

2017 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 avian influenza, climate change, farmland loss to development, food safety, and social issues for families and youth such as addressing preventive health and nutrition issues across the food system. Agriculture in Delaware remains strong today, with the Delmarva broiler industry the biggest agriculture commodity. The state has 490,000 acres of cropland (45% 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 youth, 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. Delaware is also uniquely situated geographically to share across states in the mid-Atlantic region and positions and programs are utilized across state lines.

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. Vegetable crops, specifically lima beans, and specialty crops continue to diversify the vegetable production component.

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 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; 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 is highlighted by The Center for Behavioral and Experimental Agri-Environmental Research CBEAR. The mission of the center is applying behavioral insights and experimental designs to improve programs related to agriculture and the environment.

The University of Delaware, in conjunction with the state and private industry, has devoted 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 producers, food handlers and consumers; emerging food safety and nutrition issues; and public education about how to respond to outbreaks of foodborne diseases. Recent legislation related to food safety in food service establishments has doubled the need for food safety training for this audience. Extension successfully boasts a 90% success rate of those trained in successfully receiving food safety certification.

Extension programming aimed at addressing health issues such as obesity and diabetes involves the development of healthy eating and physical activity patterns. These programs are delivered by family and consumer science educators, youth agents, paraprofessionals, master food educators and in the last few years a corps of youth health ambassadors. Special emphasis is placed on minority, low-income and educationally disadvantaged individuals since nationwide data indicate these individuals have disproportionate health rankings. Grant funded programs further enhance the efforts in these program areas. 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 increase fruit and vegetable intake, select beverage intake and increasing physical activity. A new focus this year is on addressing the social determination of health. The Robert Wood Johnson Foundation (RWJF) Well-Connected Communities project has been initiated to engage three specific communities to for health coalitions to address

community identified efforts to establish a Culture of Health.

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 and community policy is the fundamental goal of this planned program. Cooperative Extension activities are the major component of this program area.

Volunteer and Leadership development programming involves Master Gardener, Master Food Educators, Master Composters, youth health ambassadors and 4-H youth volunteers make up a volunteer corps of over 3000 volunteers. Advisory committees in each program area serve as additional

volunteers. LEADelawares is an intensive 18 month leadership program for emerging community agriculture leaders.

The 4-H youth development program focuses on mission mandate areas in STEM education, citizenship and nutrition and health. The goals of 4-H STEM are to increase awareness, understanding, and appreciation in the areas of science, technology, engineering, and mathematics. Through hands on learning experiences youth develop knowledge, skills, and abilities in science, technology, engineering, and mathematics that are both career and life skills. Reaching almost 46% of the youth 8-18 in Delaware, 4-H in multiple delivery formats including after-school programming Delaware youth develop the leadership and life skills needed to become productive, independent, contributors to our society.

Farm, small business and family resource management remains critical to the economic stability of the state. Partnerships with FSA on risk management training as well as MD Ag Law program on farm transfer and succession planning are critical components of maintaining agriculture and it's infrastructure in DE. Likewise, with major changes in health care, education on smart choices of health care is another risk management program for both farm and families alike. Recent changes in DuPont ownership by DOW pose opportunities for enhanced work with encouraging agricultural entrepreneurship to maintain jobs in Delaware.

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 his planned program are (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, salinity 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: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	42.9	16.5	80.5	8.3
Actual	33.3	17.9	94.2	10.4

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

Merit review for Delaware Cooperative Extension consists of peer and stakeholder review. Extension professionals submit individual plans that have been reviewed by their peers and by stakeholder advisory groups. These stakeholder groups including advisory group, community organizations, volunteers, research partners and state and local funding agencies provide input on critical needs and issues within their communities, which is used to develop the state plan. 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 individual and state plans and develop future plans. The second level of review is by college-wide issue teams that are cross-functional and multi-disciplinary. The county plans and research plans are combined into a college-wide plan. The College plan are submitted to the College Advisory Committee. 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..

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
- Survey of traditional stakeholder groups
- Survey specifically with non-traditional groups
- Survey of selected individuals from the general public
- Other (Permanent advisory committees for extension programs and 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 and extension priorities to state and regional problems. UD College of Agriculture and Natural Resources has a comprehensive College Advisory Board that meets twice a year and provides overall input into academic, research and extension programs. DSU College of Agriculture and Related Sciences also participate in numerous formal opportunities for input from stakeholders 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, 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.), Volunteer Programs. 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 and evaluation 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 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. In particular, when new faculty come on board focus groups with stakeholders are held to provide direction to individual plans. Stakeholders search on each of our advisory search committees when new faculty and staff positions are filled.

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: State Chamber of Commerce, Kids County Advisory Council, Delaware Public Policy Institute Task Force, Council of Farm Organizations, USDA Food and Agricultural Council, State Agriculture Technical Committee, and user groups like 4-H parents and leader advisory groups. 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. 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. Plans are underway for a statewide needs assessment for research and extension program: spring/summer 2018 for a combined UD/DSU revised Plan of Work.

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 or extension 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

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

Protected agriculture (hoop house) management

Natural resource economics and policy

Consumer 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 strategic initiatives 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. A second 350-acre Research and Education Center in Sussex County is prominently situated in the heart of Delmarva Agriculture.

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
{No Data Entered}	{No Data Entered}	{No Data Entered}	{No Data Entered}

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1891239	1186766	1104718	1249750
Actual Matching	1891239	1186766	1104718	545231
Actual All Other	1903274	153842	3358007	3138853
Total Actual Expended	5685752	2527374	5567443	4933834

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	544030	0	81000	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	SUSTAINABLE PRODUCTION SYSTEMS FOR AGRICULTURAL AND URBAN
2	SAFE AND SECURE FOOD SUPPLY FOR HUMAN NUTRITION AND HEALTH
3	VOLUNTEER, FAMILY AND YOUTH DEVELOPMENT
4	ENVIRONMENTAL STEWARDSHIP IN A CHANGING CLIMATE

V(A). Planned Program (Summary)

Program # 1

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	Pathogens 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: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	16.8	5.1	34.1	2.0
Actual Paid	15.0	4.9	29.0	3.8
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
715850	306059	320526	257302
1862 Matching	1890 Matching	1862 Matching	1890 Matching
715850	306059	320526	257302
1862 All Other	1890 All Other	1862 All Other	1890 All Other
415344	76407	527816	444339

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and extension programs fall into the following target areas:

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;including organic production (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, precision agriculture, 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. There is a particular focus of collaboration with Food & Farm Coalition in Wilmington, DE.

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 2017 the eXtension Innovation Team comprised of faculty and staff from across all planned program areas is a key connection. This group continues to provide the leadership for integration of eXtension at UD Cooperative Extension. This past year the team has focused on innovation. A partnership of eXtension matched UD/DSU funding for a total of \$15,000 investment. Eleven innovation teams were formed and pitched innovation program plans. Five were selected for funding and are in development • On-line course development with Continuing and Professional Development is in process with rollout of several nutrient management certification courses• Two individuals were selected as I-corp member in climate change initiative and diversity initiative. The largest percentage of our Ask an Expert aspect of eXtension is focused on consumer horticulture and landscape. We averaged about 600 questions through this format.

Our Delaware State Fair exhibit featured video feed of Extension program and we spoke to over 2000 individuals regarding this aspect of Extension program delivery. We are currently in development of multiple data mapping projects being developed following a training led Shane Bradt, Ph.D. Extension Specialist | Water Quality & Geospatial Technologies | UNH Cooperative Extension

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	13348	22150	752	0

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

Patent Applications Submitted

Year: 2017

Actual: 1

Patents listed

Phosphorus Nanofertilizer Containing Boron and Zinc Micronutrients for Plants Application #62324375

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	2	52	54

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Competitive Grants Awarded

Year	Actual
2017	41

Output #2

Output Measure

- Undergraduate Researchers

Year	Actual
2017	129

Output #3

Output Measure

- M.S.and Ph.D. Students

Year	Actual
2017	56

Output #4

Output Measure

- Post-doctoral Research Associates

Year	Actual
2017	12

Output #5

Output Measure

- Refereed Journal Articles

Year	Actual
2017	66

Output #6

Output Measure

- Books and Book Chapters

Year	Actual
2017	4

Output #7

Output Measure

- Extension Bulletins and Factsheets

Year	Actual
2017	74

Output #8

Output Measure

- Webpage views/downloads

Year	Actual
2017	75125

Output #9

Output Measure

- Workshops at State, National or International Level

Year	Actual
2017	42

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Best Management Practices to maintain or enhance the competitiveness of Delaware's agriculture and food systems: Number of acres or animal units adopting practices to increase yield, increase profitability or more efficiently use inputs;
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

Best Management Practices to maintain or enhance the competitiveness of Delaware's agriculture and food systems: Number of acres or animal units adopting practices to increase yield, increase profitability or more efficiently use inputs;

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
2017	36221

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Livestock producers are constantly looking for ways to decrease their feed bill. One way to combat this issue is to utilize pasture. A pasture walk is a way to disseminate knowledge from Extension personnel to producers and for producers to learn from each other. 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

What has been done

A group of livestock producers were invited to attend a pasture walk workshop held in New Castle County. The event was held on a working farm that largely utilizes forage as the main source of feed for the dairy herd to cut down on feed expenses.

Results

Program Impact: We had 26 producers that attended the event with 14 filling out an evaluation. The number of acres impacted by this workshop was 2,191 owned land and 1,848 rented ground. A variety of animals were well represented with farmers who raise chickens, sheep, beef, horses and dairy cows with a total of 199 animals. Respondents said they will alter their pasture management by splitting their pastures differently according to the pasture growth, scouting the forage more often to look for insect and weeds, taking better soil samples and monitoring their fence charger to see if it is working properly.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
205	Plant Management Systems
307	Animal Management Systems
311	Animal Diseases
405	Drainage and Irrigation Systems and Facilities
604	Marketing and Distribution Practices

Outcome #2

1. Outcome Measures

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
2017	322

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The production of grain crops is significant to Delaware's economy, but it is not without challenges. The aim of the 2017 Delaware Ag Week Agronomy Program on January 12th was to provide producers with the tools to meet marketing, nutrient management, and noxious weed challenges. This program offered unbiased research-backed information to assist the region's farmers to produce grain crops efficiently and profitably. The Agronomy Program also provided continuing education to growers who need to comply with nutrient management and pesticide regulations in Delaware and Maryland.

