2014 University of Delaware and Delaware State University 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 help ensure food security for a growing population, develop innovative means to improve profitability and productivity, and protect the environment. Emerging issues must also be addressed, including climate change, farmland loss to development, food safety, and social issues for families and youth such as reversing the growing epidemic of childhood obesity. Agriculture in Delaware remains strong today, despite these challenges, and has weathered the recent economic downturn. 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 help Delaware agriculture remain competitive, to meet its environmental challenges, sustain the state's natural resources and support our rural and urban families and communities. We focus on the following four 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. Sustainable Production Systems for Agricultural and Urban Landscapes

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, 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. Other livestock industries ($32M farm sales from dairy, beef cattle, swine) compose a smaller but locally important part of the agricultural economy. 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. 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 genetic solutions, thus research on plant genomes and related information is a unique strength in Delaware. 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.
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.

2. A Safe and Secure Food Supply for Human Nutrition and Health
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. Extension programming aimed at addressing childhood obesity involves the 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.

3. Volunteer, Family and Youth Development
The rapid economic and social changes occurring in Delaware today place high demands on families and communities. These problems occur in both rural and urban areas. 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.

4. Environmental Stewardship in a changing climate

This program focuses on maintaining and restoring renewable natural resources and the vital services provided by healthy ecosystems in Delaware after 400 years of urbanization and agriculture. 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 habitat, and nutrient enrichment of aquatic resources are key areas 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.

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 and more extreme weather events. 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. Research and extension foci 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.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	54.0	19.0	115.9	5.4
Actual	40.2	16.4	40.4	8.2

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 & research)

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

Current and Future Unique strengths of the College
Current Strengths

Future Strengths
4-H & Youth development
Climate Science-mitigation and adaptation in agriculture, ecosystems and environment
Avian Biosciences and disease
Quantitative sciences: data analytics, predictive modeling, statistics related to large data sets
Ecosystem sciences and biodiversity
Legal and regulatory policy
Experimental economics
Sustainable landscapes and ecosystems
Food Safety
Urban agriculture
Genetics and Genomics
Integration of plant, animal and ecosystem health expertise with human health-a "one health" initiative
Integrated pest management

Natural resource economics and policy

Public horticulture

Soil and water quality, nutrient management, irrigation

Pre-vet medicine and animal biology

Current and future partnerships needed to leverage resources and achieve selective excellence in the college programs have been identified.
Current and future resources for the College are identified. Future resources needed to support unique strengths include new research lab facilities to replace those in Worrilow Hall that have exceeded their useful lifetime.
Several attributes make the college unique among colleges at UD or compared to other colleges of agriculture and related sciences in the region including:
expertise in biological, physical, and social sciences that can address the human dimensions of problems as well as the underpinning science
Extension engages the College with stakeholders, deliberately aligns CANR with the core values of UD, and provides strong sense of relevance and value to Delawareans
CANR provides a small college feel within the context of a larger research university.
World-class faculty in many disciplines are approachable and accessible to students, stakeholders, industry and communities.
CANR is located in the heart of the east coast megalopolis and its 350 acre Newark farm is largely within the city limits. It provides excellent opportunities for urban agriculture interface studies as well as natural resource issues in a human dominated landscape
CANR enjoys unusually strong relationships with state and federal legislators and regional agencies in part due to the small size of Delaware relative to other states, but largely through our relevance to key sectors of the state's economy.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1335668	1179123	1649054	1244128

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	923524	1115016	1483061	1244128
Actual Matching	1040894	1115016	2466298	1244128
Actual All Other	3895617	710295	11660443	1897456
Total Actual Expended	5860035	2940327	15609802	4385712

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

Reason for not reporting

University of Delaware and Delaware State adopted the New England Consortium Planning and Reporting software. The new plan was built into the system to collect data during 2014 and beyond.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	19.1	7.7	63.9	1.4
Actual Paid	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	1890 Matching	1862 Matching	1890 Matching
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	1890 All Other	1862 All Other	1890 All Other
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	10	75	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2014	0

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2014	0

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2014	0

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2014	0

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2014	0

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2014	0

Output #7

Output Measure

- Number of Post-Doctoral Research Associates

Year	Actual
2014	0

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2014	0

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2014	0

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2014	0

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2014	0

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2014	0

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2014	0

Output #14

Output Measure

- Number of Workshops Conducted

Year	Actual
2014	0

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.

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done

{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Biotechnology and Biotechnology-based Agribusiness

☐ Reporting on this Program

Reason for not reporting

University of Delaware and Delaware State adopted the New England Consortium Planning and Reporting software. The new plan was built into the system to collect data during 2014 and beyond.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	0.5	0.0	21.3	0.1
Actual Paid	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	1890 Matching	1862 Matching	1890 Matching
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	1890 All Other	1862 All Other	1890 All Other
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	35	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2014	0

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2014	0

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2014	0

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual

2014	0

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2014	0

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2014	0

Output #7

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2014	0

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2014	0

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2014	0

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2014	0

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2014	0

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2014	0

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2014	0

Output #14

Output Measure

- Number of Workshops Conducted

Year	Actual
2014	0

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done

{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Natural Systems, Biodiversity, and Wildlife Ecology

☐ Reporting on this Program

Reason for not reporting

University of Delaware and Delaware State adopted the New England Consortium Planning and Reporting software. The new plan was built into the system to collect data during 2014 and beyond.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	1.6	1.6	3.4	1.8
Actual Paid	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	1890 Matching	1862 Matching	1890 Matching
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	1890 All Other	1862 All Other	1890 All Other
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	2	8	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2014	0

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2014	0

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2014	0

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2014	0

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2014	0

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2014	0

Output #7

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2014	0

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2014	0

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2014	0

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2014	0

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2014	0

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2014	0

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2014	0

Output #14

Output Measure

- Number of Workshops Conducted

Year	Actual
2014	0

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done

{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Family and Youth Development

☐ Reporting on this Program

Reason for not reporting

University of Delaware and Delaware State adopted the New England Consortium Planning and Reporting software. The new plan was built into the system to collect data during 2014 and beyond.

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	30%	0%	0%	0%
802	Human Development and Family Well-Being	20%	0%	0%	0%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	20%	0%	0%	0%
806	Youth Development	20%	0%	0%	0%
903	Communication, Education, and Information Delivery	10%	0%	0%	0%
	Total	100%	0%	0%	0%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	6.6	3.3	0.0	0.3
Actual Paid	0.0	0.0	0.0	0.0
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**
0	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	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?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	2	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2014	0

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2014	0

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2014	0

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2014	0

Output #5

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2014	0

Output #6

Output Measure

- Number of Technical Reports

Year	Actual
2014	0

Output #7

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2014	0

Output #8

Output Measure

- Number of Invited Presentations

Year	Actual
2014	0

Output #9

Output Measure

- Number of Volunteered Presentations

Year	Actual
2014	0

Output #10

Output Measure

- Number of Workshops Conducted

Year	Actual
2014	0

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

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

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

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 #8

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

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 #9

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
806	Youth Development
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

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food Safety

☐ Reporting on this Program

Reason for not reporting

University of Delaware and Delaware State adopted the New England Consortium Planning and Reporting software. The new plan was built into the system to collect data during 2014 and beyond.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	0.9	2.4	4.9	0.5
Actual Paid	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	1890 Matching	1862 Matching	1890 Matching
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	1890 All Other	1862 All Other	1890 All Other
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	3	22	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2014	0

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2014	0

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2014	0

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2014	0

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual

2014	0

Output #6

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2014	0

Output #7

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2014	0

Output #8

Output Measure

- Number of Books and Book Chapters

Year	Actual
2014	0

Output #9

Output Measure

- Number of Technical Reports

Year	Actual
2014	0

Output #10

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2014	0

Output #11

Output Measure

- Number of Invited Presentations

Year	Actual
2014	0

Output #12

Output Measure

- Number of Volunteered Presentations

Year	Actual
2014	0

Output #13

Output Measure

- Number of Workshops Conducted

Year	Actual
2014	0

Output #14

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2014	0

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #5

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Childhood Obesity

☐ Reporting on this Program

Reason for not reporting

University of Delaware and Delaware State adopted the New England Consortium Planning and Reporting software. The new plan was built into the system to collect data during 2014 and beyond.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	17.2	2.2	0.0	0.1
Actual Paid	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	1890 Matching	1862 Matching	1890 Matching
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	1890 All Other	1862 All Other	1890 All Other
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	3	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2014	0

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2014	0

Output #3

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2014	0

Output #4

Output Measure

- Number of Invited Presentations

Year	Actual
2014	0

Output #5

Output Measure

- Number of Volunteered Presentations

Year	Actual
2014	0

Output #6

Output Measure

- Number of Workshops Conducted

Year	Actual
2014	0

Output #7

Output Measure

- Number of Research Projects Completed

Year	Actual
2014	0

Output #8

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2014	0

Output #9

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2014	0

Output #10

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2014	0

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.

