2018 University of Massachusetts Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

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.
An overarching goal for our planned programs is effective integration of basic and applied scientific research with extension outreach, public engagement and education. There is a unique opportunity afforded by having both UMass Extension and the Massachusetts Agricultural Experiment Station situated within the same larger unit. We expect the integration of research to become a guiding principle of the Center for Agriculture, Food and the Environment. We do recognize, however, that there will remain work best conducted as traditional, scientific research, and outreach education that will have value even without integration with research activities. Nonetheless, the integration of research and extension outreach, in which those aspects of work in a particular area are tightly interwoven, and in which those aspects mutually inform and enrich one another, is a strong model and overarching goal for future programing.
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.
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 an 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.

The primary long-term outcome for our programs focused food on Food Security is that food production and food systems in Massachusetts are increasingly diverse, environmentally sound and economically vibrant. We have implemented programs designed to help our audiences develop knowledge and skills, and subsequently adopt practices that ensure the environmental sustainability and economic viability of food production and food systems in Massachusetts. In the past year, and as detailed later in this report, our program staff has identified and reported on specific measures and impacts that demonstrate progress towards these goals. These include program participants adopting vegetable growing practices consistent with Integrated Crop and Pest Management such as sprayer calibration and reduced tillage.

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.

The primary long-term outcome for our programs focused on Climate Change is that Massachusetts landscapes, farms and natural system are managed in ways that reduce or mitigate the effects or risks associated with future changes in climate or weather. We have implemented programs designed to help our audiences develop knowledge and skills, and subsequently adopt practices that reduce or mitigate the effects or risks associated with future changes in climate or weather. In the past year, and as detailed later in this report, our program staff has identified and reported on specific measures and impacts that demonstrate progress towards these goals. These include the development of educational materials for training materials for Massachusetts Department of Public Works employees and following more closely to regulations and practices that promote flood prevention and remediation.

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.

Many activities and initiative focused on sustainable energy are within our UMass Clean Energy Extension Program. The program is a collaboration between UMass Extension and the Massachusetts Department of Energy Resources The purpose of the program is to provide a resource to reduce market barriers and accelerate the adoption of clean energy for Massachusetts cities and towns, businesses, institutions, farms, low income and multi-unit housing, and others. The program works closely with businesses to assist them in entering or diversify into clean energy markets. In the past year, our program was engaged by the state energy and agricultural agencies to support the appropriate development of solar on farmland, and particularly the rules pertaining to "dual use" solar installations.

The primary long-term outcome for our programs focused on Sustainable Energy is that Massachusetts businesses, towns and citizens adopt practices that conserve energy and increasingly utilize alternative, environmentally-friendly and renewable sources of energy. We have implemented programs designed to help our audiences develop knowledge and skill for practices that increase energy efficiency and for utilizing renewable energy sources. Our programs are also designed and delivered to assist our audiences to adopt practices that increase energy efficiency and the use of renewable energy sources. One example from the past year is that we have worked with municipal officials to help them submit applications to the Massachusetts Green Communities Program. This program provides financial incentives to towns that commit to a 20% energy reduction plan over a period of five years.

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 childcare 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.

The primary long-term outcome for our programs focused on Food Safety is that Massachusetts is to ensure the safety of food grown, processed, prepared and consumed in Massachusetts and to reduce the incidence of food borne illness. We have implemented programs designed to help participants increase knowledge and skill and to subsequently adopt practices to avoid food borne illness and control other food safety risks and hazard. Our primary audiences include food producers, food processors and consumers. In the past year, and as detailed later in this report, our program staff has identified and reported on specific measures and impacts that demonstrate progress towards these goals. These include workshop participants who report they have developed and intend to implement food safety management plans in their food enterprises.

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 the importance of regular physical activity. Nutrition education programs are delivered to families with limited resources through a statewide 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.

The primary long-term outcome for our programs focused on Childhood Obesity is to help youth and families in Massachusetts to establish healthy eating habits and physically active lifestyles. Many activities are delivered through two federally sponsored programs, Expanded Food and Nutrition Education Program (EFNEP) and Supplemental Nutritional Assistance Program (Snap Ed). Guidelines for these programs ensure that they reach youth and families from communities at increased risk for obesity and poor nutrition. We have implemented programs designed to help participants increase knowledge and skill to make healthier food choices, to eat better and become more physically active. In the past year, and as detailed later in this report, our program staff has identified and reported on specific measures and impacts that demonstrate progress towards these goals. For example, youth who participated in nutrition education workshops through our statewide Expanded Food and Nutrition Education (EFNEP) program reported increased levels of physical activity.

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.

The primary long-term outcome for our programs focused on Agricultural Economic Development is to create an educated and reliable workforce that can operate agricultural businesses and manage landscapes in Massachusetts in a manner that is both economically profitable and environmentally sustainable, leading to the long-term vitality of this sector of our economy. We have implemented programs designed to help participants acquire knowledge and skill related to practices that increase economic viability and the environmental sustainability of agricultural businesses and for participants to incorporate these practices into their operations. In the past year, and as detailed later in this report, our program staff has identified and reported on specific measures and impacts that demonstrate progress towards these goals. For example, participants in our pesticide education and certification trainings reported increased knowledge of pesticide impacts on the environment as well as their intention to adopt practices that will reduce these impacts.

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.

The primary long-term outcome for our programs focused on Youth Development is to ensure that diverse youth cultivate a set of skills and experiences that are critical for future success and active citizenship. This is achieved through the support and active participation of adult volunteers. We have implemented programs designed to help youth become effective team members, communicators, and leaders. Over time, these skills will help participating youth to be successful academically, in the workplace and as active members of their community. In the past year, and as detailed later in this report, our program staff has identified and reported on specific measures and impacts that demonstrate progress towards these goals. For example, the UMass Envirothon Program is a team-based statewide environmental education program and competition that encourages high school youth to participate responsibly and effectively in environmental protection and natural resource conservation in their communities and in their careers. Nearly 100 youth on Mass Envirothon teams completed the requirements for a Community Action Award, which reflect a high level of civic engagement and community service.

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.

The primary long-term outcome for our programs focused on Environmental Stewardship is to develop programs and disseminate resources that enable Massachusetts citizens to make informed decisions and take actions to preserve or enhance the quality of our natural resources and ecosystems. We have implemented programs designed to help participants acquire knowledge and skill adopt practices to protect and enhance natural resources and ecosystems.

In the past year, and as detailed later in this report, our program staff has identified and reported on specific measures and impacts that demonstrate progress towards these goals. For example, our forest conservation team has provided educational resources that have helped forest landowners engage in estate planning to conserve forested lands. The most common approaches involve using wills and establishing land trust agreements.

