

2016 University of Massachusetts Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

In January 2016, after several years of interim leadership, the UMass Amherst Center for Agriculture, Food and the Environment welcomed a permanent Director, Jody Jellison. Dr. Jellison previously served as Associate Director for the Virginia Agricultural Experiment Station at Virginia Tech. In her current position, Dr. Jellison is the permanent Director of both UMass Extension and the Massachusetts Agricultural Experiment Station. She is also Associate Dean of the College of Natural Sciences as well as Assistant Vice Chancellor for Research and Engagement at UMass Amherst.

The Center for Agriculture, Food and the Environment at the University of Massachusetts Amherst integrates research and applied research with public education and outreach in agriculture, food systems, natural resources and human development at the University of Massachusetts Amherst. The Center is the contemporary standard-bearer of the university's land-grant origins and links the university to communities, citizens and businesses throughout the state. The Center is the organizational home of both UMass Extension and the Massachusetts Agricultural Experiment Station. The Center serves as a portal through which individuals, industries, and agencies connect with university scientists and educators.

The Massachusetts Agricultural Experiment Station is the principal agricultural research unit at the University. The experiment station supports the scientific research of nearly 100 faculty members located primarily within the College of Natural Sciences and several other colleges. The Experiment Station receives significant support through federally appropriated formula funds with competitive research grants from federal and state agencies and private sources serving as important additional sources of revenue. The mission of UMass Extension is to improve the health, well-being and security of youth, families and communities; conserve and enhance natural resources; and strengthen agriculture and food systems. We fulfill that mission by utilizing the research and teaching capacity of the University of Massachusetts Amherst to generate and communicate knowledge while creating approaches, methods, and tools for solving problems. UMass Extension links the Massachusetts land grant university with a larger community of people in collaborative partnerships to address issues of fundamental importance to the people of Massachusetts, New England, and the nation. UMass Extension addresses public concerns of high priority for the Commonwealth. Part of the national Cooperative Extension System, UMass Extension conducts workshops, conferences, distance education, training events, consultations, and applied research.

For reporting purposes, the research and extension programs sponsored by the Center for Agriculture Food and the Environment are organized in eight separate areas: Global Food Security; Climate Change; Sustainable Energy; Food Safety and Functionality; Childhood Obesity; Agricultural Economic Development; Youth Development; and Environmental Stewardship.

Global Food Security - Massachusetts is a leader in creating sustainable, local food production capacity. Expanding demand for direct sales, organic production, specialty crops, value-added products and community supported farms reflect interest and increasing commitment to local agriculture. At the same time, many residents of the state, especially those with low incomes, have difficulty taking advantage of fresh foods. The Center addresses food security in Massachusetts and the region through research and public education focusing on new production techniques and marketing strategies that protect natural resource systems while ensuring a healthy, fresh and stable supply of food and by providing research-based nutrition education in communities with higher food insecurity.

Climate Change - Massachusetts citizens must anticipate and prepare for a variety of new challenges

associated with persistent changes in climate and weather. Cities and towns must plan for and protect critical infrastructure that is threatened by increasingly extreme and unpredictable weather-related events. In addition, Massachusetts growers must meet the formidable challenges posed by the increasing demand for locally produced food against the backdrop of a changing climate. The Center conducts research and education to support ecologically restorative flood prevention and remediation, and to sustain a vital agricultural sector that recognizes the emerging benefits, threats and opportunities related to climate change.

Sustainable Energy - The supply and demand for energy has significant implications for the vitality and the sustainability of our regional economy. The cost of energy influences industrial practices, agricultural production, small business and individual consumers. The Center is an important resource for stimulating innovation in energy conservation and alternative and renewable energy sources. Research and education programs enable consumers to save money and make environmentally sound choices, while minimizing the financial vulnerability of businesses. The Center also supports resources that reduce market barriers and accelerate the adoption of clean energy for Massachusetts cities and towns, businesses, institutions, farms, low income and multi-unit housing.

Food Safety and Functionality - Food borne pathogens account for millions of illnesses and thousands of deaths in the United States each year. The Center helps growers and businesses meet established guidelines for workers and managers in food retail establishments, residential facilities, schools and child care settings. The Center also supports research on the molecular and structural properties of food and the development of ingredients that improve food texture, appearance, taste and healthfulness. Through research and education we are helping to discover the health-promoting properties of food components and identifying new technologies and practices that can detect pathogens and limit the incidence of food borne illness.

Childhood Obesity - While childhood obesity rates may finally be declining, obesity remains a critical problem nationally and in Massachusetts. Many of the long-term health problems typically associated with obesity in childhood are reversible but can also lead to obesity in adults. The Center conducts research and community outreach to inform policies and deliver programs that increase access to local produce, promote breast-feeding, educate families about healthy foods choices, and help children develop more active lifestyles. Nutrition education programs are frequently delivered to families with limited resources through a state wide network of community collaborators, so that healthy habits are established during childhood, reducing the most harmful effects of obesity and leading to healthier and more productive lives.

Agricultural Economic Development - Agricultural businesses provide employment opportunities, income, products and services that support our local economies and meet the diverse needs of our citizens. The long-term vitality of this sector of our economy relies on an educated and competent workforce. The Center supports agricultural economic development through applied research and educational programs that help individuals operate businesses and manage landscapes in ways that are economically sound and environmentally sustainable.

Youth Development - Massachusetts citizens are concerned with preparing youth for the challenges of today and into the future. Young people can only reach their full potential in environments that offer safety, caring adults, and authentic experiences. A statewide network of more than 1,000 4-H volunteers provide leadership training, life-skills development, recreation, and community service opportunities for youth during out of school time that are engaging and educational. Longstanding clubs and camps are complemented by innovative program that respond to a national 4-H mandate for educational enrichment in science and technology.

Environmental Stewardship - There is a critical need to better understand current threats to water resources, biodiversity and ecosystem integrity. Land use policies that recognize the vulnerability of natural resources as well as our reliance upon them are also essential. The Center plays a critical role in the development and deployment of innovative approaches and tools that are based on our evolving understanding of ecological and human systems. Scientific investigations are closely interwoven with educational resources that advance disciplinary knowledge, inform policy decisions and promote management practices that protect terrestrial, wetland, aquatic and coastal ecosystems.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	68.5	0.0	32.0	0.0
Actual	80.9	0.0	30.7	0.0

II. Merit Review Process

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

- Internal University Panel
- External University Panel
- External Non-University Panel
- Expert Peer Review

2. Brief Explanation

Massachusetts Agricultural Experiment Station

The procedures whereby research proposals to receive Massachusetts Experiment Station funding are reviewed and funded are being reviewed. We expect that significant changes will be made over the next few years and we will communicate those changes through this Annual Report

Currently, proposals for funded research projects proceed through different levels of review. In some cases, prospective faculty investigators collaborate with academic department chairs to propose project ideas. Brief descriptions are sent to the Associate Director of the Agricultural Experiment Station who reviews the basic concept to ensure that it is consistent with the priorities and goals of the Center and NIFA. Prospective investigators then develop a detailed research proposal that is reviewed and approved by the faculty member's academic department chair and three external (to UMass) disciplinary peers who comment on the scientific merit. Any necessary revisions are incorporated and final approval of projects is made by the Director of the Agricultural Experiment Station. In 2016, specific guidance was issued with regard to the identification of external reviewers as follows.