What has been done

The whole day event hosted speakers from the University of Delaware Cooperative Extension, Environmental Protection Agency, Farm Service Agency, University of Minnesota, and an invited

grower from Illinois. Topics included disease management in field crops, managing herbicide-resistant weeds, growing high-yielding soybeans from a grower's perspective, crediting Ag through the Chesapeake Bay partnership models, crop fertility recommendations, and five common mistakes to grain marketing.

Results

The Agronomy Program was attended by 334 individuals of which 41 completed the program evaluation. Of the 41 respondents, 33 identified themselves as growers, six as crop consultants, one as an agribusiness representative, and one as a government employee. The respondents also represent 68,000 acres across the states of Delaware, Maryland, Virginia, New Jersey, and North Carolina in the Mid-Atlantic region. The evaluation respondents indicated after the "Five Common Mistakes in Grain Marketing" presentation by Dr. Ed Usset that 72% learned something new and 76% would use the information presented in the future. Evaluation respondents gave Dr. Usset a "thumbs up" and commented, "bring him back." Dr. Amy Shober from the University of Delaware spoke about the "Updated University of Delaware Agriculture Crop Fertility Recommendations." Even though this presentation associated with environmental regulations, 83% of the evaluation respondents indicated that they learned something new and 67% said that they would use the information in the future. Dr. Mark VanGessel made a presentation about Delaware's tough to kill weeds, and 87% of the evaluation respondents indicated they learned something new and 80% would use this information in the future. Respondents estimated the economic value of the information they received at the meeting was \$13.71/acre on average. The overall economic impact of the meeting (based on the 41 respondents) was estimated to be \$946,985. Even with the low evaluation response rate, the program impacted attendees. The Agronomy Program committee hopes to see an increased evaluation response for future programs

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
307	Animal Management Systems
604	Marketing and Distribution Practices
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Issue (Who car

Issue Processing lima bean growers in Delaware and the processing vegetable industry in the Mid-Atlantic Region have been using the same varieties for the last 15 to 20 years and the genetic diversity of the available varieties is very narrow. New varieties with better yield, suitability for direct harvest and pest resistance are needed to maintain lima bean as a viable crop in Delaware.

Response In 2017, two varieties released by the University of Delaware lima bean breeding program ('Brooke' and 'Bert') were tested in strip trials in grower fields with each of the four vegetable processing companies contracting for production of lima beans in Delaware. In some of these trials, processors and growers were able to obtain yield information for the new varieties and compare them to the standard varieties under grower conditions. Additionally, 65 baby lima trial varieties and 26 Fordhook trial varieties from the UD breeding program were tested for yield and days to maturity in replicated trials and tested for resistance to lima bean downy mildew in a separate trial at UD's Thurman Adams Agricultural Research Farm in Georgetown, Delaware.

Results Bert and Brooke performed well in grower fields and processors are interested in growing these varieties in the future. Several baby lima trial varieties with upright plant architecture, high yield, mid-season maturity and high quality green seed were identified and will be tested in small plots with growers in 2018 and seed will be increased for possible release in the near future. Several Fordhook lines which have high yield, resistance to downy mildew race F (currently the predominant race) and high quality green seed were selected for increase and potential release.

Issue Vegetable growers in Delaware will need to systematically examine costs and returns for the diverse array of crops produced as a part of their businesses in order to assess which are contributing to the profitability of their farm and which are not. Growers also face many other management decisions in vegetable production where they will have to weigh the potential costs and returns in order to make a good choice for their farm business: adding a new crop to production; investing in mechanization of a certain task; using more expensive varieties with certain desirable traits; continuing to harvest a crop when prices are low.

Response A program assistant, working with Emmalea Ernest, collected information from processor field men, crop consultants, and agricultural suppliers to update the processing vegetable budgets for peas, lima bean, pickling cucumber, sweet corn, snap bean and spinach. These budgets have been updated and the 2016 versions are linked to the Delaware Veg Recs webpage at:

<http://extension.udel.edu/ag/vegetable-fruit-resources/vegetable-small-fruits-program/research-reports-fact-sheets/vegetable-crop-budgets-irrigation-cost-calculators/>.

Emmalea Ernest worked with James Adkins, UD Associate Scientist working with irrigation, to update the Irrigation Cost Calculators for diesel and electric center pivot systems and drip irrigation systems. The updated irrigation cost calculators are also available at the above website. In 2017, the program assistant working with Emmalea Ernest collected information from growers, Extension personnel and agricultural suppliers to create new fresh market vegetable budgets for bell pepper, broccoli, cabbage, cantaloupe, potato, seedless watermelon, sweet corn, and tomato, which are also available at the above

website. Gordon Johnson and Emmalea Ernest presented the new vegetable crop budgets to approximately 30 growers and crop consultants at the Mid-Atlantic Crop Management School on November 15, 2017 in a presentation titled: Using Vegetable Crop Budgets for Crop Management Decisions.

Results The vegetable crop budgets index webpage has had 412 unique pageviews in 2017. There was an increase in traffic to the site after the workshop on November 15. We plan to use these enterprise budgets in additional workshops to be held in 2018, including beginning farmer workshops

Issue For many fresh market vegetable crops, a large number of varieties are available but not all are suitable for production in Delaware. Growers need research based information on yield, quality traits and disease resistance of varieties in order to choose varieties that are likely to perform well on their farms.

Response The University of Delaware Extension Vegetable and Fruit Research Program conducts fresh market vegetable variety trials each year. In the past five years, the program has conducted variety trials on seedless watermelon, sweet corn, snap bean, onion, tomato, broccoli, Brussels sprouts, greens crops and specialty pepper. Within the last ten years, the program has also trialed lettuce, specialty melons, cantaloupe, cabbage, slicing cucumber and cauliflower. The results of these trials are used to update the variety recommendations in the Mid-Atlantic Vegetable Production Recommendations, a regionally produced Extension publication. For many of the Delaware trials, reports which include photos of the varieties are also produced and distributed at grower meetings and through the program's website.

Results Thirty-seven fresh market vegetable growers who participated in produce food safety workshops in March 2017 were surveyed to determine how many were using the variety recommendations in the Mid-Atlantic Vegetable Production Recommendations or in the variety trial reports to choose which varieties to grow. Seventy-six percent reported using the variety recommendations sometimes (32%) or often (43%). Seventy percent reported using the variety trial reports sometimes (43%) or often (27%). The variety trials and the recommendations that they are based on are a resource that Delaware vegetable growers are using to decide which varieties to grow on their farms.

Issue University of Delaware Plant Diagnostic Clinic 2017 - Nancy F Gregory, December 30, 2017 Stakeholders who work on farms, orchards, or in landscapes observe plants in decline. Diseases can affect food supplies by decreasing yield, or impact grower income due to lower quality. Plants are affected by pathogens, insect pests, environmental or cultural stresses, or may be affected by a combination of factors. Management recommendations are often very specific.

Response Using precise laboratory methods, the UD Plant Diagnostic Clinic is the primary service in Delaware that provides diagnoses of plant diseases and disorders across all crop areas, and fungal/mushroom identifications. Plants and weeds are identified, along with pest and beneficial insect identifications. Over 585 specimens of plants, insects, microbes, or soil were received in the Clinic in 2017, directly from growers, crop consultants, landscapers, homeowners, and other stakeholders. Samples also came from county offices of Cooperative Extension, and a few came from State or Federal surveys or nursery inspections. Over 55 questions were answered through Ask an Expert through eXtension, and other queries were submitted by telephone and e-mail. Timely processing, accurate diagnoses, rapid responses and management recommendations were made in cooperation with specialists and agents.

Results Specialized lab methods and expertise result in timely and accurate diagnoses of clinic samples, leading to effective management decisions. Abiotic stress played a role in over 40% of samples, including irregular watering, chemical injury, and winter injury. Without a specific pathogen or pest to control, a chemical treatment might not be

necessary, saving the cost of chemicals and applications. Accurate diagnoses led to tailoring of targeted pesticides that are more cost effective, with less impact to the environment. Accuracy and trust have resulted in increased clientele, with 57% of samples from commercial clients. New pest reports have impacts for quarantine and trade. There were 28 new state reports in 2017, including approximately 12 significant new pathogens, weeds, or insect pests. Detection of USDA-APHIS PPQ pests of regulatory significance aids in safeguarding of agricultural products in Delaware. Outreach assists growers in increased knowledge of significant regional pest threats

Issue Soil Health and Cover crops are critical to successful farms and a statewide, coordinated effort to provide educational activities has not been done.

Response Regular meetings and workshops were held throughout the year to coordinate and educate farmers.

Results New collaborations were formed with Sussex County and Kent County Conservation Districts for work on cover crop education and future events will be complimentary or collaborative. Additionally, at least one representative from each district was part of Delaware's cover crop team that attended the Baltimore training and collaborate on follow-up activities. The greatest success stories, in addition to seeing farmer adoption, were the outcomes of the regional conference and the prospects for future professional development, especially with Kent and New Castle County Conservation District staff who, generally have little experience with soil health and cover crops and are being encouraged to ramp up outreach. This year, the Delaware Soil Health became more formalized and an agreement was made with the SARE state program to continue professional development statewide and include all three county's Conservation District staff, as well as coordinating farmer education activities.

Issue Internal parasites are a major health problem affecting small ruminants worldwide, particularly the blood sucking abomasal parasite, *Haemonchus contortus* (barber pole worm). This parasite is a major threat because once in the abomasum of the animal it consumes large amounts of blood causing disease and mortality that can hinder production. This parasite is very difficult to manage as there is data showing that they have shown resistance to all available de-wormers in several places across the world. Therefore, a more integrative and integrated approach is needed to control this parasite. Data have shown that there is a high level of resistance to the benzimidazole classes (white drenches) of de-wormers and ivermectin in Delaware and surrounding states. With the warm, moist weather conditions in the Delmarva region in the 2016 - 2017 parasite problems were very high in Delaware.

Response

Delaware State University's small ruminant specialist and University of Delaware's animal science extension agents conducted a one-day fecal egg counting and FAMACHA© workshop that was designed to help producers learn the basics of selective internal parasite control. We provided hands-on training to certify producers in the use of FAMACHA© score card and fecal egg counts. In the morning, an integrative parasite management lecture was done to educated producers on all the major parasites and control methods, followed by hands-on FAMACHA© eyelid color scoring and fecal egg counting sessions in the afternoon of the program.

