

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Climate Change

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
104	Protect Soil from Harmful Effects of Natural Elements	7%		1%	
111	Conservation and Efficient Use of Water	15%		4%	
112	Watershed Protection and Management	17%		19%	
125	Agroforestry	5%		2%	
132	Weather and Climate	14%		14%	
133	Pollution Prevention and Mitigation	10%		14%	
135	Aquatic and Terrestrial Wildlife	8%		15%	
136	Conservation of Biological Diversity	15%		14%	
141	Air Resource Protection and Management	2%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	2%		0%	
304	Animal Genome	0%		2%	
315	Animal Welfare/Well-Being and Protection	0%		8%	
405	Drainage and Irrigation Systems and Facilities	5%		0%	
902	Administration of Projects and Programs	0%		2%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	142.6	0.0	9.0	0.0
Actual Paid Professional	79.9	0.0	6.0	0.0
Actual Volunteer	3975.0	0.0	0.0	0.0

2. Institution Name: Cornell University

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
664715	0	791567	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
664715	0	1232008	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

2. Institution Name: NY State Agricultural Experiment Station

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	15331	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	25454	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

This is a comprehensive effort entailing a wide range of applied research activities and multiple education methods depending on local context and need. Campus-based faculty and extension associates, regional specialists and county-based educators all are involved in designing, implementing, and evaluating tailored applied research and educational efforts depending on the focus and scope of their role. Example targeted activities include a comprehensive "Northeast Climate Impacts Assessment" that details potential impacts on crops, dairy, forests, and invasive pest species for the region and the Cornell Computational Agricultural Project that is compiling daily weather data and using complex computing tools to create a user friendly website and database for farmers to help them make critical decisions as they adapt to the changing environment. Climate change is tied intimately to sustainable energy concerns. Therefore, climate change is an important element of energy literacy initiatives across all audiences including youth.

2. Brief description of the target audience

Key audiences served, directly and indirectly include: agricultural, horticultural and natural resource producers; consultants and service providers, resource managers, governmental agencies, and local/state/federal governmental leaders and policy makers, individual consumers, and youth.

3. How was eXtension used?

eXtension public site and the professional development offered through eXtension.org. Staff across the state are encouraged to be involved in appropriate COPs, and the link to eXtension is promoted on the front page of the Cornell Cooperative Extension public staff site. Currently 347 staff are registered users of eXtension. Staff have cited the usefulness of COPs - particularly where there are identified national projects - such as with Financial Security for All COP. Examples of participation in COPs in this plan of work area include:

- Climate Change
- Climate, Woodlands, and Forests
- Agricultural Disaster Preparedness
- Floods
- Invasive Species
- Urban Integrated Pest Management

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	138797	3122714	45108	1037588

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

Patent Applications Submitted

Year: 2013
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	4	172	176

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- (2.1a) # of agricultural/natural resources producers, and/or organization and business representatives completing educational programs on the causes and implications of climate change and adaptive or mitigating strategies.
Not reporting on this Output for this Annual Report

Output #2

Output Measure

- (2.4a) # of agricultural/natural resources producers, and/or organization and business representatives completing educational programs on managing water resources and/or environmental planning.
Not reporting on this Output for this Annual Report

Output #3

Output Measure

- (2.7a) # of agricultural/ natural resources producers, and/or organization and business representatives completing educational programs on managing natural resources, invasive species, and/or biodiversity.
Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	(2.1b) # of consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders who demonstrate knowledge gains about on the causes and implications of climate change and adaptive or mitigating strategies.
2	(2.1c) # agricultural/ natural resources producers, organization and business representatives documented to have adopted recommended adaptation strategies for production agriculture and natural resources management, including invasive species, pest management, pollutant loads, wetlands, etc.
3	(2.1d) # of agencies/ organizations/ communities documented to have adopted recommended climate mitigation practices and policies.
4	(2.1e) # of agricultural/natural resources producers, and/or organizations and businesses successfully adapting to climate change effects enhancing economic viability.
5	(2.2f) # of communities adapting successfully to climate change effects.
6	(2.4b) # of consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders who demonstrate knowledge gains about managing water resources.
7	(2.4c) # consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders documented to have modified existing practices or technologies and/or adopted new practices to protect/enhance water resources.
8	(2.4d) # documented instances when consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders have improved and/or protected water resources.
9	(2.7b) # of consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders who demonstrate knowledge gains about managing natural resources, invasive species, and/or biodiversity.
10	(2.7c) # of consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders documented to have modified existing practices or technologies and/or adopted new practices to protect/enhance natural resources and/or enhance biodiversity.
11	(2.7d) # of documented instances in which implementation of natural resources management practices by consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders lead to increased open space preservation, enhanced/ protected natural resources, biodiversity, land use.
12	Climate Change and Agriculture: Building Tools for Adaptation to Change