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Climate Change

☐ Reporting on this Program

Reason for not reporting

University of Delaware and Delaware State adopted the New England Consortium Planning and Reporting software. The new plan was built into the system to collect data during 2014 and beyond.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	7.3	1.7	20.8	0.9
Actual Paid	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	1890 Matching	1862 Matching	1890 Matching
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	1890 All Other	1862 All Other	1890 All Other
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	5	30	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2014	0

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2014	0

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2014	0

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2014	0

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2014	0

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2014	0

Output #7

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2014	0

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2014	0

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2014	0

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2014	0

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2014	0

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2014	0

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2014	0

Output #14

Output Measure

- Number of Workshops Conducted

Year	Actual
2014	0

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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).

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Sustainable Energy

☐ Reporting on this Program

Reason for not reporting

University of Delaware and Delaware State adopted the New England Consortium Planning and Reporting software. The new plan was built into the system to collect data during 2014 and beyond.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	1.3	0.1	1.6	0.5
Actual Paid	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	1890 Matching	1862 Matching	1890 Matching
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	1890 All Other	1862 All Other	1890 All Other
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2014	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: 2014

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	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
2014	0

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2014	0

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2014	0

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2014	0

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2014	0

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2014	0

Output #7

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2014	0

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2014	0

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2014	0

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2014	0

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2014	0

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2014	0

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2014	0

Output #14

Output Measure

- Number of Workshops Conducted

Year	Actual
2014	0

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.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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
- 1890 Extension
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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.

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

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

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Sustainable Production Systems for Agricultural and Urban Landscapes

☑ 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	10%	10%	10%	10%
112	Watershed Protection and Management	5%	5%	5%	5%
201	Plant Genome, Genetics, and Genetic Mechanisms	10%	10%	10%	10%
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	5%	5%	5%	5%
205	Plant Management Systems	10%	10%	10%	10%
212	Diseases and Nematodes Affecting Plants	5%	5%	5%	5%
304	Animal Genome	10%	10%	10%	10%
305	Animal Physiological Processes	5%	5%	5%	5%
307	Animal Management Systems	5%	5%	5%	5%
311	Animal Diseases	15%	15%	15%	15%
405	Drainage and Irrigation Systems and Facilities	10%	10%	10%	10%
604	Marketing and Distribution Practices	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: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Paid	13.6	5.1	20.1	2.0
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**
114637	356640	1034200	135578
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
248352	356640	1521724	135578
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1464512	362803	6114102	238366

V(D). Planned Program (Activity)

1. Brief description of the Activity

I. **Best Management Practices to maintain or enhance the competitiveness of Delaware's agriculture and food systems**

A. Animal Agriculture: 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.

B. Plant Biology and Crop Production: Key activities are: (1) Agronomic, Vegetable and Horticultural Crops - 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, emphasizing the growth of local food productions systems and sustainable landscape design practices for urban settings; (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 soil/climate 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. (7) 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.

II. Develop and adopt appropriate technologies for food production and marketing in urban

areas.

Key activities are: (1) expand food production with micro entrepreneurship opportunities in urban/suburban areas; (2) leadership development for community leaders involved in urban food production projects; (3) increased educational programming to successfully plan and grow a garden/farm for individuals, communities, and community leaders (acquiring land to determine soil concerns and plant selection) increased educational programming to harvest and prepare healthy, local food for individuals, communities, and community leaders; and (4) develop appropriate technologies for food production in urban areas.

This will require us to maintain and develop new partnerships with other colleges/department/centers such as Urban Affairs and Public Policy, Institute of Public Administration, and Blueprint Communities, and others such as the Delaware Department of Agriculture, Department of Natural Resources and Environmental Control, the Delaware Center for Horticulture, City of Wilmington, Newark, and other cities in Delaware.

2. Brief description of the target audience

For animal agriculture, the target audience is 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; scientists in the U.S. and international colleagues, K-12 teachers, and environmental and community groups. For crop and soils related research and extension programs, the audience includes existing and prospective grain crop producers, vegetable and horticultural crop producers, mixed (animal and crop production, e.g., dairy, horse) farms, crop commodity and trade, the "green industry", certified crop advisors, private agricultural consultants, state and federal agencies, agrichemical and agricultural equipment companies, processors, marketers of plants of flavor, fragrance, and medicine, peer scientists in the U.S. and other countries, K-12 educators, and policy-makers. For urban agriculture the audience includes farmers, landowners, state agencies and federal agencies, land use organizations, environmental groups, business and community leaders, families, students, and the general public.

3. How was eXtension used?

In 2014 the eXtension Institutional Team comprised of faculty and staff from across all planned program areas continue to provide the leadership for this work. This past year the team has focused on the following:

- Developing a strategic plan for use of social media (created by eXtension Fellow)
- Implementing social media strategic plan- including two social media campaigns
- Additional training and implementation on Ask an Expert
- On-line course development
- Became a premier member of new eXtension structure

Our commercial and consumer horticulture and landscape programs are intensely engaged in the Ask an Expert aspect of eXtension. We average about 400 questions through this format on a yearly basis. The July social media campaign focused heavily on production systems in agriculture and provided educational information through this platform.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	18015	112074	3884	123042

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

Patent Applications Submitted

Year:	2014
Actual:	6

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	22	74	96

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Competitive Grants Awarded

Year	Actual
2014	52

Output #2

Output Measure

- Undergraduate Researchers

Year	Actual
2014	92

Output #3

Output Measure

- M.S.and Ph.D. Students

Year	Actual

2014	103

Output #4

Output Measure

- Post-doctoral Research Associates

Year	Actual
2014	29

Output #5

Output Measure

- Refereed Journal Articles

Year	Actual
2014	75

Output #6

Output Measure

- Books and Book Chapters

Year	Actual
2014	10

Output #7

Output Measure

- Extension Bulletins and Factsheets

Year	Actual
2014	70

Output #8

Output Measure

- Webpage views/downloads

Year	Actual
2014	192543

Output #9

Output Measure

- Workshops at State, National or International Level

Year	Actual
2014	4886

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	1. Best Management Practices to maintain or enhance the competitiveness of Delaware's agriculture and food systems Develop and adoption of appropriate technologies for food production and marketing in urban areas.
2	2. Development and adoption of appropriate technologies for food production and marketing in urban areas: Number of participants adopting appropriate technology for food production in urban areas.

Outcome #1

1. Outcome Measures

1. Best Management Practices to maintain or enhance the competitiveness of Delaware's agriculture and food systems Develop and adoption of appropriate technologies for food production and marketing in urban areas.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	1583

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Lima Bean Breeding Program Varieties Prepared for Release

With only two companies in the west supplying lima bean seed to the Mid-Atlantic area, lima growers in this region have few varieties available to them and none are particularly well adapted to the area.

What has been done
A lima bean breeding program was initiated at the University of Delaware in 2004 where crosses have been made to produce new and diverse breeding lines. The breeding lines have been evaluated in the field each year and selections made for advance to the next generation. Advanced lines have been tested in replicated yield trials on the Georgetown Research Farm under irrigated and unirrigated conditions and in the fields of grower cooperators. Breeding material has been screened for resistance to Phytophthora phaseoli, a major disease causing organism for limas in Delaware. Work with processors has been conducted to make sure that the quality of the blanched and frozen product is acceptable to the industry.

Results
Two baby lima bean breeding lines, DE0407905 and DE0407907, and one Fordhook lima bean breeding line, DE0701301A, have been tested for numerous years. These varieties have superior yield and/or disease resistance characteristics and have acceptable quality attributes. Growers and processors surveyed during the Lima Bean Forum on December 16, 2014 overwhelmingly indicated that they would like these varieties to be released for commercial production.