Results

A total of 20 participants attended the Fecal Egg Counting and FAMACHA© workshop with all participants coming from Delaware. Post conference evaluations (n = 12) returned showed that 83% of participants rated the overall workshop as excellent and the remaining 17% as good with all the participants believing the information was given in a clear and concise manner. Knowledge gained by participants: 100% learned how to conduct fecal egg count correctly 100% were effective in conducting FAMACHA scoring As a result of the

knowledge gained, 100% of the producers indicated that they will be implementing the use of FAMACHA cards before treatment their animals.

Issue Redheaded flea beetles have become an important nursery pest over the past eight years in the eastern half of the country. Adults cause substantial chewing damage to foliage which leads to unsalable crops. There are at least two generations a year in the mid-Atlantic, and their activity occurs from May until mid-November depending on location. Many nursery operators often apply broad spectrum insecticides weekly for managing this pest; consequently, IPM practices on some crops are disrupted due to non-target impacts. The majority of the research on redheaded flea beetles is conducted at the University of Delaware, thus other regions dealing with this pest request additional information via fact sheets or presentations.

Response The Ornamentals IPM specialist has visited multiple locations in the southeast during the past year to share research results. The locations for invited presentations have included North Carolina, South Carolina, and Georgia. Fact sheets and recommendations have been shared through e-mail with Alabama, Indiana, Michigan, Tennessee, Georgia and Quebec, specifically, and nationally through the ornamentals listserver. The research results shared with other institutions discuss insect phenology, host plant preferences, biological control or biopesticide opportunities, and results from insecticide efficacy trials targeting adults and immature flea beetles. This year's results also focused on trap crop opportunities and preliminary trials examining the nutritional quality of hosts.

Results Presentations in other regions and sharing the information with colleagues has provided collaborative opportunities on grants and projects looking to further information regarding host plant preferences, impacts of irrigation, selection of non-neonicotinoid insecticides, or impact of biological control agents. The results from an evaluation survey after a presentation in North Carolina follows: 95% of professionals in NE North Carolina learned new information about redheaded flea beetle biology with 50% of attendees stating they learned twice as much as they knew prior to attending the presentations. 72% of nursery operators in attendance stated they learned how to scout for the larva stages. 82% learned how to use the Growing Degree Days (GDD) as a tool and what websites are available to assist with tracking GDD. 60% stated they increased their knowledge of management tactics available for redheaded flea beetles. 18% intend to use GDD to track the flea beetle life cycle. 9% said they intend to try to use biological control (entomopathogenic nematodes or fungi) as a management strategy. 60% are likely to start using either insecticide drenches or incorporate granular products into soil media to target larvae as part of their management strategy. Colleagues from Indiana and North Carolina have said their nursery operators have begun to use the GDD information to better target vulnerable stages with insecticide applications. Any industry representative from North Carolina told me at a recent meeting (Testimonial), "Nursery operators in eastern North Carolina have been appreciative of the efforts the University of Delaware has spent towards managing redheaded flea beetles because they believe it will become a predominate pest in nursery settings in the years to come. They feel it will rival Japanese beetles in the impact they have on profitability of some crops. They wanted me thank you for coming to a different region to share your information."

Issue (Who cares and why?) - 500 characters or less

Nutrient impairments are common in Delaware waters, resulting from non-point sources of nitrogen (N) and phosphorus (P) from agricultural and urban areas. Agricultural nutrient losses are linked to the use of manures and inorganic fertilizers to supply nutrients to growing crops. The 1999 Delaware Nutrient Management Act mandated that individuals who fertilize more than 10 acres of land, own/manage more than eight animal units (1 animal unit = 1000 pounds of live animal weight), apply nutrients for a fee (commercial

fertilizer handler), or consult in the business of nutrients must become nutrient certified. A total of 6 to 12 hours of classes must be taken for initial certification. All certified individuals, with the exception of nutrient consultants, must maintain their certification by accruing 6 continuing education credits (1 credit = 50 min of instruction) every three years; nutrient consultants must accrue 5 credits annually.

Response (What has been done?) - 500 characters or less

University of Delaware Cooperative Extension offers initial nutrient management certification training to individuals as required by law. State-wide training sessions are led by UD Cooperative Extension, with oversight by the Delaware Nutrient Management Commission and the Delaware Department of Agriculture. The Delaware Nutrient Management Certification program is unique among Chesapeake Bay states in that farmers and landscape professionals receive comprehensive nutrient management education. Other states in the Chesapeake Bay region (i.e., VA, PA, WV, NY) provide comprehensive education only for nutrient management plan writers. The Delaware Certification covers the following topics: water quality, fertilizer and manure management, animal mortality management, soil testing and plant analysis, and plant selection. Since 2001, we have certified more than 3,184 individuals at four certification levels (nutrient generator, private nutrient handler, commercial nutrient handler, and nutrient consultant). In 2013, we updated the initial certification educational materials and introduced a pre- and post-test and post-session evaluations to determine change in knowledge and behavior as a result of the sessions.

Results (What has changed for participants as a result of this work?) - 1000 characters or less

Increase in knowledge and awareness as a result of participation in the certification sessions. Based on results of 90 pre- and post-test evaluations completed in 2017, we determined that 68% of participants (61 of 90) increased their knowledge of Delaware's nutrient management issues and certification requirements after 6 hours of instruction. The overall increase in knowledge for the whole group was 19%. Based on results of our evaluation survey, 87% of respondents (104 of 120 respondents) indicated that they learned new information during the initial certification sessions that would help them comply with the Delaware Nutrient Management Law. Similarly, 95% of respondents (124 of 130 respondents) indicated that they gained knowledge of Delaware's water quality issues as a result of attending the nutrient management sessions. Better management of N and P leads to reductions in nutrient losses from agricultural crop land. As a result of knowledge gained in the initial nutrient management sessions (2017), 8 individuals (67%) reported that they would change the way that they manage N and P on their operation. In 2017, we certified 27 private nutrient handlers (individuals who apply fertilizer to 10 or more acres of land that they own or manage in Delaware). These private nutrient handlers indicated that they make nutrient management decisions on 7,356 acres of crop land in Delaware, which represents 1.7% of Delaware's 439,157 acres of total cropland (USDA-NASS, 2015).

Upon completion of the certification sessions, private nutrient handlers are required to implement a nutrient management plan. This nutrient management plan requires field level nutrient management (nutrient application rate, timing, and application methods based on the realistic yield goal and best practices). The Chesapeake Bay Program estimates that annual N and P loads from agricultural land that is not managed under nutrient management are 23 and 1 lb/ac, respectively. Estimated load reductions for field level nutrient management are 12.79% for N and 10% for P (Chesapeake Bay Program, 2015). We estimate that 10.8 tons of N and 0.37 tons of P were prevented from leaving agricultural fields and entering sensitive waterbodies (like the Chesapeake and Delaware Bays) for acreage managed by newly certified private nutrient handlers (2017) as a result of our nutrient management certification efforts, assuming all 17 private nutrient handlers are

now in compliance with the Delaware nutrient management law and have implemented their nutrient management plan (following field level nutrient management practices). We teach advanced nutrient management topics (e.g., pre-sidedress nitrogen testing, Phosphorus Index, manure injection) as part of the initial certification and through continuing education. Implementation of advanced nutrient management practices would likely result in larger load reductions on a subset of the land. In contrast, failure of some individuals to comply with the Delaware Nutrient Management Law would result in lower load reduction for that land. We assume that the benefits of advanced nutrient management are offset by non-compliance.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 2

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: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	8.5	6.6	14.8	1.2
Actual Paid	8.0	7.0	23.0	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
460367	437227	218976	269550
1862 Matching	1890 Matching	1862 Matching	1890 Matching
460367	437227	218976	269550
1862 All Other	1890 All Other	1862 All Other	1890 All Other
213277	47489	1297807	1986884

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 2017 the eXtension Innovation Team comprised of faculty and staff from across all planned program areas is a key connection. This group continues to provide the leadership for integration of eXtension at UD Cooperative Extension. This past year the team has focused on innovation. A partnership of eXtension matched UD/DSU funding for a total of \$15,000 investment. Eleven innovation teams were formed and pitched innovation program plans. Five were selected for funding and are in development • On-line course development with Continuing and Professional Development is in process with rollout of several nutrient management certification courses• Two individuals were selected as I-corp member in climate change initiative and diversity initiative. The largest percentage of our Ask an Expert aspect of eXtension is focused on consumer horticulture and landscape. We averaged about 600 questions through this format. Our Delaware State Fair exhibit featured video feed of Extension program and we spoke to over 2000 individuals regarding this aspect of Extension program delivery. We are currently in development of multiple data mapping projects being developed following a training led Shane Bradt, Ph.D. Extension Specialist | Water Quality & Geospatial Technologies | UNH Cooperative Extension

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	6734	7323	12733	9228

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

Patent Applications Submitted

Year: 2017
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	40	40

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Competitive Grants Awarded

Year	Actual
2017	18

Output #2

Output Measure

- Undergraduate Researchersw

Year	Actual
2017	79

Output #3

Output Measure

- M.S. and Ph.D Students

Year	Actual
2017	59

Output #4

Output Measure

- Post-doctoral Research Associates

Year	Actual
2017	3

Output #5

Output Measure

- Refereed Journal Articles

Year	Actual
2017	4

Output #6

Output Measure

- Books and Book Chapters

Year	Actual
2017	3

Output #7

Output Measure

- Extension Bulletins and Fact Sheets

Year	Actual
2017	4070

Output #8

Output Measure

- Webpage views/downloads

Year	Actual
2017	35544

Output #9

Output Measure

- Workshops at State, National, and International Level

Year	Actual
2017	11

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
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	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	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

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
- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	13222

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to the 2008-2012 American Community Survey, the poverty rates in New Castle, Kent and Sussex counties were 10.7, 12.4 and 12.9 percent respectively. Research has indicated that poverty is associated with low nutrition and increased risk of many diseases. Poverty and food insecurity were found to be associated with lower food expenditures, low fruit and vegetables consumption and lower quality diets. The highest rate of obesity occurred among population groups with the highest poverty rates and least education.

