2015 University of Vermont Combined Research and Extension Annual Report of Accomplishments and Results

Status: Submitted

Date Submitted: 04/01/2016

I. Report Overview

1. Executive Summary

At the University of Vermont, Cooperative Extension (UVM Extension) is a standalone unit led by a Dean and Director that reports to the Provost. The Agricultural Experiment Station (VT-AES) is housed in the College of Agriculture and Life Sciences with the Dean of the college also being Director of the Agricultural Experiment Station. The two Deans meet regularly to discuss programming and to maintain a collaborative and cooperative approach to addressing the applied research and outreach needs of agriculture across Vermont. As in many higher education institutions, budgetary constraints continue to grow and impact the variety and extent of our individual and combined work. The two units work hard to focus and manage limited budgetary resources on identified programmatic needs within their priority areas; strive to have administrative oversight that aligns planning, reporting, evaluation and funding to ensure our units are meeting identified programmatic needs within our priority areas; and encourage collaboration as an effective way to link expertise on campus with stakeholders in the state.

As is the case each year, the research and outreach results described in this report are but a short list of the daily and ongoing efforts of UVM Extension and VT-AES that impact people, families, communities, farms and our overall health and welfare: developing new local community leaders; 4-H STEAM programming engaging youth; studying climate change and assisting farmers with adapting to it and reducing phosphorus runoff; working with local food businesses and entrepreneurs to address food safety in dairy, meat and vegetable products; educating Master Gardener volunteers who address local food access issues and contribute to community; teaching enhanced grazing techniques to reduce water quality issues. All the research and outreach of UVM contributes to the strength of our state economy and communities.

Through the planned program efforts of VT-AES and UVM Extension, our work is integrated to best serve our citizens. Multidisciplinary work and integration of our research and outreach fall within and across our planned programs. As a result of this and due to the size of our overall programs in Vermont, it is most practical to report the bulk of our efforts within the NIFA Global Food priority area. Since we do not necessarily have programs of sufficient size to divide neatly into other priority areas, we have chosen to report our efforts within Global Food even if some part of the work could be legitimately allocated to other NIFA priorities. Our efforts are to help grow and maintain a viable market for local and regional food producers and processors for vegetables, meat, and manufactured food products such as artisanal cheeses. These efforts span work from safe production, to safe storage, to safe processing and distribution. The work can range from developing and applying good agricultural practices, to research on the rapid detection of food borne pathogens, to developing new opportunities for artisanal cheese makers or working to understand disease resistance in dairy cattle. The Global Food program area encompasses a wide variety of work conducted at UVM.

Last year UVM Extension staff documented the implementation of 271 recommended practices that protect air, water and soil on Vermont farms. A portion of those practices were the result of work done over a three-year period by UVM Extension agronomists and support staff through outreach and technical assistance. Over those three years, a total of 461 conservation practices were implemented on 260 farms

in the Lake Champlain watershed, reducing soil and nutrient runoff from 58,608 acres of cropland and associated livestock production facilities. The state benefits by having a healthier environment and strong agricultural economy and working landscape, high priorities in Vermont.

Evaluations documented the implementation of 1,378 recommended practices that improve or protect business sustainability. One UVM Extension effort provided clinics for Vermont dairy farmers needing help understanding the financial impact of the 2014 Farm Bill's Margin Protection Program for Dairy (MPP-Dairy). Participating in MPP-Dairy is an important business decision for Vermont's dairy farmers, potentially providing some financial stability to this stressed business. Over 70% of dairy farmers enrolled in the program after working with UVM Extension. Extension and its partners continue to support and strengthen the agriculture industry with its 30 plus projects across Vermont.

As of March 2015, the Certification for Sustainable Transportation (CST) program worked with companies that operated approximately 3,085 motor coaches, with each coach on average consuming 8,600 gallons of fuel each year. Companies now regularly report seeing drops in idle-times and an improvement in fuel efficiency. It is estimated that companies working with CST are reducing fuel consumption by 2-8% annually. A 2-8% reduction equates to between 530,620 and 2,122,480 gallons conserved, representing 11,875,275 to 47,501,102 in carbon savings annually. CST programs have been designed to help mitigate the impact transportation has on climate change and will continue to promote the eRating Vehicle Certification Program on a national level.

Measuring the economic impact and contribution of Vermont's food system to the total state food supply will enable VT-AES researchers to inform policy and investment decisions. In 2012 a study was done measuring how much local food Vermont consumed. In 2015, 7% of food dollars were spent on local foods, representing a substantial increase from 2.5% in 2012. These results were presented to the 2015 Farm to Plate Gathering providing a metric for consumer trends.

AES studies are focused on enhancing knowledge on the effects of environmental and genetic influences on economically important traits in cattle, such as behavior. Epigenics is providing useful information on gene expression and to date has not been used to quantify behavior-related traits in livestock species. The primary objective of this research is to map the bovine brain methylome with the goal of quantifying docility in cattle.

VT-AES research is being done to measure the economic impacts and contributions of elements of Vermont's food system. Understanding the specific impacts will guide policy and investment decisions. Interviews and surveys were done at different steps of the livestock supply chain (farmers, processors, distributors and buyers) currently engaged in pasture-raised livestock markets. Questions focused on the following areas: internal operations of business, original underpinning values, ownership structure, management, key partnerships, agreements, governance interviews. The VT-AES research seeks to investigate the potential of value chain partnership to overcome barriers identified in previous studies which limit the economic viability of sustainable livestock production in Vermont. Vermont is well-suited for the pasture-based model which brings a set of socio-economic and environmental benefits to farmers, consumers and their communities. Research in other areas has shown strong potential demand for pasture-raised livestock products but it is constrained by availability and logistical barriers.