Finally, engagement with students has become an increasingly important component of our portfolio. This has been accomplished primarily through a summer internship program. Now in its third year, The CAFE Summer Scholars Program offers paid, summer internships for UMass Amherst undergraduate students who have the unique opportunity to make significant contributions that advanced the design, implementation and goals of an existing research or extension project. Projects reflect the broad portfolio of programs supported by CAFE and students spend their summer in faculty research laboratories, offices and field stations, as well as in communities where extension professionals are engaged directly with citizens. In addition to project-based work, field trips to research and Extension facilities and professional development activities help students to prepare for future careers and educational opportunities while gaining insight into the land grant mission and the relationship between research and public outreach education.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	90.0	0.0	30.0	0.0
Actual	84.6	0.0	19.2	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

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 Massachusetts Agricultural Experiment Station who reviews the basic concept to ensure that it is consistent with the priorities and goals of our Center and of USDA/NIFA. Prospective investigators then develop a detailed research proposal that is reviewed by the faculty member's academic department chair and three external (to UMass) disciplinary peers. Reviewers are asked to complete an assessment form with six areas: justification for research; previous work and outlook; goals, objectives and outputs; outcomes/impacts; methods; and evaluation. Reviewers rate the proposal on a 3-point scale (exemplary, satisfactory or unsatisfactory) in each area and use the same scale to assign an overall rating. Reviewers also make additional, specific comments on how to improve the proposal. Based on the reviews, the Associate Director of the Massachusetts Agricultural Experiment Station will request any necessary revisions and make sure they are incorporated into the proposal prior to submission to NIFA.

The Director of the Agricultural Experiment Station also solicits research initiatives in specific disciplinary areas or as supplements to existing projects. A recent example is our Call for Integrated Research and Extension Initiatives. This is a competitive opportunity for which faculty submit proposals that are reviewed by an internal committee composed of faculty and professional staff. The Assistant Director ensures that there is fidelity to the work as it is described in the proposal, well-functioning and mutually reinforcing connections between research and extension activities, and that funded projects conform to NIFA requirements for annual reporting.

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. Extension in Colorado and Delaware are also users of the on-line system. Through system allows program staff and administrators to access the content of plans in all six states at the organizational level, the team level and for individuals. Extension administrators are able to use 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 original 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 as well as team/group plans, 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. Annual review of budgets, activities, outcomes and goals is a major function of this board. The Board is composed of individuals from the following organizations:

- Massachusetts Farm Bureau Federation
- Massachusetts Arborist Association
- Massachusetts Audubon Society
- Massachusetts Forestry Association
- Massachusetts 4-H Foundation
- Massachusetts Nutrition Board
- 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)

A recommendation from the Board of Public Overseers in the most recent year, which is being enacted, is for Extensions to increase efforts to work with graduate students as a way to extend outreach capacity, provide valuable professional and academic training experiences and introduce the history and value of extension work to a new generation of students and professionals. Graduate students were incorporated into our summer intern program in 2018 and a meeting has been planned for later this semester between Extension staff and the Plant Biology program as a way to inform individuals in the program about Extension activities and facilities and to find opportunities for collaborating with faculty and engaging graduate students on integrated research and extension initiatives.

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 routinely solicits input from internal and external stakeholders to identify organizational priorities and help us to structure our organization in ways to 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. We continue to rely on data obtained from a February 2016 web-based survey we conducted 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. The seven area assessed were:

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

These seven areas are a reflection of the way our center's programs are organized internally and how we present information about our organization to external audiences. There is significant conceptual and disciplinary overlap with the eight planned programs that form the foundation of this report, which were created and utilized primarily for reporting purposes in response to a mandate from NIFA. When the 2020 Plan of Work is submitted on June 1 of this year, we will once again consider reorganizing our reporting framework based on the desire to achieve better alignment between NIFA's Science Emphasis Areas (yet to be released) and our state-defined critical issue areas.

In 2017, information obtained from the web-survey was used primarily to guide internal strategic discussions among our Agriculture Extension team whose programmatic focus is on both food and on commercial horticulture. During the spring of 2017, a committee was formed to guide these efforts. After significant deliberation, the committee designed and implemented a survey specifically for Agricultural Extension professional staff, which was followed by a facilitated meeting with a private consultant. The process was necessarily framed within boarder organizational challenges of diminishing internal resources in a time of increasing external needs. The survey obtained information on perceived stakeholder needs and priorities and the most appropriate roles and functions for extension educators. The facilitated discussion allowed the group to consider the survey results as well as hiring priorities, engaging stakeholders, and equity and fairness among staff.

Strategic planning continued in 2018. One of the explicit goals was creating better alignment between externally identified needs and internal capacity. With the help of a hired facilitator, we identified key programmatic and organizational challenges. Ongoing stakeholder engagement was one of the identified challenges and the official summary doucument concluded, "We must routinely engage with our stakeholders to understand their evolving needs and maintain their support. Related issues involve effectively communicating what we do, our unique value and impact while also managing stakeholder expectations for what we are not able to address" A related set of questions were also identified in the summary:

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

The retirement of the long time Directors of our Agriculture Extension program in 2018 has created the need to pause our strategic planning efforts for the time being.

Other units within our center continue to obtain specific programmatic input from stakeholders in various additional ways 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 continues its close association with an Extension Board of Public Overseers that was created in 1997 to give stakeholders in UMass Extension areas a formal advisory role. 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.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

Brief explanation.

Approximately six hundred fifty individuals were identified as potential respondents for the 2016 stakeholder survey. The survey was an opportunity 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 continue to 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 expectations that are more concrete. A follow up, internal survey was conducted in 2017 with approximately 25 professional educators from our Agriculture Extension team whose programmatic focus includes both food and commercial horticulture
Respondents to the large stakeholder survey 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 continues to guide a strategic planning process for our organization. The initial focus has been on the Food and Agriculture Extension programs. That effort is 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.
In 2018, strategic planning was initiated within our 4-H Youth Development Program with the goal of developing a new 5-Year plan. The previous plan was active from 2013 to 2018. A facilitator was hired to gather input from internal stakeholder (4-H professionals and administrative staff). Some information was also obtained from 4-H volunteers; however, a broader stakeholder process for the statewide 4-H program is currently planned for 2019. This will include more extensive input from current stakeholders and also identifying new stakeholders who share an interest in youth development in Massachusetts.

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.

The web-based stakeholder survey, internal strategic planning efforts, a recent survey and facilitated discussion among our extension professional staff are all mechanisms for engaging stakeholders both internally and externally. Listening session with 4-H volunteers and stakeholders are currently being planned. Additional formal opportunities to obtain feedback occur when UMass Extension convenes the Extension Board of Public Overseers. Our interactions with the Board, while they include programmatic presentations and organizational updates, 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 considered in a variety of ways. We continue to use results obtained from our 2016 organizational stakeholder survey to inform subsequent stakeholder engagement efforts at various levels and to inform strategic planning for our organization more generally. An overarching theme for these discussions has been, and will continue to be, how to use limited resources to most effectively address our mission and meet our programmatic goals. It is in this context that our 4-H Youth Development Program is working to identify strategies and plan ways to sustain and improve organizational functions. A major topic identified for these discussions involves engaging our staff, stakeholders and potentially new audiences to understand their evolving needs and maintain their support. A preliminary analysis of 4-H stakeholder information resulted in the following list of trends for future consideration and planning.

- Declining enrollments
- Online learning
- Increasing parent demands
- Educating whole child
- Increasing school enrichment interest
- Increasing role for technology

- Increased access for kids with diverse abilities

These trends will continue to be explored, in the context of results obtained from our stakeholder survey and in future, strategic conversations and we will continue to use formal and informal methods to consider stakeholder input and better serve our external constituents.
The input we receive from our Extension Board of Public Overseers is typically used to inform broad organizational goals, programming priorities and advocacy strategies. More specific programmatic input we receive is 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.