What has been done

A series of classes targeting adults who have major responsibility for food planning and preparation and with incomes below 185 percent of poverty are conducted throughout Delaware. The Expanded Food and Nutrition Education Program (EFNEP) focuses on low-income families with children developing skills to make healthy food choices based on their budget, to use their resources wisely, to handle food safely, and to participate in physical activity each day. The program empowers individuals and families participating in the program to expand their horizons and to link diet, physical activity, and health together. Each session lasts for one to four hours (with most lasting two hours) depending on the needs of the group. Because time and day have been identified as a barrier for participating in the program, courses are offered in New Castle and Sussex Counties and at times of the day and week to meet the needs and schedules of the participants. Key topics include meal planning, food resource management, food selection and purchasing, food preparation, food safety, and physical activity

Results

EFNEP reached 179 individuals with young children in 2017 in New Castle and Sussex Counties. Based on data from 24-hour food recalls taken on individuals upon entering and exiting the program, 87 percent had a positive change in any food group at exit. Specifically, 14, 16, 16, 12, and 6 percent had a positive change in protein, grain, vegetables, dairy, and fruit consumption, respectively. Additionally, 71, 68, and 38 percent of participants improved one or more nutrition, food resource management, and food safety practice, respectively. These skills included more often planning meals in advance (32 percent), thinking about food choices (24 percent), preparing food without adding salt (24 percent), using Nutrition Facts on food labels (44 percent), reporting their children ate breakfast (23 percent), comparing prices when shopping (28 percent), and using a grocery list (28 percent). Forty-one percent always followed the practice of not letting food sit at room temperature for more than two hours while 43 percent showed improvement in not thawing food at room temperature. As a result of the program, 26 percent were less likely to run out of food.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
806	Youth Development

Outcome #2

1. Outcome Measures

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
------	--------

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Foodborne illnesses are a common and costly ? yet preventable ? public health issue. According to the Centers for Disease Control and Prevention, approximately one in six Americans (nearly 48 million people) get sick, 128,000 are hospitalized and 3,000 die of foodborne illnesses each year (CDC, 2017). Estimates are used because only a fraction of illnesses are actually diagnosed and reported. In late 2015, the State of Delaware Department of Health and Social Services determined that individuals producing non-hazardous foods in a home-style kitchen needed to receive training that culminated in an exam in order to be in compliance with Cottage Industry laws. The Delaware Department of Agriculture requires On-Farm Food Processors who sell non-hazardous food products on their farm, at a roadside stand or a farmer?s market to complete similar training and pass a certification exam as well

What has been done

University of Delaware Family and Consumer Science staff conducted three 8 hour trainings for individuals who are Cottage Industry Entrepreneurs or On-Farm Entrepreneurs. The training includes hands-on activities that emphasize critical food safety principles. The program concentrates on personal hygiene with the emphasis on hand washing, appropriate sanitation of food surfaces and temperature control of foods. In addition, it reviews liability associated with these types of business practices

Results

In 2017, 20 individuals participated in the training. All participants passed the examination at the end of the class. Seventy five percent of the participants stated they would apply for a permit after attending the class. As a result of the program, 100% indicated that they would improve at least one food handling practice. Eighty two percent stated they would wash hands more frequently and 94% understand the liability associated with selling an unsafe food product. Additionally 94% will thoroughly wash and sanitize work surfaces as a result of attending the training. Anecdotally, participants felt the demonstrations helped emphasize points taught in the class and that what they learned will carry over to all food preparation

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
724	Healthy Lifestyle
806	Youth Development

Outcome #3

1. Outcome Measures

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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1580

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Currently, according to the CDC, approximately 3,000 Delawareans over 35 die from heart disease and almost 5,000 Delawareans are living with cancer. 10.6% have been diagnosed with diabetes which is higher than the national average of 9.4% and 13.1% of Delawareans are at a risk of developing diabetes because they are pre-diabetic. According to the 2015 Robert Wood Johnson County Health Ranking report, 28% of Delawareans are obese. This does not reflect the number of those who are overweight which often leads to obesity.

What has been done

Healthy eating and physical activity have been shown to reduce levels of heart disease, diabetes, certain types of cancers and obesity. Family and Consumer Science educators and Master Food Educator volunteers conducted educational programming statewide in various topics including Portion Control, Mindful Eating, Get Your Snack on Track, Mealtime in Less Time, Cooking from the Spring Garden, Cooking for One or Two, Understanding the New Food Label and Dazzling and Delicious Salads. These programs gave participants knowledge and tools to make healthier choices and become more physically active.

Results

Thirty programs were conducted statewide reaching approximately 325 participants. Post

program surveys indicated that 87% of participants either agree or strongly agree that they plan on doing something differently as a result of the information provided in the program they attended; 90% of participants either agree or strongly agree that they are more confident in their ability to address the topic presented; 90% of participants either agree or strongly agree that they will refer to handouts provided at the program.

Anecdotally, participants commented that as a result of the workshop they plan to read information about ingredients more carefully, look at nutrition facts, consider the variety of colors of vegetables they buy at the grocery store, put healthy snacks in their home, reduce fats, sugars, add more protein and fiber Slice veggies ahead of time, eat more fruits/vegetables, and eat less meat. They will also make their own salad dressing, eat more salads, use MyPlate as a guideline for portions, incorporate making a healthy plate and reading food labels, try new vegetables, work harder to get exercise into their life, prepare food ahead to save time.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Issue Delaware's adult obesity rate has doubled in recent decades and is ranked 23rd in the nation. The rate is currently at 30.7 percent.

Response DSU SNAP-Ed coordinated with state service centers and Title 1 schools in New Castle, Kent, and Sussex counties of Delaware to provide Rethink Your Drink demonstrations. All demonstrations consisted of sugar amount in drink display, informative handouts and infused water or apple cider to sample.

Results DSU SNAP-ED reached over 600 participants while conducting Rethink Your Drink demonstrations at state service centers and school events. Participants were encouraged to rethink their drink by drinking less sugary drinks and more water and healthy options.

Issue Season extension is key to Delaware specialty crops- small farmers. There is need for targeted activities associated with organic transitioning, sustainable production along with season extension technologies.

Response Four (30 X48) ft. High tunnels put up at Delaware State University (DSU)-Smyrna Outreach and Research Center (SORC) continue to serve as a showcase of examples of High Tunnel options available for growers, who are encouraged to visit. A total of 9 workshops related to season extension were carried out at DSU-SORC over the last 4 years. Speakers were invited from in and out of state to deliver talks and share experiences. Follow up farm visits were made to high tunnel growers to collect soil samples and answers grower concerns. Trials have been carried out at SORC and data recorded. Trials included; - Tomato production in high tunnels (4 years) - Starting potato slips in high tunnels (4 years) - Use of biocontrol in high tunnels (3 years) - Strawberry in high tunnels (3 years) - Scotch bonnet pepper production (3years) - Evaluating cucumbers, onions, Kale, collard greens, eggplants - Temperature and humidity data collected all year round Each Year, presentations concerning updates of High Tunnel Research and extension was made during two major conferences; Delaware Ag week' and 'Profiting From A Few Acres Conference'.

Results Over forty high tunnels have been funded by the NRCS during this period. In 2017 DE-Ag week, 127 Delaware growers attended High Tunnel related talks. In 2017, up to 67 participants attended and participated in High Tunnel sessions during DSU-'Profiting From A Few Acres Conference'. An average of 45 small farmers attended workshops and increased their knowledge on 'scheduling of crops for efficient use of High Tunnel space', 'water and nutrient management', 'practicing IPM' and the 'importance of temperature and humidity regulation' in High Tunnels. In 2017, we had requests from 7 special High Tunnel visits to learn more about designs and factors to consider when locating High Tunnels in their premises. In 2017, I made a total of 56 High Tunnels related farm visits which included data collection from sites. Undergraduate student workers, helping with the project gained immense practical experience in vegetable production. One of the three undergraduate students involved in the project, joined graduate school

Issue Stress affects adolescents in their daily lives and can reduce memory and emotion processing as well mental connections. Early life persistent stress can increase incidence of depression, anxiety, sleep disorders, and cardiovascular disease later in life. Mindfulness therapeutic interventions have been proven to be effective in managing stress and stress related symptoms. Mindfulness has been shown to decrease perceived stress levels, medical and anxiety symptoms and blood pressure and increase awareness, acceptance, emotion processing and coping skills in students.

Response The mindfulness program is a 5 hour series of lessons on mindfulness-based stress management designed for ages 10 and up. The program is interactive and teaches stress coping and relaxation techniques and was administered in middle schools (Shue Medill Middle School, Talley Middle School), community locations (Hockessin Recreation Center, Appoquinimink Community Center, Seaford Library, Smyrna Boys & Girls Club) as well at other Cooperative Extension events (4-H Leaders Forum, 4-H National Healthy Living Summit, Delaware Youth-Adult Partnership Conference).

Results This program reached a total of 974 individuals, including youth and adults, throughout the state. Extension professionals developed an evaluation tool and administered the survey to a total of 332 youth who received 5 hours of mindfulness training in stress management skills. 72% of program participants increased their knowledge of positive stress techniques specific to learning how to identify personal stressors and ways to reduce them. After the program, 75% of participants can set personal wellness goals and determine steps to reach them. Over 90% of participants adopted at least one new positive stress technique as a result of the program.

Issue There is a need for safe, quality, affordable afterschool programs in the Selbyville where a large percentage of youth are living in poverty. According to recent figures provided by the Delaware Department of Education and the Indian River School District, upwards of 50% of students attending Phillip C. Showell Elementary in Selbyville live in poverty as determined by free and reduced lunch eligibility rates. According to research by the American Psychological Association, "living in poverty has a wide range of negative effects on the physical and mental health and well-being of our nation's children," placing them at greater risk for "poor academic achievement, school dropout, abuse and neglect, behavioral and socio-emotional problems, physical health problems, and developmental delays" (www.apa.org). Two recent incidents in Selbyville, one in which a 4 year old preschooler passed out over 200 bags of heroin to classmates and the other in which a 13 year old student ingested heroin at a middle school dance further underscore the need for 4-H afterschool programming in the area. Through a grant from the Delaware Department of Education 21st Century Community Learning Centers (21st CCLC), 4-H Afterschool and the Indian River School District have collaborated to offer a 4-H Afterschool/Summer Program at Phillip C. Showell Elementary in Selbyville, DE.

Response In discussions with the school principal, staff and in accordance with the 21st CCLC grant goals and objectives, 4-H program staff identified specific areas to target. The staff focused on: Academic improvement, increased school connectedness, health and nutrition, and increasing capacity of participants to be productive adults.