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
212	Diseases and Nematodes Affecting Plants
405	Drainage and Irrigation Systems and Facilities
604	Marketing and Distribution Practices
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

2. Development and adoption of appropriate technologies for food production and marketing in urban areas: Number of participants adopting appropriate technology for food production in urban areas.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	93

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Need for Integrated Pest Management topics and techniques to community members for implementation in their home and community gardens.

What has been done
Extension Specialists, Agents, and Master Gardener Volunteer Educators worked together to design and deliver a wide variety of educational opportunities either focused on or including

information to address Integrated Pest Management including:
An Integrated Pest Management Urban Garden Companion Planting project was developed in partnership with the three community gardens/farms.
Two Integrated Pest Management walk and talks at the New Castle County Extension Office demonstration gardens in
Two ?Ask an Expert? events at Urban Farm locations near Wilmington, DE.

Results

Evaluations were distributed at one Integrated Pest Management Walk and Talk and one Ask an Expert event. The following information was captured.

Before participating in the program 13 attendees reported when they use an insecticide they find out what the insect is and choose a product targeting this pest with minimal impact on non-targets; only one person reported they?d pick the product with the longest list of insects it kills. 10 participants thought IPM stood for integrated pest management; 4 participants had no idea what IPM stood for.

After the program, participants reported increased knowledge:
Value of Insects
Potential damage
New things about pesticides

After the program 17 participants also reported that Integrated Pest Management (IPM) meant managing pests using cultural methods, biological control, and chemicals when necessary (pest population high and plant health at risk).

Participants reported, as a result of this workshop, they?d: do more research about their planting environment so that they can plant what will work well in their garden; implement pest control; try to garden; combine different plants with veggies; make wiser planting decisions; scout for insects; look more closely; use neem; look for evidence and bring to Cooperative Extension for input; consider beneficial insect value prior to using broad spectrum insecticide; plant asteraceae family flowers around garden.

After completing evaluations, participants reported they?d do the following differently in their gardens: rotate crops; test soil (12); fertilize in fall (2); participate in Livable Lawns program; plant at best times, properly (3); protect plants; grow berries (21); fertilize (2); prune better (22); plan (5); soil preparation and maintenance (2); mulch with organic materials (2); mulch properly (4); build raised beds (5); more carefully consider plant choice for site (2); revise amount of fertilizer; start composting (8); improve composting (7); try to attract beneficial insects; rotate crops; clean and sharpen tools; gardening can be year round; purchase and incorporate more native plants (7); vegetable garden in the spring and fall; start a vegetable garden; implement sustainable landscape techniques; consider rain barrels (2); reduce my lawn; adjust mowing height; create backyard habitat (2); install a rain garden.

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
212	Diseases and Nematodes Affecting Plants
405	Drainage and Irrigation Systems and Facilities
604	Marketing and Distribution Practices
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Appropriations changes

Brief Explanation

Reduced IPM Funds.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Research:

• We have shown that adding an exogenous protease to whole plant corn at the time of ensiling, accelerates the proteolytic process that naturally occurs during normal ensiling. The end result could be useful to dairy farmers because the nutritive value of corn silage could be improved after only a month of ensiling versus waiting for natural proteolytic mechanisms to take place that would normally take 7-8 months to occur. Production of the protease at economic levels must be evaluated.

• We made key contributions to our understanding of regulatory molecules called miRNAs in Brachypodium (model for wheat and bioenergy corps), Arabidopsis (the reference plant), and 34 species across the plant kingdom, as well as miRNA targets in the first two plants. The studies provided new insights (e.g.... about plant aging, the response to submergence, and the conservation and divergence of miRNAs in diverse species), new resources for the research community, and the foundation for future work.

• Research evaluating the impact of different feeding strategies on dairy cow performance and health. By evaluating the impact of a hyperimmune egg product on dairy cow health and also measured the blood and milk protein responses to a rumen-protected methionine product. In addition we worked on trying to fine-tune in vitro assays of cow white blood cell function to make them more effective tools as relatively non-invasive measures of animal health. The industry-sponsored work is ongoing and results are being used to improve dairy cow feeding strategies.

• In 2014, Dr. Jack Gelb and his colleagues Brenda Sample, Brian Ladman and Dr. Dan Bautista on behalf of the University of Delaware Poultry Health System (UDPHS), received provisional accreditation from the internationally recognized, American Association for Laboratory Accreditation (A2LA) for avian influenza virus and avian paramyxovirus 1 real time RT-PCR surveillance testing of commercial and backyard poultry and wild birds. The accreditation is key to the UDPHS' ongoing participation in USDA's National Animal Health Laboratory Network and supporting Delaware's $4.5 billion poultry industry. Dr. Gelb, with Brian Ladman and Miguel Ruano, developed a new experimental vaccine to control

infectious layrngotracheitis of chickens, a common disease in Delaware, and other states and countries where poultry are produced. They filed an international patent application on October 30, 2014.

Extension:

Issue: Hollow heart disorder in watermelon affects the marketability of the fruit, and results in a profit loss of millions of dollars across the United States, Most severe in the eastern half of the country, the disorder is unpredictable and there are no proven management practices to reduce incidence.

Response: A 2014 progressive pollinizer spacing study showed that increasing distance from a pollen source increased hollow heart and reduced flesh density.

The theory that inadequate pollination increases hollow heart incidence and severity has considerable evidence; the effect, however, differs significantly with variety. Recommended management to reduce hollow heart includes insuring adequate pollen availability with matched pollinizer/triploid selection, use of mixed pollinizers with different flowering peaks, planting extra pollinizers, maintaining vigor of vines, and planting to avoid cold weather at pollination. To improve pollen transfer, place extra bees, place hives in several locations around or in the field, consider using bumblebees for plantings where flowering occurs in colder weather, time bee placement properly, and manage pesticides to reduce effects on bees.

Results: This research and subsequent recommendations have for the first time offered information on causes of hollow heart and management options for controlling this disorder.

Results from the research have been presented at regional and national horticulture meetings to other watermelon researchers and extension workers. From these professional meetings, invitations have been extended to speak on the topic in all major Eastern watermelon producing regions including Delmarva, Indiana, the Carolina's and Florida. The presentations have reached over 400 watermelon growers representing over 20,000 acres. The recommendations have been well received with over 91 % of growers surveyed in 7 states indicating that they would change one or more growing practice due to the presented research and recommendations.

Issue: Backyard beekeepers have very little tools for managing honey bee pests in their hives which has led to annual declines in over-wintering colonies. This annual die-off can be quite discouraging and can cause significant economic loss for this sector of the beekeeping community.

Response: The Apiculture program at the University of Delaware developed Bugonia, a citizen-science based IPM protocol for managing Varroa mites and other honey bee pests for backyard beekeepers, in 2014. Bugonia's framework utilizes an online website for participant registration and protocol dissemination. Varroa IPM study and the BUNCH study (focusing on small hive beetle control) were hosted and provided detailed protocols for participating beekeepers. Site visits helped to show study participants how to conduct assays properly.

Results: A total of 150 bee yards participated in both projects throughout the Mid-Atlantic, representing close to 600 honey bee colonies. Nearly 150 backyard beekeepers were instructed about non-chemical protocols for honey bee pest management. Over 40 beekeepers in the Varroa study have adopted our non-chemical Varroa IPM management protocol.

Issue: Livestock producers are constantly looking for ways to decrease their feed bill.

Response: Conducting a pasture walk can combat the issue by disseminating knowledge from Extension personnel to producers; producers can then share the information with other producers. While walking through pastures, producers can observe forage and weed species present and how the land is managed. As a result, producers are better equipped

to evaluate and manage pastures.

A group of livestock producers were invited to attend three pasture walk workshops; one held in Kent County and two held in New Castle County. The events were held in the spring and fall on working farms that largely utilize livestock to harvest the forage as a means to cut down the cost of operating expenses.

At the conclusion of the pasture walks, 53 participants completed an evaluation.

Participants learned:

- How to identify and control weeds.
- The life cycle and how to identify forage plants.
- How to properly take a soil sample.
- Pasture fertility.
- How to renovate and establish a pasture.
- Pasture design and rotation.

Impact: Representing 2,419 acres and over 527 livestock animals, fifty-three producers stated their intent to develop better pasture management plans. Respondents will now:

- Evaluate pastures more often
- Develop a rotation/renovation plan
- Select new grasses that fit their management
- Be more vigilant in weed ID
- Utilize the pasture weed management guide for herbicide selection
- Use proper soil-testing protocols and test soil more frequently
- Use soil test results to determine fertilizer and lime needs

Issue: Delaware has had a continued decrease in operational farmland; if small producers are to create successful enterprises, Delaware State University Cooperative Extension staff must be willing to spend the time to meet the individual producer's needs and provide technologies to assist those operations to be successful and sustainable.