Brief Explanation of what you learned from your Stakeholders

A primary theme that continues to emerge from our stakeholder engagement activities is that the populations we serve have growing timely and significant needs and expectations of us. This is combined with the identification of additional needs from potentially new or previously underserved audiences and stakeholders. Our faculty and staff are finding it increasingly difficult to adequately meet the needs and expectations of stakeholders in the context of decreasing internal programmatic resources. Please note that stable annual allocations or allocations that do not increase at the rate of our non-discretionary cost increases, such as mandated raises, or the repair of failing infrastructure, is slowly creating a situation where our organizational effectiveness is dfficult to maintain.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		**Research**	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
{No Data Entered}	{No Data Entered}	{No Data Entered}	{No Data Entered}

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		**Research**	
	Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
Actual Formula	2274822	0	2327820	0
Actual Matching	3183471	0	2327821	0
Actual All Other	6100783	0	4102821	0
Total Actual Expended	11559076	0	8758462	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	899737	0	1865720	0

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

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%		19%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		4%	
202	Plant Genetic Resources	0%		4%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		7%	
204	Plant Product Quality and Utility (Preharvest)	5%		1%	
205	Plant Management Systems	15%		3%	
206	Basic Plant Biology	0%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	14%		11%	
212	Diseases and Nematodes Affecting Plants	16%		0%	
216	Integrated Pest Management Systems	28%		0%	
301	Reproductive Performance of Animals	0%		13%	
304	Animal Genome	0%		3%	
307	Animal Management Systems	4%		0%	
311	Animal Diseases	0%		11%	
503	Quality Maintenance in Storing and Marketing Food Products	0%		10%	
511	New and Improved Non-Food Products and Processes	0%		1%	
604	Marketing and Distribution Practices	5%		0%	
701	Nutrient Composition of Food	0%		7%	
703	Nutrition Education and Behavior	0%		1%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	3.0	0.0	15.0	0.0
Actual Paid	1.6	0.0	10.3	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**
331941	0	892665	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
320283	0	1103448	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
315049	0	2090132	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Demonstrations
- Diagnostic Services
- Facilitated Group Meetings and Conferences
- Grant Submission or Other Funding Proposal
- Individual Consultations and Site Visits
- Printed Material (newsletter, factsheet, field manual)
- Published Article (News, Professional, Trade)
- Research Project (Applied Research)
- Research Project (Basic Research)
- Single day workshop, presentation or event
- Survey, Needs Assessment, or Other Data Collection
- Websites or Other Electronic Delivery
- Workshop series or educational course

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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	16126	352515	0	0

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	12	24	32

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Demonstrations

Year	Actual
2018	23

Output #2

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2018	43

Output #3

Output Measure

- Individual Consultations and Site Visits

Year	Actual
2018	1526

Output #4

Output Measure

- Printed Materials

Year	Actual
2018	186

Output #5

Output Measure

- Single day workshop, presentation or event

Year	Actual
2018	145

Output #6

Output Measure

- Websites or other computer-based delivery

Year	Actual
2018	43

Output #7

Output Measure

- Workshop series or educational course

Year	Actual
2018	10

Output #8

Output Measure

- Peer review publications

Year	Actual
2018	8

Output #9

Output Measure

- Applied Research Projects

Year	Actual
2018	32

Output #10

Output Measure

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

Output #11

Output Measure

- Survey, Needs Assessment or Other Data Collection
  Not reporting on this Output for this Annual Report

Output #12

Output Measure

- Published News, Professional or Trade Article

Year	Actual
2018	33

Output #13

Output Measure

- Diagnostic Services

Year	Actual
2018	75

Output #14

Output Measure

- Grant Submission or Other Funding Proposal

Year	Actual
2018	8

Output #15

Output Measure

- Direct - Other

Year	Actual
2018	18

Output #16

Output Measure

- Displays and Exhibits
  Not reporting on this Output for this Annual Report

Output #17

Output Measure

- Presentation/Poster (Academic)

Year	Actual
2018	17

Output #18

Output Measure

- Student Supervision/Support/Advising (Graduate)

Year	Actual
2018	8

Output #19

Output Measure

- Indirect - Other

Year	Actual
2018	4

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

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
2018	289

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cranberry producers in Massachusetts are struggling to remain economically competitive and environmentally sustainable. In 2018, and with approval from USDA, the cranberry industry agreed to require growers to destroy a significant proportion of their crop to better regulate market supply and demand. More than ever, growers must respond an array of both environmental challenges and economic forces in order to remain viable.

What has been done
Faculty and staff at our Cranberry Research and Extension Field Station held a series meetings attended by 196 growers. Additional bog-side workshops were conducted with 81 growers. Seven issues of the Cranberry Station newsletter were distributed to 244 recipients. The UMass Cranberry Web site was used to disseminate additional information and had nearly 9,000 visitors between October 1, 2017-September 30, 2018.

Results
According to formal and informal post workshops assessments, growers who accessed Cranberry Station resources increased their knowledge of production practices that helped their operations function more efficiently. Efficiency in water use practices was the most frequently mentioned areas of increased knowledge.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

211	Insects, Mites, and Other Arthropods Affecting Plants
503	Quality Maintenance in Storing and Marketing Food Products

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
2018	831

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
In the past year, faculty and staff provided farmers with access to current research information on new and alternative species and varieties, advanced horticultural management techniques, marketing and business management strategies, pest-ecology, and pest-management procedures. Research on pest ecology and management was conducted in ways that inform strategies that optimize control, reduce chemical use and increase fruit quality.

Results
A year-end program survey is conducted to evaluate program outputs and assess impacts. We also rely on observations and communication with growers to understand and measure impact. Survey results showed that participants increased their use of practices that help them grow fruit crops in ways that enhanced profitability.

4. Associated Knowledge Areas

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

205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
503	Quality Maintenance in Storing and Marketing Food Products

Outcome #3

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Participants adopt practices that ensure environmentally sustainable food production

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	648

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
In the past year, faculty and staff provided farmers with access to current research information on new and alternative species and varieties, advanced horticultural management techniques, marketing and business management strategies, pest-ecology, and pest-management procedures. Research on pest ecology and management was conducted in ways that inform strategies that optimize control, reduce chemical use and increase fruit quality.

Results
A year-end program survey is conducted to evaluate program outputs and assess impacts. We also rely on observations and communication with growers to understand and measure impact. Survey results showed that participants increased their use of practices that help them grow fruit crops in ways that enhanced environmental sustainability.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems

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

V(H). Planned Program (External Factors)

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

A year-end program survey with our Fruit program participants is conducted to evaluate program outputs and assess impacts. We also rely on observations and communication with growers to understand and measure impact. Survey results showed that participants increased their use of practices that help them grow fruit crops in ways that enhanced environmental sustainability. According to formal and informal post workshops assessments, growers who accessed Cranberry Station resources increased their knowledge of production practices that helped their operations function more efficiently. Efficiency in water use practices was the most frequently mentioned areas of increased knowledge.
According to post program evaluations, participants in our statewide vegetable program indicated they increased their knowledge and understanding of numerous environmentally beneficial growing practices. These include: boom sprayer calibration; hydroponic techniques, or weed management for organic or minimal tillage systems. A separate analysis determined that participants have or will implement environmentally beneficial practices for one or more of the following topics: Corn Genetics, Mulches for flea beetle control, Insectary plantings Fusarium wilt of basil, Organic fertilizers in lettuce, Using bee-friendly fungicides, Cucurbit downy mildew resistant varieties, Bee diseases, and use of state solar energy incentives.

