

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Climate Change

- Reporting on this Program

Reason for not reporting

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

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

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

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

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

V(D). Planned Program (Activity)

1. Brief description of the Activity

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

2. Brief description of the target audience

For animal agriculture, primarily poultry integrators, growers, breeders, trade groups and allied industries; dairy and beef producers; livestock commodity groups; forage producers, equine owners, producers and interest groups; for crop and soils related research and extension programs, the audience includes existing and prospective grain crop producers, mixed (animal and crop production, e.g., dairy,

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

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

2014	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Year: 2014
 Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2014	Extension	Research	Total
Actual	5	30	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Competitive Grants Submitted

Year	Actual
2014	0

Output #2

Output Measure

- Number of Competitive Grants Awarded

Year	Actual
2014	0

Output #3

Output Measure

- Number of Research Projects Completed

Year	Actual
2014	0

Output #4

Output Measure

- Number of Undergraduate Researchers

Year	Actual
2014	0

Output #5

Output Measure

- Number of M.S. Graduate Students

Year	Actual
2014	0

Output #6

Output Measure

- Number of Ph.D. Graduate Students

Year	Actual
2014	0

Output #7

Output Measure

- Number of Post-doctoral Research Associates

Year	Actual
2014	0

Output #8

Output Measure

- Number of Refereed Journal Articles

Year	Actual
2014	0

Output #9

Output Measure

- Number of Books and Book Chapters

Year	Actual
2014	0

Output #10

Output Measure

- Number of Technical Reports

Year	Actual
2014	0

Output #11

Output Measure

- Number of Extension Bulletins and Factsheets

Year	Actual
2014	0

Output #12

Output Measure

- Number of Invited Presentations

Year	Actual
2014	0

Output #13

Output Measure

- Number of Volunteered Presentations

Year	Actual
2014	0

Output #14

Output Measure

- Number of Workshops Conducted

Year	Actual
2014	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done

{No Data Entered}

Results

{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #5

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #6

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #7

1. Outcome Measures

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

2. Associated Institution Types

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

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #8

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1890 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

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

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #9

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research
- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done

{No Data Entered}

Results

{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #10

1. Outcome Measures

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

2. Associated Institution Types

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

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2014	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done

{No Data Entered}

Results

{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}