Response: DSU Extension's Small Farms team continues to promote opportunities for Delaware's small farm owners and operators to increase their agriculture production. The team includes horticulture and risk management specialists, and farm management agents and educators who work one-on-one with landowners to increase knowledge about opportunities available promote sustainable and profitable farming.

Results: Utilizing assistance from the DSU extension team, Mr. Hazlett developed an orchard enterprise and has planted more than 300 trees including peaches, nectarines, plums, cherries and pears on five acres of his farm that was previously unused. As the Haslett's continue to expand their new orchard, they are taking advice from DSU's Small Farms team to incorporate some vegetable cash flow crops this year which will assist with the heavy capital investment costs of the orchard and to help jumpstart their Ag venture for 2015.

Impact: DSU Cooperative Extension noted an increased adoption of innovations in marketing and risk management by farmers in the region. Forty-four high tunnels of at least 1,000 sq. feet have been constructed--over half are of commercial size (over 2,00 sq. ft.)--since the beginning of the project. An additional 14 are currently being constructed. An agriculture service provider has developed an educational program around the "Airstream Innovations Tunnel", which was showcased through SARE programming. She has been awarded a USDA 1890 Capacity-Building grant for approximately $175,000 to construct the tunnel for "free-range" poultry, which can still prosper during colder temperatures and have vastly improved air circulation. Three other agriculture service providers (one a capacity building program) have included high tunnels in their programming. The number of high tunnels at DSU's Outreach and Research Center (farm) has increased from one to five during this project.

- Increased number of growers applying for high tunnel construction assistance though NRCS.
- Increased use of soil management programs and best management practices in high tunnels.
- Workshop attendee testimonials:
  - Seventy-five percent of growers in attendance increased their knowledge of soil management programs and best management practices for high tunnels, and expressed willingness to put them into practice.
  - One grower quipped, "I appreciate the workshops and the tours; this year I used my high tunnel to capacity and got record tomato yields."

Key Items of Evaluation

Continued capacity funding for IPM programming is critical.

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Safe and Secure Food Supply for Human Nutrition and Health

☑ 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	5%	5%	5%	5%
703	Nutrition Education and Behavior	25%	25%	25%	25%
704	Nutrition and Hunger in the Population	10%	10%	10%	10%
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	20%	20%	20%	20%
723	Hazards to Human Health and Safety	5%	5%	5%	5%
724	Healthy Lifestyle	10%	10%	10%	10%
806	Youth Development	25%	25%	25%	25%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Paid	7.2	6.5	7.8	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**
83004	232213	8968	239255
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
119126	232213	149685	239255
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
773200	307180	1515188	230862

V(D). Planned Program (Activity)

1. Brief description of the Activity

I. Nutrition and Health Promotion
Extension programs will have a nutrition and health focus. The Expanded Food and Nutrition Education Program (EFNEP) and the Supplemental Nutrition Assistance Education Program focus on low income adults and children. Nutrition education programs for the broader population will include Dining with Diabetes and Eat Smart for a Healthy Heart. Delaware will fully invest in the youth mandate area of healthy living by preparing youth for healthy lifestyle choices in nutrition and physical activities. Additional health approaches will include drug and alcohol prevention, and bullying and suicide prevention. Curricula will include Health Rocks, Up for the Challenge, and Food Smart Families. Master Food Educator Volunteers and trained adult volunteers and teen mentors will participate in program delivery.

II. Food Safety
Research efforts involve high pressure processing to reduce bacteria, viruses, protozoan oocysts, and bacterial endospores; inactivation of pathogenic bacterial species with high pressure and mild heat; using various antimicrobial films to control bacteria, such as Listeria monocytogenes; physiological and genetic analysis of pressure-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.

III. Healthy Living
This is a new interdisciplinary focus on health beyond nutrition education. Research will explore the "One Health" concept and the contribution of plant, animal and ecosystem health to human health. Extension efforts will dovetail with the Cooperative Extension National Framework for Health approved by ECOP in spring 2014. The Delaware Extension program will focus on the topics of health literacy, chronic disease prevention and management, positive youth development for health, and integrated nutrition, health, environment, agriculture systems. This programmatic effort will highlight some new partnerships including the College of Health Sciences and the DE Department of Health.

2. Brief description of the target audience

Adults, youth, particularly low income adults and youth, 4-H adult and teen volunteers, as well as Master Food Educators are the primary target audiences for the Extension programs. Community groups and health organizations will be another audience but also partners in outreach efforts.

3. How was eXtension used?

In 2014 the eXtension Institutional Team comprised of faculty and staff from across all planned program areas continue to provide the leadership for this work. This past year the team has focused on the following:

- Developing a strategic plan for use of social media (created by eXtension Fellow)
- Implementing social media strategic plan- including two social media campaigns
- Additional training and implementation on Ask an Expert
- On-line course development
- Became a premier member of new eXtension structure

The social media strategy particularly focused on safe and secure food supply issues during targeted holiday seasons as well as during food preservation time.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	32208	94224	38119	8349

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

Patent Applications Submitted

Year:	2014
Actual:	1

Patents listed
need patent info

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	53	53

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Competitive Grants Awarded

Year	Actual
2014	23

Output #2

Output Measure

- Undergraduate Researchers

Year	Actual
2014	70

Output #3

Output Measure

- M.S. and Ph.D. Students

Year	Actual
2014	58

Output #4

Output Measure

- Post-doctoral Research Associates

Year	Actual
2014	10

Output #5

Output Measure

- Refereed Journal Articles

Year	Actual
2014	53

Output #6

Output Measure

- Books and Book Chapters

Year	Actual
2014	8

Output #7

Output Measure

- Extension Bulletins and Fact Sheets

Year	Actual
2014	1612

Output #8

Output Measure

- Webpage views/downloads

Year	Actual
2014	60689

Output #9

Output Measure

- Workshops at State, National, and International Level

Year	Actual
2014	2137

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	1. Nutrition and Health: Increases in the knowledge, skills and plans to adopt and/or adoption of healthful diet practices and/or physical activity.
2	2. Food Safety: Increases in the knowledge, skills and plans to adopt better food safety/food handling practices. The number of people certified in safe food handling practices. Basic and applied research 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.
3	3. Healthy Living: Increases in the knowledge, skills and plans to adopt and/or adoption of health literacy and chronic disease management and prevention skills. Increases in the knowledge, skills and plans to adopt and/or adoption of practices to prevent accidents and injuries. Increases in the knowledge, skills and plans to adopt and/or adoption of practices to prevent bullying and suicides. Increases in the knowledge, skills and plans to adopt and/or adoption of positive behaviors regarding health and legal risks of using tobacco, drugs, and alcohol.

Outcome #1

1. Outcome Measures

1. Nutrition and Health: Increases in the knowledge, skills and plans to adopt and/or adoption of healthful diet practices and/or physical activity.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	12365

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As of 2013, about 11 percent of the Delaware population reported having been diagnosed with diabetes, and this number has been steadily increasing, keeping pace with the increasing rate of pre-diabetes and diabetes in the country. There is a need for more diabetes education in Delaware, as only 49 percent of those diagnosed with diabetes have taken a class about managing their diabetes and diabetes is the sixth leading cause of death in the state.

What has been done
Dining with Diabetes consists of three classes that provide diabetes education, cooking demonstrations and tasting of healthy foods. Participants learn how to reduce sugar, salt, and fat without giving up taste. The first class focuses on desserts, the second class focuses on main dishes, and the last class focuses on side dishes. After each lesson the participant takes home recipes and diabetes resources, as well as knowledge on how they can manage their diabetes on a daily basis.

Results
In 2014, a total of 34 individuals enrolled in the Dining with Diabetes workshop series held once in the spring and once in summer. As a result, attendees reported eating more vegetables (21 percent), eating more fruits (15 percent), reading Nutrition Facts labels (32 percent), reading ingredient labels (29 percent), being more physically active (18 percent), more likely to eat on a regular basis (24 percent), and more likely to eat breakfast (18 percent). Furthermore, planning healthier meals, using different artificial sweeteners, and using better portion control were noted as additional ways to manage their diabetes by 32, 16, and 26 percent of participants, respectively.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
723	Hazards to Human Health and Safety
724	Healthy Lifestyle
806	Youth Development

Outcome #2

1. Outcome Measures

2. Food Safety: Increases in the knowledge, skills and plans to adopt better food safety/food handling practices. The number of people certified in safe food handling practices. Basic and applied research 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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	4509

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A better understanding is needed of the processes that contribute to the microbial contamination of fresh produce.