Individuals submitting proposals should not identify reviewers in the following categories:

- Anyone you have published with in the last 3 years
- Anyone you collaborated with on a competitive grant in the last 3 years
- Anyone for whom you recently served as a supervisor
- Anyone who recently served as your supervisor
- Your graduate program chair/advisor
- A person for whom you served as their graduate program chair/advisor
- A family member

The Director of the Agricultural Experiment Station also solicits research initiatives in specific disciplinary areas or with other criteria, such as research experiences for undergraduates or integration with extension type work. For these opportunities, a separate call is issued, a brief pre-proposal may be submitted and a committee composed of faculty and professional staff recommends the most promising ideas. These may be linked to existing projects or prospective investigators will develop a detailed new proposal and identify reviewers. The Associate Director ensures that changes recommended by reviewers are incorporated and funding is provided at the Director's discretion. Funded projects develop detailed assessment plans that

will monitor and document the success of the project.

UMass Extension

University of Massachusetts Extension continues its long-standing agreement with Extension in Maine, Vermont, and New Hampshire to utilize a four-state, web-based planning and reporting system. Through the on-line system, program staff and administrators can access the content of plans in all four states at the organizational level, the team level and for individuals. Extension administrators from each of the four states are able to utilize the system to review work that is occurring across the region. Regular telephone meetings with planning and reporting leaders offer the opportunity for each of the states to provide feedback on specific programs or on the statewide goals and initiatives. The process of developing this shared system has also resulted in discussions around regional programs, opportunities for multistate work, sharing staff resources and a much better understanding of how each of our unique programs are similar to, and different from, others programs in New England. The four states have agreed to provide periodic formal and informal merit review and feedback for each state as a component of our partnership. The system provides access to each state plan of work for all four states, allowing for easy sharing of ideas and opportunities for further collaboration.

The Massachusetts legislature established a Board of Public Overseers to provide advice and oversight to UMass Extension. This 15 member board, comprised of representatives of constituent organizations, meets quarterly to review and advise UMass Extension and the Chancellor the UMass Amherst. Annual review of budgets, activities, outcomes and goals is a major function of this board. The composition of the Board is as follows:

- Massachusetts Farm Bureau Federation - 4 members from among 12 nominations
- Massachusetts Arborist Association - 2 members from among 5 nominations
- Massachusetts Audubon Society - 1 member from among 3 nominations
- Massachusetts Forestry Association - 1 member from among 3 nominations
- Massachusetts 4-H Foundation - 1 member from among 3 nominations
- Massachusetts State 4-H Council - 1 member from among 3 nominations
- Massachusetts Nutrition Board - 1 member from among 3 nominations
- Massachusetts Commissioner of Agricultural Resources
- University of Massachusetts President's Office
- University of Massachusetts Amherst Chancellor's Office
- UMass Extension Director's Office (ex-officio)

There were no changes or alterations to the composition of the Board of Public Overseers in 2016.

III. Stakeholder Input

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

- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public

Brief explanation.

The Center for Agriculture, Food and the Environment continues to solicit input from internal and external stakeholders to identify organizational priorities and help us to structure our organization in ways that better serve constituents. Our plan has different components that are designed to obtain feedback at both broad organizational and more specific programmatic levels and will continue to be implemented over a period of several years.

In February 2016 we conducted a web-based survey with internal and external stakeholders. The

survey obtained information on stakeholder opinions and perceptions of the most significant public issues and concerns in seven areas that reflect the priorities and expertise within the Center. We will also ask respondents to suggest ways the Center could best address the identified issues and concerns. The seven assessed were:

- Agriculture and Food Systems;
- Commercial Horticulture;
- Water Resources;
- Natural Resource Management;
- Energy Use;
- Youth Development;
- Nutrition

Information obtained from the survey is now being used to guide a series of internal strategic discussion that will occur across the organization at different levels. Our Food and Agriculture program was identified for the initial round of programmatic discussions that are currently underway. Information from the survey has provided a basis for a shared understanding of public perceptions and priorities. Key questions and challenges derived from this input and are currently informing strategies in our planning for the future of the program.

The Center also continues its efforts to obtain more detailed and specific programmatic input from stakeholders. In these cases various programs solicited input from an array of formal advisory bodies and somewhat less collaborators and participant groups. Programs and teams that engaged in focused efforts to obtain feedback from stakeholders include: Turf Program, Cranberry Station, Fruit and Vegetable Production, Greenhouse Management, Landscape & Nursery, Natural Resources Conservation, Massachusetts 4-H Livestock and Equine.

Finally, UMass Extension continued its close association with an Extension Board of Public Overseers. As directed by the enabling legislation. UMass Extension meets with the board several times per year and membership on the board is specifically defined in the enabling legislation and appointed by the governor. In the past year, individuals serving on the Extension Board of Public Overseers represented the following agencies, organizations and groups: Massachusetts Farm Bureau; MA 4-H Foundation; UMass Donahue Institute; Massachusetts Audubon Society; Massachusetts Arborists Association; Massachusetts State Department of Agricultural Resources; Massachusetts Forest Land Owner Association; Massachusetts Nutrition Board; Massachusetts State 4-H Advisory Council.

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
- Open Listening Sessions
- Needs Assessments

Brief explanation.

Approximately six hundred fifty individuals were identified as potential respondents for the initial stakeholder survey. The stakeholder survey is a chance to obtain feedback from individuals with some pre-existing connection to the Center, as well as those whose knowledge and connection to our work is less well established. In contrast, we also gather specific programmatic feedback through our formal advisory bodies, and less formally through interactions with our many collaborators and participant groups. These groups are composed primarily of existing stakeholders with whom we have long-standing or and well-established relationships. These individuals and groups already possess clear knowledge and understanding of our organization and programs and frequently have more concrete expectations.

Respondents were identified through a review of contact lists maintained by the Center communications office. The list of survey respondents includes approximately 450 internal (UMass campus-based) stakeholders and approximately 200 external stakeholders. A more specific breakdown of the identified respondents is as follow:

- (38) UMass Dean, Department Head or Administrator
- (302) Center Staff and Aligned Faculty
- (119) Other UMass Staff and Faculty
- (203) External Stakeholder

Information obtained from the survey is now being used to guide a strategic planning process for our Food and Agriculture Extension program. That effort is being facilitated by the Assistant Director of the Center for Agriculture, Food and the Environment who, along with the Food and Agriculture Program Leader convened a leadership group selected to represent individuals from different program areas as well as a balance of both long-term and newer professional staff. This group is currently designing a framework and process for obtaining feedback from all members of the Food and Agriculture program.

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 specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public

Brief explanation.

In addition to the stakeholder survey and our internal strategic planning efforts that have been informed by the survey results, the Center continues engaged in ongoing activities designed to obtain input from stakeholders. Formal opportunities to obtain feedback occur when UMass Extension convenes the Extension Board of Public Overseers. While these interactions include programmatic presentations and organizational updates, they are designed largely as opportunities for listening to our stakeholder representatives who provide feedback on budgets, activities, outcomes and goals, and future directions. Significant input is also routinely collected at the level of individual projects and specific programs. These include formal opportunities for collecting feedback on specific programs through focus groups, interviews, stakeholder meetings, written or web-based surveys as well as many informal opportunities that transpire during the course of regular meetings, conferences events and presentations.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Action Plans

Brief explanation.

The input we obtain from stakeholders is used at various levels. In general, we use feedback for strategic planning and somewhat less formal organizational interactions that focus on ways to better

serve our external constituents. The input we receive from our Extension Board of Public Overseers is typically used to inform organizational goals, programming priorities and advocacy strategies. The programmatic input we receive is more typically directed towards helping us to refine existing programs and identify topics for future efforts that better serve our audiences and constituents. This input is combined with internal feedback we gather from staff, program leaders, department heads and aligned faculty. Center administrators meet two times a month and a major focus of these meetings is to consider this input in ways that allow us to effectively integrate research and applied research with public education, outreach and extension.

