #12

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2013	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Statewide educational programs for K-12 youth and teachers focused on nutrition, healthy diets and obesity causing factors that will help reduce the likelihood of food-borne illness, develop good nutritional and dietary habits, avoid obesity, and prevent chronic illnesses related to poor nutrition.
2	Targeted educational programs on understanding the causes of obesity and the means to reduce obesity for low-income communities, youth through after-school programs and childcare workers.
3	Increased number of program participants improving one or more nutrition practices.
4	Increased number of program participants who improve the frequency and quality of family meals.
5	Increased number of program participants engaged in greater levels of physical activity
6	Reducing obesity in Delaware by extension programs that modify individual, family, and community behavior in a manner that promotes healthy lifestyles, physical activity on a regular basis, the consumption of healthy foods in appropriate quantities, and increasing family meals.
7	Greater understanding, particularly in low-income communities and by youth, of the health risks associated with obesity and the options available to prevent or correct obesity problems.
8	Master Food Educators expand extension reach into communities through volunteer development

Outcome #1

1. Outcome Measures

Statewide educational programs for K-12 youth and teachers focused on nutrition, healthy diets and obesity causing factors that will help reduce the likelihood of food-borne illness, develop good nutritional and dietary habits, avoid obesity, and prevent chronic illnesses related to poor nutrition.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youths may not fully understand the importance of consuming nutritious meals

What has been done
Delaware State University Extension?s SNAP educators collaborated with multiple schools throughout Kent and New Castle counties. Underserved youths attending the following schools participated in a series of nutrition education classes on food safety and physical activity.

Fairview Elementary School (Kent County)
East Dover Elementary School (Kent County)
Albert Jones Elementary School (New Castle County)
Carrie Downie Elementary School (New Castle County)
Keene Elementary School (New Castle County)
Anna P. Mote (New Castle County)

Last year, Delaware State University Cooperative Extension utilized curricula from USDA SNAP ED, MYPLATE and TEAM Nutrition to develop a five-week nutrition program for third and fourth grade elementary students. The program introduced the students to the MyPlate food guide, which highlights the importance of eating whole grain foods, fruits and vegetables, and healthy fast foods; practicing food safety; and engaging in physical activity. After each lesson, students received a nutritious snack to reinforce the lesson of the day.

Results

A total of 442 third and fourth graders participated and completed the series. A total of 90 workshops were held during which each student received five fact sheets. Pre and post test results reflected an 85 percent increase in knowledge of fruits and vegetables, an 80 percent knowledge increase of healthy fast food options, a 66 percent knowledge increase of food safety and a 75 percent knowledge increase of the importance of physical activity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Targeted educational programs on understanding the causes of obesity and the means to reduce obesity for low-income communities, youth through after-school programs and childcare workers.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youths may not fully understand portion control issues relating to the consumption of fruits, vegetables and whole grains. Also, they may not know how to prepare healthy meals and nutritious snacks.

What has been done
The DSU SNAP-Ed program offers students in underserved communities a series of five, 45-50 minute lessons based on the 2010 Dietary Guidelines for Americans and the SNAP-Ed Key Behavior Outcomes listed in the FY 2013 Guidance. Each lesson is accompanied by a relevant nutritious snack and students take home letters for parents that explain the lesson of the day and activities that they can do with their child. The final lesson includes a section on physical activity, which the students perform for 5 ? 10 minutes during the lesson to demonstrate how easy it is to

incorporate exercise into their day.

Results

A total of 1,368 students completed the program and 6,840 factsheets were distributed. By comparing pre- and post-test data, it was clear that students became more aware of safe food handling practices, the importance of eating whole grains and fruits and vegetables, the importance of daily physical activity, and the importance of reducing the intake of high fat, high sugar foods. Additionally, some classrooms prepared thank you cards independently, indicating the things they learned from the classes. A weekly newsletter was sent home with the students to the parents to encourage follow-up activities at home. Anecdotal evidence from several parents indicated that their children asked them to buy more carrots for snacks and to eat less often at fast food restaurants. The parent newsletters were translated into Spanish for the children of Spanish-speaking households.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
903	Communication, Education, and Information Delivery

Outcome #3

1. Outcome Measures

Increased number of program participants improving one or more nutrition practices.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Following a careful meal plan is the first step in controlling blood sugar. This is also the most difficult step in diabetes control. This program helps those individuals with diabetes or pre-

diabetes learn strategies to manage their diabetes through menu planning, carbohydrate counting, portion control and label reading.

What has been done

Delaware State University Cooperative Extension?s Expanded Food and Nutrition Education Program (EFNEP) educators re-established partnerships with Capitol School District, Dover State Housing Authority, local shelters and faith-based organizations to host the 6-8 week Eating Smart and Being Active curriculum. The nutrition and health activity teaches participants about food safety, physical fitness, nutritious meal planning and food budgeting. Each week, families received great recipes, menu planning ideas, fun physical activities, educational incentives and food demonstrations.