What has been done
Yan Jin, professor of soil science and an environmental physicist in the Department of Plant and Soil Sciences, is conducting research that will link crop surface properties, physics of small-scale water organization and subsequent nutrient availability with the attachment, growth and colonization of bacteria.

Results

The research will provide insight to improve risk assessment methods and pathogen control protocols of produce contamination. Researchers will apply their knowledge of colloid/bacteria attachment and transport processes in porous media to understand how microbial pathogens attach and colonize to fruit and vegetable surfaces. Researchers also expect to develop a computational model, which will provide a quantitative and predictive tool for addressing the key biophysical factors influencing bacterial attachment, survival and colonization on fresh produce.

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
723	Hazards to Human Health and Safety
806	Youth Development

Outcome #3

1. Outcome Measures

3. Healthy Living: Increases in the knowledge, skills and plans to adopt and/or adoption of health literacy and chronic disease management and prevention skills. Increases in the knowledge, skills and plans to adopt and/or adoption of practices to prevent accidents and injuries. Increases in the knowledge, skills and plans to adopt and/or adoption of practices to prevent bullying and suicides. Increases in the knowledge, skills and plans to adopt and/or adoption of positive behaviors regarding health and legal risks of using tobacco, drugs, and alcohol.

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	13036

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Child Policy Resource Center notes that the obesity rate for Delaware youth ages 10-17 is 33.2% vs. 31.6% nationally, and the level of vigorous activity for youth ages 6-17 in Delaware is 62.7% versus a national rate of 64.3%. Activity rates are lower and obesity is higher in Delaware.

What has been done

Delaware 4-H partnered with EFNEP staff to address the issues around nutritional deficiencies, healthy food choices, and physical activity for 3,000 underserved youth ages 8-12 and their families in rural, suburban, and urban communities in Delaware. EFNEP and 4-H youth collaborated and provided development activities for youth ages 13-19 as co-teachers of the ?Up for the Challenge? curriculum, and for students ages 8-12 as participants. Teens were engaged as educators and leaders.

Results

27% improved response to eat vegetables.
22% improved response to eat fruits.
30% improved response to ask someone to buy low fat milk.
22% improved response to do physical exercise.
69% improved knowledge necessary to choose foods consistent with Federal Dietary Guidelines.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
723	Hazards to Human Health and Safety
724	Healthy Lifestyle
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Public Policy changes
- Government Regulations

Brief Explanation

Food Safety Legislation regarding public eating facilities increased both the demand for programming and the competition to others providing the mandated education

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Research:

• The project in the lab with the greatest direct relevance to the agricultural community has been our work examining the interaction of commensal bacterial communities of cattle with shigella-toxigenic E. coli (STEC). This project is a component of a larger USDA coordinated agricultural project (CAP grant) administered out of the Univ. of

Nebraska. This work, done in pre-harvest cattle, seeks to understand the cattle microbiome as on of the myriad factors that may contribute to the prevalence of STEC in the beef food supply chain. STEC strains are responsible for thousands of food-bourne illnesses each year and 10s to 100s of deaths or permanent disabilities. Working with collaborators at the Univ. of Nebraska and Kansas State, we have discovered that STEC infection is correlated with lower bacterial community diversity on cattle hide and within cattle feces. We have also discovered connections between the occurrence of certain bacterial populations and the occurrence of STEC. It is our hope that this fundamental work will one day lead to new technological directions for improving the safety of the beef food supply by mitigating STEC contamination.

- Most people are concerned about the food they eat--how many calories? How much fat?--Yet most people do not think about the toxic compounds they are exposed to through food consumption. Seyfferth's research seeks to understand the soil-food-human pathway of contaminant transport and to devise solutions to this problem in order to decrease the risk to human health. Seyfferth's lab is currently investigating arsenic transport into rice and mitigation technologies using soil incorporation of silica--a non toxic and beneficial element. We have discovered that certain rice residues are capable of decreasing arsenic uptake without exacerbating greenhouse gas emissions. This technology can be adopted by smallholder farmers in developing countries as well as large-scale farmers in developed countries, thereby enhancing food security on a global scale.
- The Delaware Livable Lawns Program has signed up 5 landscape maintenance companies that have committed to following the outlined nutrient management and sustainability practices. An incentive has been funded by DNREC and offered on the website to homeowners who hire Livable Lawn Maintenance companies or perform the practices themselves. Homeowners will be given a $50 gift certificate to purchase native plants at participating retail outlets. This program has been widely publicized through Delaware Gardener columns in the Wilmington News Journal, industry meetings and an active website. This program encourages proper lawn fertilization practices and promotes the use of native plants in the landscape.
- Joerger studied a gene from Salmonella and showed that its product supports Salmonella in surviving highly acidic conditions such as those encountered in the stomach. Knowledge of the components of the gene network responsible for survival of Salmonella in acidic environments is important as it may aid in the development of antimicrobial agents and prevention strategies.
- Food borne illness strikes one in six Americans each year and contamination can originate anywhere along the farm to fork continuum. Research into understanding mechanisms for survival and persistence of pathogenic bacteria and viruses can reduce the number of illnesses each year. Undergraduate and graduate students conduct research to develop scientifically-based metrics for irrigation water standards to reduce pathogen transmission to crops; assess biocontrol measures for sustainable agriculture; and determine virus survival in environmentally-beneficient hydroponic systems.
- Jung-lim Lee, associate professor in the Department of Human Ecology at DSU is conducting research that will rapidly detect and quantify Salmonella and Campylobacter in poultry egg products using Recombinase Polymerase Amplification (RPA) technique.

The application of the RPA assay will allow for rapid monitoring, detection and quantify Salmonella and Campylobacter in poultry egg products within 30 minutes.

Extension:

Issue: While some sectors in society are rebounding as the U.S. recovers from the recent economic downturn, underserved populations have not been as fortunate. As such, underserved individuals, families and communities in Kent County may require educational efforts to help them make informed choices about food, food safety and food budgeting.

Response: DSU's EFNEP staff presented the Eating Smart and Being Active curriculum (eight lessons) to low-income families in Kent County. Participants met weekly for nutrition education and demonstrations on food safety, food budgeting, nutrition/disease prevention, healthy nutritious meal planning, and fun and fitness. Participants also learned to incorporate physical activity into their lives and received educational incentives upon graduation.

Results:

At 90% graduation rate, the participants completed six weeks of nutrition education and physical activity. Non-graduates were encouraged to complete classes at neighboring sites with a variety of available dates.

Graduates received samples of items from the curriculum to support maintenance of learned knowledge and skills, as well as adoption of healthy behaviors. Items included water bottles, measuring cups and spoons, vegetable scrub, resistant exercise band, handouts of curriculum materials, a cookbook, and a certificate of completion.

Statistical results indicate that 100 percent of participants increased knowledge, 75 percent increased their vegetable intake and 85 percent increased their physical activity. All evaluations can be viewed on the Webneers system.

Issue: Food Smart Families Youth Program for Low-income youth Based on consumption data, we know that many youth are not consuming the recommended amount of vegetables, fruits, and whole grains and are over consuming sweetened beverages and high fat items. Additionally, only 42 percent of children ages 6 to 11 years participate in 60 minutes of physical activity each day.

Response: Each summer, EFNEP paraprofessionals conduct educational programs for low-income youth ages 8 to 12 years old. The 2014 curriculum, 4-H Food Smart Families....Choose Health, featured reducing sweetened beverages; consuming more fruits, vegetables, and whole grains; selecting lower fat fast foods; eating breakfast; and being physically active. To conduct the summer program, EFNEP partnered with University of Delaware 4-H. The teen project was funded by a National 4-H Council ConAgra grant. University of Delaware was one of five national sites selected to pilot the project. Forty-two teens (ages 13 to 18) were trained to assist in delivering the educational programs

Results: Nearly 1,500 youth were engaged in the 4-H Food Smart Families...Choose Health youth program during the summer. They improved their healthy choices by eating more fruits and vegetables (35 and 38 percent, respectively), choosing healthy snacks (42 percent), and eating breakfast (21 percent). , Additionally, 33 percent indicated that they increased their physical activity.