A more recent formal approach involves a current focus on a series of strategic discussions regarding the future of our organization. An overarching theme for our discussions are how to use our resources to most effectively address our mission and meet our programmatic goals. It is in this context that the Extension Agriculture and Commercial Horticulture Programs are working to identify strategies and plan ways to sustain and improve the organizational functions. A major topic identified for these discussions involves engaging our stakeholders to understand their evolving needs and maintain their support. Key questions identified for further discussion and planning are:

- How do we best engage our existing stakeholders?
- How can we continue to engage new stakeholders, partners and collaborators?
- How can we best communicate the value and impacts of our work?
- How can staff place appropriate limits on the range of activities areas they work in?

These questions were specified, and will continue to be explored, in the context of results obtained from our recent stakeholder survey. Specifically we are considering stakeholder input on what they consider to be the most significant public issues and concerns in Massachusetts related to 1) Agriculture and Food Systems; and 2) Commercial Horticulture.

Brief Explanation of what you learned from your Stakeholders

Primary themes that emerged from our Stakeholder survey related to Agriculture & Food Systems were:

- Increase local and culturally appropriate food production, capacity and access
- Policy development, implementation and regulation
- Access to, and preservation of, farm land
- Environmental impacts and resource conservation
- Economic viability of farming and local food production
- Hunger, food insecurity and food equity

Primary themes that emerged from our Stakeholder survey related to Commercial Horticulture were:

- Environmental impacts and resource conservation
- Economic viability of horticultural businesses
- Effects of climate change
- Pollinator Health
- Nutrient management
- Policy development, implementation and regulation

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
2748388	0	2710841	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	2671516	0	2101534	0
Actual Matching	3028620	0	2787400	0
Actual All Other	6713530	0	8358579	0
Total Actual Expended	12413666	0	13247513	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	840488	0	0	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Global Food Security and Hunger
2	Climate Change
3	Sustainable Energy
4	Food Safety
5	Childhood Obesity
6	Economic Development
7	Youth Development
8	Environmental Stewardship
9	Administration - Massachusetts Center for Agriculture, Food and the Environment

V(A). Planned Program (Summary)**Program # 1****1. Name of the Planned Program**

Global Food Security and Hunger

 Reporting on this Program**V(B). Program Knowledge Area(s)****1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	13%		3%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		3%	
202	Plant Genetic Resources	0%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		8%	
204	Plant Product Quality and Utility (Preharvest)	5%		0%	
205	Plant Management Systems	15%		12%	
206	Basic Plant Biology	0%		1%	
211	Insects, Mites, and Other Arthropods Affecting Plants	14%		7%	
212	Pathogens and Nematodes Affecting Plants	16%		4%	
216	Integrated Pest Management Systems	28%		0%	
301	Reproductive Performance of Animals	0%		28%	
304	Animal Genome	0%		1%	
307	Animal Management Systems	4%		0%	
311	Animal Diseases	0%		12%	
503	Quality Maintenance in Storing and Marketing Food Products	0%		7%	
603	Market Economics	0%		1%	
604	Marketing and Distribution Practices	5%		0%	
701	Nutrient Composition of Food	0%		7%	
724	Healthy Lifestyle	0%		1%	
	Total	100%		100%	

V(C). Planned Program (Inputs)**1. Actual amount of FTE/SYs expended this Program**

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	3.5	0.0	14.8	0.0
Actual Paid	3.5	0.0	11.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
339066	0	618143	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
420344	0	983154	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
169809	0	3256633	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Demonstrations
- Facilitated Group Meetings and Conferences
- Individual Consultations and Site Visits
- Printed Materials
- Single day workshop, presentation or event
- Websites or other computer-based delivery
- Workshop series or educational course
- Peer Review Publications
- Applied Research Projects
- Research, Grant or Policy Report
- Survey/needs assessment or other data collection
- Published News, Professional or Trade Article
- Published Article, Book or Chapter (Academic)
- Research Project (Basic Research)
- Grant submission or Other Funding Proposal
- Diagnostic Services
- Presentations/Posters

2. Brief description of the target audience

The primary audience for this plan are Massachusetts growers and food production-related businesses. This includes established producers as well as new, immigrant, part-time, conventional and organic growers. Others audiences include government agencies, non-profit and community-based organizations, including food banks and pantries that serve low-income families. The broader scientific community involved in basic and applied research related to all aspects of food production is another key audience.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	9294	69882	35	60

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

Patent Applications Submitted

Year: 2016
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	3	56	59

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Demonstrations

Year	Actual
2016	8

Output #2

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2016	8

Output #3

Output Measure

- Individual Consultations and Site Visits

Year	Actual
2016	162

Output #4

Output Measure

- Printed Materials

Year	Actual
2016	33

Output #5

Output Measure

- Single day workshop, presentation or event

Year	Actual
2016	59

Output #6

Output Measure

- Websites or other computer-based delivery

Year	Actual
2016	99

Output #7

Output Measure

- Workshop series or educational course

Year	Actual
2016	3

Output #8

Output Measure

- Peer review publications

Year	Actual
2016	59

Output #9

Output Measure

- Applied Research Projects

Year	Actual
2016	20

Output #10

Output Measure

- Research, Grant or Policy Report

Year	Actual
2016	5

Output #11

Output Measure

- Survey, Needs Assessment or Other Data Collection

Year	Actual
2016	1

Output #12

Output Measure

- Published News, Professional or Trade Article

Year	Actual
2016	1

Output #13

Output Measure

- Presentations/Posters

Year	Actual
2016	1

Output #14

Output Measure

- Diagnostic Services

Year	Actual
2016	1

Output #15

Output Measure

- Published Article, Book or Chapter (Academic)

Year	Actual
2016	6

Output #16

Output Measure

- Research Project (Basic Research)

Year	Actual
2016	33

Output #17

Output Measure

- Grant Submission or Other Funding Proposal

Year	Actual
2016	10

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Participants acquire knowledge and skills for practices that ensure economically viable food production.
2	Participants adopt practices that ensure economically viable food production
3	Participants acquire knowledge and skills for practices that ensure the environmentally sustainable food production
4	Participants adopt practices that ensure environmentally sustainable food production
5	Creation and synthesis of knowledge related to Global Food Security and Hunger
6	Food production enterprises in Massachusetts are more robust, diverse and economically viable
7	Participants adopt practices that protect and enhance natural resources and ecosystems.

Outcome #1

1. Outcome Measures

Participants acquire knowledge and skills for practices that ensure economically viable food production.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	15300

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
604	Marketing and Distribution Practices

Outcome #2

1. Outcome Measures

Participants adopt practices that ensure economically viable food production

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1415

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
216	Integrated Pest Management Systems
604	Marketing and Distribution Practices

Outcome #3

1. Outcome Measures

Participants acquire knowledge and skills for practices that ensure the environmentally sustainable food production

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	1763

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Fruit farms and vineyards provide open space and scenic vistas that enhance the quality of life in Massachusetts. The lands surrounding agricultural production provide buffer zones for native species of plants and animals and corridors for their movement or expansion. To remain a vital part of the Massachusetts economy, both new and established growers must learn to produce crops sustainably and to adapt production systems to market opportunities.

What has been done

Research and demonstration Projects at UMass Cold Spring Orchard included use of plant growth regulators, systems For Managing Apple Scab and cluster thinning regimes. Projects at 15 cooperating grower sites included: monitoring invasive pests, NEWA weather and disease/insect modeling data and IPM for diversified farms. Outreach & Education activities included hosting and maintaining websites, publications (print and online) in professional and trade publications, conferences, educational presentations and trainings, and one-on-one consultations.