Results

Before the fitness component was added, EFNEP educators reached 54 participants during program year 2011. In 2012, the number of participants grew to 187 participants, with a 90 percent graduation rate . In 2013, DSU EFNEP educators reached 174 participants, with a graduation rate of 92 percent. Pre and post test results suggest that participants increased their knowledge of food safety, fitness activity, food budgeting and meal planning. Eighty percent of participants stated that they increased the amount of activity per day. More than 85 percent of participants said they increased the amount of fruits, vegetables, and water consumed. The results also suggest that 66 percent of participants monitored portion sizes of proteins and whole grains. Adding the fitness exploration to the activity increased participation more than 300 percent.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
903	Communication, Education, and Information Delivery

Outcome #4

1. Outcome Measures

Increased number of program participants who improve the frequency and quality of family meals.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Increased number of program participants engaged in greater levels of physical activity

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The number of individuals and households receiving SNAP benefits continues to rise in Delaware. In May of 2013, 153,339 individuals representing 72,523 households received food supplement benefits in Delaware. These numbers represent a substantial increase over January 2012 and May 2011 when 148,854 and 135,131 individuals in 69,730 and 62,310 households were enrolled for these benefits, respectively. These individuals need help stretching their resources to get the most nutrition for their dollar.

What has been done
Two federally funded programs, the Expanded Food and Nutrition Education Program (EFNEP) and Supplemental Nutrition Assistance Program Education (SNAP-Ed), provide a minimum of 10 hours of interactive, hands-on education. The focus of both programs is on participants developing skills to make healthy food choices based on their budget, to use their resources wisely, to handle food safely, and to participate in physical activity each day. This program empowers individuals and families participating in the program to expand their horizons and to link diet, physical activity, and health together.

Results
A total of 450 individuals graduated from FoodSkills, a SNAP-Ed program, in 2013. Seventy percent of participants improved one or food resource management skills including more often planning meals in advance (42 percent), more often comparing prices when shopping (38 percent), running out of food less often (36 percent), and using a grocery list (40 percent). Furthermore, 68 percent of participants improved one or more nutrition practices. Specifically, 36 percent more often thought about healthy food choices when deciding what to eat; 30 percent more often prepared foods without added salt; 45 percent more often used the Nutrition Facts on food labels to make food choices, and 44 percent reported eating breakfast more often. Consumption of fruits and vegetables increased with 35 and 42 percent consuming more fruits and vegetables, respectively, at the end of the program as compared to the beginning.
EFNEP reached 337 individuals with young children in 2013. Based on data from 24-hour food recalls taken on individuals upon entering and exiting the program, 59, 57, 56, 56, and 51 percent had a positive change in protein, vegetable, grain, dairy, fruit, and dairy consumption, respectively. Additionally, 72 percent of participants improved one or more food resource management skills including more often planning meals in advance (48 percent), more often comparing prices when shopping (41 percent), running out of food less often (38 percent), and using a grocery list (44 percent). Fifty-seven percent showed improvement in one or more food

safety practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
903	Communication, Education, and Information Delivery

Outcome #6

1. Outcome Measures

Reducing obesity in Delaware by extension programs that modify individual, family, and community behavior in a manner that promotes healthy lifestyles, physical activity on a regular basis, the consumption of healthy foods in appropriate quantities, and increasing family meals.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Parents may not fully understand how to prepare healthful snacks or best practices when coping with picky eaters

What has been done
DSU Extension?s Brown Bag for Busy Parents combines efforts of the Delaware Department of Health and Social Services, other social service agencies and family courts in each county to help parents and caregivers improve their childcare skills. The convenient, correspondence parenting education program helps adults improve knowledge and skills of parenting education topics including conflict resolution, resolving sibling rivalry, preparing healthful snacks and coping with picky eaters. Participants receive all lessons by mail, along with corresponding tests, which they then return within a designated timeframe.

Results
A total of 295 participants completed the eight lessons by mail. Once participants returned completed tests, which were scored for accuracy, DSU Extension mailed out Certificates of

Completion as validation required by social service agencies. A survey was provided at the end of the program, which has generated new ideas for future program topics. Participants continue to score the convenience of the program very high, since many lack adequate resources (i.e. transportation and childcare, etc.) to attend parenting education in the traditional classroom setting.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
903	Communication, Education, and Information Delivery

Outcome #7

1. Outcome Measures

Greater understanding, particularly in low-income communities and by youth, of the health risks associated with obesity and the options available to prevent or correct obesity problems.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Healthy living is a topic that impacts both adults and youth. According to dosomething.org, ?More than one-third of adults and over 12.5 million children and teens in the US are obese. In the last 30 years, obesity in children and teens has nearly tripled.? Healthy living issues also include mental & emotional wellness and personal development. Mentalhealth.gov states the following facts from 2011:

?One in 10 young people experienced a period of major depression
?One in five American adults experienced a mental health issue
?Suicide is the 10th leading cause of death in the United States.