EFNEP staff members were excited to continue using teen mentors to deliver educational programs to low-income children.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 11

1. Name of the Planned Program

Volunteer, 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
601	Economics of Agricultural Production and Farm Management	15%	15%	15%	15%
801	Individual and Family Resource Management	15%	15%	15%	15%
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	25%	25%	25%	25%
806	Youth Development	35%	35%	35%	35%
901	Program and Project Design, and Statistics	10%	10%	10%	10%
	Total	100%	100%	100%	100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Paid	12.4	2.9	0.3	0.2
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**
257791	267200	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
301765	267200	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
1185447	29114	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Extension programs will target: (1) Science, Technology, Engineering, and Math (STEM) for youth development, (2) Volunteer and Leadership Development, and (3) Farm, Small Business and Family Resource Management.

Science, Technology, Engineering, and Math (STEM) will be a key component of 4-H Youth Development programs. Incorporating a youth assets approach, 4-H programs will focus on life skills development, positive life choices, leadership development, citizenship/community involvement, and career exploration with emphasis on science, engineering and technology knowledge. Appropriate settings including clubs, camps, school enrichment and after school will use the latest technology to deliver the sustained opportunities. All programming will encompass the latest research on positive youth development and will incorporate the components of positive and sustained adult-youth relationships; life skills-building activities for youth; and opportunities for youth participation in and leadership of valued community activities.

Volunteer Leadership Development programs will be delivered across all program areas. With a core of 3000 volunteers in Cooperative Extension, this program will include core volunteer competencies for volunteer leadership development that will be implemented with 4-H adult and teen volunteers and camp counselors, master gardeners, master food educators; middle management volunteers (volunteers managing volunteers); and extension advisory committees. Core competencies as well as subject matter training and update training to maintain certifications will be provided. Delivery of educational program through volunteers will also occur across all program areas.

Farm, Small Business, and Family Resource management educational programs will be developed and delivered focusing on strategies for effective consumer decision making, financial planning and financial management practices, basic budgeting and credit management, and risk management including health insurance literacy. Additionally, business management strategies focused on business and marketing plans, new business development, business diversification, and improving employability and building human capital skills.

2. Brief description of the target audience

The target audience includes:Youth ages 5-19, 4-H members, 4-H volunteers, new 4-H volunteers, Master Gardeners, Master Food Educators, Community Leaders, at-risk youth and families, court appointed and incarcerated youth and adults, parents of children (from birth through school-age), 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, farm owners and farm families.

3. How was eXtension used?

In 2014 the eXtension Institutional Team comprised of faculty and staff from across all planned program areas continue to provide the leadership for this work. This past year the team has focused on the following:

- Developing a strategic plan for use of social media (created by eXtension Fellow)
- Implementing social media strategic plan- including two social media campaigns
- Additional training and implementation on Ask an Expert
- On-line course development
- Became a premier member of new eXtension structure

The social media strategy successfully propelled Delaware to win the national Hughes.net 4-H Grown contest this year. This campaign further advanced connections to our volunteer, family and youth development program area. Ask and Expert second highest use area is in this program area as well.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	11204	9291	21054	4132

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

Patent Applications Submitted

Year:	2014
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Competitive Grants Awarded

Year	Actual
2014	4

Output #2

Output Measure

- Undergraduate Researchers

Year	Actual
2014	1

Output #3

Output Measure

- M.S. and Ph.D. Students

Year	Actual
2014	0

Output #4

Output Measure

- Post-doctoral Researchers

Year	Actual
2014	0

Output #5

Output Measure

- Refereed Journal Articles

Year	Actual
2014	0

Output #6

Output Measure

- Books and Book Chapters

Year	Actual
2014	0

Output #7

Output Measure

- Extension Bulletins and Fact Sheets

Year	Actual
2014	41

Output #8

Output Measure

- Webpage views/downloads

Year	Actual
2014	184767

Output #9

Output Measure

- Workshops and regional, national and international levels

Year	Actual
2014	1367

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	1. Science, Technology, Engineering, and Math: 1) Increased knowledge of STEM content areas resulting in increased critical thinking and scientific inquiry. 2) Increased numbers of youth pursuing education and careers in science and in contributing to society using science skills.
2	2. Volunteer Leadership Development: 1) Increased knowledge of leadership skills and apply of these skills volunteering and leadership within the community. 2) Augmentation of Cooperative Extension program and resources through volunteer leaders providing education in communities and groups.
3	3. Farm, Small Business, and Family Resource management: 1) Increased knowledge, increased awareness of skills to use, and adoption of best practices in financial management. 2) Increased knowledge, increased awareness and adoption of skills to use and evaluate and enhance business and marketing plans.

Outcome #1

1. Outcome Measures

1. Science, Technology, Engineering, and Math: 1) Increased knowledge of STEM content areas resulting in increased critical thinking and scientific inquiry. 2) Increased numbers of youth pursuing education and careers in science and in contributing to society using science skills.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a need for afterschool and summer academic enrichment at the Middle School level in Newark, DE to provide year-round support to students of families with low-income and low educational attainment who are unable to access affordable, quality afterschool and summer programming in the community. School data indicates that middle school students are at a below target rating in adequate yearly progress with 58% low-income students. The School Profile data indicates low performance of lower socio-economic students as compared to overall students.

What has been done
Aligning with the goals of the School Improvement Plan, 4-H Afterschool programs work to increase academic achievement for all students in reading and math; help maintain a positive, safe school environment by increasing attendance and decreasing disciplinary infractions; and increase parental involvement. The 4-H Afterschool program provides academic support for homework help. Enrichment activities are linked to school core competencies using the 4-H curriculum in healthy living, STEM and Leadership, as well as parent engagement through information sharing and parent night activities.

Results
At Gauger Middle School 118 students completed the program with the following report card grade and test score results: 19% increased their grade in math by half a grade or more; 25% increased their grade in reading by half a grade or more; 42% decreased their grade by half a grade or more in math; 53% decreased their grade by half a grade or more in reading; 57% neither increased nor decreased their grade in math; and 40% neither increased nor decreased their grade in reading.

At Kirk Middle School, 112 students completed the program with the following report card grade results: 24% increased their grade in math by half a grade or more; 32% increased their grade in reading by half a grade or more; 33% decreased their grade in math by half a grade or more; 35% decreased their grade in reading by half a grade or more; 55% neither increased or decreased their grade in math; and 46% neither increased nor decreased their grade in reading.

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development
901	Program and Project Design, and Statistics

Outcome #2

1. Outcome Measures

2. Volunteer Leadership Development: 1) Increased knowledge of leadership skills and apply of these skills volunteering and leadership within the community. 2) Augmentation of Cooperative Extension program and resources through volunteer leaders providing education in communities and groups.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The University of Delaware and Delaware State University require the help of the Master Gardener Program to provide research based information to the surrounding communities. The educational program of the Master Gardener volunteers helps provide education in the form of workshops, demonstrations, plant and insect identification, and information about environmentally-friendly practices for the home gardener.

What has been done
The Master Gardener Program of Kent and Sussex County has 123 active volunteers enrolled in the program that provides assistance and outreach for both counties. A new class will be trained

in 2015.

Results

This year, Sussex County Master Gardener reported over 7,212.3 volunteer hours (that is an average of 101 hours per Master Gardener [71 active] or 192 work weeks or 962 average work days) and saved the Universities over $146,337.56. (Professional rate of $20.29/hr) (7.5hr. day/37.5 hr. wk)* Independent Sector.org/volunteer_time. DE value for 2013.

Kent County Master Gardeners reported over 5,113.75 volunteer hours (average 98.34 volunteer hours per Master Gardener (52 active) or 136.36 work weeks or 681.83 average work days) and saved the Universities $103,757.98. (Professional rate of $20.29/hr) (7.5hr. day/37.5 hr. wk)* Independent Sector.org/volunteertime. DE value for 2013.

Combined Kent and Sussex Master Gardeners have saved DE Cooperative Extension (DSU and UD) 12,326.05 hours, worth $250,095.54 ($248,305.23 in 2013).

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
901	Program and Project Design, and Statistics

Outcome #3

1. Outcome Measures

3. Farm, Small Business, and Family Resource management: 1) Increased knowledge, increased awareness of skills to use, and adoption of best practices in financial management. 2) Increased knowledge, increased awareness and adoption of skills to use and evaluate and enhance business and marketing plans.