Results

Participants increased knowledge in: 1) minimizing environmental impacts from fruit production. (e.g., sprayer calibration, soil health improvement, recirculating spray equipment, solid set micro sprinkler technology), 2) new crops or products to guard against crop or market failures. (e.g., Asian pears, wine or table grapes, frozen/processed products, wine), 3) improving production efficiency and reducing preventable crop loss (e.g., high density planting, native pollinator conservation, soil health assessment, season extension, value added production, food safety), 4) management practices related to integrated pest and crop management (IPM/ICM) as outlined in the New England Pest Management Guides and other Extension publications.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
216	Integrated Pest Management Systems

Outcome #4

1. Outcome Measures

Participants adopt practices that ensure environmentally sustainable food production

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Creation and synthesis of knowledge related to Global Food Security and Hunger

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Food production enterprises in Massachusetts are more robust, diverse and economically viable

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Participants adopt practices that protect and enhance natural resources and ecosystems.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	300

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Sustainable farming systems should be based on natural soil fertility and minimum off-farm inputs. The key to natural soil fertility is providing ample foods for soil micro organisms through increasing soil organic matter. Management of all natural nutrients sources including animal manure and cover crops within the constraints of the production system is fundamental to both economic viability and environmental quality. Poor management of plant nutrients can lead to economic losses and environmental degradation of soil, air, and water quality.

What has been done

We introduced methods to integrate winter grain cover crops to increase resiliency and sustainability of dairy operations. We are promoting adoption of no-till systems that protect soil from erosion and compaction, enhance soil natural fertility, sequesters more carbon into the soil, and conserves water so crops can tolerate more severe drought periods that farmers have experienced in recent years. We are introducing new crops and cover crops to the region so farmers have more alternatives to select from that fit better with their rotation system.

Results

More growers are cultivating world crops that are new to Massachusetts. More growers use reduced tillage and cover crops to improve farm ecosystem and soil health. Participants are adopting management practices that reduce off-farm purchase of fertilizers and minimize non-point source pollution.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
206	Basic Plant Biology

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

74% of newsletter recipients adopted growing practices consistent with Integrated Crop and Pest Management. 22 Agricultural Professionals adopted growing practices consistent with Integrated Crop and Pest Management and 20 Farmers participating in on-farm scouting and on-farm research trials adopted growing practices consistent with Integrated Crop and Pest Management

Key Items of Evaluation

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
111	Conservation and Efficient Use of Water	10%		0%	
112	Watershed Protection and Management	40%		0%	
131	Alternative Uses of Land	10%		0%	
132	Weather and Climate	40%		100%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	1.2	0.0	0.8	0.0
Actual Paid	0.0	0.0	0.3	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
3755	0	20695	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
196301	0	45406	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	100524	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Facilitated Group Meetings and Conferences
- Single day workshop, presentation or event
- Websites or Other Computer-based Delivery
- Peer Review Publications
- Research Project (Basic)
- Individual Consultations

2. Brief description of the target audience

General public, land owners, food producers, municipal officials, state agencies and regulators

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	641	0	25	0

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

Patent Applications Submitted

Year: 2016

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	2	2	4

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2016	5

Output #2

Output Measure

- Printed Materials
Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Single day workshop, presentation or event

Year	Actual
2016	7

Output #4

Output Measure

- Websites or Other Computer-based Delivery

Year	Actual
2016	1

Output #5

Output Measure

- Peer review publications

Year	Actual
2016	4

Output #6

Output Measure

- Analytic Tools and Techniques
Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Workshop series or educational course

Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Research Project (Basic)

Year	Actual
2016	1

Output #9

Output Measure

- Individual Consultation

Year	Actual
2016	4

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Participants acquire knowledge and skill to reduce or mitigate the effects or risks associated with future changes in climate or weather
2	Participants implement practices to reduce or mitigate the effects or risks associated with future changes in climate or weather
3	Creation and synthesis of knowledge related to future changes in climate or weather
4	Massachusetts Ecosystems are managed in ways that reduce or mitigate the effects or risks associated with future changes in climate or weather

Outcome #1

1. Outcome Measures

Participants acquire knowledge and skill to reduce or mitigate the effects or risks associated with future changes in climate or weather

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Participants implement practices to reduce or mitigate the effects or risks associated with future changes in climate or weather

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Creation and synthesis of knowledge related to future changes in climate or weather

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Massachusetts Ecosystems are managed in ways that reduce or mitigate the effects or risks associated with future changes in climate or weather

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Public Policy changes

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

No evaluation results for Climate Change activities are reported for 2016

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Sustainable Energy

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
131	Alternative Uses of Land	0%		7%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		61%	
402	Engineering Systems and Equipment	50%		0%	
403	Waste Disposal, Recycling, and Reuse	0%		32%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	50%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	0.6	0.0	1.1	0.0
Actual Paid	0.0	0.0	0.7	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	37039	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
42417	0	107198	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
218752	0	444026	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Applied Research Projects
- Diagnostic Services
- Grant Submission or Other Funding Proposal
- Individual Consultations and Site Visits
- Facilitated Group Meetings and Conferences
- Research Project (Basic)
- Peer Review Publications

2. Brief description of the target audience

Growers, agricultural businesses, real estate developers, building managers, municipalities, public utilities, homeowners, institutional leaders and decision-makers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	34	0	0	0

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

Patent Applications Submitted

Year: 2016
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	2	3	5

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Applied Research Projects

Year	Actual
2016	1

Output #2

Output Measure

- Printed Materials
Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Single day workshop, presentation or event
Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Analytic Tools and Techniques
Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Demonstrations
Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Diagnostic Services
Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Grant Submission or Other Funding Proposal

Year	Actual
2016	1

Output #8

Output Measure

- Individual Consultations and Site Visits

Year	Actual
2016	12

Output #9

Output Measure

- Academic Poster or Presentation
Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Published News, Professional or Trade Article
Not reporting on this Output for this Annual Report

Output #11

Output Measure

- Academic Article, Book or Chapter
Not reporting on this Output for this Annual Report

Output #12

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2016	7

Output #13

Output Measure

- Research Project (Basic)

Year	Actual
2016	5

Output #14

Output Measure

- Peer review publications

Year	Actual
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2016

5

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Creation and synthesis of knowledge related to environmentally sustainable energy resources
2	Target audiences adopt practices that increase energy efficiency
3	Target audiences increase knowledge and skill for practices that increase energy efficiency
4	Target audiences increase use of energy from renewable sources
5	Target audiences increase knowledge and skill for utilizing energy from renewable sources

Outcome #1

1. Outcome Measures

Creation and synthesis of knowledge related to environmentally sustainable energy resources

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Target audiences adopt practices that increase energy efficiency

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	226

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

Outcome #3

1. Outcome Measures

Target audiences increase knowledge and skill for practices that increase energy efficiency

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	921

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

Outcome #4

1. Outcome Measures

Target audiences increase use of energy from renewable sources

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	50

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment

Outcome #5

1. Outcome Measures

Target audiences increase knowledge and skill for utilizing energy from renewable sources

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	27

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes
- Government Regulations

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

No evaluation results for Sustainable Energy activities are reported for 2016

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Food Safety

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management	0%		5%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	0%		18%	
501	New and Improved Food Processing Technologies	20%		0%	
502	New and Improved Food Products	0%		38%	
702	Requirements and Function of Nutrients and Other Food Components	0%		24%	
703	Nutrition Education and Behavior	0%		1%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	35%		1%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	45%		13%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	0.8	0.0	6.5	0.0
Actual Paid	0.6	0.0	7.2	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
27956	0	281578	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
89188	0	538845	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
19405	0	2151968	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Workshop series or educational course
 Peer review publications
 Analytic Tools and Techniques
 Grant Submission or Other Funding Proposal
 Individual Consultations and Site Visits
 Single day Workshop, Presentation or Event
 Facilitated Group Meetings & Conferences
 Demonstrations
 Curricula/Instructional Materials
 Research Project (Basic)