What has been done
The Delaware 4-H Program agreed to host a regional Youth-Adult Conference for 2014 with Healthy Living as the theme. Planning for this event began in early 2013. Fifteen 4-H youth and adult volunteers, along with 4-H staff members, served as the planning committee that developed a program with engaging workshops, two motivational speakers and group activities designed to advance awareness and offer tools toward healthy living goals. Thirteen Northeast states were invited and we were pleased that groups from West Virginia and Massachusetts chose to attend. Yoga, cardio-movement, peer-pressure, developing a positive self-image, Internet safety, distracted driving, dealing with stress and conflict, bullying, personal responsibility, identifying healthy refreshments and making wise consumer choices were a few of the specific activities offered. The youth and adults were trained in ways to brainstorm, plan, and implement healthy living initiatives in their communities.

Results
A total of 125 youth, leaders, and 4-H staff attended the YAP conference on Healthy Living. Some of the issues the 4-H youth identified, and plan to address locally in their communities include school bullying, driving while texting, obesity, sexual health and responsibility, drugs and alcohol abuse prevention.

The conference had a great impact on helping attendees make healthy food choices, eating a balanced diet, and feel more comfortable in meetings with people of different age groups.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle
903	Communication, Education, and Information Delivery

Outcome #8

1. Outcome Measures

Master Food Educators expand extension reach into communities through volunteer development

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In Delaware over the past 30 years, the prevalence of overweight and obesity has increased sharply for both adults and children. According to the CDC report about Delaware (http://www.cdc.gov/chronicdisease/states/delaware.htm), in 2007, 65% of adults in Delaware were overweight or obese and 18% of high schools students were overweight, based on self-reported height and weight. These figures show a great need for the nutrition programs that UD Cooperative Extension has to offer. But with few full-time staff to address the nutrition and wellness concerns of clientele, Cooperative Extension needed to increase its capacity to reach citizens of Delaware.

What has been done

This year?s Master Food Educator Training Program was a 42-hour professional development curriculum offered in Kent and New Castle County via Adobe Connect. The program helps volunteers increase knowledge and confidence about nutrition, food science, wellness, food preparation, and food safety.

Results

During the 2014 program year 4 (Kent/Sussex) Master Food Educators volunteered to support workshops and public events giving just over 132 hours to Cooperative Extension?s outreach efforts. This has an approximate economic value of $3037.00 (based on $23.01/hour 2014 values from Independent Sector.org).

The Master Food Educators conducted a variety of outreach programs including:

?Staffing Displays at 8 Public Events including at 4-H Favorite Foods, Milton Elementary School back to school night, events at Fifer Orchards, Frederica Senior Center, Sussex County Farm Tour.

?Assisting Extension Agents with over programs such as Dining with Diabetes, ServSafe and DineSafe, Food Safety for Entrepreneurs and Food Preservation 101 by conducting demonstrations, preparing food for taste testing and assisting with the program implementation.

?Created factsheets that addressed different fruits providing basic nutrition and handling information as well as 2 low cost simple recipes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation of the Childhood Obesity planned program for FY13 (0.1 Research FTE, 19.4 Extension FTEs) shows a diverse and comprehensive extension effort to address the statewide issues associated with health, nutrition, diets, and families. Some particularly strong areas of extension programming include: (i) an integrated team effort to modify individual, family, and community behavior in a manner that promotes healthy lifestyles, encourages physical activity on a regular basis, promotes the consumption of healthy foods in appropriate quantities, and increases the frequency of family meals and (ii) an extensive set of programs for after-school children and childcare providers on healthy lifestyles and diets. Evaluations of extension programming showed continued excellent success in grants (4 of 7 submitted were awarded), the publication of 30 new fact sheets, 50 invited and volunteered presentations in local communities and at regional and national meetings, and the presentation of more than 500 workshops. Our evaluations have included annual internal administrative reviews and numerous surveys and other evaluation methods conducted with stakeholders participating in workshops and other extension programs. Specific examples of stakeholder evaluation of these programs are provided in the "Outcomes" section of the FY13 annual report. Stakeholder feedback and internal reviews are quite positive and appreciative of the very comprehensive programs our Extension professionals have developed and are implementing widely and successfully today.