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

You and Health Insurance; Making a Smart Choice

Both the currently insured and the previously uninsured 200 million Americans in total have new options for health insurance under the Affordable Care Act. In Delaware the figure totals an estimated 90,000 people including those who would be newly eligible for Medicaid, and youth and adults who are currently uninsured. Research shows that almost all consumers are confused about how to purchase and use this new health insurance.

What has been done

In early 2014, working with team members from University of Maryland Extension Health Insurance Literacy team, a Delaware Extension educator worked to create a tax credit case study that helped to showcase how to use the Smart Choice educational materials by those participants who would be purchasing insurance from the Health Care Marketplace. In 2013 a program specifically designed for agriculture producers, Smart Choice Health Insurance for Farm Community was developed.

The Smart Choice Health Insurance program was offered to horticulture and landscape personnel during the August 2014 Turf and Landscape Expo and Ag Week. Frequently Asked Questions and Ask and Expert resources have been added to the extension.org and local UME and UD extension websites. Certification training has been offered around the country by the UME/UD team. A UD team member assisted with one of these trainings and assisted in presenting materials at the UME Personal Finance Seminar, and the APCPE Conference.

Results

As of January 1, 2015 certification training for use of this program has reached 29 states through the Cooperative Extension system reaching 129 educators.

In Delaware, the UD team offered 12 sessions scheduled throughout the state and 64 individuals, including 10 agricultural producers, attended the Agriculture Smart Choice program at Ag Week 2014 and 29 horticulture professionals during the Turf and Landscape Expo held in August 2014. Evaluation data analysis confirms that this educational program makes a difference. There is a statistically significant, strong positive correlation between the pre-test and the post-test showing that participants have an increase in confidence to make a Smart Choice Health Insurance decision as a result of attending the program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
801	Individual and Family Resource Management
806	Youth Development
901	Program and Project Design, and Statistics

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Public Policy changes
- Government Regulations

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Issue: Delaware 4-H State Environmental Camp

The danger exists that Americans may not know enough about science, technology, or mathematics to significantly contribute to, or fully benefit from, the knowledge-based society that is already taking shape around us (Rising Above the Gathering Storm, Pre-Publication Version, February 2006 Edition, p. 3-24).

Response:

Delaware 4-H organizes an annual Environmental Camp for youth, including non-traditional youth, to encourage the pursuit of science outside of school. Delaware 4-H organized a three day-two night residential camp focused on environmental and natural resource conservation sciences. Students were educated on the importance of natural resources and conservation practices. They answered questions on the materials presented at the camp and related the importance of clean water, natural habitats for wildlife, and a clean community. Students demonstrated the knowledge they gained by offering suggestions of practices in which they could engage to conserve natural resources and protect the environment, and by participating in an exit survey using personal data collection strategies.

Results:

The majority of the youth answered 100% of all content-related questions correctly. In addition, 75% of the participants indicated that their favorite part of camp included the recreational portions. Finally, 61% indicated positively that they would return to this camp and 32% indicated that their future participation was probable.

Issue: Expanding Cooperative Extension's Reach into Communities through Volunteer Development

A 2013 CDC report about Delaware (http://www.cdc.gov/chronicdisease/states/delaware.htm) finds the following: 65% of adults in Delaware were overweight or obese and 32% of high schools students were overweight, based on self-reported height and weight; 69% of adults in Delaware consumed fruits and vegetables less than 1 time per day; 59% of Delaware high school students did not attend physical education classes; and 50% of adults in Delaware were not engaged in sufficient moderate or vigorous physical activity.

Response: Master Food Educator 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 helped volunteers increase knowledge and confidence about nutrition, food science, wellness, food preparation, and food safety. In addition, content such as working with adult audiences, preparing presentations, conducting food demonstrations, participants learn how to present information to the public. Hands-on activities and demonstrations enabled participants to apply their knowledge.

Impact:

During the 2014 program year, 29 Master Food Educators volunteered to support 22 workshops, 24 public events and assisted in judging 3 events, giving 900+ hours to Cooperative Extension's outreach efforts. This has an approximate economic value of $20,709 (based on $23.01/hour 2014 values from Independent Sector.org). MFE's reached 2,848 individuals through their workshops and public events efforts.

Issue:

The 2014 Farm Bill carries with it many new complex and date-sensitive policies that producers need to understand, evaluate and make decisions about regarding their farms and crops.

Response:

USDA-FSA and Cooperative Extension personnel have been trained on the tools and materials needed to deliver the educational information to producers. Producers need this education and unbiased information in order to make important and informed decisions for their farms. These decisions will impact their farms for the life of the farm bill (the next five years).

Results:

94 producers have participated in training thus far, and 94 have indicated that as a result of attending the meetings, they have a better understanding of the Farm Bill programs than they did prior to attending the workshops.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 12

1. Name of the Planned Program

Envrionmental Stewardship In A Changing Climate

☑ 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
111	Conservation and Efficient Use of Water	10%	10%	10%	10%
112	Watershed Protection and Management	10%	10%	10%	10%
124	Urban Forestry	5%	5%	5%	5%
132	Weather and Climate	10%	10%	10%	10%
135	Aquatic and Terrestrial Wildlife	15%	15%	15%	15%
136	Conservation of Biological Diversity	10%	10%	10%	10%
216	Integrated Pest Management Systems	20%	20%	20%	20%
302	Nutrient Utilization in Animals	5%	5%	5%	5%
806	Youth Development	10%	10%	10%	10%
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: 2014	Extension		Research	
	1862	1890	1862	1890
Plan	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Paid	6.9	1.9	12.2	4.8
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**
468092	258963	439893	869295
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
371651	258963	794889	869295
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
472458	11198	4031153	1428228

V(D). Planned Program (Activity)

1. Brief description of the Activity

I. Increased knowledge of and best management practices to mitigate the effects of climate change
a. 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. The 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.
b. 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 groundwater 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. 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;
c. 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 is an important area of ecological research today. 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; 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; 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; 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. 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 fields, 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; Fisheries - population status, spawning areas, and management of Atlantic sturgeon in the Delaware River.

d. 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, target audiences are 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, field border systems, and conservation buffers; 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

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3. How was eXtension used?

In 2014 the eXtension Institutional Team comprised of faculty and staff from across all planned program areas continue to provide the leadership for this work. This past year the team has focused on the following:

- Developing a strategic plan for use of social media (created by eXtension Fellow)
- Implementing social media strategic plan- including two social media campaigns
- Additional training and implementation on Ask an Expert
- On-line course development
- Became a premier member of new eXtension structure

This year the groundwork has been established for the development of online course development around nutrient management and new and beginning farmers. Both of these programs are a part of this goal and anticipated outcomes of this effort will be realized in 2016.

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	11755	37332	449	295

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

Patent Applications Submitted

Year:	2014
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	4	30	34

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Competitive Grants Awarded

Year	Actual
2014	14

Output #2

Output Measure

- Undergraduate Researchers

Year	Actual
2014	68

Output #3

Output Measure

- M.S. and Ph.D. Students

Year	Actual

2014	40

Output #4

Output Measure

- Post-doctoral Researchers

Year	Actual
2014	12

Output #5

Output Measure

- Refereed Journal Articles

Year	Actual
2014	34

Output #6

Output Measure

- Books and Book Chapters

Year	Actual
2014	7

Output #7

Output Measure

- Extension Bulletins and Fact Sheets

Year	Actual
2014	19

Output #8

Output Measure

- Webpage views/downloads

Year	Actual
2014	57555

Output #9

Output Measure

- Workshops at regional, national, and international levels

Year	Actual
2014	317

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	We anticipate an increase in knowledge of, an acquisition of skills, and/or an adoption of practices that: 1) mitigate the effects of climate change; 2) reduce greenhouse gas emissions and increase carbon sinks; 3) use energy efficiently; 4) protect and improve soil, air, and water quality; 5) promote biodiversity and sustainable landscapes; 6) reduce risks through Integrated Pest Management tactics.

Outcome #1

1. Outcome Measures

We anticipate an increase in knowledge of, an acquisition of skills, and/or an adoption of practices that: 1) mitigate the effects of climate change; 2) reduce greenhouse gas emissions and increase carbon sinks; 3) use energy efficiently; 4) protect and improve soil, air, and water quality; 5) promote biodiversity and sustainable landscapes; 6) reduce risks through Integrated Pest Management tactics.