Outcome #1

1. Outcome Measures

(2.1b) # of consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders who demonstrate knowledge gains about on the causes and implications of climate change and adaptive or mitigating strategies.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3544

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
125	Agroforestry
132	Weather and Climate
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
141	Air Resource Protection and Management
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

Outcome #2

1. Outcome Measures

(2.1c) # agricultural/ natural resources producers, organization and business representatives documented to have adopted recommended adaptation strategies for production agriculture and natural resources management, including invasive species, pest management, pollutant loads, wetlands, etc.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	577

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
132	Weather and Climate
133	Pollution Prevention and Mitigation
405	Drainage and Irrigation Systems and Facilities

Outcome #3

1. Outcome Measures

(2.1d) # of agencies/ organizations/ communities documented to have adopted recommended climate mitigation practices and policies.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	115

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
132	Weather and Climate

Outcome #4

1. Outcome Measures

(2.1e) # of agricultural/natural resources producers, and/or organizations and businesses successfully adapting to climate change effects enhancing economic viability.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

(2.2f) # of communities adapting successfully to climate change effects.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

(2.4b) # of consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders who demonstrate knowledge gains about managing water resources.

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

(2.4c) # consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders documented to have modified existing practices or technologies and/or adopted new practices to protect/enhance water resources.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3217

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
132	Weather and Climate
133	Pollution Prevention and Mitigation
136	Conservation of Biological Diversity
141	Air Resource Protection and Management

Outcome #8

1. Outcome Measures

(2.4d) # documented instances when consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders have improved and/or protected water resources.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1131

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
132	Weather and Climate

Outcome #9

1. Outcome Measures

(2.7b) # of consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders who demonstrate knowledge gains about managing natural resources, invasive species, and/or biodiversity.

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

(2.7c) # of consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders documented to have modified existing practices or technologies and/or adopted new practices to protect/enhance natural resources and/or enhance biodiversity.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6844

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
132	Weather and Climate

- 133 Pollution Prevention and Mitigation
- 135 Aquatic and Terrestrial Wildlife

Outcome #11

1. Outcome Measures

(2.7d) # of documented instances in which implementation of natural resources management practices by consumers, residents, agricultural/ natural resources producers, organization and business representatives, and/or local government and community leaders lead to increased open space preservation, enhanced/ protected natural resources, biodiversity, land use.

Not Reporting on this Outcome Measure

Outcome #12

1. Outcome Measures

Climate Change and Agriculture: Building Tools for Adaptation to Change

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Technical knowledge of climate change issues and mitigation strategies is evolving rapidly. The primary on-farm opportunities to increase profit margins while reducing carbon footprints lie in energy conservation; improved carbon storage, or sequestration, in the soils through increasing soil organic matter; and efficient use of nitrogen fertilizer. For farmers to seize these opportunities, they need tools tailored to New York's diverse soils and cropping systems that will help them navigate their options, whether their crop is field corn, vegetables, fruits or dairy.