Results According to the survey results from youth who participated in the 2016-2017 Phillip C. Showell 4-H Afterschool Program because of their experience in the 4-H afterschool program: 96% of respondents agreed or strongly agreed they participate in math and science activities more often; 87% of respondents agreed or strongly agreed they have assets that will help them in my future; 96% of respondents agreed or strongly agreed they make better food choices; 92% of respondents agreed or strongly agreed they feel valued by 4-H staff; 96% of respondents agreed or strongly agreed they can work successfully with adults; 82% of respondents agreed or strongly agreed they feel close to school and 4H staff; 87% of respondents agreed or strongly agreed they understand the effects of drugs and alcohol; 92% of respondents agreed or strongly agreed they are motivated to do well in school; 78% of respondents agreed or strongly agreed they feel a part of their school; 100% of respondents agreed or strongly agreed they could get help with their homework.

Issue The Sussex County 4-H program has provided the Jr. Leader Weekend event in the spring for many years where teen members learn and increase leadership and teambuilding skills that are used in roles as counselors at various 4-H camps and events. Many new Jr. Leader members (ages 13 and older) who want to become counselors do not have access to such training until the 4-H year is half-way complete.

Response In an effort to better prepare new Junior Leaders and provide them with the necessary skills to serve as a 4-H counselor, volunteers and staff suggested having a leadership retreat in the fall. Since we have a very active group of Jr. Leaders, the 4-H staff decided to let the Jr. Council officers plan and lead this fall retreat. The weekend includes teambuilding, leadership, and counselor skills. A community service component was included in the program schedule which allowed members to gain five service hours volunteering at the Evans Farms Fall Festival.

Impact: Sixteen teens attended this retreat. Seven of those members were attending an event like this for the first time. The officers did an excellent job of leading activities and making everyone feel included. A survey was given after the event. Participants were asked to rank how their leadership skills had improved and how they will use the information gained from this event. The majority of participants said that they gained a variety of leadership skills. Many will use the information from the event to strengthen their skills as

a counselor at county and statewide events. Others stated that they learned important skills that will help them throughout their lives. Participants were also asked what they would like to learn about at future retreats and most responded teambuilding. Based on the survey, Sussex 4-H plans to continue this fall retreat in the future to help new and current members succeed in becoming better leaders and team members.

Results The following results were reported: (n=16) 75% increased understanding of how leaders must learn to use content, process and relationship skills as well as fundamental skills such as team work. 88% increased confidence in holding a leadership position. 88% increased ability to identify and work on specific leadership growth. 88% increased ability to successfully work on leadership projects in groups. 94% increased capacity to do self-reflection leadership work. The Fall Leadership Retreat participants shared feedback such as: "I liked how inclusive it was and everyone seemed to have a great time." "I enjoyed being able to go volunteer at the festival and helping out the community." "I will use (what I learned) to better my understanding of others and bring my leadership skills into the workforce and school to help others to my best ability." "I will use (what I learned) to become a more effective leader and [better] serve as a counselor."

Issue The 2016 Delaware State Epidemiological Profile on consumption, context and consequences of alcohol, tobacco, and other drugs of abuse published by the University of Delaware Center for Drug and Health Studies and state partners for the Delaware SPF-PFS Program documented the 8th grade percent of students reporting past month use of substances as 4% tobacco, 10% alcohol, 7% Marijuana, and 3% other illegal drugs. In the 2017 Delaware State Epidemiological Profile, percentages had dropped for 8th grade use as follows: 2% tobacco, 8% alcohol, 7% Marijuana, 2% illegal drug. The age of onset for alcohol use in this age group is 12, and age 13 for Marijuana. In the 2017 report, information on opioid specific use was included and reported at 1% for 8th grade.

Response University of Delaware 4-H has been implementing the Health Rocks Tobacco, Drug and Alcohol life skills curriculum for 10 years, and has witnessed the increasing decline among our middle school audience of the use of these substances. As any use of these substances is both illegal and potentially life altering, DE 4-H continued to teach 10 lessons of prevention education statewide to over 6000 youth in DE in 2017 with the goal of improving life skills such as stress management, decision making, goal setting and other skills to help youth resist tobacco, alcohol and drugs. 6,010 youth received 10 lessons of Health Rocks, and 1,681 students participated in the post and pre retrospective survey.

Results Responses to 5 life skill related questions of the 13 total questions are as follows: If a friend wanted to try drugs I could talk them out of it: Prior to the training, 38% agreed and 37% strongly agreed, and after the training series 33.31% agreed and 55% strongly agree that they could demonstrating a 14% improvement. When I feel stressed I am able to talk about it with people I trust: Prior to the training 33% agreed and 39% strongly agreed, and after the training series 29% agreed and 54% strongly agree demonstrating a 33% improvement. It is important for me to stay focused on learning at school: Prior to the training 23% agreed and 69% strongly agreed and following the training series 15% agreed and 81% strongly agreed demonstrating a 12% improvement into the strongly agree response. I need to think about how my choices will affect my future: Prior to the training 30% agreed and 61% strongly agree, and following the training series 19% agreed and 77% strongly agree demonstrating a 16% improvement to strongly agree. I would help other kids like me to stay away from alcohol or drugs: Prior to the training 30% agreed and 58% strongly agreed, and following the training series 20% agreed and 73% strongly agreed demonstrating a 31% improvement to the strongly agree.

Impact: As a result of this training, youth indicate that they are focused on their future, their school work, and feel confident that they can help themselves and others resist tobacco, alcohol and drugs and have identified people who they can go to if they are

experiencing feelings of stress.

Issue Delaware Cooperative Extension is increasingly moving towards a policy, system, and environment change methodology to create a Culture of Health in Delaware. In order to do this, training on youth and adult partnerships and community development is required.

Response In November, Delaware 4-H hosted a Youth Adult Partnership Healthy Living regional conference at the Atlantic Sands Hotel in Rehoboth Beach, Delaware. 4-H adult volunteer leaders, staff, and youth came together to work and learn about youth adult partnerships and working together to benefit the community around the subject of health. While at the conference, they worked in teams to create a plan on improving the health of a community. Youth and adults identified assets and needs before developing their plan. Each team committed to a community healthy living goal to achieve over the next year.

Results A pre and post-test adapted from the 4-H Common Measures was developed and administered to all participants to assess their attitudes around health and community engagement. The pre-evaluation was administered Friday evening, and the post evaluation on Sunday morning.

A total of 52 people participated. An analysis of the responses demonstrate that there was a significant difference in attitudes and abilities before the conference started and improvement when the post evaluation was administered. The following evaluation results were reported: (n=52)
Pre-test results: 91% youth and 69% adults reported they strongly agreed that they always feel comfortable meeting with people who are different ages, ethnicities, genders, religion (etc) from them. 38% youth and 36% adults reported they strongly agree that they can apply their knowledge in ways that solve "real life" problems through community service. 65% youth and 71% adults reported they strongly agreed that in the future they will use what they have learned to continue to work to better the health of their community. 41% youth and 27% adults reported they strongly agreed that they have the skills to work on projects that better the health of their community.

Post-test results: 100% youth and adults reported they strongly agreed that they always feel comfortable meeting with people who are different ages, ethnicities, genders, religion (etc) from them. 88% youth and 70% adults reported they strongly agreed that they can apply their knowledge in ways that solve "real life" problems through community service. 100% youth and adults reported they strongly agree that in the future they will use what they have learned to continue to work to better the health of their community. 87% youth and 100% adults reported they strongly agreed that they have the skills to work on projects that better the health of their community.

Implications of the responses: Post conference 100% of both youth and adults reported feeling comfortable working with diverse audiences which is a 9% improvement for the youth and a 31% improvement for the adults. 88% of youth and 70% of adults now strongly agree that they can apply their knowledge in ways that solve "real life" problems through community service" which represents a 50% improvement for youth and a 34% improvement for the adults. 100% of youth and adults stating they strongly agree that in the future they will use what they have learned to continue to work to better the health of their community, marks a 35% improvement for the youth and a 29% improvement for the adults. Lastly, a 46% improvement for youth and a 30% improvement for the adults reporting that they strongly agreed that they have the skills to work on projects that better the health of their community. From these vast improvements, Delaware 4-H youth and adults attending this conference feel comfortable with diverse audiences, can apply knowledge to community problems, agree that in the future they will work to better the health of their community, and feel that they have the needed skills for this work.

Issue According to the 2008-2012 American Community Survey, the poverty rates in New

Castle, Kent and Sussex counties were 10.7, 12.4 and 12.9 percent respectively. Research has indicated that poverty is associated with low nutrition and increased risk of many diseases. Poverty and food insecurity were found to be associated with lower food expenditures, low fruit and vegetables consumption and lower quality diets. The highest rate of obesity occurred among population groups with the highest poverty rates and least education.

Response A series of classes targeting adults who have major responsibility for food planning and preparation and with incomes below 185 percent of poverty were conducted throughout Delaware. The program, FoodSkills (a SNAP-Ed program), focuses on participants developing skills to make healthy food choices based on their budget, to use their resources wisely, to handle food safely, and to participate in physical activity each day. The program empowers individuals and families participating in the program to expand their horizons and to link diet, physical activity, and health together. Each session lasts for one to four hours (with most lasting two hours) depending on the needs of the group. Because time and day have been identified as a barrier for participating in the program, courses are offered throughout the state and at times of the day and week to meet the needs and schedules of the participants. Key topics include meal planning, food resource management, food selection and purchasing, food preparation, food safety, and physical activity.

Results In 2017, a total of 345 adults participated in FoodSkills. Fifty-two percent of participants improved one or more food resource management skills including more often planning meals in advance (24 percent), more often comparing prices when shopping (29 percent), running out of food less often (20 percent), and using a grocery list (21 percent). Additionally, 61 percent of participants improved one or more nutrition practices. Specifically, 27 percent more often thought about healthy food choices when deciding what to eat; 21 percent more often prepared foods without added salt; 32 percent more often used the Nutrition Facts on food labels to make food choices, and 21 percent reported eating breakfast more often. Safe food handling practices improved among FoodSkills graduates with 39 percent reporting improvement in one or more food safety practices. As a result of the program, 19 percent said he/she more often followed the recommended practice of not allowing meat and dairy foods to sit at room temperature for more than two hours, while 34 percent indicated they more often followed the recommended practice of not thawing food at room temperature.