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
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The 2004 Chesapeake Bay Watershed Blue Ribbon Finance Panel estimated that it will cost approximately six billion dollars per year to clean up the Chesapeake Bay to fishable and swimmable standards. As a result of these costs, EPA contracted with the University of Maryland?s Environmental Finance Center (EFC) to conduct education and outreach events across the 64,000 square mile Chesapeake Bay Watershed on funding options available to help implement the best management practices (BMPs) necessary to achieve the needed pollutant reductions in each state.

What has been done
A meeting with the funders was organized to provide better understanding of key issues and potential barriers to promote ag BMPs to help implement Delaware?s WIP and craft a more productive meeting for farmers later in the year.
The ?Delaware Agricultural Financing Forum: Show Me the Money? event was held on August 20th and was sponsored by UD Extension, PNC Bank, MidAtlantic Farm Credit, Chesapeake Bay Foundation, and hosted by the EFC.

Results

The financing forum was well attended with 44 attendees, approximately half of whom were farmers or representatives from ag industry. An evaluation was distributed at the close of the forum and 11 attendees submitted a completed form (25% response rate). Of those surveyed, 100% of respondents indicated that, as a result of the program, they gained a better understanding about the resources available to help finance effective BMPs. Six of the 11 respondents (55%) indicated that they increased their knowledge about the environmental and operational benefits of precision agriculture tools, conservation tillage practices, and irrigation systems, a direct indicator of the participants increasing their knowledge of BMPs to protect and improve soil, air, and water quality. Four of the 11 respondents (36%) indicated that they now intend to adopt one of the featured BMPs to protect and improve soil, air, and water quality. As a result of the program?s success and feedback, a new session for Delaware?s Ag Week has been developed that will feature an interactive financing game, and provide an overview of local financial resources.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Public Policy changes
- Government Regulations

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Research:

• Biological control, which involves importing host-specific insects that feed on and suppress non-native weeds, provides an environmentally sound method of control that can improve and help restore native ecosystems. In FY 2014, our laboratory determined the developmental threshold and number of degree days required for development of the mile-a-minute weevil, a biological control insect for mile-a-minute weed (Persicaria perfoliata). This information will help us to predict under what environmental conditions the weevil will successfully control the weed. In addition, a new project was initiated to look for biocontrol agents aimed at Japanese stiltgrass, one of the most damaging and difficult to control invasive weeds in our native forest understory.

- The relative effectiveness of a novel bioretention basin design for removal of nitrogen and phosphorous from stormwater runoff is being investigated. Nitrogen and phosphorous are two macronutrients that play important roles in the degradation of surface waters. Water quality samples for paired bioretention systems show the advanced media that incorporates water treatment residuals is more effective that a conventional media for removal of phosphorous. We need to collect additional warm-weather data to determine the effectiveness of the design for removal of nitrogen through denitrification.
- It is increasingly realized that the concentration based research as well as assumption based model simulations are not sufficient to understand the intricacies of nutrient cycling. Concept of recycling and recalcitrancy in the environmental context been barely considered seriously. Our approach of source tracking using stable isotopes from molecular scale to ecosystem scale processes, for example, identifying sources and processes of phosphorus in the Chesapeake Bay and understanding nutrient cycling in soils has generated several new findings. The major being the predominance of organic matter remineralization as a dominant pathway of phosphorus cycling. This finding has the potential for paradigm shift on current understanding on how coastal dead-zone are formed and sustained.
- A recognized concern of on-farm manure storage and usage is the exposure to human pathogens that may occur in the manure. Manure handling and field application procedures have been implicated in the pollution of surface waters by pathogens, especially bacteria. Chirnside's research examined a novel, engineered treatment method that can reduce bacteria numbers within dairy cattle wastewater before it is applied on agricultural fields. We demonstrated that a particular white rot fungus could reduce the numbers of bacteria in the liquid dairy manure. The fungus was grown in bioreactors designed to treat the liquid wastewater before it is handled by agricultural workers.
- Spark's research on the impact of sea level rise on contaminant cycling is being shared with a low socio-economic community in Wilmington. This community is located in old industrial areas that have large concentrations of contaminants, such as arsenic and chromium, and is in an area that is adjacent to the Christina River. Flooding is increasingly a problem, exacerbated by climate change, and the community is concerned about the cycling of the contaminants. Our data will provide important information to them about the impacts of sea level rise and flooding on the cycling of As and Cr.
- Dr Vargas has established the first outdoor laboratory in Delaware to study greenhouse gases from a coastal ecosystem. This outdoor laboratory has state-of-the art instrumentation that will provide invaluable information to managers, policy makers, researchers and student regarding the health and value of coastal ecosystems. Dr. Vargas is working towards quantifying a greenhouse balance inventory of this coastal ecosystem to improve the understanding of ecosystem resiliency to climate variability and global environmental change.
- Dr. Ozbay's research at DSU examines the impact of Phragmities australis on native invertebrates using blue crab as an indicator species at the Delaware Blackbird Creek. This research showed that total phosphorous, nitrate, total nitrogen are high in areas dominated by Spartina and mixed marsh grass species. This effort has provided enhanced insight into the importance of marsh surface vegetation in relation to the way blue crabs and resident fish utilize such habitats. This information will contribute to improved management and restoration efforts currently in place that address the common reed.

Extension:

Issue: Poultry Production and Nutrient Management Program

Commercial poultry growers in Delaware are required to be certified by the Delaware Nutrient Management Program and must maintain certification by attending programs that offer continuing education credits.

Response:

The Nutrient Management Program at the University of Delaware strives to provide growers with educational opportunities to maintain their certifications and provide information on the latest technologies that enable them to be competitive, as well as aware of conservation practices that benefit the state's water quality. A recent program showcased talks on mortality freezers, cost share opportunities, animal welfare and LED lighting.

Results:

The Poultry Production and Nutrient Management Program was attended by 66 individuals. The total poultry capacity of the farms present during the meeting was 3,056,900. Based on the evaluations of the program, 11 of the participants plan to adopt the poultry freezers, 20 plan to participant in the cost share programs, 14 plan to adopt new animal welfare practices, and 30 plan to use LED lighting on their operations after hearing about these new practices/ technologies.

Issue: Evaluating and Revision the Delaware Phosphorus Site Index Update

Historical use of manure at rates exceeding the phosphorus (P) requirements of field crops has resulted in elevated soil test P levels in Delaware that increase the risk for P loss from agricultural soils. Phosphorus loss from agricultural fields in Delaware (and the Mid-Atlantic) is a major concern, because of water quality degradation in the Chesapeake Bay, Delaware Inland Bays, and other regionally sensitive water bodies.

Response:

Delaware received $130K from an NRCS Conservation Innovation grant as part of a regional Chesapeake Bay group (PSU, UD, UM, VaA Tech, Cornell, WVU, USDA-ARS, and UMES). As part of this multi-state team, Delaware will evaluate and update the Delaware P Site Index over the next few years. As part of the regional Conservation Innovation Grant, a survey was distributed to certified nutrient consultants to get input from practitioners of the Delaware P Site Index to identify strengths and weaknesses of the tool and professional opinions on if and how the tool should be modified. A regional panel of experts was also convened to represent the Coastal Plain region of the Chesapeake Bay watershed. In conjunction with researchers at USDA-ARS, UMES, and Rutgers, UD researchers and graduate students were awarded a $25K seed grant from the Delmarva Land Grant Universities to begin investigating subsurface transport of P in artificially (ditch) drained agricultural fields on Delmarva.

Results:

A total of 18 people responded to the consultant survey. In general, survey respondents indicated that any revised P Site Index should be based on physiographic region rather than state boundaries and that a screening tool should be used to determine when risk assessment was needed. Only eight of 18 respondents felt that revisions to the Delaware P Site Index were necessary; two respondents thought that a revised index should be more restrictive and future limit manure applications. The regional expert panel, which included representatives from DE and MD Departments of Agriculture, VA Department of Conservation, USEPA, environmental organizations, farmers, and consultants, concurred with many findings of the survey. Most participants wanted a P Site Index based on physiographic boundaries with interpretation (i.e., value for low, medium, high) at the state scale. The panel overwhelming agreed that subsurface transport of P needed to be better understood and considered in risk assessment tools on the Coastal Plain. More results are expected as research activities continue over the next two years.

Key Items of Evaluation

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
0	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
0	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
0	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
0	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.