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%		100%	
112	Watershed Protection and Management	30%		0%	
132	Weather and Climate	60%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	1.4	0.0	0.7	0.0
Actual Paid	0.2	0.0	0.1	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	16456	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
117621	0	12502	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Facilitated Group Meetings and Conferences
- Single day workshop, presentation or event
- Workshop series or educational course

2. Brief description of the target audience

wetlands and other scientists
farmers
general public
Northeast Climate Adaptation Science Center
MA Division of Fisheries and Wildlife
MA Division of Ecological Restoration
MA Coastal Zone Management
The Nature Conservancy
EcoAdapt,
Harvard Forest
Massachsetts Executive Office of Environmental Affairs

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	322	11487	0	0

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	0	1	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2018	3

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
2018	3

Output #4

Output Measure

- Websites or Other Computer-based Delivery

  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Peer review publications

  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Analytic Tools and Techniques

Year	Actual
2018	10

Output #7

Output Measure

- Workshop series or educational course

Year	Actual
2018	9

Output #8

Output Measure

- Research, Grant, or Policy Report
  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	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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	13

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	37

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Haphazard growth has impacted water resources, natural resource-based enterprises, open space, wildlife habitat, and community character. Climate Change is already affecting natural resources and the way that people interact with natural systems. We address these concerns through related initiatives that focus on habitat loss and fragmentation, establishing priorities for ecological restoration, mitigating development impacts on wildlife and ecosystems, and climate change adaptation.

What has been done
We developed a MA Wildlife Climate Action Tool to share detailed information about how climate change is likely to affect citizens, wildlife and other natural resources, vulnerability assessments for over 60 wildlife species, and specific actions that can be taken to protect natural resources in the face of climate change. We also created the Massachusetts Ecosystem Climate Adaptation Network,now with 191 members, it is a community of practice for those interested in climate adaptation.

Results
In the past year, the Mass ECAN web site received 1,661 hits from 1,354 users. From September 1, 2017 through August 31, 2018, the Massachusetts Wildlife Climate Action Tool recorded 27,887 hits from 11,487 users. Despite the inclusion of ?Massachusetts? in the name of the site/tool, 68.7% of the users and 56.2 % of hits were from people outside of Massachusetts, suggesting broad interest in this new type of climate adaptation education tool. The MA Division of Ecological Restoration (DER) referenced the Climate Action Tool in their Culvert Replacement Municipal Assistance Grant Program RFR. In a notice accompanying the release of the RFR, DER stated: ?We were also able to showcase the MA Wildlife Climate Action Tool, by asking applicants to use the Tool to determine their proposed culvert?s priority for replacement.?

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate

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

The Massachusetts Ecosystem Climate Adaptation Network (Mass ECAN), now with 191 members, it is a community of practice for people interested in climate adaptation to protect ecosystems. In the past year, the Mass ECAN web site received 1,661 hits from 1,354 users. From September 1, 2017 through August 31, 2018, the Massachusetts Wildlife Climate Action Tool recorded 27,887 hits from 11,487 users. Despite the inclusion of "Massachusetts" in the name of the site/tool, 68.7% of the users and 56.2 % of hits were from people outside of Massachusetts, suggesting broad interest in this new type of climate adaptation education tool. The MA Division of Ecological Restoration (DER) referenced the Climate Action Tool in their Culvert Replacement Municipal Assistance Grant Program RFR. In a notice accompanying the release of the RFR, DER stated: "We were also able to showcase the MA Wildlife Climate Action Tool, by asking applicants to use the Tool to determine their proposed culvert's priority for replacement."

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
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		34%	
402	Engineering Systems and Equipment	50%		0%	
403	Waste Disposal, Recycling, and Reuse	0%		34%	
511	New and Improved Non-Food Products and Processes	0%		27%	
601	Economics of Agricultural Production and Farm Management	0%		5%	
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: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.3	0.0	1.5	0.0
Actual Paid	0.0	0.0	0.6	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**
0	0	95329	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
50292	0	58161	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
280490	0	213030	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Analytic Tools & Techniques
- Facilitated Group Meetings and Conferences
- Individual Consultations and Site Visits
- Research Project (Applied Research)
- Websites or Other Electronic Delivery
- Grant Submission or other Funding Proposal
- Workshop Series or Educational Course

2. Brief description of the target audience

Growers, agricultural businesses, real estate developers, building managers, municipalities, public utilities, homeowners, institutional leaders and decision-makers, Community organizations, Environmental health professionals

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1158	10	62	0

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	1	7	8

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Applied Research Projects
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Analytic Tools and Techniques

Year	Actual
2018	1

Output #3

Output Measure

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

Output #4

Output Measure

- Grant Submission or Other Funding Proposal

Year	Actual
2018	2

Output #5

Output Measure

- Individual Consultations and Site Visits

Year	Actual
2018	132

Output #6

Output Measure

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

Output #7

Output Measure

- Committee or Board Service
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2018	26

Output #9

Output Measure

- Websites or Other Electronic Delivery

Year	Actual
2018	1

Output #10

Output Measure

- Workshop Series or Educational Course

Year	Actual
2018	6

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
2018	11

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
We worked with businesses and community groups on clean energy technologies, hydropower, energy storage, microgrids, air source heat pumps, combined heat and power, modern wood heating. We conducted air emissions monitoring from wood pellet facilities in central/western MA and supported a group of 21 towns as they consider economic development opportunities related to wood pellet production. We established a certification program for pollinator/wildlife friendly solar PV siting which we hope to launch in the coming year.

What has been done
We worked with businesses and community groups on clean energy technologies, hydropower, energy storage, microgrids, air source heat pumps, combined heat and power, modern wood heating. We conducted air emissions monitoring from wood pellet facilities in central/western MA and supported a group of 21 towns as they consider economic development opportunities related to wood pellet production. We established a certification program for pollinator/wildlife friendly solar PV siting which we hope to launch in the coming year.

Results
Post program assessments determined that municipal officials from target communities gained expertise to assist them in meeting energy reduction goals. Six municipal officials from target

communities submitted applications to the state's Green Communities Program which requires them to manage their energy accounts, commits them to 20% energy reduction plans over 5 years, and provides state support.

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
2018	151

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The transition to clean energy is critical for Massachusetts to meet its greenhouse gas reduction commitments and provides an opportunity to foster new economic development in the Commonwealth. The UMass Clean Energy Extension provides a resource dedicated to reduce market barriers and accelerate the adoption of clean energy for Massachusetts cities and towns, businesses, institutions, farms, low income and other multiunit housing, and others.

What has been done
We worked with businesses and community groups on clean energy technologies, hydropower, energy storage, microgrids, air source heat pumps, combined heat and power, modern wood heating. We conducted air emissions monitoring from wood pellet facilities in central/western MA and supported a group of 21 towns as they consider economic development opportunities related to wood pellet production. We established a certification program for pollinator/wildlife friendly solar PV siting which we hope to launch in the coming year.