2. Brief description of the target audience

Food growers/producers
 Food Processors
 Food Retailers
 Food Service Managers
 Residential care facility staff
 School cafeteria workers
 General public
 Cosmetic and Pharmaceutical industries
 Farmers Markets

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	376	222	0	0

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

Year: 2016
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	2	46	48

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Workshop series or educational course

Year	Actual
2016	2

Output #2

Output Measure

- Websites or Other Computer-based delivery
- Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Peer review publications

Year	Actual
2016	48

Output #4

Output Measure

- Analytic Tools and Techniques

Year	Actual
2016	2

Output #5

Output Measure

- Grant Submission or Other Funding Proposal

Year	Actual
2016	3

Output #6

Output Measure

- Individual Consultations and Site Visits

Year	Actual
2016	40

Output #7

Output Measure

- Printed Materials
Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Published News, Professional or Trade Article
Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Single day Workshop, Presentation or Event

Year	Actual
2016	1

Output #10

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2016	11

Output #11

Output Measure

- Demonstrations

Year	Actual
2016	2

Output #12

Output Measure

- Curricula/Instructional materials

Year	Actual
2016	17

Output #13

Output Measure

- Research Project (Basic)

Year	Actual
2016	10

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Creation and synthesis of knowledge related to the safety, and the functional and bioactive properties of food.
2	Participants acquire knowledge and skill to avoid food borne illness and control other food safety risks and hazards
3	Participants adopt practices to avoid food borne illness and control other food safety risks and hazards

Outcome #1

1. Outcome Measures

Creation and synthesis of knowledge related to the safety, and the functional and bioactive properties of food.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Participants acquire knowledge and skill to avoid food borne illness and control other food safety risks and hazards

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	244

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Food borne pathogens account for millions of illnesses and thousands of deaths in the United States each year. Growers and businesses need assistance in meeting established guidelines for workers and managers in food retail establishments, residential facilities, schools and childcare settings. Research and education can serve to identify and disseminate new technologies and practices that can detect pathogens and limit the incidence of food borne illness and discover the health-promoting properties of food components.

What has been done

UMass Food Science Extension program has focused on addressing food safety issues related to the Food Safety Modernization Act's Preventive Control Rules for processors and producers. Key activities include: Better Process Control School, Product Development Short Courses, Hazard Analysis and Critical Control points and Produce Safety Workshops, produce safety videos, guidelines for growers; the development of a Regional Center for Food Safety

Results

Food industry professionals acquired skills and knowledge for making safe decisions regarding their food products. Growers increase skills and knowledge of tools and techniques for safely managing postharvest rinse water. Participants increase their knowledge and skill for the safe and healthy production of value-added products from specialty crops

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #3

1. Outcome Measures

Participants adopt practices to avoid food borne illness and control other food safety risks and hazards

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	87

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Food borne pathogens account for millions of illnesses and thousands of deaths in the United States each year. Growers and businesses need assistance in meeting established guidelines for workers and managers in food retail establishments, residential facilities, schools and childcare settings. Research and education can serve to identify and disseminate new technologies and practices that can detect pathogens and limit the incidence of food borne illness and discover the health-promoting properties of food components.

What has been done

UMass Food Science Extension program has focused on addressing food safety issues related to the Food Safety Modernization Act's Preventive Control Rules for processors and producers. Key activities include: Better Process Control School, Product Development Short Courses, Hazard Analysis and Critical Control points and Produce Safety Workshops, produce safety videos,

guidelines for growers; the development of a Regional Center for Food Safety

Results

Food industry professionals made safer decisions regarding their food products. Growers effectively employ tools for safely managing postharvest rinse water. Hazard Analysis of Critical Control Point Participants created food safety management plans. Workshop participants implemented practices that ensure the safe and healthy production of value-added products from specialty crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Food industry professionals made safer decisions regarding their food products. Growers effectively employ tools for safely managing postharvest rinse water. Hazard Analysis of Critical Control Point Participants created food safety management plans. Workshop participants implemented practices that ensure the safe and healthy production of value-added products from specialty crops.

Food industry professionals acquired skills and knowledge for making safe decisions regarding their food products. Growers increase skills and knowledge of tools and techniques for safely managing postharvest rinse water. Participants increase their knowledge and skill for the safe and healthy production of value-added products from specialty crops.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Childhood Obesity

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
502	New and Improved Food Products	0%		3%	
702	Requirements and Function of Nutrients and Other Food Components	0%		23%	
703	Nutrition Education and Behavior	50%		46%	
704	Nutrition and Hunger in the Population	20%		0%	
724	Healthy Lifestyle	30%		28%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	2.4	0.0	0.8	0.0
Actual Paid	0.0	0.0	1.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
11846	0	203902	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
193363	0	163241	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
4076859	0	92133	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Demonstrations
- Displays and Exhibits
- Single day workshop, presentation or event
- Workshop series or educational course
- Peer review publications
- Academic Poster or Presentation
- Curricula/Instructional Materials
- Facilitated Group Meetings and Conferences
- Printed Material (Newsletter, Fact Sheet, Field Manual)
- Published Article, Book or Chapter (Academic)
- Survey, Needs Assessment or other Data Collection
- Research Project (Basic)

2. Brief description of the target audience

Youth and families from limited-resource communities, specifically those who are eligible for federal food assistance (Supplemental Nutrition Assistance Program); school teachers, social service organizations

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	15912	93966	58810	25222

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

Patent Applications Submitted

Year: 2016
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total

Actual	1	4	5
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V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Demonstrations

Year	Actual
2016	156

Output #2

Output Measure

- Displays and Exhibits

Year	Actual
2016	265

Output #3

Output Measure

- Single day workshop, presentation or event

Year	Actual
2016	413

Output #4

Output Measure

- Workshop series or educational course

Year	Actual
2016	2717

Output #5

Output Measure

- Peer review publications

Year	Actual
2016	5

Output #6

Output Measure

- Academic Poster or Presentation

Year	Actual
2016	3

Output #7

Output Measure

- Curricula/Instructional Materials

Year	Actual
2016	3

Output #8

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2016	1

Output #9

Output Measure

- Printed Material (newsletter, factsheet, field manual)

Year	Actual
2016	14

Output #10

Output Measure

- Published Article, Book or Chapter (Academic)

Year	Actual
2016	6

Output #11

Output Measure

- Survey, Needs Assessment, or Other Data Collection

Year	Actual
2016	4

Output #12

Output Measure

- Research Project (Basic)

Year	Actual
2016	6

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Participants gain knowledge and skill to improve physical activity behaviors
2	Participants improve physical activity behaviors
3	Participants gain knowledge and skill to improve dietary behaviors
4	Participants improve dietary behaviors
5	Creation and synthesis of knowledge related to childhood obesity
6	Participants improve food resource management behaviors
7	Participants adopt practices to avoid food borne illness and control other food safety risks and hazards

Outcome #1

1. Outcome Measures

Participants gain knowledge and skill to improve physical activity behaviors

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Participants improve physical activity behaviors

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	308

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Rates of obesity and poor nutrition continue to increase for both adults and children in the United States. This is especially prevalent among low-income populations, as parents frequently turn to calorie-dense but low-nutrient foods when family food resources are limited. Eating habits that are formed during childhood are critically important as they lay the groundwork for future patterns that can affect lifelong health. Families need guidance to get the most nutrition from their limited resources in order for their children to grow and thrive.

What has been done

UMass Extension improves the nutrition and health of low-income families with young children. Our EFNEP program identifies individuals from target communities who are recruited and trained to deliver nutrition education to small groups of families for 2 to 4 months. Our Snap-Ed education staff, based at UMass Amherst and in five field offices are providing nutrition education to SNAP participants in five Massachusetts regions (West, Central, Northeast, East, and Southeast.) in partnership with over 50 collaborators throughout the Commonwealth.