Key Items of Evaluation

There are no major items requiring NIFA attention at this time, other than the continued need for more federal funding for research and extension programs that will help build on our current successes and allow us to reach more families and provide them with the skills needed to prevent or correct the serious problem of childhood obesity.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Climate Change

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	15%	15%	15%	15%
111	Conservation and Efficient Use of Water	10%	10%	10%	10%
132	Weather and Climate	10%	10%	10%	10%
136	Conservation of Biological Diversity	5%	5%	5%	5%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	10%	10%	10%	10%
205	Plant Management Systems	10%	10%	10%	10%
305	Animal Physiological Processes	10%	10%	10%	10%
307	Animal Management Systems	10%	10%	10%	10%
311	Animal Diseases	5%	5%	5%	5%
601	Economics of Agricultural Production and Farm Management	5%	5%	5%	5%
605	Natural Resource and Environmental Economics	5%	5%	5%	5%
903	Communication, Education, and Information Delivery	5%	5%	5%	5%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	9.0	1.5	20.0	1.5
Actual Paid Professional	7.0	0.4	20.7	1.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
404553	142194	658570	170496
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
278867	142194	348557	170496
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
956101	11198	3889098	133187

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and extensions programs will focus on: (1) Animal agriculture: understanding impacts of climate change on animal physiological processes, health, and disease, particularly for poultry and dairy; developing management practices to rapidly diagnose, prevent, and mitigate (e.g., new vaccines) effects of avian diseases on poultry health and productivity, including current disease problems and new ones that may appear and proliferate under new climatic conditions; developing new systems and technologies to reduce effects of environmental stress on animal health and productivity; latest research projects are focusing on animal care, management and environmental design to ensure animal well-being and raise awareness of environmental protection, law and legislation. These studies are on four fronts, including monitoring technologies for animal physiological and behavioral response, assessment of animal-environment interactions, quantitation of air quality and emissions from animal feeding operations, and assessment and development of best management practices aiming at mitigating air emissions based on their character, amount, and dispersion. (2) Agronomic crops: basic research on how environmental stresses associated with climate change (e.g., heat, moisture stress) affect crop physiology and productivity; plant genetics and breeding studies to develop cultivars of major crops better adapted to a changing climate, in terms of water use efficiency and resistance to insects and disease; applied research and extension programs on irrigation management and water use efficiency for periods of prolonged drought and restricted water use and for groundwaters that may become more saline from salt water intrusion; integrated pest management to diagnose and control insects, weeds, and diseases (current and newly emerging) during longer growing seasons and under warmer and wetter growing conditions; nutrient cycling and management, particularly for manures and other byproducts where decomposition and nutrient release rates and timings are affected by warmer, wetter climates; basic and applied research on factors controlling C sequestration and new agronomic management practices that help mitigate greenhouse gas emissions by sequestering C in soils; and new studies now underway on how changing temperature and rainfall patterns will affect phosphorous management and water quality impacts, using isotope geochemistry to identify how and why the phosphorous has been released from cropland to surface and ground waters. (3) Natural Ecosystems: characterizing effects of climate change on biodiversity of plants and wildlife exposed to greater pressure from droughts, insects, disease, and invasive species; studying how climate change affects natural ecosystems and insects critical to crop production (e.g., pollination, honeybees); investigate value of marshes, wetlands, and forests to sequester C; increase C storage by encouraging tree planting and sustainable forestry management; and new studies using weather radar to quantify bird distributions and to track migratory birds. Understanding stopover ecology of migratory birds, including how they select the habitats where they stop and how that impacts their behavior and the success of their migrations, as climate change occurs, is an important area of ecological research today. Two new projects will collectively map important stopover areas for birds during their migrations along the entire US Atlantic coast using the national network of weather radars; (4) Resource

economics: develop creative new economic policies to profitably link agriculture and forestry with those sectors generating significant quantities of greenhouse gases (e.g., energy, transportation) in cooperative efforts to mitigate greenhouse gas emissions; improve understanding of the relationship of climate change to agricultural and environmental policy development, including farmland preservation, conservation reserve programs; study impacts of climate change on groundwater aquifers, integrate climate change into the Chesapeake Bay water quality model; contribute to policies and educational programs on recycling, develop environmentally-friendly bio-based fuels from local feed stocks, and assist in analysis of Delaware's greenhouse gas inventories from energy use (mobile sources, utilities, residential, industrial, transportation, commercial, natural gas distribution, waste management, agriculture, land use, etc.).

2. Brief description of the target audience

For animal agriculture, primarily poultry integrators, growers, breeders, trade groups and allied industries; dairy and beef producers; livestock commodity groups; forage producers, equine owners, producers and interest groups; for crop and soils related research and extension programs, the audience includes existing and prospective grain crop producers, mixed (animal and crop production, e.g., dairy, horse) farms, crop commodity groups and trade associations, the "green industry" (e.g., horticulture, nurseries, landscapers), and certified crop advisors; for natural resource and ecology programs, private and not-for-profit organizations managing forests, wetlands, marshes, and other natural resource areas; state and federal agencies responsible for wildlife, forestry management, and coastal ecosystems; for our resource economic programs the audience includes farmers, landowners, policy-makers and state and federal agencies directly related to climate change policy (Delaware Development Office; Land Use Planning and Preservation; Department of Agriculture; Department of Health and Human Services; Department of Natural Resources & Environmental Control; Department of Transportation; Economic Development Office, USDA, NRCS, USEPA). For all programs, Delaware State Government and local legislators, homeowner associations, educators, community leaders, utility managers, retail stores distributing Energy Star products, fleet managers, building industry, Delaware Clean State Program members, Delaware Farm Bureau leaders, federal-state-local agriculture businesses, state and federal agencies; federal research laboratories; peer scientists in the U.S. and international colleagues, K-12 teachers, and environmental and community groups.