Results

Post program assessments determined that municipal officials from target communities gained expertise to assist them in meeting energy reduction goals. These included increases in knowledge and skills related to the use of energy efficiency technologies and policies.

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
2018	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The transition to clean energy is critical for Massachusetts to meet its greenhouse gas reduction commitments and provides an opportunity to foster new economic development in the Commonwealth. The UMass Clean Energy Extension provides a resource dedicated to reduce market barriers and accelerate the adoption of clean energy for Massachusetts cities and towns, businesses, institutions, farms, low income and other multiunit housing, and others.

What has been done
We worked with businesses and community groups on clean energy technologies, hydropower, energy storage, microgrids, air source heat pumps, combined heat and power, modern wood heating. We conducted air emissions monitoring from wood pellet facilities in central/western MA and supported a group of 21 towns as they consider economic development opportunities related to wood pellet production. We established a certification program for pollinator/wildlife friendly solar PV siting which we hope to launch in the coming year.

Results

Post program assessments determined that municipal officials from target communities gained expertise to assist them in meeting energy reduction goals. This included three businesses adopted renewable energy systems.

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 #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
2018	243

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The transition to clean energy is critical for Massachusetts to meet its greenhouse gas reduction commitments and provides an opportunity to foster new economic development in the Commonwealth. The UMass Clean Energy Extension provides a resource dedicated to reduce market barriers and accelerate the adoption of clean energy for Massachusetts cities and towns, businesses, institutions, farms, low income and other multiunit housing, and others.

What has been done
We worked with businesses and community groups on clean energy technologies, hydropower, energy storage, microgrids, air source heat pumps, combined heat and power, modern wood heating. We conducted air emissions monitoring from wood pellet facilities in central/western MA and supported a group of 21 towns as they consider economic development opportunities related to wood pellet production. We established a certification program for pollinator/wildlife friendly solar PV siting which we hope to launch in the coming year.

Results

Post program assessments determined that municipal officials from target communities gained expertise to assist them in meeting energy reduction goals. Two hundred fifty participants statewide increased knowledge and skill of renewable energy options and increase knowledge of state energy incentives and eligibilities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management

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

Post program assessments determined that municipal officials from target communities gained expertise to assist them in meeting energy reduction goals. These included increases in knowledge and skills related to energy efficiency and use of renewable energy sources. Six municipal officials from target communities submitted applications to the state's Green Communities Program which requires them to manage their energy accounts, commits them to 20% energy reduction plans over 5 years, and provides state support. Two hundred fifty participants statewide increased knowledge and skill of renewable energy options and increase knowledge of state energy incentives and eligibilities. Three businesses adopted renewable energy systems.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Food Safety and Functionality

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	20%		0%	
502	New and Improved Food Products	0%		41%	
702	Requirements and Function of Nutrients and Other Food Components	0%		40%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	35%		0%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	45%		19%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	0.8	0.0	6.0	0.0
Actual Paid	0.2	0.0	3.2	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**
0	0	258569	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
92873	0	517726	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	637318	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Workshop series or educational course
- Facilitated Group Meetings and Conferences
- Individual Consultations and Site Visits
- Curricula/Instructional materials
- Demonstrations
- Facilitated Group Meetings and Conferences
- Teaching - Other

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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3332	75	15	0

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	1	98	99

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Workshop series or educational course

Year	Actual
2018	5

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

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

- Grant Submission or Other Funding Proposal
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Individual Consultations and Site Visits

Year	Actual
2018	70

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
  Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Curricula/Instructional Materials

Year	Actual
2018	9

Output #11

Output Measure

- Demonstrations

Year	Actual
2018	8

Output #12

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2018	43

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

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

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

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Post Program surveys distributed to participants revealed that food industry professionals who attended our workshops acquired skills and knowledge for making safe decisions regarding their food products.

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
703	Nutrition Education and Behavior	50%		36%	
704	Nutrition and Hunger in the Population	20%		0%	
724	Healthy Lifestyle	30%		64%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	1.5	0.0	1.0	0.0
Actual Paid	0.3	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**
0	0	39871	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
184748	0	30138	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
4022945	0	11238	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Analytic Tools and Techniques
- Committee or Board Service
- Demonstrations
- Displays and Exhibits
- Printed Material (newsletter, factsheet, field manual)
- Published Article, Book or Chapter (Academic)
- Single day workshop, presentation or event
- Survey, Needs Assessment, or Other Data Collection\
- Teaching - Other
- Workshop series or educational course

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, African American Women and Children in the lower Pioneer Valley

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	16174	93170	64856	24562

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	4	3	4

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Demonstrations

Year	Actual
2018	175

Output #2

Output Measure

- Displays and Exhibits

Year	Actual
2018	200

Output #3

Output Measure

- Single day workshop, presentation or event

Year	Actual
2018	412

Output #4

Output Measure

- Workshop series or educational course

Year	Actual
2018	3201

Output #5

Output Measure

- Peer review publications

Year	Actual
2018	3

Output #6

Output Measure

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

Output #7

Output Measure

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

Output #8

Output Measure

- Committee or Board Service

Year	Actual
2018	9

Output #9

Output Measure

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

Output #10

Output Measure

- Analytic Tools & Techniques

Year	Actual
2018	3

Output #11

Output Measure

- Survey, Needs Assessment, or Other Data Collection

Year	Actual
2018	1

Output #12

Output Measure

- Grant Submission

Year	Actual
2018	1

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 increase use of effective nutrition education resources and materials

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
2018	679

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
The Expanded Food and Nutrition Education Program helps limited-resource families acquire the knowledge, skills, attitudes, and changed behaviors necessary for nutritionally sound diets, and to contribute to their personal development and the improvement of the total family diet, nutritional well-being, and levels of physical activity. Four professional staff (1.17 FTE) and 14 paraprofessional staff (11.2 FTE) provided nutrition education programming to low-income adults and youth. A total of 1,434 adults and 2,459 youth were reached in FY2018.

Results
Program entry and exit measures with both adults and youth measured change in the five core EFNEP areas: diet quality, food resource management, food safety, physical activity, and food

security for both adult and youth participants. Improvements after participating in EFNEP for adult participants included: 95% Showed a positive change in consumption of at least one food group; 79% Improved in Food Resource Management; 94% Improved in Nutrition Practices; 80% Improved in Food Safety; 30% Improved in Physical Activity. For youth participants: 74% improved in Diet Quality; 50% improved in Food Safety; 47% improved in Food Resource; Management; 28% improved in Physical Activity Behaviors.

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

Not Reporting on this Outcome Measure

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
2018	1348

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
Nutrition education programs and activities assist SNAP participants to establish healthy eating habits and physically active lifestyles. Staff in five field offices reached 70,208 adult and youth participants with direct education, making a total of 238,101 direct nutrition education contacts. A total of 182,844 individuals were reached through indirect education methods (displays, food demonstrations at farmers' markets and Transitional Assistance offices, leave-behind enrichment activities for school staff to use with children, and newsletters).