Results

SNAP-Ed programming resulted in significant changes with regard to youth being physically active more often. More than 300 EFNEP participants showed an increase in the level of physical

activity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #3

1. Outcome Measures

Participants gain knowledge and skill to improve dietary behaviors

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	224

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #4

1. Outcome Measures

Participants improve dietary behaviors

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	17691

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Rates of obesity and poor nutrition continue to increase for both adults and children in the United States. This is especially prevalent among low-income populations, as parents frequently turn to calorie-dense but low-nutrient foods when family food resources are limited. Eating habits that are formed during childhood are critically important as they lay the groundwork for future patterns that can affect lifelong health. Families need guidance to get the most nutrition from their limited resources in order for their children to grow and thrive.

What has been done

UMass Extension improves the nutrition and health of low-income families with young children. Our EFNEP program identifies individuals from target communities who are recruited and trained to deliver nutrition education to small groups of families for 2 to 4 months. Our Snap-Ed education staff, based at UMass Amherst and in five field offices are providing nutrition education to SNAP participants in five Massachusetts regions (West, Central, Northeast, East, and Southeast.) in partnership with over 50 collaborators throughout the Commonwealth.

Results

SNAP-Ed programming resulted in significant changes with regard to youth eating vegetables more often, youth eating fruit more often, and youth eating breakfast more often. Nearly 1,500 EFNEP showed a positive change in dietary intake for at least one food group. More than 900 showed improvement in one or more nutrition practices related to planning meals: making healthy food choices, preparing foods without added salt, reading nutrition labels, and having children in the family eat breakfast

4. Associated Knowledge Areas

KA Code	Knowledge Area
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- 703 Nutrition Education and Behavior
- 704 Nutrition and Hunger in the Population

Outcome #5

1. Outcome Measures

Creation and synthesis of knowledge related to childhood obesity

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Participants improve food resource management behaviors

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	9060

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Rates of obesity and poor nutrition continue to increase for both adults and children in the United States. This is especially prevalent among low-income populations, as parents frequently turn to calorie-dense but low-nutrient foods when family food resources are limited. Eating habits that are formed during childhood are critically important as they lay the groundwork for future patterns that can affect lifelong health. Families need guidance to get the most nutrition from their limited resources in order for their children to grow and thrive.

What has been done

UMass Extension improves the nutrition and health of low-income families with young children. Our EFNEP program identifies individuals from target communities who are recruited and trained to deliver nutrition education to small groups of families for 2 to 4 months. Our Snap-Ed education staff, based at UMass Amherst and in five field offices are providing nutrition education to SNAP participants in five Massachusetts regions (West, Central, Northeast, East, and Southeast.) in partnership with over 50 collaborators throughout the Commonwealth.

Results

Over 9,000 EFNEP Participants showed improvement in one or more food resource management practices related to planning meals: comparing prices, not running out of food, and using a grocery shopping list.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #7

1. Outcome Measures

Participants adopt practices to avoid food borne illness and control other food safety risks and hazards

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	704

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

- SNAP-Ed programming resulted in significant changes with regard to youth being physically active more often.
- More than 300 EFNEP participants showed an increase in the level of physical activity.
- SNAP-Ed programming resulted in significant changes with regard to youth eating vegetables more often, youth eating fruit more often, and youth eating breakfast more often.
- Nearly 1,500 EFNEP showed a positive change in dietary intake for at least one food group. More than 900 showed improvement in one or more nutrition practices related to planning meals: making healthy food choices, preparing foods without added salt, reading nutrition labels, and having children in the family eat breakfast
- Over 9,000 EFNEP Participants showed improvement in one or more food resource management practices related to planning meals: comparing prices, not running out of food, and using a grocery shopping list.

Key Items of Evaluation

Our Nutrition Education programs (EFNEP and Snap-Ed) are our most consistently and rigorously evaluated programs. Evaluation results demonstrate the importance of the program documenting significant improvements in participant's dietary behaviors and levels of physical activity.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Economic 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
102	Soil, Plant, Water, Nutrient Relationships	10%		0%	
111	Conservation and Efficient Use of Water	15%		0%	
133	Pollution Prevention and Mitigation	10%		34%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		21%	
204	Plant Product Quality and Utility (Preharvest)	6%		9%	
205	Plant Management Systems	22%		0%	
211	Insects, Mites, and Other Arthropods Affecting Plants	11%		33%	
212	Diseases and Nematodes Affecting Plants	11%		0%	
601	Economics of Agricultural Production and Farm Management	10%		0%	
723	Hazards to Human Health and Safety	5%		0%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		3%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	5.8	0.0	2.9	0.0
Actual Paid	4.1	0.0	2.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
681905	0	146703	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
751540	0	202539	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1107473	0	530333	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Facilitated Group Meetings and Conferences
 Printed Materials
 Single day workshop, presentation or event
 Websites or other computer-based delivery
 Applied Research Projects
 Peer review publications
 Research Project (Basic)

2. Brief description of the target audience

Farmers
 Landowners
 Resource Managers
 Horticultural Green Industry businesses and personnel
 Professional Organizations and Industry Groups
 Natural Resource Agencies
 Municipalities

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1621	389770	0	0

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

Patent Applications Submitted

Year: 2016
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	1	15	16

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2016	10

Output #2

Output Measure

- Individual Consultations and Site Visits
 Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Printed Materials

Year	Actual
2016	40

Output #4

Output Measure

- Single day workshop, presentation or event

Year	Actual
2016	21

Output #5

Output Measure

- Websites or other computer-based delivery

Year	Actual
2016	117

Output #6

Output Measure

- Workshop series or educational course
Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Applied Research Projects

Year	Actual
2016	1

Output #8

Output Measure

- Diagnostic Services
Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Peer review publications

Year	Actual
2016	16

Output #10

Output Measure

- Research Projects (Basic)

Year	Actual
2016	6

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Participants acquire knowledge and skills that enhance the environmental sustainability of agricultural businesses.
2	Participants adopt practices that enhance the environmental sustainability of agricultural businesses.
3	Participants acquire knowledge and skills that enhance the economic viability of agricultural businesses
4	Participants adopt practices that enhance the economic viability of agricultural businesses
5	Creation and synthesis of knowledge related to the environmentally sustainable and economic viability agricultural businesses
6	Participants acquire the knowledge and skill to reduce the risk of exotic pests, diseases, and invasive species.

Outcome #1

1. Outcome Measures

Participants acquire knowledge and skills that enhance the environmental sustainability of agricultural businesses.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	630

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

More than 5,000 firms in Massachusetts are involved in horticultural production, retail and landscape services. Plant production is also the basis for many associated horticultural industries. These companies have significant economic and environmental impacts for Massachusetts. Sustainable greenhouse management requires solutions to problems of energy, pest management, trained labor, water quality, production practices and plant nutrition for a diverse range of crops and complex agricultural and environmental issues.

What has been done

Sustainable greenhouse production addressed the following issues: Maintaining economic viability for the floriculture and greenhouse industries and enhancing environmental sustainability, (greenhouse cultural practices, integrated pest management, organic production, water and energy conservation, exotic insects, diseases and invasives). Programs addressing these issues were delivered workshops and conferences, grower site visits, newsletters, electronic media and diagnostic services.