3. How was eXtension used?

In 2013 UD and DSU eXtension Institutional Team comprised of faculty and staff from across all planned program areas completed the following:

· Training on how to incorporate eXtension into grants
· Connected the Extension website with eXtension.org
· Implemented Ask an Expert throughout the state. Staff and faculty engaged in the eXtension Learn feature
· Faculty and staff increased participation in the Communities of Practice (COP)-DE is represented by 81 eXtension members in 43 of the 73 approved CoP
·

We trained 40 "experts" to use the Ask an Expert system and have fielded over 295 questions in the past 9 months. (84% of those questions were answered by Delaware experts). For Planned Program #7, we have two staff members actively involved in the Climate, Forests and Woodlands CoP. We also have 3 faculty involved in the Disaster Education Network that provides educational information with natural disasters related to climate. Also, when hurricane weather impacted Delaware last year, eXtension resources were culled to provide fact sheets to producers related to salt water on agronomic production lands. This information was readily available through the CoP within 24 hours of the storm. A fact sheet and web information were provided as well as links to other states information were provided to stakeholders.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	16530	75877	2866	650

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	6	59	65

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2013	72

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2013	36

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2013	68

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2013	62

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2013	45

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2013	25

Output #7

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2013	13

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2013	65

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2013	6

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2013	24

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2013	36

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2013	105

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2013	95

Output #14

Output Measure

- Number of Websites Established

Year	Actual
2013	16

Output #15

Output Measure

- Number of Workshops Conducted

Year	Actual
2013	157

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Educational programs for the poultry, livestock and equine industries on likely effects of climate change on animal health, productivity, the incidence of disease, greater energy costs due to warmer temperatures, and their management options to prevent new problems.
2	Greater awareness by farmers, the "Green Industry", other producers, and land managers of the types and possible magnitude of climate change impacts on crop production, with an emphasis on drought and irrigation management, increased incidences and diversity of pest pressures from insects, disease, and weeds, and nutrient cycling and transport for different crop rotations and tillage systems.
3	Outreach programs and demonstration projects on underlying principles and soil management programs now available to enhance carbon sequestration by agriculture, forestry, and other natural ecosystems (e.g., marshes, wetlands).
4	Educational programs for K-12 teachers, policy-makers, and the public on climate change and its potential effects on agriculture, natural ecosystems, and current and proposed approaches and new policies that could mitigate problems associated with climate change.
5	Increased number of poultry and livestock producers adopting management practices specifically designed to mitigate disease and animal health problems associated with climate change, particularly those related to year-round warmer conditions and weather extremes.
6	Increased number of crop producers adopting management practices specifically designed to mitigate plant growth problems associated with climate change, particularly those related to drought, pest pressures, and nutrient use.
7	Development of systematic strategies and plans to address climate change impacts on natural resource areas, particularly those related to plant species change, loss of biodiversity, wildlife ecology, and invasive plants.
8	Increased number of farmers, natural resource managers, and others aware of and participating in programs related to mitigating greenhouse gas emissions through programs such as carbon credits and carbon trading.
9	Greater scientific understanding of the fundamental mechanisms by which climate change affects plant and animal physiological processes, soil biological and chemical processes, and ecosystem health, with particular emphasis on challenges due to plant and animal diseases, water use efficiency, and biodiversity
10	Successful adoption of research-based management practices and economic policies that sustain animal agriculture, ensure crop productivity, protect or restore natural resource areas negatively impacted by climate change, and reduce greenhouse gas emissions.

Outcome #1

1. **Outcome Measures**

Educational programs for the poultry, livestock and equine industries on likely effects of climate change on animal health, productivity, the incidence of disease, greater energy costs due to warmer temperatures, and their management options to prevent new problems.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Greater awareness by farmers, the "Green Industry", other producers, and land managers of the types and possible magnitude of climate change impacts on crop production, with an emphasis on drought and irrigation management, increased incidences and diversity of pest pressures from insects, disease, and weeds, and nutrient cycling and transport for different crop rotations and tillage systems.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Outreach programs and demonstration projects on underlying principles and soil management programs now available to enhance carbon sequestration by agriculture, forestry, and other natural ecosystems (e.g., marshes, wetlands).