Results
Pre and post program evaluation measures showed that SNAP-Ed programming resulted in the following statistically significant changes. Grade 3-5 and grade 6-8 youth eating vegetables more often; Grade 3-5 and grade 6-8 youth eating fruit more often; Grade 3-5 youth being physically active more often; Grade 6-8 youth drinking high sugar beverages less often; Grade 6-8 youth spending less time watching TV or movies, playing electronic games, or using a computer for something that is not school work (i.e. less screen time).

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

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

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Participants increase use of effective nutrition education resources and materials

Not Reporting on this Outcome Measure

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

A total of 1,434 adults and 2,459 youth were reached in FY2018 by educators with our Expanded Food and Nutrition Education Program (EFNEP) . Entry and exit measures obtained with both adults and youth participants measured change in five core areas: diet quality, food resource management, food safety, physical activity, and food security for both adult and youth participants. Improvements after participating in EFNEP for adult participants included: 95% Showed a positive change in consumption of at least one food group; 79% Improved in Food Resource Management; 94% Improved in Nutrition Practices; 80% Improved in Food Safety; 30% Improved in Physical Activity. For youth participants: 74% improved in Diet Quality; 50% improved in Food Safety; 47% improved in Food Resource; Management; 28% improved in Physical Activity Behaviors.
SNAP-Ed programming staff in five field offices reached 70,208 adult and youth participants with direct education, making a total of 238,101 direct nutrition education contacts.Pre and post program evaluation measures showed that SNAP-Ed programming resulted in the following statistically significant changes. Grade 3-5 and grade 6-8 youth eating vegetables more often; Grade 3-5 and grade 6-8 youth eating fruit more often; Grade 3-5 youth being physically active more often; Grade 6-8 youth drinking high sugar beverages less often; Grade 6-8 youth spending less time watching TV or movies, playing electronic games, or using a computer for something that is not school work (i.e. less screen time).

Key Items of Evaluation

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%		0%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		62%	
204	Plant Product Quality and Utility (Preharvest)	6%		0%	
205	Plant Management Systems	22%		0%	
211	Insects, Mites, and Other Arthropods Affecting Plants	11%		0%	
212	Diseases and Nematodes Affecting Plants	21%		30%	
723	Hazards to Human Health and Safety	5%		0%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		8%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	5.2	0.0	1.2	0.0
Actual Paid	5.0	0.0	1.0	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**
494014	0	154940	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1010014	0	124940	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
918092	0	460414	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Analytic Tools and Techniques
- Diagnostic Services
- Facilitated Group Meetings and Conferences
- Individual Consultations and Site Visits
- Printed Material (Newsletter, Fact Sheet or Field Manual)
- Published Article (News, Professional, Trade)
- Single Day Workshop, Presentation or Event
- Survey, Needs Assessment, or Other Data Collection
- Teaching - Undergraduate Course
- Websites or Other Electronic Delivery
- Workshop Series or Educational Course

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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	13623	92500	70	0

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	3	0	3

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2018	22

Output #2

Output Measure

- Individual Consultations and Site Visits

Year	Actual
2018	3831

Output #3

Output Measure

- Printed Materials

Year	Actual

2018	5109

Output #4

Output Measure

- Single day workshop, presentation or event

Year	Actual
2018	78

Output #5

Output Measure

- Websites or other computer-based delivery

Year	Actual
2018	112

Output #6

Output Measure

- Workshop series or educational course

Year	Actual
2018	46

Output #7

Output Measure

- Applied Research Projects
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Diagnostic Services

Year	Actual
2018	6623

Output #9

Output Measure

- Peer review publications
  Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Committee or Board Service
  Not reporting on this Output for this Annual Report

Output #11

Output Measure

- Community Service Project
  Not reporting on this Output for this Annual Report

Output #12

Output Measure

- Demonstrations
  Not reporting on this Output for this Annual Report

Output #13

Output Measure

- Printed Material

Year	Actual
2018	5109

Output #14

Output Measure

- Analytic Tools and Techniques

Year	Actual
2018	4

Output #15

Output Measure

- Teaching - Other

Year	Actual
2018	3

Output #16

Output Measure

- Direct - Other

Year	Actual

2018	68

Output #17

Output Measure

- Published Article (News, Professional or Trade)

Year	Actual
2018	3

Output #18

Output Measure

- Survey, Needs Assessment, or Other Data Collection

Year	Actual
2018	1

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 viabilty agricultural businesses

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
2018	6572

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Pesticides are vital tools for controlling pests and maintaining an adequate food supply. If used improperly, pesticides can also threaten human health and the natural environment. Inexperienced applicators, accidents, inadequate protection and equipment continue to be areas of concern that increase the potential for negative personal and environmental impacts from pesticide exposure. We educate pesticide users about safe application, state regulation and proper use of pesticides in Massachusetts.

What has been done
The Pesticide Education Program conducted seventeen workshops to help individuals prepare for the Massachusetts state pesticide license exams. Individuals use this workshop as a supplement to self-study and to ask questions. A take-home practice exam is provided to individuals to use as a pesticide exam study tool. The program also offered 18 pesticide recertification training workshops to individuals that have pesticide licenses and certifications/ These have been updated to include respirator use training.

Results
The program used exam results provided by the Massachusetts Department of Agricultural Resources to determine the exam-passing rate for our workshop participants. Individuals who took the workshop continue to pass at a higher rate than those who did not take the workshop. Seventy percent of the individuals who took the workshop passed the exam compared to a passing rate of 62% for nonparticipants. There were 1,949 individuals who participated in the workshops. All participants were given an opportunity to evaluate the workshops. Of the 1009 individuals who completed evaluations, 61% indicated that they increased their knowledge, "very much" and 61% indicated that they would "very much" use the information/techniques that they learned.

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
2018	63

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
The major focus of all activities has been improving soil health and natural soil fertility through advocating for cover cropping and transitioning from conventional to the no-till cultivation systems. In addition, the project focused on maintaining environmental quality through minimizing commercial fertilizer, manure management through innovative composting systems, and use of cover crops in various cropping systems.

Results
In collaboration with NRCS, the number of dairy farms that currently grow cover crops on time to harvest it as a high quality forage in May has been dramatically increased. In addition, the number of farmers that are replacing conventional tillage with no-till system is increasing. The new adopted system results in improving soil health which is foundation of sustainable farming,

protects the environment through reducing the application of commercial fertilizer thus protecting the environment, and finally improves the farmers' income. The introduction of the two composting systems (aerated composting bins and static aerated composting piles) has been a great success. These two systems have been adopted and have drawn attention and interest nationwide.

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	173

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nursery and greenhouse production is ranked first among the state's agricultural commodities with hundreds of millions of dollars in estimated sales. There are more than 5,000 Massachusetts businesses involved in production, retail, and landscape services. These companies have significant economic and environmental impacts for Massachusetts. Sustainable greenhouse management requires economically viable solutions to problems of energy, pest management, trained labor, water quality, production practices and plant nutrition.

What has been done
The New England Greenhouse Webinar series was launched in 2018. Eight webinars were presented featuring top experts in the field who addressed the theme of 'Growing Healthy Roots'. The webinars reached hundreds of growers and were developed in cooperation with other New England Extension programs. Our team also facilitated face-to-face programs including: a winter greenhouse production and management workshop, a winter educational meeting in partnership

with the Massachusetts Flower Growers Association (MFGA), and a summer meeting and trial garden tour.