Issue Delaware demonstrates a need for more diabetes education, as only 51 percent of those diagnosed have taken a class about managing their condition, according to the 2012 Behavioral Risk Factor Surveillance System. Diabetes is the seventh leading cause of death in the U.S. The long-term health consequences of untreated or high blood sugar levels are staggering and result in blindness, heart disease, amputation of limbs, renal failure and other serious problems. 10.6 percent of Delaware residents age 18 and older reported they had been diagnosed with diabetes. In addition, pre-diabetes, a condition that places persons at high risk of developing type 2 diabetes affects 13.1% or more than 84,600 Delawareans 18 and older.

Response Following the National Dining with Diabetes model, the 5 class series included diabetes education, cooking demonstrations and tasting of healthy recipes. Participants took home recipes, diabetes resources, and information on management of diabetes. They learned to reduce sugar, salt, and fat without sacrificing taste and how to incorporate physical activity in their daily lives. Cooperative Extension staff including a registered dietitian conducted the educational programs and cooking demonstrations. Six series' were conducted statewide.

Results In 2017, a total of 48 individuals enrolled in the Dining with Diabetes workshop series statewide. Of those, 33 completed the 4 sessions and the follow up reunion session.

The remaining 15 participants will attend their follow up reunion session in January 2018. The impact information below is based on responses from the 33 individuals who completed all 5 sessions. Follow-up program participants report statistically significant changes in the following: I feel confident I can keep my diabetes under control, or help the person I care for keep their diabetes under control; number of days I exercise for 20 minutes or more; number of days I consider portion sizes when making meal choices. At the follow-up program, attendees reported the following changes: 58% are cooking more at home and 83% are eating smaller portions.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 3

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: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	9.8	2.9	0.9	0.3
Actual Paid	11.0	5.9	0.0	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
306094	368520	0	18379
1862 Matching	1890 Matching	1862 Matching	1890 Matching
306094	368520	0	18379
1862 All Other	1890 All Other	1862 All Other	1890 All Other
627591	5640	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 and (4) Positive Youth Development

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.

Positive Youth Development educational programs include skills in civic engagement, communication, and decision making 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 2017 the eXtension Innovation Team comprised of faculty and staff from across all planned program areas is a key connection. This group continues to provide the leadership for integration of eXtension at UD Cooperative Extension. This past year the team has focused on innovation. A partnership of eXtension matched UD/DSU funding for a total of \$15,000 investment. Eleven innovation teams were formed and pitched innovation program plans. Five were selected for funding and are in development • On-line course development with Continuing and Professional Development is in process with rollout of several nutrient management certification courses• Two individuals were selected as I-corp member in climate change initiative and diversity initiative. The largest percentage of our Ask an Expert aspect of eXtension is focused on consumer horticulture and landscape. We averaged about 600 questions through this format. Our Delaware State Fair exhibit featured video feed of Extension program and we spoke to over 2000 individuals regarding this aspect of Extension program delivery. We are currently in development of multiple data mapping projects being developed following a training led Shane Bradt, Ph.D. Extension Specialist | Water Quality & Geospatial Technologies | UNH Cooperative Extension

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	7737	1471	12280	1200

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

Patent Applications Submitted

Year: 2017
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Competitive Grants Awarded

Year	Actual
2017	0

Output #2

Output Measure

- Undergraduate Researchers

Year	Actual
2017	0

Output #3

Output Measure

- M.S. and Ph.D Students

Year	Actual
2017	0

Output #4

Output Measure

- Post-doctoral Researchers

Year	Actual
2017	4

Output #5

Output Measure

- Refereed Journal Articles

Year	Actual
2017	0

Output #6

Output Measure

- Books and Book Chapters

Year	Actual
2017	0

Output #7

Output Measure

- Extension Bulletins and Fact Sheets

Year	Actual
2017	29

Output #8

Output Measure

- Webpage views/downloads

Year	Actual
2017	113036

Output #9

Output Measure

- Workshops and regional, national, and international levels

Year	Actual
2017	14

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
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	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	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.
4	Positive Youth Development

Outcome #1

1. Outcome Measures

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
2017	2285

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is a high-need to increase innovation and youth interest in STEAM (science, technology, engineering, arts and math) related learning.

What has been done

In 4-H afterschool (4HAS) we provided STEAM centered activities throughout the school year. We focused on experiential/hands-on learning with a host of opportunities (lesson plans/activities) to increase student interest in STEAM. Examples of activities include: drones, NYSD, recycling, coding, kitchen science, structures/architect, climate, gardening, visual/performing arts and more. In January, April, July (summer camp) and December - students received a total of 100+ hours of STEAM related instruction/facilitation. Activities during the school-year (inclusive of summer camp) - guided students through the process of: Observation (how to conduct research), Hypothesis (proposing our findings), Prediction (what we will discover), Experiment (tools we used to answer our questions) and lastly the conclusions of our activities (who, what, where and how). I feel our plan of work was instrumental in impacting our population of students, as well as, their families - with not only, a safe secure environment for academic support - but - also an opportunity to reinforce basic concepts for long-term success in the areas of STEAM. As a result, 109 students were surveyed and prompted prior to survey - to respond based on their 4HAS experiences in stated content: 48.62% male, 35.78% female, 44.95% 6th graders, 28.44% 7th graders, 29.36% 8th graders and the impacts are noted below

Results

85% of students surveyed have a more positive attitude towards STEM 57% of students foresee a career in STEM 82% of students would like to experience more STEM hands-on learning in 4HAS 77% of students feel excited/inspired now that they understand STEM plays a large part of

their lives

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

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
2017	4745

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Delaware Cooperative Extension is increasingly moving towards a policy, system, and environment change methodology to create a Culture of Health in Delaware. In order to do this, training on youth and adult partnerships and community development is required.

What has been done

In November, Delaware 4-H hosted a Youth Adult Partnership Healthy Living regional conference at the Atlantic Sands Hotel in Rehoboth Beach, Delaware. 4-H adult volunteer leaders, staff, and youth came together to work and learn about youth adult partnerships and working together to benefit the community around the subject of health. While at the conference, they worked in teams to create a plan on improving the health of a community. Youth and adults identified assets and needs before developing their plan. Each team committed to a community healthy living goal to achieve over the next year.

Results

A pre and post-test adapted from the 4-H Common Measures was developed and administered to all participants to assess their attitudes around health and community engagement. The pre-evaluation was administered Friday evening, and the post evaluation on Sunday morning. A total of 52 people participated. An analysis of the responses demonstrates that there was a significant difference in attitudes and abilities before the conference started and improvement when the post evaluation was administered.

The following evaluation results were reported: (n=52)

Pre-test results:

- 91% youth and 69% adults reported they strongly agreed that they always feel comfortable meeting with people who are different ages, ethnicities, genders, religion (etc) from me.
- 38% youth and 36% adults reported they strongly agree that they can apply my knowledge in ways that solve ?real life? problems through community service.
- 65% youth and 71% adults reported they strongly agreed that in the future they will use what they have learned to continue to work to better the health of their community.
- 41% youth and 27% adults reported they strongly agreed that they have the skills to work on projects that better the health of their community.

Post-test results:

- 100% youth and adults reported they strongly agreed that they always feel comfortable meeting with people who are different ages, ethnicities, genders, religion (etc) from me.
- 88% youth and 70% adults reported they strongly agreed that they can apply my knowledge in ways that solve ?real life? problems through community service.
- 100% youth and adults reported they strongly agree that in the future they will use what they have learned to continue to work to better the health of their community.
- 87% youth and 100% adults reported they strongly agreed that they have the skills to work on projects that better the health of their community.

Implications of the responses:

?Post conference 100% of both youth and adults reported feeling comfortable working with diverse audiences which is a 9% improvement for the youth and 31% improvement for the adults. ?88% of youth and 70% of adults now strongly agree that they can ?apply my knowledge in ways that solve ?real life? problems through community service? which represents a 50% improvement for youth and a 34% improvement for the adults.

?100% of youth and adults stated they strongly agree that in the future they will use what they have learned to continue to work to better the health of their community, which marks a 35% improvement for the youth and a 29% improvement for the adults.

?Lastly, a 46% improvement for youth and a 30% improvement for the adults reporting that they strongly agreed that they have the skills to work on projects that better the health of their community.

From these vast improvements, Delaware 4-H youth and adults attending this conference feel comfortable with diverse audiences, can apply knowledge to community problems, agree that in the future they will work to better the health of their community, and feel that they have the needed skills for this work.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
806	Youth Development

Outcome #3

1. Outcome Measures

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
2017	1337

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Small minority producers have limited capacity to produce and market products on their own. Delaware small farmers face a number of challenges including high input costs; low product pricing; and limited access to markets. Other factors affecting small farmers are rapid changes in the global market place, changes in government regulations; and the emergence of new technologies. The diverse and growing populations of consumers in the Northeast and Mid-Atlantic states has created a growing demand for local foods, along with an unprecedented opportunity for producers of fruits, vegetables and other high-value niche products to enhance profitability, while also supporting rural economic development. Small farmers additionally lack the scale, resources, knowledge and skill sets required to take advantage of emerging direct and indirect local market opportunities. These challenges have in many instances negatively impacted minority and other underserved farmers disproportionately; as traditionally, they have not benefited much from land grant university extension programs (see for instance Pompelli et al., 1997). Economic and social networks organized around local and regional food systems or value chains have the potential to increase these farmers' access to resources, skills and scale of logistical or distribution assets that are prerequisites for profitable expansions into urban markets. A document that will assist educators to help producers form cluster groups or organizations can go a long way to address profitability of small agricultural enterprises

What has been done

DSU Cooperative Extension collaborated with Tennessee State University, University of Maryland Eastern Shores, Penn State University and Northeast Regional Center for Rural Development. In

addition to co-authoring the manual, I identified the producers, as well as developed and administered the survey instruments to one group of farmers in the network study. Producers were selected from a master list of producers who received technical assistance from DSU Cooperative Extension Programs in the past. A survey instrument was developed and administered in order to conduct the network analysis. Farmers were asked about their relationships, if any, with other producers in the network. They were also questioned about who they would go to request guidance regarding production and marketing. This data helped to identify the influencers or information brokers (most central and important individuals within the networks). The survey also provided additional information on their demographics, including their income, production practices, years of experience, assets, opinions and attitudes. Farmers were contacted via telephone and farms visits. Funding for this project was received from USDA NIFA Capacity Building Grant No. 2011-38821-30966.

Results

The manual is available to farmer organizations and groups at Land Grant Universities, as well as extension educators who want to assist producers in cutting production costs and increase market access.