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Educational programs for K-12 teachers, policy-makers, and the public on climate change and its potential effects on agriculture, natural ecosystems, and current and proposed approaches and new policies that could mitigate problems associated with climate change.

2. **Associated Institution Types**

- 1862 Extension
- 1890 Extension

3a. **Outcome Type:**

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youths, teachers, policy makers, and the general public may not fully understand the potential effects of climate change.

What has been done
DSU?s Claude E. Phillips Herbarium educator has helped DSU gain certification as a Tree Campus of America and has led many programs to educate the public about natural resources and the environment. Activities have included campus-based tours of DSU?s Woodland Trail and Arboretum, as well as educational programs throughout the state. The educator stresses the importance of biodiversity and conservation, which are especially important in a changing climate.

Results
A total of 152 participants have increased knowledge via the Campus Nature Walks Program, Youth Botanical Tours, DSU class lectures, and invited off-campus weekend nature field trips.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
205	Plant Management Systems
307	Animal Management Systems
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

Outcome #5

1. Outcome Measures

Increased number of poultry and livestock producers adopting management practices specifically designed to mitigate disease and animal health problems associated with climate change, particularly those related to year-round warmer conditions and weather extremes.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Increased number of crop producers adopting management practices specifically designed to mitigate plant growth problems associated with climate change, particularly those related to drought, pest pressures, and nutrient use.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A changing climate can lead to decreased yields. It is important for farmers to be prepared by adopting management practices that can mitigate potential negative effects of climate change.

What has been done
New technologies and programs, geared toward increased profitability, have been introduced to small farm owners in Delaware. High tunnels offer farmers one such solution; they are relatively low in cost and can increase crop production when climates outside of the tunnels are intolerable.

Results
Four workshops and a conference were held, which focused primarily on high tunnels. One hundred seventy-six participants received information about high tunnels; more than 30 Delaware farmers have constructed new high tunnels in the last few years.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
132	Weather and Climate
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems

601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

Outcome #7

1. Outcome Measures

Development of systematic strategies and plans to address climate change impacts on natural resource areas, particularly those related to plant species change, loss of biodiversity, wildlife ecology, and invasive plants.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Citizens in Delaware and other mid-Atlantic states, state and federal agencies concerned about climate change impacts on state economic sectors and the need for strategies to address potential climate impacts

What has been done
A two-year effort to develop detailed climate change projections for Delaware (through 2100) was completed and used by a state task force to identify vulnerabilities of all major economic sectors (our focus was agriculture) to these new, detailed projections of climate change.

Results
A comprehensive study ("Delaware: Climate Change Impact Assessment") has been published and is being used to guide policies and inform education programs related to climate change. University of Delaware research and extension faculty contributed input and ideas to this study, particularly in the "Agriculture" and "Water Resources" sections. UD extension programs and new research projects are using this information to educate citizens, agricultural and environmental groups, and granting agencies about actions and new research studies now needed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
136	Conservation of Biological Diversity
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

Outcome #8

1. Outcome Measures

Increased number of farmers, natural resource managers, and others aware of and participating in programs related to mitigating greenhouse gas emissions through programs such as carbon credits and carbon trading.

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Greater scientific understanding of the fundamental mechanisms by which climate change affects plant and animal physiological processes, soil biological and chemical processes, and ecosystem health, with particular emphasis on challenges due to plant and animal diseases, water use efficiency, and biodiversity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Natural resource managers, water quality agencies and groups concerned about impacts of extreme storms on stream runoff export of dissolved carbon from forested watersheds and resultant impacts on aquatic ecology

What has been done
Field research quantified stream runoff exports of particulate and dissolved organic carbon from a 12 ha forested watershed from a wide range of storm events varying in severity, including three

extreme events associated with Hurricanes Nicole, Irene, and Sandy.

Results

Findings from the study showed that POC and DOC exports from small events were comparable but that runoff following extreme events increased 6-8 fold; in one year, Hurricane Irene events alone accounted for 56% and 12% of annual POC and DOC losses. Results from the study led to the identification of a precipitation threshold value above which POC losses increased markedly compared to DOC losses. In general, the study showed that important differences exist in POC and DOC losses due to temporal and hydrologic variability with extreme events identified as being highly important in carbon export from forests to streams to downstream waters. Given the predicted increase in extreme events due to climate change, developing accurate models of C loss is critical to protect ecosystem and human health.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
132	Weather and Climate
136	Conservation of Biological Diversity
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
305	Animal Physiological Processes
307	Animal Management Systems
311	Animal Diseases