VT-AES is also conducting research that characterizes and manipulates virulence factors of mastitis pathogens for enhancing host defenses in cows. In a 12-month study of milk quality on 43 organic dairy farms, research objectives include: characterization of pathogen virulence factors, antimicrobial resistance, and molecular epidemiology and diagnostic tools. The work focuses on the epidemiology of staphylococci in emerging sectors of the dairy industry in Vermont including niche dairy farms. A pilot study examined the presence of contagious mastitis pathogen transmission in a herd where cows were milked in robotic systems. The research identified more than 20 different strain types with 90% of the isolates clustering in

three clonal complexes. The goal is to combine molecular and mathematical epidemiological approaches to unravel the complex mechanisms leading to chronic intramammary infections and antimicrobial resistance emergence and transmission in cattle populations.

Vermont is not just focusing on agricultural production - we also concentrate on training human capital. Central to our mission, in addition to agriculture, are public service, civic engagement and furthering economic development, as well as human health. Efforts continue to evolve to address issues of importance to Vermonters as each year passes and new problems arise. Faculty and staff hires and grant funds support existing, new and expanding research and outreach efforts in these areas.
In 2015, Vermont AgrAbility Project (VAP) helped 45 farmers with disabilities to maintain employment. VAP has provided assistive devices such as power wheelchairs, shower transfer benches and lift chairs to clients; all sourced and delivered free of charge. The dollar value of this equipment in the past year totals almost $100,000 and has provided priceless relief and comfort to the farmers who are able to continue farming due to this service. While supporting individuals and families, VAP is also protecting a way of life and making agricultural working lands a priority for Vermonters and those visiting Vermont.

Nationally there is growing apprehension about how much time today's children spend indoors playing computer games or watching television. Connections between inactive indoor behaviors and obesity, reductions in social and cognitive skills and reduced appreciation for natural resources have been established. Studies show that contact with nature makes children healthier, more focused, and better able to perform in school. This year 4-H programs have resulted in a total of 711 youth mastering one or more

- Expert Peer Review

2. Brief Explanation

Extension key staff have monthly telephone meetings with the four states that cooperated to develop an on-line planning and reporting system. These are an opportunity to get feedback on programs and statewide goals and initiatives. Discussions include regional programs, opportunities for multistate work, sharing staff resources and other programming strategies and issues. In addition, staff at the faculty and administrative level access the on-line system (www.lmprs.net) to view peers' work. Program staff, faculty and administration are active in regional and national discussions around program success and challenges.

VT-AES provides the opportunity for seed project funding through a competitive proposal process. Project proposals are evaluated for scientific and technical merit through a peer review process. Projects are intended as seed funding to aid the principal investigator (PI) in establishing a new research direction or to augment dimensions of their current, extramurally funded research program.

III. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of the general public
- Other (see narrative for details)

Brief explanation.

Many projects have advisory committees of one form or another that provide a sounding board and input on the current program issues and help prioritize programmatic direction. This input helps in all aspects of programming, including delivery method, outreach and content. Most events ask participants of programs if the programming met their needs and expectations. Post event evaluations, including six month follow-up check-ins about behavior change, are standard practice for UVM Extension faculty and staff. This effort also provides an opportunity to gather further input informing future program effort.

A state advisory board meets with the Director and key staff two times per year. They meet with faculty and program staff to hear about programmatic efforts, needs and changes in behavior measured following the educational efforts. The Board serves in an advisory capacity directly to the Dean. The members represent a broad perspective with diverse experience and backgrounds.

Partnerships and communities, public and private organizations and businesses are important to reaching and serving clients with appropriate programming. These relationships remain a critical part of identifying needs and gaps for programming.

The Director of VT-AES has an advisory board which meets twice a year to provide feedback and advice on future trends of agriculture and life sciences. The Dean/Director of Extension and Dean of Agriculture and Life Sciences (Director of VT-AES) meet regularly and share stakeholder input relevant to their work.

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

-

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 Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

As a small state we know our citizens. Collected data is used to refine, remove or create new educational programs and delivery methods that will serve the needs of the state. UVM Extension has close relationships with state and local government, an asset when seeking input and when sharing expertise and/or concerns of citizens.

The VT-AES advisory board provides a source of council to the Director, using member input to help formulate a research direction.

Brief Explanation of what you learned from your Stakeholders

This year the State Advisory Board brainstormed a list of potential new educational opportunities that could generate revenue for other programs. Those ideas are currently being prioritized and investigated for return on investment.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1889752	0	1863030	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1959246	0	1841709	0
Actual Matching	2617192	0	2246858	0
Actual All Other	7259304	0	0	0
Total Actual Expended	11835742	0	4088567	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	116102	0	323334	0

2015 University of Vermont Combined Research and Extension Annual Report of Accomplishments and Results

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	5.0	0.0	15.0	0.0
Actual Paid	29.9	0.0	16.8	0.0
Actual Volunteer	8.9	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**
1050182	0	871786	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1402850	0	945046	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
3891084	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Project listed in bold followed by delivery methods:

- **Ag Business Management.** Conferences, courses, consultations and farm visits.
- **Agricultural Safety.** Courses, consultations and farm visits.
- **Beginning Farmer Initiative.** Focus groups, learning circles, workshops, mini-courses and publications.
- **Community Preparedness.** Workshops and discussion groups.
- **Dairy Management.** Conferences, workshops, consultations.
- **Equine Program.** Annual equine event, publications, and consultations.
- **Extension Master Gardener.** Course, train the trainer.
- **Farm and Forest Transfers.** Workshops, consultations, farm visits.
- **Farm Viability.** Farm visits, consultations, and discussion groups.
- **Farming Alternatives.** Workshops, consultations, farm visits.
- **Forage and Pasture Management Education.** Conference, farm visits, consultations.
- **GAP.** Consultations, workshops, publications.
- **Ground Work: Building Capacity to Provide Tractor Education.** Workshops, curriculum development.
- **Livestock Production and Products.** Consultations, discussion groups, workshops.
- **Maple Program.** Conference, workshops, newsletter.
- **Nutrient Management Program.** Farm visits, consultations, workshops.
- **Organic Grain Project.** Demonstrations, data gathering.
- **Pest Management Education.** IPM and Pesticide Education and Safety Program (PESP) training.