Results

As a result of our efforts this year: 188 growers plan to use a new learned practice within the next year; 98 growers stated that they will benefit economically; 93 will use a new biological control practice such as using banker plants, using beneficial nematodes and better utilization of predatory mites; 11 growers plan to practice better greenhouse sanitation using tools they learned; 20 growers indicated that they will practice more environmentally sound disease and weed control strategies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
----------------	-----------------------

133	Pollution Prevention and Mitigation
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #2

1. Outcome Measures

Participants adopt practices that enhance the environmental sustainability of agricultural businesses.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	365

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #3

1. Outcome Measures

Participants acquire knowledge and skills that enhance the economic viability of agricultural businesses

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Participants adopt practices that enhance the economic viability of agricultural businesses

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Creation and synthesis of knowledge related to the environmentally sustainable and economic viability agricultural businesses

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Participants acquire the knowledge and skill to reduce the risk of exotic pests, diseases, and invasive species.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	637

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code Knowledge Area

205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Diseases and Nematodes Affecting Plants
723	Hazards to Human Health and Safety

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

As a result of our efforts this year: 188 growers plan to use a new learned practice within the next year; 98 growers stated that they will benefit economically; 93 will use a new biological control practice (such as using banker plants, using beneficial nematodes and better utilization of predatory mites); 11 growers plan to practice better greenhouse sanitation using tools they learned; 20 growers indicated that they will practice more environmentally sound disease and weed control strategies.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

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
802	Human Development and Family Well-Being	20%		100%	
806	Youth Development	80%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	0.0	0.0
Actual Paid	8.2	0.0	0.4	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
988523	0	11255	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
230760	0	9692	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
389960	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- 4-H Clubs
- Community Service Projects
- Curricula/Instructional Materials
- Facilitated Group Meetings and Conferences
- Printed Materials
- Single day workshop, presentation or event
- Websites or other computer-based delivery
- Workshop series or educational course
- Displays and Exhibits
- Individual consultations and site visits
- Research Project (Basic)

2. Brief description of the target audience

- Youth from all backgrounds
- Adults from all backgrounds (volunteers, parents, collaborating organization staff)
- Youth Serving Organizations and Programs from diverse communities (including K-12, Home Schooled youth, and Camps)
- Community Coalitions
- UMass Amherst Faculty
- Faculty from other colleges and universities

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1757	13637	31721	28015

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

Patent Applications Submitted

Year: 2016
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- 4-H Clubs

Year	Actual
2016	219

Output #2

Output Measure

- Community Service Projects

Year	Actual
2016	16

Output #3

Output Measure

- Curricula/Instructional Materials

Year	Actual
2016	2

Output #4

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2016	51

Output #5

Output Measure

- Printed Materials

Year	Actual
2016	20

Output #6

Output Measure

- Single day workshop, presentation or event

Year	Actual
2016	55

Output #7

Output Measure

- Websites or other computer-based delivery

Year	Actual
2016	1

Output #8

Output Measure

- Workshop series or educational course

Year	Actual
2016	1275

Output #9

Output Measure

- Displays and Exhibits

Year	Actual
2016	174

Output #10

Output Measure

- Individual Consultations and Site Visits

Year	Actual
2016	126

Output #11

Output Measure

- Research Project (Basic)

Year	Actual
2016	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Youth acquire skills that will help them succeed academically and in the workplace
2	Youth demonstrate skills that will help them succeed academically and in the workplace
3	Youth are effective team members, communicators, and leaders
4	Youth increase knowledge and skill and interest in science, engineering and technology
5	Youth engage in community service
6	Youth acquire citizenship skills
7	Adults acquire knowledge of the effects of deployment on military youth
8	Military youth feel supported

Outcome #1

1. Outcome Measures

Youth acquire skills that will help them succeed academically and in the workplace

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	515

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

More than 20% of the population of Massachusetts is under age 18. These young people are the future workforce and leaders of our state and our nation. The healthy development of these youth cannot be left to chance.

What has been done

A statewide network of thousands of dedicated volunteers and leaders serve as mentors and role models to 4-H youth throughout the state. Volunteers and collaborators lead a variety of clubs, school enrichment activities and special interest programs that emphasize experiential learning and help youth build valuable life skills. 4-H Educators collaborate with volunteers to plan and deliver local programs, such as animal science, visual presentation programs, and community service projects that have a lasting effect on youth.

Results

4-H youth participants increased communication, record-keeping and decision-making skills. Many also increased knowledge and skills in an area of science.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #2

1. Outcome Measures

Youth demonstrate skills that will help them succeed academically and in the workplace

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Youth are effective team members, communicators, and leaders

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	2928

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #4

1. Outcome Measures

Youth increase knowledge and skill and interest in science, engineering and technology

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	2222

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

1. Outcome Measures

Youth engage in community service

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	2432

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #6

1. Outcome Measures

Youth acquire citizenship skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	48

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code **Knowledge Area**
806 Youth Development

Outcome #7

1. Outcome Measures

Adults acquire knowledge of the effects of deployment on military youth

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code **Knowledge Area**
802 Human Development and Family Well-Being
806 Youth Development

Outcome #8

1. Outcome Measures

Military youth feel supported

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	602

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

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

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The following results are associated with Mass Envirothon, a statewide environmental education program and team competition for high school age young people and their advisors **that emphasizes** hands-on, team-oriented problem solving and community

involvement that prepares young people for environmental careers and active citizenship. More than 90% of responding team members increased their knowledge of invasive species issues. 96% of team members agreed or strongly agreed that they had become more familiar with outdoor places and ecosystems in their communities. Overall, approximately two-thirds of team members agreed or strongly agreed that they had gained better knowledge and field skills for water, forest, wildlife, and soil resources. More than 85% of team members agreed or strongly agreed that they had learned how to make more effective presentations through their Envirothon preparation, and 92% agreed or strongly agreed that they had increased their ability to work with others as a team. 85% of responding team members agreed or strongly agreed that that had become better able to find and talk to people with knowledge about the environment in their communities. More than 85% also agreed that they knew more about how decisions about the environment are made in their communities. More than 42% of responding coaches saw gaining stronger community research skills as a major factor in all their team members' learning. More than 89% of responding team members agreed or strongly agreed that they had become more interested in taking action for the environment in their communities. More than 40% of respondents agreed, and nearly 19% strongly agreed they were more interested in college studies and careers related to the environment after their Envirothon experience.

Key Items of Evaluation

V(A). Planned Program (Summary)**Program # 8****1. Name of the Planned Program**

Environmental Stewardship

 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	5%		1%	
111	Conservation and Efficient Use of Water	0%		19%	
112	Watershed Protection and Management	5%		7%	
123	Management and Sustainability of Forest Resources	24%		0%	
124	Urban Forestry	10%		0%	
131	Alternative Uses of Land	6%		0%	
133	Pollution Prevention and Mitigation	2%		0%	
135	Aquatic and Terrestrial Wildlife	15%		8%	
136	Conservation of Biological Diversity	16%		0%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		1%	
211	Insects, Mites, and Other Arthropods Affecting Plants	4%		6%	
212	Pathogens and Nematodes Affecting Plants	4%		5%	
213	Weeds Affecting Plants	0%		1%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	0%		15%	
216	Integrated Pest Management Systems	4%		28%	
302	Nutrient Utilization in Animals	0%		7%	
605	Natural Resource and Environmental Economics	0%		2%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	5%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)**1. Actual amount of FTE/SYs expended this Program**

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	3.2	0.0	2.5	0.0
Actual Paid	0.8	0.0	5.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
156316	0	366469	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
497169	0	667830	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
667238	0	1782962	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Analytic Tools and Techniques
- Diagnostic Services
- Facilitated Group Meetings and Conferences
- Printed Materials
- Published Articles (News, Professional and Trade)
- Single day workshop, presentation or event
- Survey or needs assessment
- Websites or other computer-based delivery
- Workshop series or educational course
- Applied Research Projects
- Peer review publications
- Individual Consultations and Site Visits
- Community Service Projects
- Presentation/Poster
- Published Article, Book or Chapter (Academic)
- Research Project (Basic)

2. Brief description of the target audience

- Natural Resource Agencies
- Regional Planning Authorities
- Development and Planning Agencies
- Municipalities
- Conservation Organizations
- Landowners and Land Managers
- Business/Industry