Outcome #10

1. Outcome Measures

Successful adoption of research-based management practices and economic policies that sustain animal agriculture, ensure crop productivity, protect or restore natural resource areas negatively impacted by climate change, and reduce greenhouse gas emissions.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation of the Climate Change planned program shows growing activity in research and extension in this area as faculty and extension professionals have begun to incorporate a range of aspects on climate change into existing projects and launch new studies where climate change impacts are a central component. A total of 36 grants supported the efforts of 145 graduate students, post-docs, and undergraduate researchers who conducted studies in areas that would be affected by expected changes in future climates. Similarly, 65 refereed journal articles, 200 invited and volunteered presentations, and 157 workshops were completed in areas where climate change impacts must be considered more carefully in the future. Our evaluations suggest that farmers, land managers, state and federal agencies, environmental groups, and the public value efforts to determine how current priority areas for research in Delaware may be affected by the anticipated changes in future climate

Key Items of Evaluation

There are no major items requiring NIFA attention at this time, other than the continued need for more federal funding for research and extension programs that seek to incorporate potential climate change impacts into current and planned projects on areas of high priority to Delaware.

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Sustainable Energy

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	15%	15%	15%	15%
201	Plant Genome, Genetics, and Genetic Mechanisms	25%	25%	25%	25%
205	Plant Management Systems	25%	25%	25%	25%
403	Waste Disposal, Recycling, and Reuse	10%	10%	10%	10%
601	Economics of Agricultural Production and Farm Management	15%	15%	15%	15%
605	Natural Resource and Environmental Economics	5%	5%	5%	5%
903	Communication, Education, and Information Delivery	5%	5%	5%	5%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	1.5	0.5	1.5	0.5
Actual Paid Professional	1.6	0.4	1.6	0.1
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
16438	0	1226	170496
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
7798	0	1540	170496
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
65523	0	87072	156706

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and extension programs will focus on: (1) Plant molecular biology studies with bioenergy crops. Research is now underway to identify small RNAs (short stretches of ribonucleic acid) related to stresses such as drought, temperature and nutrient deprivation and then correlate them to the emerging genetic code of Brachypodium distachyon, thus enhancing the plant's value as a functional genomic model for energy crops and temperate grasses. Brachypodium has many advantages for carrying out functional studies in the laboratory compared to energy crops such as switchgrass and Miscanthus, and temperate grasses that are important sources of food like wheat. (2) Plant and soil management systems for existing (e.g., corn) and newly emerging bioenergy crops (e.g., barley, sweet sorghum).While just beginning, we expect this research to address many aspects of biomass/bioenergy crop production including genetics and basic plant biology studies, especially of plant-microbe interactions that enhance growth and water use efficiency of biomass crops; production and agronomic management practices for current (barley) and innovative new cropping systems (e.g., sweet sorghum, switchgrass, poplars); equipment changes and needs for new biomass crops, especially related to planting and harvesting; improving nutrient management BMPs (reduces energy consumption for fertilizer production); mitigating potential environmental impacts of biomass energy crops and assessing their impacts on water quality relative to current cropping systems; and addressing economic, social and cultural issues related to changing from long-standing to new cropping systems. (3) Bioenergy production systems and re-use of byproducts: evaluation of farm-scale anaerobic digestion for bioenergy production, using animal manures, cover crops (e.g., forage radishes), and other by-products; evaluation of gasification/pyrolysis technologies, especially those using poultry litter. Related studies will focus on finding beneficial agricultural uses for the by-products of energy production such as biochar from litters and distillers' grains.

2. Brief description of the target audience

For animal agriculture, the targeted audience is broad, given the impacts of energy costs on all aspects of animal production and includes poultry integrators, growers, breeders, trade groups and allied industries; dairy and beef producers; livestock commodity groups; forage producers, equine owners, producers and interest groups; for crop and soils related research and extension programs, the audience includes existing and prospective grain crop producers, mixed (animal and crop production, e.g., dairy, horse) farms, crop commodity groups and trade associations, the "green industry" (e.g., horticulture, nurseries, landscapers), and certified crop advisors; for natural resource and ecology programs, private and not-for-profit organizations managing forests, wetlands, marshes, and other natural resource areas; state and federal agencies responsible for wildlife, forestry management, and coastal ecosystems; for our resource economic programs the audience includes farmers, landowners, policy-makers and state and

federal agencies directly related to climate change policy (Delaware Development Office; Land Use Planning and Preservation; Department of Agriculture; Department of Health and Human Services; Department of Natural Resources & Environmental Control; Department of Transportation; Economic Development Office, USDA, NRCS, USEPA). For all programs, Delaware State Government and local legislators, homeowner associations, educators, community leaders, utility managers, retail stores distributing Energy Star products, fleet managers, building industry, Delaware Clean State Program members, Delaware Farm Bureau leaders, federal-state-local agriculture businesses, state and federal agencies; federal research laboratories; peer scientists in the U.S. and international colleagues, K-12 teachers, and environmental and community groups.