- **Private/Commercial Landowner and Industry Professional Education.** Tour and conference.
- **Soil Health.** Workshops.
- **Sustainable Forests.** Classes, workshop series, various media.
- **UVM Tax School.** Conference, tax manual.
- **Vegetable and Berry Growers.** Consultations, farm visits, meetings, various media, presentations, website.
- **Vermont New Farmer Network.** Conference, networking, consultations.
- **Vermont Pasture Network.** Pasture walks, demonstrations and trials, conference, consultations, various media.
- **Vermont Tourism and Recreation.**

- Agriculture: Farm Families
- Agriculture: Farm Managers
- Agriculture: Farmers
- Agriculture: Goat & Sheep Producers
- Agriculture: Greenhouse Ornamental Growers
- Agriculture: Home Gardeners
- Agriculture: Industry Professionals
- Agriculture: Livestock producers
- Agriculture: Maple Industry
- Agriculture: Maple Sugar Producers
- Agriculture: Non-Dairy Producers
- Agriculture: Nursery operators
- Agriculture: Ornamentals Industry Professionals
- Agriculture: Service Providers
- Agriculture: Small Fruit & Vegetable Growers
- Agriculture: Veterinarians
- Agriculture: Dairy Goat, Meat Goat and Dairy Sheep Producers

VT-AES Target Audience:

- Wine producers
- Organic Agencies
- Students and biological scientists
- Entomologists
- Geneticists
- Policymakers
- Investors
- Consumers

3. How was eXtension used?

1. Women in Agriculture Learning Network Coordination/Participation

2. eOrganic CoP Participation

3. Farm Energy eXtension Project:

Developing a sustainable regional bioenergy supply chain requires the co-development of a consistent supply of bioenergy feedstocks as well as industry for handling, processing and marketing. USDA acknowledges the complexity of this issue and has invested $146 million into six regional Coordinated Agricultural Projects (CAPs). Each Project will facilitate the development of a sustainable regional production of biofuels by integrating research, education and Extension/outreach/technology transfer. As the national site for Extension collaborations and outreach, eXtension.org provides the logical platform to disseminate knowledge from the Bioenergy CAPs. To develop science based resources that are suited for the general farming audience can be a complex process.

To better coordinate outreach efforts of these large bioenergy research projects, Sue Hawkins, the

direction and published through the eXtension Farm Energy site, which provides integration with existing site materials.

Two Bioenergy CAP Projects, CenUSA and NEWBio, involving 194 collaborators, 15 States, 16 Universities, 8 Federal and 12 Industry Partners are using eXtension Farm Energy to share their collective knowledge. A growing resource base of articles, webinars, video, ask-an-expert specialists, enterprise budgets, decision making tools from these projects are now available to assist bioenergy stakeholders and the public to make choices and overcome obstacles to entering the bioenergy supply chain.

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	40371	440104	1056	553

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

Patent Applications Submitted

Year:	2015
Actual:	1

Patents listed
Check-valve spout, CA 2659789, issued November 25, 2015

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	3	29	32

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Class/course

Year	Actual
2015	24

Output #2

Output Measure

- Conference

Year	Actual
2015	46

Output #3

Output Measure

- Consultation

Year	Actual
2015	2051

Output #4

Output Measure

- Consumer Publication

Year	Actual
2015	6

Output #5

Output Measure

- Demonstration

Year	Actual
2015	84

Output #6

Output Measure

- Discussion group

Year	Actual
2015	78

Output #7

Output Measure

- Educational/evaluation instrument

Year	Actual
2015	3

Output #8

Output Measure

- Electronic Communication/phone

Year	Actual
2015	1479

Output #9

Output Measure

- Field day/fair

Year	Actual
2015	6

Output #10

Output Measure

- Field site visit

Year	Actual
2015	64

Output #11

Output Measure

- Funding request

Year	Actual
2015	22

Output #12

Output Measure

- Presentation

Year	Actual
2015	295

Output #13

Output Measure

- Publication - Peer Reviewed

Year	Actual
2015	3

Output #14

Output Measure

- Publication - curriculum

Year	Actual
2015	27

Output #15

Output Measure

- Publication - fact sheet

Year	Actual
2015	28

Output #16

Output Measure

- Publication - magazine article

Year	Actual
2015	19

Output #17

Output Measure

- Publication - manual

Year	Actual
2015	17

Output #18

Output Measure

- Publication - newsletter

Year	Actual
2015	53

Output #19

Output Measure

- Publication - newsprint article

Year	Actual
2015	73

Output #20

Output Measure

- Research project

Year	Actual
2015	150

Output #21

Output Measure

- TV segment/ATF

Year	Actual
2015	22

Output #22

Output Measure

- Technical Publication

Year	Actual
2015	36

Output #23

Output Measure

- Tour(s)