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

Outcome #4

1. Outcome Measures

Positive Youth Development

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	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

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Issue To be successful and competitive, small, limited resource and socially disadvantaged farmers in Delaware may take advantage of market niches with high-value alternative enterprises that are more conducive for their smaller operations. The proximity of farmers in Delaware to large, diverse, ethnic populations in the northeast US presents enviable opportunities for the production and marketing of desirable alternative enterprises and ethnic crops to supply these potential markets.

However, production, management and marketing information about these enterprises are not readily available or accessible to all socially disadvantaged farmers and veterans. The above challenges and opportunities along with the influx of new and potential socially disadvantaged, veterans and other limited resource farmers into Delaware has created increased pressures on the technical assistance and outreach programs currently offered by DSU Cooperative Extension Small Farms Program to this clientele.

Response John Clendaniel and his DSU Team conducted the second round of the DSU Farm

School Mentoring Program to provide intensive education and technical assistance through a 24-month mentoring program to reach beginning, socially disadvantaged and veteran farmers from Delaware. The goals of this comprehensive farm-mentoring program (DSU Farm School) is to reach new target audiences, including socially disadvantaged and veteran participants, to facilitate farm ownership, and provide the knowledge and skills to be successful.

Results After completing 70 hours of classroom training, hands-on training and completing an agricultural business plan, 18 beginning farmers completed the DSU Farm School course. There were Ag Enterprise options that each participant was able to choose from and experience the start to finish process including marketing and sales. Now those individuals are continuing on their land and still receiving mentoring from the DSU staff. Of the participants that completed the extension course, 90% adopted a farming practice that they learned for this program. This included three of our participants that have purchased a farm and are beginning new enterprises on their farm.

Issue Research shows almost all consumers are confused about how to purchase and use health insurance. Only 12 percent of English-speaking American adults had proficient health literacy skills, according to the Department of Education's National Assessment of Health Literacy, which used 2003 data - the latest comprehensive information on health literacy. Adults ages 25 to 39, those who are white and Asian-Pacific, people with higher levels of education, and those with higher incomes are more health literate than adults ages 65 and older, most minority groups, people with less education and people with low incomes. Many of the eligible consumers are challenged with making a health insurance decision and do not know how to choose coverage based on risks, needs and personal financial situations. About half (51 percent) of Americans do not understand the basic health insurance terms premium, deductible and copay. When people need to do math to figure out out-of-pocket costs, the lack of understanding grows. Only 16 percent of respondents in a Nov. 2014 Kaiser Family Foundation survey could calculate the cost of an out-of-network lab test, for example.

Response Smart Choice/Smart Use workshops were held during the 2017 program year. Seven webinar sessions were offered reaching 54 people and 10 face-to-face programs reaching 150 Delawareans. Webinars were marketed through University of Maryland and University of Delaware Extension as well as national Smart Choice certified educators. Several of the webinar attendees were from Delaware.

Smart Choice Basics was offered six times reaching 67 participants. You and Your Health Benefits was offered one time reaching four. Smart Actions for Using your Health Insurance was offered four times reaching 34 and Understanding and Estimating Health Insurance Costs was offered four times reaching 99. All of these programs help participants understand health insurance terms and build knowledge and skills around choosing or using their health insurance plan effectively. During each session, interactive activities help participants build their knowledge and skills around the topic. Stories or case studies are used to bring the material to life and provide real examples. Each participant leaves with a workbook or fact sheets that encourage them to apply what they have learned to their own situations. A train the trainer session was provided for Minnesota and Iowa Extension Educators who were eager to help pilot test the Understanding and Estimating Health Insurance Costs module. Data collected by these educators will help us show that the program is sound. I anticipate a journal article and presentations in 2018 based on these results.

Results Pre and post program surveys were used to evaluate changes in confidence, knowledge and likelihood in using the knowledge gained to make an improved decision/take action. All participants showed an increase in confidence, knowledge and likelihood of making an improved decision as a result of attending the program. This year, I

was involved in working to show that the Understanding and Estimating Costs program was sound in terms of meeting its educational objectives. Eighty-three responses from both online and paper surveys was evaluated and statistically significant differences were shown in all three questions, indicating that participants who attended the workshop showed a statistically significant increase in their confidence in understanding health insurance cost terms, estimating the total health care costs, and determining how much they need to save to cover their health care expenses. The Smart choice/Smart use educational modules was given a national award from The Association for Financial Counseling, Planning and Education. The award for best program was awarded in November 2017 during their annual awards banquet.

Issue Since 2001, the Targeted State Crop Insurance Education Program offered through the USDA Risk Management Agency (RMA) has been extremely beneficial to Delaware farmers. Compared to the year 2000 (the year prior to implementation of the Targeted States Program), Delaware has seen an 83% increase in the number of policies sold, a 47% increase in the number of acres insured, and nearly four-times the level of aggregate coverage. More farmers appreciate crop insurance as a part of a risk management strategy thanks to the Delaware-led network implementing the Targeted States Program.

Response The University of Delaware Cooperative Extension collaborated with Farmers First Services, Inc., Delaware Department of Agriculture, farmer organizations, and other stakeholders to deliver crop insurance and risk management education to Delaware producers through an in-state network. Emerging tools such as Whole Farm Revenue Coverage, as well as enhancements to more established crop insurance tools, were highlighted in this project. Programs were delivered through a variety of mediums, including presentations to small and large audiences, individual/family consultations, social media and quarterly newsletters. To reach a new audience, we combined crop insurance and nutrient management topics in the same meeting. As a result, livestock producers, who typically do not attend crop insurance education sessions, gained valuable information. Overall, our project reached nearly 2,000 young, beginning, women, specialty crop and organic/sustainable producers, as well as conventional row crop operations of all sizes.

Results 89 producers learned about the features of existing and emerging crop insurance products, including Whole-Farm Revenue and Supplemental Coverage Option. 69 producers learned the benefits of using crop insurance as a risk management tool for price and production. 59 producers learned how crop insurance can be used in tandem with other types of risk management tools, including marketing tools to best protect their operation. 69 producers learned about crop insurance deadlines in a timely manner so that informed decisions can be made prior to closing dates.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

ENVIRONMENTAL 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: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	7.8	1.9	30.7	4.8
Actual Paid	7.3	1.2	42.2	4.5
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
408928	74960	565216	704519
1862 Matching	1890 Matching	1862 Matching	1890 Matching
408928	74960	565216	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
647062	24306	1532384	707630

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 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; 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, 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, audiences include 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, 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. Train the trainer programs will develop volunteers in Master Gardeners and Forest Stewards to augment program outreach.

3. How was eXtension used?

In 2017 the eXtension Innovation Team comprised of faculty and staff from across all planned program areas is a key connection. This group continues to provide the leadership for integration of eXtension at UD Cooperative Extension. This past year the team has focused on innovation. A partnership of eXtension matched UD/DSU funding for a total of \$15,000 investment. Eleven innovation teams were formed and pitched innovation program plans. Five were selected for funding and are in development • On-line course development with Continuing and Professional Development is in process with rollout of several nutrient management certification courses• Two individuals were selected as I-corp member in climate change initiative and diversity initiative. The largest percentage of our Ask an Expert aspect of eXtension is focused on consumer horticulture and landscape. We averaged about 600 questions through this format. Our Delaware State Fair exhibit featured video feed of Extension program and we spoke to over 2000 individuals regarding this aspect of Extension program delivery. We are currently in development of multiple data mapping projects being developed following a training led Shane Bradt, Ph.D. Extension Specialist | Water Quality & Geospatial Technologies | UNH Cooperative Extension

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	10867	22316	623	0

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

Patent Applications Submitted

Year: 2017
 Actual: 1

Patents listed

Novel in vitro system for Rapid, Efficient, Robust, and Cost Effective Mass Propagation of Miscanthus x Giganteus; #621534,935

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	28	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Competitive Grants Awarded

Year	Actual
2017	11

Output #2

Output Measure

- Undergraduate Researchers

Year	Actual
2017	24

Output #3

Output Measure

- M.S. and Ph.D. Students

Year	Actual
2017	33

Output #4

Output Measure

- Post-doctoral Researchers

Year	Actual
2017	6

Output #5

Output Measure

- Refereed Journal Articles

Year	Actual
2017	21

Output #6

Output Measure

- Books and Book Chapters

Year	Actual
2017	4

Output #7

Output Measure

- Extension Bulletins and Fact Sheets

Year	Actual
2017	30

Output #8

Output Measure

- Webpage views/downloads

Year	Actual
2017	48

Output #9

Output Measure

- Workshops at regional, national, and international levels

Year	Actual
2017	15

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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	234

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Fusarium head blight (FHB) is considered one of the most damaging pathogens worldwide, reducing yields of wheat and barley. This disease also contaminates grain with a carcinogenic mycotoxin called deoxynivalenol (DON). Grain with DON levels exceeding 2ppm are often docked at elevators and higher levels can be rejected. Approximately 66% of Delaware growers have reported that they have been affected by FHB in the past 5 years. Research has shown that the FHB is best managed by 1) planting a moderately resistant wheat variety and 2) using a fungicide for FHB suppression. Adoption of planting varieties with moderate resistance to FHB has been low because historically, these varieties have not yielded as well as more susceptible varieties in the absence of FHB. Some of the newer, commercially available varieties of wheat that are moderately resistant to FHB also have excellent yield potential but growers are hesitant to adopt them because of past experiences with the older FHB resistant varieties.

What has been done

The UD IPM team in collaboration with the UD Plant Pathology lab conducted six on-farm demonstrations to provide growers with experience with some of the "newer" wheat varieties with moderate FHB resistance. Blocks of "newer" wheat varieties with moderate FHB resistance were planted by the grower adjacent to a variety the grower typically plants for comparison. One site also demonstrated the use of applying a fungicide for scab suppression. Yield data and FHB incidence was collected from each demonstration site and results were shared with clientele and

posted on the UD IPM website. A Youtube video was also created to educate growers about how to stage wheat and when to apply fungicides for FHB suppression

Results

A phone survey was conducted of participants in the demonstration project to measure the impacts of the project. 100% (5) of participants reported that the information gained from participating in the demonstration will help their farming operation. The estimated value per acre of the demonstration project is \$60.30. Demonstration project participants harvested a total of 2,200 acres of wheat in 2017 and the information shared from this project has an economic impact of \$132,660. After participating in the demonstration project, 100% (5) of the project participants intend to use the FHB Nursery Screening Results when selecting varieties in the future. The information shared from this project potentially impacts 65,000 acres of wheat harvested in Delaware annually with an economic value of \$3,919,500.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
124	Urban Forestry
132	Weather and Climate
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
216	Integrated Pest Management Systems
302	Nutrient Utilization in Animals
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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Issue As required by Delaware law, those who are certified through the Nutrient Management Program must maintain their certifications by attending continuing education programs. In 2017, 351.25 Delaware Nutrient Management Continuing Education Credits were offered with 138 being offered through face-to-face programs. Yet, participation in face-to-face programs is prohibitive for some certified individuals due to travel or time constraints. As such, certified individuals have requested online continuing education courses to allow for flexibility when maintaining their certifications.