What has been done

Management practices were developed to improve farm energy efficiency and reduce carbon dioxide, nitrogen fertilizer, and dairy operation methane emissions. Hatch funded project: Providing New York Vegetable, Fruit and Dairy Farmers with Greenhouse Gas and Carbon Management Tools (Wolfe and van Es; 2010-2013), Providing New York Vegetable, Fruit and Dairy Farmers with Greenhouse Gas and Carbon Management Tools- Fruit Crops (Lakso, Wolfe, and van Es; 2010-2013), and Climate Change Mitigation and Adaption with New Tools for Soil Carbon and Nitrogen Management (van Es, Melkonian, Wolfe, and Abawi; 2011-2014) each aimed to improve existing tools for calculating greenhouse gas and carbon management to better serve the needs of New York farmers. Low cost soil tests for strategic soil sampling and soil carbon assessment as part of the Cornell Soil Test were improved to better capture carbon and nitrogen cycling. called The Adapt-N tool, A tool for calculating the precise nitrogen needs of a crop at a particular time point, was widely tested to validate its effectiveness at estimating nitrogen needs. Results and approaches have been extended through Cornell Cooperative Extension into 24 counties and farmers through workshops and conferences.

Results

The projects improved the methodology for and awareness of climate change mitigation strategies. The outcomes include a new protocol for measuring soil proteins and the adoption of a soil respiration assay for the Cornell Soil Health test, which are indicators for soil carbon and nitrogen which will be important for management. They are now included in the Adapt-N tool. Pilot farm tests demonstrated that use of Adapt-N can increase profits while reducing excess nitrogen. The small sample of farms using it showed profit gains of \$27/acre and average nitrogen reductions of #27 /acre. Lessons learned in applied research have been shared across the state by regional and local Cooperative Extension staff. Information about the Adapt-N tool and Farm energy analysis have been the focus of workshops, webinars and trainings offered to producers and residents of 24 counties in 2013. In the five counties involved in the Lake Ontario Fruit Program, 371 individuals participated in trainings focused on responsiveness to climate change, with 200 persons reporting knowledge gains about adaptive/mitigation strategies and 75 participants documenting adoption of adaptation strategies related to climate change.

4. Associated Knowledge Areas

KA Code	Knowledge Area
104	Protect Soil from Harmful Effects of Natural Elements
112	Watershed Protection and Management
132	Weather and Climate
133	Pollution Prevention and Mitigation

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
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Climate change issues play out in a complex and volatile context involving weather extremes, changing governmental policies and regulations, competitive land uses and shifting development patterns, evolving consumer demands, and globally influenced markets. The specific implications of these external factors vary greatly by locale and across commodities and business forms. Technical knowledge of climate change issues and mitigation strategies is evolving rapidly. Flooding and frost events during recent years have elevated consumer and community interest in planning/disaster preparedness for families, communities and farms. The shift in interest, program offerings and campus and research support is evident.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

In general, the evaluation approach included in our plan can more accurately be described as an evaluation "system" rather than as bounded "studies" or investigations. Because each of the plans addresses a broad combination of applied research and extension initiatives spanning multiple audiences, methods, and intended outcomes, a combination of routine program monitoring and documentation, near-term outcome assessment, and targeted follow-up activities is required to provide comprehensive assessment. Program documentation results are aggregated in a statewide accountability system which includes both qualitative and quantitative data for reporting and helping us to better understand our impacts.

Cornell Cooperative Extension works with the Cornell Office of Research and Evaluation (CORE) to strengthen evaluation practice and build evaluation capacity in CCE. CORE has developed a Protocol for evaluation that takes a systems approach, recognizing that individual programs and their evaluations are part of larger program portfolios and are shaped by needs and context at multiple levels of the Extension system. CORE has tested and refined this Protocol in partnership with CCE programs since 2006. A key step in the Protocol is to develop program models, in both familiar columnar form as logic models and in a visual form called pathway models. These models form the basis for focusing evaluation efforts in Extension programs.

Beginning in 2013, CORE and CCE partnered to initiate program modeling and evaluation

planning at the level of the statewide Plans of Work. This effort, which is ongoing, will contribute to a framework for programming and evaluation at multiple levels. The Protocol is also being integrated into professional development in CCE, in collaboration with CCE leadership, to promote consistent approaches to evaluation of county-based, regional, and state-wide programs. CCE organizational development efforts are also being devoted to organizing common high-quality measures that can be used by a wide range of programs where applicable.

Key Items of Evaluation

See cross-cutting outcomes in state defined outcomes.