Year	Actual
2015	1

Output #24

Output Measure

- Train the Trainer trainings
  Not reporting on this Output for this Annual Report

Output #25

Output Measure

- Website development and updates
  Not reporting on this Output for this Annual Report

Output #26

Output Measure

- Workshop - series

Year	Actual
2015	50

Output #27

Output Measure

- Workshop - single session

Year	Actual
2015	156

Output #28

Output Measure

- Publication - book

Year	Actual
2015	2

Output #29

Output Measure

- Publication - Video Produced

Year	Actual
2015	3

Output #30

Output Measure

- Publication - Referreed Journal Article

Year	Actual
2015	5

Output #31

Output Measure

- In-Office Visit

Year	Actual
2015	5

Output #32

Output Measure

- Conference Proceedings

Year	Actual
2015	4

Output #33

Output Measure

- Trainee/Volunteer Delivered Programming

Year	Actual
2015	212

Output #34

Output Measure

- Mass Media: Blog post/social media/web page/internet site updating

Year	Actual
2015	921

18	Number of winery owners working together who share information of marketing, production, management, and technical support.

Outcome #3

1. Outcome Measures

number of farmers who implement best field management practices(s) crop/pasture, product, and/or soil productivity while protecting water, air and/or soil

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	271

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Phosphorus and soil that moves off site from agricultural lands in Vermont has been identified as a major cause for degraded water quality in the Lake Champlain. Phosphorus is blamed for blue-green algae blooms on Lake Champlain. The algae produce toxins that can cause illness in humans, pets, fish and waterfowl. Farmers face continued and rising pressure to address water quality, and are in need of training, guidance and resources to help them make recommended changes and meet expectations.

What has been done
In 2015, Extension provided technical assistance on conservation practice implementation to farms including manure incorporation, conservation rotation, riparian buffer establishment, mulch till, no-till planting, cover crops, and improved grazing management. Extension and industry partners have coordinated with farms to establish integrated research/demonstration plots. Education has been delivered through field days, coalition meetings, workshops, consultations and more.

Results
Last year UVM Extension staff documented the implementation of 271 recommended practices that protect air, water and soil on Vermont farms. A portion of those practices were the result of work done over a three-year period by UVM Extension agronomists and support staff through outreach and technical assistance. Over those three years, a total of 461 conservation practices were implemented on 260 farms in the Lake Champlain watershed, reducing soil and nutrient runoff from 58,608 acres of cropland and associated livestock production facilities. The state benefits by having a healthier environment and strong agricultural economy and working landscape, high priorities in Vermont.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
216	Integrated Pest Management Systems
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation

Outcome #4

1. Outcome Measures

Number of individuals who implement IPM practice(s) increasing the protection of water, air and/or soil

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	669

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
205	Plant Management Systems
216	Integrated Pest Management Systems

Outcome #5

1. Outcome Measures

Number of individuals and business owners who implement recommended practice(s)that accomplish owner values and goals to improve/protect business sustainability

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1378

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Farming is a multifaceted and complicated business. Factors like keeping up with and applying new research and changing technology, aging farmers and a limited workforce, and environmental impact issues are just a few of the challenges. Extension is a non-regulatory, unbiased source of expertise for farmers to access the latest research for best recommended practices and information.

What has been done
Extension programs are accessible in multiple formats and topics, based on the current needs and priority areas in the state. Last year UVM Research and Extension agricultural programs completed 2,051 consultations, 295 presentations, 264 total publications, 46 conferences, and 206 workshop sessions or series. Topics ranged from food safety, to New American farmer support, to stockmanship.

Results
Evaluations documented the implementation of 1,378 recommended practices that improve or protect business sustainability. One Extension effort provided clinics for Vermont dairy farmers needing help understanding the financial impact of the 2014 Farm Bill's Margin Protection Program for Dairy (MPP-Dairy). Participating in MPP-Dairy is an important business decision for Vermont's dairy farmers, potentially providing some financial stability to this stressed business. Over 70% of dairy farmers enrolled in the program after working with UVM Extension. Extension and its partners continue to support and strengthen the agriculture industry with its 30 plus

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation
205	Plant Management Systems
216	Integrated Pest Management Systems
308	Improved Animal Products (Before Harvest)
311	Animal Diseases
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
704	Nutrition and Hunger in the Population
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #6

1. Outcome Measures

The number of individuals who complete a plan including preventative measures to secure animal health, food safety and public health protecting the food chain and market integrity

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #7

1. Outcome Measures

The number of growers who adopt new crop/plant variety(ies) resulting in maintaining or increasing sales

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	523

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Over the past four years commercial hard cider production has seen growth of over 50% annually in the U.S. and 73% in Vermont since 2008. This presents a potential high-value processing market for apple growers. Significant expansion of commercial cideries has occurred in Vermont, including investments of several million dollars, supporting over 200 employees statewide.

What has been done
Research is being done on the costs of production for apples grown for hard cider production. There are concerns that continued economic expansion will be limited by the ability to source apples for hard cider making. Research is being conducted to find opportunities to reduce inputs and change management practices in cider orchards and the economic impact of cider apple production system.

Results
Collaborations with commercial apple growers and cideries in Vermont is producing best management practices. Surveys have been sent to growers that will determine what apple varieties are best-suited. Results show that Red Delicious, Fuji, Gala, McIntosh, and Cortland are

the best for making high-quality commercial ciders, while providing adequate and sustainable crop yield that make their production economically feasible.

the project, 63 individuals had already reported using the education and technical assistance they received through the project to establish a new farm. One farm reported that only two years after accessing land, sales in the month of August had already surpassed sales from their entire first year. As a result, the farm added seven new wholesale accounts at local colleges and food hubs. The farm's owner recognized the impact of UVM Extension's support: "We wouldn't have had a chance of being profitable without the assistance of the Vermont New Farmer Network."