Results
Follow up surveys revealed that growers of greenhouse crops improved cultural practices. Specifically, 17 viewers of ?Using Mineral Nutrition to Prevent Root-Borne Pathogens? indicated greater ability to manage root-borne pathogens with mineral nutrition. While 21 viewers of ?Growing Strong Roots from the Start - Plugs and Rooted Cuttings? indicated a greater ability to grow healthy roots for plugs and rooted cuttings. Ten viewers of the ?Insecticide Drenches? indicated greater ability to manage root-affecting insect pests after viewing the webinar and 29 indicated greater ability to use and manage diseases with fungicide drenches. Finally, 29 viewers of the ?Root-Borne Pathogens ? Identification and Control? webinar indicated greater ability to identify and manage root-borne pathogens.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems

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 viabilty agricultural businesses

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	169

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

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

The Pesticide Education Program used exam results provided by the Massachusetts Department of Agricultural Resources to determine the exam-passing rate for our workshop participants. Individuals who took the workshop continue to pass at a higher rate than those who did not take the workshop. Seventy percent of the individuals who took the workshop passed the exam compared to a passing rate of 62% for nonparticipants. There were 1,949 individuals who participated in the workshops. All participants were given an opportunity to evaluate the workshops. Of the 1009 individuals who completed evaluations, 61% indicated that they increased their knowledge, "very much" and 61% indicated that they would "very much" use the information/techniques that they learned.
In collaboration with NRCS, the number of dairy farms that currently grow cover crops on time to harvest it as a high quality forage in May has been dramatically increased. In addition, the number of farmers that are replacing conventional tillage with no-till system is increasing. The new adopted system results in improving soil health which is foundation of sustainable farming, protects the environment through reducing the application of commercial fertilizer thus protecting the environment, and finally improves the farmers' income.
Follow up surveys with participants in our webinars revealed that growers of greenhouse

crops improved cultural practices. Specifically, 17 viewers of "Using Mineral Nutrition to Prevent Root-Borne Pathogens" indicated greater ability to manage root-borne pathogens with mineral nutrition. While 21 viewers of "Growing Strong Roots from the Start - Plugs and Rooted Cuttings" indicated a greater ability to grow healthy roots for plugs and rooted cuttings. Ten viewers of the "Insecticide Drenches" indicated greater ability to manage root-affecting insect pests after viewing the webinar and 29 indicated greater ability to use and manage diseases with fungicide drenches. Finally, 29 viewers of the "Root-Borne Pathogens - Identification and Control" webinar indicated greater ability to identify and manage root-borne pathogens.

Key Items of Evaluation

The introduction of two innovative composting systems (aerated composting bins and static aerated composting piles) has been a great success. These two systems have been adopted in Massachusetts and have drawn additional attention and interest nationwide.

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%		78%	
806	Youth Development	80%		22%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	7.5	0.0	0.3	0.0
Actual Paid	4.2	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**
904727	0	21928	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
403622	0	80144	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
274554	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- 4-H Clubs
- Community Service Project
- Curricula/Instructional materials
- Direct - Other
- Facilitated Group Meetings and Conferences
- Single day workshop, presentation or event
- Websites or Other Electronic Delivery
- Workshop series or educational course
- Displays/Exhibits
- Individual Consultations and Site Visits

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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3447	21652	24233	1080

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total

Actual	0	7	7

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- 4-H Clubs

Year	Actual
2018	217

Output #2

Output Measure

- Community Service Projects

Year	Actual
2018	234

Output #3

Output Measure

- Curricula/Instructional Materials

Year	Actual
2018	2

Output #4

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2018	30

Output #5

Output Measure

- Printed Materials

Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Single day workshop, presentation or event

Year	Actual
2018	105

Output #7

Output Measure

- Websites or other computer-based delivery

Year	Actual
2018	24

Output #8

Output Measure

- Workshop series or educational course

Year	Actual
2018	376

Output #9

Output Measure

- Displays and Exhibits

Year	Actual
2018	156

Output #10

Output Measure

- Individual Consultations and Site Visits

Year	Actual
2018	11

Output #11

Output Measure

- Direct - Other

Year	Actual
2018	466

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

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
2018	471

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Holyoke and Springfield public school districts are among the lowest performing districts in the state. There is a dire need in these communities for high-quality in-school and after-school enrichment programming. The Massachusetts Urban 4-H Program in Springfield and Holyoke strives to expand the Science, Technology, Engineering, Art, and Math (STEAM) skills of youth in grades K-9. The majority of participants are youth of color and they are underserved and underrepresented compared to their white counterparts in neighboring towns and cities throughout the state.

What has been done
The Massachusetts Urban 4-H Program in Springfield and Holyoke strives to expand the Science, Technology, Engineering, Art, and Math (STEAM) skills of youth in grades K-9. Through partnerships with a variety of community centers and schools, Massachusetts 4-H provides programming based on national 4-H curricula. About 425 youth from underserved communities participated in the program in 2018.

Results
According to post program evaluations: 1) 80% of youth report an increased interest in STEAM subjects; 2) 100% of youth learn new science concepts; 3) 100% of youth demonstrate an increase in STEAM vocabulary; 4) 90% of youth are be able to record scientific data accurately; 5) 90% of youth are able to formulate a question that can be answered through data collection; and 6) 90% of youth are able to analyze the results of a scientific experiment or investigation.

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	947

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. Since 1919, the Massachusetts 4-H Program has provided support, resources and educational opportunities to Massachusetts youth. The mission of Massachusetts 4-H is to assist youth in developing life and work skills that will prepare them to be capable, caring and competent adults. Massachusetts 4-H is an active participant in the national 4-H "Grow Leaders" campaign as we work to prepare our youth to be the leaders of tomorrow.

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 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
Statements taken from written 4-H records: I really liked taking part in Visual Presentation. I used to hate speaking in front of an audience but I got over my fears and I earned a 4-H Public Speaking award (age 17); We (members) work as if we are a family (age 10); When people at school are presenting they might be too quiet or really unprepared. Because of 4-H I have more experience in public speaking and can usually be more confident in front of groups (age 11); I like the community service events we do in 4-H because I love to help others and the community. I have been able to do this thanks to the 4-H organization and my two awesome leaders Shari and Cindy who have been so patient to help me (age 11); The knowledge I gain in Hippology assisted me in my school science class due to the terminology and general science application (age 16).

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

Youth are effective team members, communicators, and leaders

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

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

Not Reporting on this Outcome Measure

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
2018	1898

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth benefit from access to applied science and youth development expertise across the Commonwealth as well as on the UMass campus. The UMass Envirothon network includes local officials and citizens who are interested in helping to prepare youth who will be active citizens in Massachusetts communities in decades to come. A primary focus of the program is work with the

school teachers and youth leaders who guide the high school age youth in their community-based learning.

What has been done
In 2018, the Massachusetts Envirothon program provided a rich, positive youth development experience in natural resource and environmental affairs, and also in teamwork, presentation skills, and community research. Program participation represents significant geographic diversity, including rural, suburban, and urban teams from across Massachusetts. The Issue focus for this year was whether our communities can work with the natural infrastructure of our watersheds towards sustainable development even as climate change accelerates.