Response In March 2017, the Delaware Nutrient Management program released nine online modules for those seeking online continuing education credits. Online continuing education modules are available, free of charge, on Canvas.net in a variety of formats including readings, webinars, and recorded "live" presentations. Once certified users review module materials, they are then asked to complete a quiz and module evaluation. A minimum score of 80% is required for a certified user to receive continuing education credit for completing a module. A total of five continuing education credits are currently offered online.

Results Since March 2017, 144 certified users have completed one or more online continuing education modules. Based on the evaluations, 104 of 120 participants (86%) felt that they now know more about the topics addressed in the online course than they did before they completed the module. Based on the evaluations, 88 out of 122 participants (72%) felt the online course were useful to their operation. A total of 97 out of 122 respondents (79%) indicated they would apply the information learned in the online course to their operation. Online participants indicated the online credit option is more convenient than attending face-to-face meetings, as 39 out of 44 participants (88%) responded that they have a busy schedule.

Issue There is a continued need to provide lawn and garden education to our communities to support sustainable landscape development and maintenance.

Response In response to declining attendance in our traditional two-hour, weekday evening workshops, Master Gardeners planned two weekend events designed to offer a variety of topics and a ton of information in one program. Master Gardener volunteer educators worked together to develop and offer the two Home Gardener events at the New Castle County Extension Office.

Results Together with the Horticulture Educator, Master Gardener Volunteer Educators designed, planned and successfully offered two major Home Gardener events this Spring (March to the Garden) and Fall (Fall into the Garden). These events debuted a new format designed to educate home gardeners in a variety of areas in one program. The two events educated 49 home gardeners in pruning, lawn care, soil health and composting, backyard wildlife habitat, plant selection with the emphasis on native plants, and garden design and maintenance.

March to the Garden took place on March 11 and had 27 participants. In the program survey, participants rated the event highly. The majority of the participants stated it was an excellent event in which the topics were interesting and valuable. They appreciated that they received education and information on several topics in one event. Fall into the Garden took place on October 7 and had 22 participants. In the program survey, participants rated the event highly. The majority stated it was either very good or excellent, and informative. After attending both or one of the home gardener events, participants reported in the surveys that they would do the following differently in their home or community gardens: soil preparation, plant, mulch, modify their landscape design, use shade and sun areas of their garden better, incorporate more native plants, take better care of their tools, plant for pollinators and compost.

Issue In recent years, the Delaware Nutrient Management Program has experienced a surge in the number of new poultry growers seeking education to comply with State law. This trend was echoed in recent local media coverage of Delmarva's expanding poultry production. With so many new poultry growers, some who are new to agriculture, there was a need to educate growers on production basics, best management practices as well as State and Federal regulations. Today's poultry grower needs to be aware of the tools available that will help them have a productive farm but also minimize environmental risks.

Response Because the University of Maryland already offers training for new growers, the University of Maryland and University of Delaware offered a revamped training with Delaware specific information regarding best management practices, ventilation basics, and regulations. The program was taught by Delaware and Maryland personnel and offered continuing education credits to those who are seeking to comply with state required education. This program provided production information on brooding, bird welfare, composting, litter management, financial management and vegetative buffers.

Results This all-day program was offered free of charge in Kent County, Delaware and was sponsored by Mid-Atlantic Farm Credit. Following the program, a traditional evaluation was given to participants. 75% (18) of program participants indicated they learned something new about the Delaware Nutrient Management Law. 66% (16) of participants indicated they would change how they maintain and implement best management practices on their farm following the program. 71% (17) of program participants indicated that they would change how they ventilate their poultry houses and 58% (14) indicated that they would change how they manage bird welfare, composting and mortalities on their farm. One participant commented "I found everything very helpful and informative, I wouldn't change anything." Based on evaluation responses and class participation, this training provided new growers with a source of basic information that was well received.

Issue In Delaware and across the region, the most prevalent water quality impairments are from nutrients, largely due to their nature as a non-point source pollutant and an abundance of agriculture and urban lands where they are applied as fertilizers. Nutrients have been the focus of status and trends research, regulatory efforts, implementation of best management practices, and funding programs for decades but other lesser known pollutants are emerging as new contaminants of concern. The water quality monitoring and regulatory community in Delaware expressed a need to better understand what contaminants are classified as emerging, their fate and transport through our ecosystem and potential threats to human health and control mechanisms that can be utilized.

Response A one-day symposium was held in March 2017 to provide an opportunity for 93 representatives from local, state, and federal government agencies, academia, environmental groups, and industry to establish an emerging contaminants baseline in Delaware. Experts from across the region presented on the definition of emerging contaminants, transport pathways through the ecosystem, measures to protect human life, and treatment technologies and practices to reduce environmental impacts. Additionally, the afternoon featured projects by local researchers studying a variety of emerging contaminants in and around Delaware.

Results The symposium served as a benchmark for Delaware's efforts to understand and mitigate potential environmental impacts from emerging contaminants. Of the 93 participants in attendance, 73 (78%) submitted an evaluation measuring knowledge gained. Of those surveyed, 99% (72/73) indicated that they increased their understanding of what contaminants are currently considered emerging; 96% (70/73) better understand how these contaminants move through the environment; and 93% (68/73) now have a better understanding of the known and potential consequences to the ecosystem and human health.

In addition, the overwhelming majority of participants felt they increased their knowledge of the current local monitoring programs for these contaminants (89%; 65/73), how the contaminants are regulated from a drinking water perspective (75%; 55/73), and best management practices to reduce and remove them from the environment (75%; 55/73). Despite the wealth of information shared and gained at the symposium, a recurring theme was shared by all of those presenting: there are still many unknowns and uncertainties about emerging contaminants. During the final discussion portion of the day, a number of research needs were identified related to the fate and transport of these contaminants; the overall effects of these contaminants in the ecosystem; the inter-relationships of these contaminants mixing in the environment; and the prospect that the replacements or alternatives may also have negative environmental effects. Additionally, it was noted that very little of this information has been communicated to the public or decision makers to date and this was identified as a need for the future. Cooperative Extension and Sea Grant are poised to fill this role due to their connection to University research.

Issue There is an increase need for the environmental stewardship for changing climate.

Response Identified the target audience and worked with these targeted audience to help enhance their knowledge in environmental issues and how climate change impacts daily lives of people in the state.

Results Many more people understand the science behind climate change and accept it as the major issue of today's world and in the near future. People are willing to be involved in activities to adapt to climate change and mitigate the effects of climate change.

Recognition of sponsors, in-kind contributors or partners (please provide name, organization, what was contributed). NSF MADE-CLEAR Climate Education Network provided educational materials and workshops. USDA Northeast Climate HUB Network educational materials, expert scientists and extension specialists, information via newsletters. K-12 Teachers and Students were involved in workshops and activities and helped the program enhance the contents. DNREC Scientists provided expertise and resources to be available for the public education. U.S. Forest Service provided leadership and expertise to integrate climate change and sustainability in the outreach efforts. DSU faculty and students provided feedback on the program activities and recommended changes and contents to enhance the program capabilities.

Issue Land and Forest owners in Delaware are looking to utilize their woodland areas for economic viability and sustainability of forest diversity.

Response DSU Cooperative Extension designed a woodland workshop series for 2017. In these sessions we teach forest and landowners techniques for managing their forest areas. DSU brought in several speakers and educators to explain methods for maintaining a sustainable forest. The workshop series had an abundance of topics for 2017. The first workshop was about tree identification. The purpose of this workshop was to teach forest and landowners how to identify trees on their property by using the Tree Campus USA at Delaware State University. The second was a chainsaw 101 class to educate participants on the importance of chainsaw maintenance techniques and safety procedures. The third session was an economic session where the participants learned how to select and harvest firewood from their property. This session was especially important because forests constantly change and there are things we can do to maintain forests in a sustainable way. By removing certain trees, other more profitable trees can reproduce. The fourth session conducted was about tree pruning and how to care for trees on your property to make them more profitable. The last workshop was about building wood duck boxes to increase the diversity of wildlife on your property. Tree Identification Walk and Talk- August 24th 5pm at DSU Come join us at Delaware State University. We will walk and talk about some of the native and nonnative tree species we have located on our Tree Campus

USA. A tour will be provided by Dr. Cynthia Hong-Wa, our herbarium curator. (1200 North DuPont Highway Dover, DE 19901) Chainsaw 101 - September 23rd 10-12pm This workshop will show you the do's and don'ts when it comes to chainsaw operations. You will learn safety tips as well as general chainsaw maintenance techniques. The class will be taught by Sam Topper from the Delaware Department of Agriculture's Forest Service. (915 Kenton Rd. Dover DE 19904) Selecting and Harvesting Firewood October 26th 3-5pm. During this workshop, you will learn what trees to choose for harvest and which to let grow. You will also learn techniques for harvesting and selecting firewood for sale. This class will be taught by a Delaware Department of Agriculture Forest Service Representative. (142 Simmental Meadows lane Marydel, DE 19964) Tree Trimming November 9th 10-12pm This workshop will teach you the importance of proper tree trimming. The first half of the class will be instructions on how to make a proper cut and the second part will be a demonstration outside. The class will be taught by Mr. Richard Pratt. (884 Smyrna Leipsic Rd Smyrna DE 19977) Building Wood Duck Boxes December 14th 6-8pm Build them and they will come. During this session you will learn the importance of wood ducks and why we should promote the species. You will be able to build and prepare a wood duck box and take it home with you free of charge. (884 Smyrna Leipsic Rd Smyrna DE 19977)

Results The knowledge of the individual participants were increases and some of them are planning on developing enterprises from their forest areas in Delaware. Partners in this success were RREA and DDA.

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 with 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.