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation

Outcome #9

1. Outcome Measures

number of participants who make an intentional, informed decision regarding starting a business based on feasibility, personal goals and values

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
604	Marketing and Distribution Practices

Outcome #10

1. Outcome Measures

Number passing the USDA GAPs audit to gain or maintain a market for their locally grown crop(s)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	18

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The majority of produce farms in Vermont direct market their products, as such, few are currently required by buyers to be Good Agricultural Practices (GAPs) certified. Yet to stay competitive, grow their businesses, and expand to new markets, growers must understand produce safety, write and implement produce safety plans, and train their employees in food safety practices.

What has been done
As part of the Specialty Crop Block Grant, five day-long Practical Produce Safety (PPS) workshops were held to enhance growers' competitiveness. These workshops provided farmers with the information needed to write an on-farm food safety plan to share with customers. In addition, Extension staff provided 88 consultations, led 18 workshops, and produced 14 educational materials to assist farmers with GAPs certification.

Results
In 2015, 18 farms have been audited and received USDA GAPs certification in 10 Vermont counties. As a result of the five PPS workshops, 70 farms from Vermont, New Hampshire, New York, and Massachusetts (as well as several agricultural service providers, gleaners and food hub staff) initiated draft produce safety plans for their operations. One of the primary goals of the PPS curriculum is to share with farmers inexpensive, easy, and common-sense ways to improve hygiene while simultaneously increasing efficiency and produce quality or shelf-life. This approach seems to be working in terms of helping small scale and diversified growers to choose implementation of produce safety practices as one more way to improve their business.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices

712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #11

1. Outcome Measures

The number of growers growing organic crops increase revenues improving business sustainability

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	32

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management

1. Outcome Measures

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #13

1. Outcome Measures

number of farmers who implement key element(s) of their nutrient management plan protecting water and soil

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #14

1. Outcome Measures

number of individuals who assess vulnerabilities and implement a practice to secure animal health, food safety, and/or public health protecting the food chain and market integrity

Not Reporting on this Outcome Measure

Outcome #15

1. Outcome Measures

Number of individuals who implement recommended gardening practice(s) protecting water, air, and/or soil

Not Reporting on this Outcome Measure

Outcome #16

1. Outcome Measures

Number of identified new and sustainable disease and arthropod pest management systems for organic apple growers.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Apple production in Vermont generates about 10 million dollars from about 3,000 acres of orchards and represents a significant component of the state's diversified agricultural industry. There has been significant interest in growing organic apples in the state yet growers face daunting challenges limiting adoption of organic production.

What has been done
The study was conducted in a certified organic orchard. Sprays for each organic management system were applied to five three tree plots of the cultivars 'Ginger Gold', 'Honeycrisp' and 'Liberty'. Three organic management studies were used. Organic management system 1 was based on the use of sulfur fungicides. Organic management system 2 used the sulfur sprays. Organic management system 3 was the standard organic management system.

Results
The results showed that Organic management system 2 was best to manage pests in organic apple fields.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
206	Basic Plant Biology
216	Integrated Pest Management Systems

Outcome #17

1. Outcome Measures

Number of farmers who report that accessibility, cost, and associated challenges of child care are factors in their success and wellbeing.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	36

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Child care influences farm business decisions, affecting divisions of farm labor, productivity, farm growth, and allocation of financial resources, often causing stress within farm families and diminishing quality of life.

What has been done
Farm families surveyed who report problems with child care relate it to affordability, availability, quality, or philosophy of caregiver. Child care is particularly difficult for first generation and women farmers.

Results
Farmers who report having trouble with child care are more likely to be beginning, young, and have small farms. Of that women are more likely to report child care problems. 43.9% of women surveyed reported that child care is an important factor in farm decisions. Child care subsidies specifically for farmers, and evaluation of subsidy eligibility by farm viability specialists, would alleviate the financial burden of off-farm care costs (according to the surveys results).

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions and Social Services

Outcome #18

1. Outcome Measures

Number of winery owners working together who share information of marketing, production, management, and technical support.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

coS 3a. Outcome Type: iM ך ך

3b. Quantitative Outcome

Year	Actual
2015	11

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Wineries are an important and growing sector of the Vermont agricultural economy, and yet little systematic information exists about the sector and the effectiveness of promotional strategies used by farmers to attract customers and tourists.

What has been done
The research applies emerging tools of network science to the issue of evaluating alternative promotional strategies used by multi-functional wine producing operations.

Results
Socioeconomic and basic marketing data on wineries in the state, key outcomes of the research include a more systematic understanding of the independent effects of producers' network positions and characteristics; demographic variables; and promotional strategies used on each producer's effectiveness as measured by sales or visitors attracted per dollar spent on promotions. Vermont wine producers worked with other agricultural producers to co-promote Vermont products. The information gathered has been shared with more than 20,000 agricultural producers, service providers, market planners, researchers, educators, and policy makers in the US.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management

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

Evaluation #1: The specific objective of the Forage and Weed Identification and Management Professional Development Program is to train 21 agricultural service providers in New England to gain skills in weed and forage identification and biology, and integrated weed management techniques. The target goal for these trainees will be to provide educational programs and services to 200 experienced and beginning farmers who manage an average of 120 acres. Of those 200 farmers, 100 will adopt integrated weed control and forage management practices that extend the grazing season, decrease herbicide usage, reduce purchased feed inputs, and improve animal

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Community Development and the Personal and Intellectual Development of Youth and Adults