Results
Program evaluations and judge?s observation forms determined that about 200 youth increased their understanding of current issues of environment and development in Massachusetts communities and their degree of civic participation and community service.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #6

1. Outcome Measures

Youth acquire citizenship skills

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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

According to post program evaluations of youth in our urban 4-H Program: 1) 80% of youth report an increased interest in STEAM subjects; 2) 100% of youth learn new science concepts; 3) 100% of youth demonstrate an increase in STEAM vocabulary; 4) 90% of youth are be able to record scientific data accurately; 5) 90% of youth are able to formulate a question that can be answered through data collection; and 6) 90% of youth are able to analyze the results of a scientific experiment or investigation.

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%		0%	
111	Conservation and Efficient Use of Water	6%		9%	
112	Watershed Protection and Management	5%		10%	
123	Management and Sustainability of Forest Resources	24%		0%	
124	Urban Forestry	10%		0%	
133	Pollution Prevention and Mitigation	2%		4%	
135	Aquatic and Terrestrial Wildlife	15%		14%	
136	Conservation of Biological Diversity	16%		0%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		22%	
211	Insects, Mites, and Other Arthropods Affecting Plants	4%		0%	
212	Pathogens and Nematodes Affecting Plants	4%		9%	
216	Integrated Pest Management Systems	4%		2%	
302	Nutrient Utilization in Animals	0%		29%	
607	Consumer Economics	0%		1%	
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: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	3.5	0.0
Actual Paid	0.7	0.0	2.5	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**
85983	0	342197	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
400095	0	332795	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
143264	0	690689	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Analytic Tools and Techniques
- Facilitated Group Meetings and Conferences
- Printed Material (newsletter, factsheet, field manual)
- Research Project (Applied Research)
- Single day workshop, presentation or event
- Survey, Needs Assessment, or Other Data Collection
- Websites or Other Electronic Delivery
- Workshop series or educational course
- Student Supervision/Support/Advising (Graduate)
- Direct Other
- Teaching - Graduate Course
- Published Article (News, Professional, Trade)

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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	335483	197413	250	0

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

Patent Applications Submitted

Year: 2018

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	13	12	42

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Analytic Tools and Techniques

Year	Actual
2018	9

Output #2

Output Measure

- Diagnostic Services

Year	Actual
2018	0

Output #3

Output Measure

- Facilitated Group Meetings and Conferences

Year	Actual
2018	9

Output #4

Output Measure

- Printed Materials

Year	Actual
2018	9

Output #5

Output Measure

- Published Articles (News, Professional and Trade)

Year	Actual
2018	31

Output #6

Output Measure

- Single day workshop, presentation or event

Year	Actual
2018	60

Output #7

Output Measure

- Survey or needs assessment
  Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Websites or other computer-based delivery

Year	Actual
2018	28

Output #9

Output Measure

- Workshop series or educational course

Year	Actual
2018	23

Output #10

Output Measure

- Applied Research Projects

Year	Actual
2018	5

Output #11

Output Measure

- Peer review publications

Not reporting on this Output for this Annual Report

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

Not reporting on this Output for this Annual Report

Output #15

Output Measure

- Community Service Project

Not reporting on this Output for this Annual Report

Output #16

Output Measure

- Demonstrations

Not reporting on this Output for this Annual Report

Output #17

Output Measure

- Diagnostic Services

Year	Actual
2018	0

Output #18

Output Measure

- Student Supervision/Support/Advising (Graduate)

Year	Actual
2018	1

Output #19

Output Measure

- Direct - Other

Year	Actual
2018	2

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

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
2018	1068

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The UMass Extension Plant Diagnostic Lab fulfills its primary mission of providing fast, reliable diagnosis of plant problems and detailed diagnostic reports outlining environmentally sustainable management techniques. We also provide sound management strategies that utilize an integrated pest management approach. This includes cultural and chemical controls, when necessary. An emphasis is made to utilize management strategies that limit the input of insecticides, fungicides, bactericides and fertilizers into the landscape.

What has been done
Sample submitters receive education on the specific plant pathogen involved and management tactics tailored to the organisms or organisms found. Diagnostic lab staff participated in many educational outreach programs, which included: invited seminars for various trade groups, twilight walks to discuss disease and insect pests, printed and electronic publications, performing site visits for disease identification, editing technical manuals, and updating plant pathology fact sheets on many different CAFE websites.

Results
Many of the thousands of individuals who receive information from the Plant Diagnostics lab in response to samples they submitted respond in ways that suggest an increased in their knowledge of environmentally sustainable management techniques for specific plant problems. Many individuals have told us they could not do their job without the diagnostic and management assistance we provide. Our membership in the National Plant Diagnostic Network provides staff with updates on exotic and quarantine pests, presents educational opportunities for professional development, and allows lab staff to educate growers about exotic and/or newly emerging diseases.

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
2018	283

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 during crucial decision-making periods.

What has been done
Our activities for this past year are similar to previous years and include enhancement of social networks to inform landowner decisions: Utilizing the internet and other technologies to reach landowners and to facilitate their information sharing; Conservation-based Estate Planning Outreach for Landowners; Training influential community opinion leaders to inform landowner decisions with regard to forest management. A new initiative for 2018 focused on providing forest conservation information in events especially designed for female forest owners.

Results
An overwhelming majority of participant report increases in knowledge related to conserving forested land, both the importance of it and the most effective ways to accomplish it. Our most recent survey also reveals: participant contributed 42,054 hours to conservation related activities,

53% of which were volunteer hours. Their efforts are equivalent to >21 full-time conservation positions. Based on the estimated value of $24.69 for an hour of volunteer time participants contributed $549,550 worth of volunteer time. Thirty-seven women participated in our programs targeted to female forest owners. According to a survey, half said that that the all-women nature increased their likelihood of attending and 80% noted that the specific audience increased their enjoyment and value of the 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 #3

1. Outcome Measures

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

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

We evaluated our Keystone Forest Cooperators Network with a mail survey to approximately 500 participants using the Dillman Total Survey Design Method. An overwhelming majority report increases in knowledge related to conserving forested land, both the importance of it and the most effective ways to accomplish it. The survey also seeks to quantify the total impact that Cooperators made in the previous 12-month period. Our most recent survey

reveals: participant contributed 42,054 hours to conservation related activities, 53% of which were volunteer hours. Their efforts are equivalent to >21 full-time conservation positions. Based on the estimated value of $24.69 for an hour of volunteer time participants contributed $549,550 worth of volunteer time. Participants own or are involved with the management decisions on 320,514 total acres of land. Participants made contact with 18,823 people about forest conservation and made 7,304 referrals to conservation information resources. Referrals to land trusts, government programs, private foresters, and public foresters. Additionally, thirty-seven women participated in our programs targeted to female forest owners. According to a survey, half said that that the all-women nature increased their likelihood of attending and 80% noted that the specific audience increased their enjoyment and value of the 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: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	3.5	0.0	0.5	0.0
Actual Paid	3.7	0.0	0.9	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**
458157	0	505865	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
603923	0	67967	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
146389	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

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year:	2018
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	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

V(I). Planned Program (Evaluation Studies)

Evaluation Results

No evaluative information was collected for this program.

Key Items of Evaluation

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
1348	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
1479	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.