3. How was eXtension used?

In 2013 UD and DSU eXtension Institutional Team comprised of faculty and staff from across all planned program areas completed the following:

· Training on how to incorporate eXtension into grants
· Connected the Extension website with eXtension.org
· Implemented Ask an Expert throughout the state. Staff and faculty engaged in the eXtension Learn feature
· Faculty and staff increased participation in the Communities of Practice (COP)-DE is represented by 81 eXtension members in 43 of the 73 approved CoP
·

We trained 40 "experts" to use the Ask an Expert system and have fielded over 295 questions in the past 9 months. (84% of those questions were answered by Delaware experts). For Planned Program #8, Delaware eXtension involvemetn includes participation in the CoP on Urban Forestry and Energy Conservation as well as Wood Energy and wood products. Information from eXtension is incorporated into program fact sheets and handouts as well as presentations.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1356	533	214	0

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	9	9

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2013	12

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2013	7

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2013	12

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2013	15

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2013	8

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2013	2

Output #7

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2013	3

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2013	9

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2013	1

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2013	2

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2013	0

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2013	11

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2013	12

Output #14

Output Measure

- Number of Websites Established

Year	Actual
2013	1

Output #15

Output Measure

- Number of Workshops Conducted

Year	Actual
2013	19

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased knowledge base on the part of the Delaware agricultural and natural resource community of the options to increase energy use efficiency and develop alternative energy sources that are more sustainable.
2	Greater adoption of solar energy and biomass energy technologies by animal agriculture to help reduce the operating costs of poultry and dairy production in particular.
3	Widespread use of energy conservation practices by Delaware farmers engaged in production of agronomic and vegetable crops, as a result of extension education programming.
4	A more energy-efficient poultry industry that is able to utilize alternative sources of energy cost-effectively, particularly solar energy, energy derived from by-products of poultry production, and wind energy.
5	Incorporation of sustainable energy technologies into other major agricultural technology systems, such as irrigation and major equipment used for production, harvesting, and processing of agronomic and vegetable crops.

Outcome #1

1. **Outcome Measures**

Increased knowledge base on the part of the Delaware agricultural and natural resource community of the options to increase energy use efficiency and develop alternative energy sources that are more sustainable.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Greater adoption of solar energy and biomass energy technologies by animal agriculture to help reduce the operating costs of poultry and dairy production in particular.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Widespread use of energy conservation practices by Delaware farmers engaged in production of agronomic and vegetable crops, as a result of extension education programming.

2. **Associated Institution Types**

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Poultry growers, integrating companies, private and government energy organizations, public and not for profits concerned about increasing energy use efficiency in agricultural systems

What has been done
New, more energy efficient lighting systems have been developed and tested in research and on commercial broiler houses. The new systems use light emitting diodes (LEDs) that have led to

>50% decreases in energy use.

Results

On-farm studies have shown that new LED lighting systems for broiler houses can pay for themselves in less than a year through savings in energy costs. Comparisons of different types of LED systems now on the market, in ongoing research studies, point to the importance of careful evaluation of the pros and cons of various options prior to selection and installation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
201	Plant Genome, Genetics, and Genetic Mechanisms
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
903	Communication, Education, and Information Delivery

Outcome #4

1. Outcome Measures

A more energy-efficient poultry industry that is able to utilize alternative sources of energy cost-effectively, particularly solar energy, energy derived from by-products of poultry production, and wind energy.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Incorporation of sustainable energy technologies into other major agricultural technology systems, such as irrigation and major equipment used for production, harvesting, and processing of agronomic and vegetable crops.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Evaluation of the Sustainable Energy planned program indicates that this area is still not a major research or extension effort at the present time. However, the emergence of the multi-disciplinary, university-wide Delaware Energy Institute is expected to foster greater basic and applied research on sustainable energy in the future. Areas of particular interest and strength will most likely be in plan molecular biology, as related to the identification and characterization of plants most suitable for use in new technologies to generate biofuels from agricultural crops. Extension programs in the near term will most likely continue to focus on improving energy use efficiency by Delaware's large poultry industry and by farmers using irrigation to produce grain crops. In FY13, there were 7 grants awarded to support the efforts of 28 graduate students, post-docs, and undergraduate researchers who conducted studies in areas that would be affected by expected changes in future climates. This led to 9 refereed journal articles, 26 invited and volunteered presentations, and 19 workshops in areas related to various aspects of the development and implementation of programs focused on alternative energy sources. Our evaluations suggest that the agricultural and environmental communities are interested in energy conservation and alternative sources of energy (solar, wind, bioenergy) and that industry, state and federal agencies and advisory are also interested in continued multi-disciplinary efforts on the development of plant-based renewable feedstocks for biofuels, which we plan to pursue through the University of Delaware Energy Institute in the future.

Key Items of Evaluation

There are no major items requiring NIFA attention at this time, other than the continued need for more federal funding for research and extension programs that will support cross-disciplinary efforts to educate our constituents about energy use and conservation and support basic and applied research to identify bioenergy sources that fit Delaware agriculture.