☑ 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
124	Urban Forestry	7%		0%	
608				0%	

V(D). Planned Program (Activity)

1. Brief description of the Activity

• 4-H Positive Youth Development Program: Help youth acquire Life Skills in the following areas: Decision Making; Critical Thinking; Problem-Solving; Communication; Goal-Setting; and Skills for Everyday Living to succeed as adults. Delivery Methods: 6-8 sequential learning hours using experiential learning techniques for in-school, afterschool, or out-of-school settings

• Vermont Operation Military Kids (OMK): Educates Vermont communities on the unique experiences and challenges of military life and its impact on families, while providing positive opportunities for youth. OMK aims to establish community partnerships that will connect and educate people by: creating community support, delivering opportunities to youth and families, supporting military kids, collaborating with community partners, educating the public (including the education community) and incorporating military families into existing community resources.

• 4-H Science, Engineering, and Technology (SET) Activities: 4-H SET will begin to show how science and engineering issues affect youths' lives and prepare a future generation of scientists and engineers. The 4-H SET program will present 4-H with a new opportunity to connect to the Land Grant University's SET research community and integrate with current youth workforce development initiatives.

• Community Market Analysis, Needs Assessment and Strategic Planning: This program provides the community with analytical techniques that can be put to work immediately in economic revitalization efforts. The process requires input from local residents so that recommendations reflect both market conditions as well as the preferences of the community. Delivery Methods: Group meetings and discussion groups in community.

• Community Leadership: Assessing, addressing and expanding community capacity through leadership and public policy education efforts including building coalitions and collaboratives, and educating their members and clientele.

• Coping with Separation and Divorce (COPE): Parent education for parents of minor children who have filed for separation, divorce, dissolving of a civil union, parentage, changes in rights and responsibilities concerning their children. This is a court mandated program.

• Migrant Education Recruitment Program (MEP): To ensure that children of migrant farm workers, and qualifying youth under age 22, are aware of the educational support services available to them. Delivery Methods: Outreach to schools, agricultural employers, and social service agencies throughout the state.

• Vermont AgrAbility Project: To make recommendations that can be used by farmers with disabilities to maintain employment, through development of accommodations. Delivery Methods: Process involves recruitment of eligible individuals through referrals. Intake information is recorded on farms provided by the National AgrAbility Project. Site visits are the primary means of contact.

• Take Charge/Re-Charge Community Development Programs: Helping community adult members to gain the skills necessary to be confident enough to take part in town government by ultimately competing for town government leadership positions. Delivery Methods: Meetings, discussion groups.

• Vermont Urban and Community Forestry program: a joint initiative between the University of Vermont Extension and the Department of Forests, Parks and Recreation. The mission of the program is to promote the stewardship of the urban and rural landscapes to enhance the quality of life in Vermont communities.

- Migrant Out of School Youth
- School Enrichment Program Participants (Youth)

3. How was eXtension used?

Enhancing Rural Community Capacity CoP participation.

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	10908	21576	11103	1053

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

Patent Applications Submitted

Year: 2015

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- 4-H Afterschool

Not reporting on this Output for this Annual Report

Output #2

Output Measure

- 4-H Club

Year **Actual**

2015	234

Output #3

Output Measure

- 4-H Day Camp

Year	Actual
2015	4

Output #4

Output Measure

- 4-H Overnight camp

Year	Actual
2015	17

Output #5

Output Measure

- 4-H School enrichment

Year	Actual
2015	61

Output #6

Output Measure

- 4-H Short-term/special interest

Year	Actual
2015	402

Output #7

Output Measure

- Class/course

Year	Actual
2015	28

Output #8

Output Measure

- Conference

Year

Year	Actual
2015	2

Output #15

Output Measure

- Publication - newsletter

Year	Actual
2015	88

Output #16

Output Measure

- Publication - newsprint article

Not reporting on this Output for this Annual Report

Output #17

Output Measure

- Radio Spots/program (educational

Not reporting on this Output for this Annual Report

Output #18

Output Measure

- TV segment/ATF

Year	Actual
2015	9

Output #19

Output Measure

- Train the Trainer sessions

Not reporting on this Output for this Annual Report

Output #20

Output Measure

- Web Page

Not reporting on this Output for this Annual Report

Output #21

Output Measure

- Workshop - series

Year	Actual

2015	16

Output #22

Output Measure

- Workshop - single session

Year	Actual
2015	75

Output #23

Output Measure

- Trainee delivered programming

Year	Actual
2015	91

Output #24

Output Measure

- Electronic Communication/phone
  Not reporting on this Output for this Annual Report

Output #25

Output Measure

- Mass Media: blog post/social media/web page/internet site updating

Year	Actual
2015	19

Output #26

Output Measure

- Display or Exhibit

Year	Actual
2015	20

Output #27

Output Measure

- Educational Tour

Year	Actual
2015	1

Output #28

Output Measure

- Curriculum Publication or Update

Year	Actual
2015	7

Output #29

Output Measure

- Mass Media Event

Year	Actual
2015	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	increase in number of farmers with disabilities maintaining employment
2	Number of Migrant Education eligible students enrolled
3	Increase the number of program participants serving as leaders on Committees
4	Number of individuals (youth and volunteers) increasing knowledge and/or skills in content and careers (across subject areas ranging from animal science to environmental science to technology)
5	Number of individuals who use leadership and decision making skills in executing their role and responsibilities effectively developing and/or implementing policy
6	Increase the number of parents understanding family transition through parentage, divorce or separation who understand the impact of these changes on their children.
7	increase in number of youth reached with positive youth development programming demonstrate mastery for targeted life skills, including: Decision making; wise use of resources; communication; accepting differences; leadership; useful/marketable skills; healthy lifestyle choices; and/or self-responsibility
8	Number of volunteers and staff demonstrating new techniques/activities in clubs and programs learned through 4-H training and developmemnt
9	the number of published policy changes addressing best practices in child welfare.
10	Number of individuals who use skills and effectively participate in addressing community issue(s) (e.g. green infrastructure, local leadership, hunger, volunteerism, etc.)
11	Number of participants who are English language learners will increase their level of English proficiency
12	Number of participants who report improvements in children's self-regulation and attachment related behaviors
13	The number of communities or community group/organization(s) establishing or expanding projects to improve or mitigate a community issue