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	21028	279187	320	0

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

Patent Applications Submitted

Year: 2016
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	2	27	29

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Analytic Tools and Techniques

Year	Actual
2016	9

Output #2

Output Measure

- Diagnostic Services

Year	Actual
------	--------

2016 21923

Output #3

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2016	19

Output #4

Output Measure

- Printed Materials

Year	Actual
2016	18720

Output #5

Output Measure

- Published Articles (News, Professional and Trade)

Year	Actual
2016	17

Output #6

Output Measure

- Single day workshop, presentation or event

Year	Actual
2016	63

Output #7

Output Measure

- Survey or needs assessment

Year	Actual
2016	32

Output #8

Output Measure

- Websites or other computer-based delivery

Year	Actual
2016	123946

Output #9

Output Measure

- Workshop series or educational course

Year	Actual
2016	83

Output #10

Output Measure

- Applied Research Projects

Year	Actual
2016	5

Output #11

Output Measure

- Peer review publications

Year	Actual
2016	29

Output #12

Output Measure

- Research, Grant or Policy Report
Not reporting on this Output for this Annual Report

Output #13

Output Measure

- Curricula/Instructional Materials
Not reporting on this Output for this Annual Report

Output #14

Output Measure

- Individual Consultations and Site Visits

Year	Actual
2016	5262

Output #15

Output Measure

- Community Service Projects

Year	Actual
2016	2

Output #16

Output Measure

- Presentation/Poster (Academic)

Year	Actual
2016	1

Output #17

Output Measure

- Published Article, Book or Chapter (Academic)

Year	Actual
2016	1

Output #18

Output Measure

- Research Project (Basic)

Year	Actual
2016	33

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Participants acquire knowledge and skill to promote, implement or participate in practices or programs that protect natural resources and ecosystems
2	Participants promote, implement or participate in practices or programs that protect natural resources and ecosystems
3	Creation and synthesis of knowledge related to the protection of natural resources and ecosystems
4	Participants acquire knowledge and skill for environmentally sustainable practices for soil fertility and nutrient management.
5	Participants acquire knowledge and skill to protect and enhance community resources and urban ecosystems
6	Participants acquire knowledge and skills that lower the risk from and exposure to pesticides and fertilizers
7	Participants acquire knowledge and skills in environmentally sustainable practices for operating agricultural businesses.

Outcome #1

1. Outcome Measures

Participants acquire knowledge and skill to promote, implement or participate in practices or programs that protect natural resources and ecosystems

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	9504

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Sixty-two percent of Massachusetts is forested and most forests are privately owned. When something triggers a decision about forest management or future, decisions may be made without the benefit of knowing their full range of options. The goal of the Forest Conservation project is to put into place in each community the people that can deliver accurate information at crucial decision making times.

What has been done

Our initiatives for 2016 included 1) Grant funded applied research to inform the critical issues, the project outputs we produce, and to quantify the impacts we achieve. 2) Enhancement of social networks to inform landowner decisions. 3) Utilize the internet and other technologies to reach landowners and to facilitate their information sharing. 4) Forest Resources Management - to protect and restore forest resources while providing forest products, including ecosystem services.

Results

Thousands of Massachusetts forest land owners and community leaders acquire a greater understanding of the options for beginning the estate planning process and conserving land. Many of these same participants also learned how to access information from private forester or a Forest Conservation program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources

133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #2

1. Outcome Measures

Participants promote, implement or participate in practices or programs that protect natural resources and ecosystems

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	98

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With more 1 million street trees, Massachusetts features a relatively large proportion of canopy cover in cities and towns with plans to increase urban tree populations and existing canopy cover. The value of trees planted in residential settings has been documented, and citizens are often passionate about maintaining urban trees and community green space. Community trees, however, are frequently presented with very challenging growing conditions and there is very little scientific data related to their survival and growth in urban environments.

What has been done

Key activities for the past year focused on conducting direct and web-based outreach to inform target audiences and the public about the importance of urban forests. A foundation for collaboration was work with urban forest managers and tree care professionals through the Massachusetts Tree Wardens and Foresters Association and the New England Chapter of the International Society of Arboriculture. Increasingly targeted efforts were also focused on collaborating directly with Tree Wardens in nearly 50 communities throughout Massachusetts.

Results

Significant progress was made towards increasing public knowledge regarding the importance of urban and community forests and their associated benefits. A program of applied research focused on measuring the growth responses of trees in the urban environment and on developing pest-resistant tree species suitable for establishment in the urban landscape. Program participants made decisions, implemented programs and initiated practices to maximize tree survival and health in urban settings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #3

1. Outcome Measures

Creation and synthesis of knowledge related to the protection of natural resources and ecosystems

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Participants acquire knowledge and skill for environmentally sustainable practices for soil fertility and nutrient management.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	2858

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Management of all nutrients sources within the constraints of the production system is fundamental to both economic viability and environmental quality. Poor management of plant nutrients can lead to economic losses and environmental degradation of soil, air, and water quality. The overall objective of the Soil Fertility and Nutrient Management project is to develop and promote practical, innovative, and affordable solutions to existing and emergent issues related to soil fertility and nutrient management in the Commonwealth and beyond.

What has been done

We offered accurate and affordable analytical testing of nutrients in soils, plant tissue, compost, and greenhouse media. We also offer analysis of heavy metals in soil, plant tissue, and compost. Our lab promotes sustainable management practices by providing research-based interpretation of analytical results and fertilizer and lime recommendations.

Results

Nearly 200 clients/participants increased awareness in the safety of crop production in suspected heavy metal contaminated sites. More than 2,000 participants acquired knowledge and skills for implementing more environmentally sound, and economically viable practices for soil fertility and nutrient management.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Participants acquire knowledge and skill to protect and enhance community resources and urban ecosystems

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	12833

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
124	Urban Forestry

- 605 Natural Resource and Environmental Economics
- 804 Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

Outcome #6

1. Outcome Measures

Participants acquire knowledge and skills that lower the risk from and exposure to pesticides and fertilizers

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	533

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #7

1. Outcome Measures

Participants acquire knowledge and skills in environmentally sustainable practices for operating agricultural businesses.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2016	656

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
216	Integrated Pest Management Systems
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Thousands of Massachusetts forest land owners and community leaders acquired a greater understanding of the options for beginning the estate planning process and conserving land. Many of these same participants also learned how to access information from a private forester or a Forest Conservation program.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Administration - Massachusetts Center for Agriculture, Food and the Environment

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
901	Program and Project Design, and Statistics	20%		0%	
902	Administration of Projects and Programs	60%		50%	
903	Communication, Education, and Information Delivery	20%		50%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2016	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	0.4	0.0
Actual Paid	1.2	0.0	2.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
462149	0	415750	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
607538	0	69495	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
64034	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Administration of Extension and Experiment Station Projects and Programs
 Administration and oversight at UMass farms facilities
 Website and Other Computer-based delivery
 Printed Material
 Program planning and assessment
 Strategic Planning and communication

2. Brief description of the target audience

citizens
 communities
 organizations
 businesses
 government agencies
 policy-makers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2016	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	150	150	0	0

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

Patent Applications Submitted

Year: 2016
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2016	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Administrative Initiatives, Systems and Procedures
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	Massachusetts Center for Agriculture projects and initiatives are sustained and advanced, consistent with organizational expectations and stakeholder needs

Outcome #1

1. Outcome Measures

Massachusetts Center for Agriculture projects and initiatives are sustained and advanced, consistent with organizational expectations and stakeholder needs

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

No evaluation results for Administration - Massachusetts Center for Agriculture, Food and the Environment activities are reported for 2016

Key Items of Evaluation

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
17691	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.