Outcome #1

1. Outcome Measures

increase in number of farmers with disabilities maintaining employment

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	45

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Farming is a way of life for many and often is a legacy passed on to next generations, protecting Vermont's ever important working landscape. Farmers are aging and farming can be physically demanding making illness or injury at any age a challenge or barrier to continuing to maintain a viable farming operation. Services and resources for farmers with these challenges are limited in Vermont.

What has been done
The Vermont AgrAbility Project (VAP) helps such farmers find ways to overcome disabling conditions to continue their existing farming operation, transition to other roles on the farm, or find other means of employment to promote their livelihood and/or vocation. This may include modifications to their equipment, barns, and home and/or finding and accessing assistive medical equipment. Since 2007, VAP has helped more than 400 farmers with disabilities remain in their chosen occupation.

Results
In 2015, Vermont AgrAbility Project helped 45 farmers with disabilities to maintain employment. VAP has provided assistive devices such as power wheelchairs, shower transfer benches and lift chairs to clients; all sourced and delivered free of charge. The dollar value of this equipment in the past year totals almost $100,000 and has provided priceless relief and comfort to the farmers who are able to continue farming due to this service. While supporting individuals and families, VAP is also protecting a way of life and making agricultural working lands a priority for Vermonters and those visiting Vermont.

4. Associated Knowledge Areas

KA Code	Knowledge Area

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Access to local foods has been an issue for the Island Pond community. The one store that was carrying some local foods in the area closed during the late winter of 2015. Surveys and focus groups conducted in the community indicated a desire for more local foods.

What has been done
Utilizing UVM Extension's Take Charge Program, a Healthy Food Access Forum was held to address identified issues in the region. As a result of the forum, four committees were formed to work on healthy food access, and one chair was elected for each group. One of the committees focused on the Island Pond community's desire for local foods.

Results
Because of their participation in the Healthy Food Access Forum, the Island Pond committee has started a community garden project that makes garden space available to community members to grow their own local foods. Committee members used the skills learned from Extension?s Take Charge program to organize citizens in the community to participate in the planning and organization of the community garden. The group was able to secure land that is both accessible to community members and offers the infrastructure to grow a successful garden. Produce has already been harvested with more harvests to come.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #4

1. Outcome Measures

Number of individuals (youth and volunteers) increasing knowledge and/or skills in content and careers (across subject areas ranging from animal science to environmental science to technology)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	833

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Assr ‘ ‘ ﻝ $ F W ' 0 0 D[] 0 d 1 1 1 rg [] 0 d 1 0 0 1 0 0 cm BT 1 0 0 1 105 690. X O W V

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1237

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

1. Outcome Measures

increase in number of youth reached with positive youth development programming demonstrate

In partnership with others, Operation: Military Kids (OMK) offered more than 250 military youth-focused programs over seven years, reaching military children and youth over 3,000 times. By educating the community, and relying on the support of partners, OMK also engaged volunteers a total of 1,814 times, donating a total of 4,059 hours of their service to OMK efforts (equating to $79,421.92 based on annual data from the Independent Sector's value of volunteer time).

Results

Staff have witnessed military youth form friendships, learn and use new skills, volunteer for their communities, transition into leadership roles, speak publicly about being from a military family, and return to OMK events year after year. Parents reported that 88% of youth had developed positive relationships with other military children and 68% felt more supported by his or her community because of OMK's efforts. The network OMK has created for Vermont's military children and youth over the past seven years is one that will outlive the program. Whether faced with the absence of a parent, the stress of a new job, or being cut from a sports team, OMK programs have helped arm military kids with new skills, strong connections and a sense of

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
805	Community Institutions, Health, and Social Services
806	Youth Development

Outcome #12

1. Outcome Measures

Number of participants who report improvements in children's self-regulation and attachment related behaviors

Not Reporting on this Outcome Measure

Outcome #13

1. Outcome Measures

The number of communities or community group/organization(s) establishing or expanding projects to improve or mitigate a community issue

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	41

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Many of Vermont's urban and community forests are being neglected due to shrinking municipal budgets. In addition, lack of comprehensive planning, active management and understanding of the value of trees are also barriers to the development of tree programs throughout the state. Managers of these urban and community forests need support to attain accurate data, develop strategic plans, and enhance tree care skills in order to maintain good forest health, enhance

public benefits, and strengthen local support.

What has been done
The Urban and Community Forestry Program (UCF) provides educational, technical and financial assistance to communities in the management of trees and forests, in and around the built landscape. This year, UCF staff worked with tree wardens, community volunteers and municipal staff in 36 towns to conduct tree inventories, develop master plans, and expand programming in support of forests and trees. A grant from USDA Forest Service helped UCF to support efforts in 20 of those communities.

Results
This year, all 36 communities established or expanded projects to improve their community tree program. In six of those communities (supported by the abovementioned grant), 3,047 public trees were inventoried, demonstrating an annual public value of over $300,000 in ecosystem services and savings to those communities. The support provided by UCF to these six communities is equivalent to over $11,500, representing significant savings for municipal budgets. These communities now have the data and language to communicate the benefits of their forests and trees to leadership and citizens and are expected to continue their work by developing strategic plans and offering trainings for town staff on proper tree care and management.

4. Associated Knowledge Areas

KA Code	Knowledge Area
124	Urban Forestry
608	Community Resource Planning and Development
805	Community Institutions, Health, and Social Services
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

UVM Extension 4-H Teen & Leadership Program created the Teens Reaching Youth (TRY) for the

V(A). Planned Program (Summary)

Program # 3

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
102	Soil, Plant, Water, Nutrient Relationships	0%		26%	
104	Protect Soil from Harmful Effects of Natural Elements	0%		10%	
112	Watershed Protection and Management	0%		2%	
123	Management and Sustainability of Forest Resources	10%		32%	
125	Agroforestry	0%		2%	
131	Alternative Uses of Land	0%		5%	
132	Weather and Climate	13%		2%	
133	Pollution Prevention and Mitigation	49%		7%	
205	Plant Management Systems	0%		6%	
601	Economics of Agricultural Production and Farm Management	12%		2%	
602	Business Management, Finance, and Taxation	16%		0%	
610	Domestic Policy Analysis	0%		2%	
801	Domestic Policy Analysis			2%	

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
83214	0		
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
111159	0		
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
308321	0		

2. Brief description of the target audience

Agriculture: Farmers
Forestry: Government Agency Personnel
Maple producers
Plant retailers
Policymakers
Public: Small Business Owners/Entrepreneurs
Researchers, Extension Faculty and Staff
USDA personnel

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	999	14447	0	0

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

Patent Applications Submitted

Year:	2015
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	0	15	15

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research projects focusing on climate change.

Year	Actual
2015	12

Output #2

Output Measure

- Presentations

Year	Actual
2015	12

Output #3

Output Measure

- Interviews

Year	Actual
2015	3

Output #4

Output Measure

- Radio

Year	Actual
2015	1

Output #5

Output Measure

- T.V. Programs

Year	Actual
2015	1

Output #6

Output Measure

- Publication: newsletters, articles, magazines

Year	Actual
2015	8

Output #7

Output Measure

- Mass Media: blog post/social media/webpage/internet site updating

2015 University of Vermont Combined Research and Extension Annual Report of Accomplishments and Results

Year	Actual
2015	6

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of climate change management practices on Vermont farms that aid in climate change adaptation.
2	Number of ecological and evolutionary factors that influence invasive plants in Vermont
3	Number of enterprises who implement recommended environmental behaviors to meet or exceed terms to have vehicles certified through the eRating program
4	Number of drivers completing a personal pledge to embrace 'Eco-driving' practices.
5	Number of eRating certified vehicles
6	Number of new and continuing Enterprise/Organizations offering CST 'eco-driver' and/or 'idle free' themed certification courses to employees and related stakeholders in order to promote saving fuel, money, and reducing environmental impacts.
7	Number of research projects examining fiddlehead ferns to determine the impact of gene transformation resulting from climate change.

Outcome #1

1. Outcome Measures

Number of climate change management practices on Vermont farms that aid in climate change adaptation.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Climate change forecasts increases in precipitation averages, frequency of extreme weather events and changing plant and animal communities. These changes will impact farm viability and farmer livelihoods in Vermont.

What has been done
How farmers use their knowledge of climate change in decision making processes about farmer management is being researched.

Results
20 farmers were interviewed in order to compare farmer knowledge and beliefs about climate change to populations in Vermont. Process based vegetation models were used to provide a mechanistic basis for projecting future climate change. Suggested management practices include cover crops, rotational grazing, no-till farming storm water management, and wetland conservation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
104	Protect Soil from Harmful Effects of Natural Elements
112	Watershed Protection and Management
125	Agroforestry
132	Weather and Climate
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management

610	Domestic Policy Analysis
903	Communication, Education, and Information Delivery

Outcome #2

1. Outcome Measures

Number of ecological and evolutionary factors that influence invasive plants in Vermont

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Invasive plants can cause irreversible damage to Vermont ecosystems. Genetic changes in the grass Phalaris arundinacea affect the growth rate and lead to invasion of the grass in Vermont wetlands. Resource managers and farmers will use this information to halt invasions.

What has been done
Research examines how genetic changes contribute to the invasive characteristics of the plant Phalaris arundinacea, a major invasive plant in Vermont wetland communities. Genetic analysis, greenhouse experiments and theoretical models were done.

Results
The result showed that Phalaris arundinadea plants had undergone a change in their DNA content that allowed them to grow greater leaf material. The leaf material is more resistant to decomposition and slows down decomposition processes in the wetland community. When decomposition processes slow down, Phalaris arundinacea can better compete for resources in the wetland community and achieve a competitive advantage. Having a competitive advantage ultimately leads to greater invasiveness.

4. Associated Knowledge Areas

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

1. Outcome Measures

Number of enterprises who implement recommended environmental behaviors to meet or exceed terms to have vehicles certified through the eRating program

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	4000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
602	Business Management, Finance, and Taxation

Outcome #6

1. Outcome Measures

Number of new and continuing Enterprise/Organizations offering CST 'eco-driver' and/or 'idle free' themed certification courses to employees and related stakeholders in order to promote saving fuel, money, and reducing environmental impacts.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	70

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
More than 25% of carbon dioxide emissions in the U.S. can be attributed to transportation activities; 73% of which come from passenger transportation. In Vermont, the transportation sector accounts for 46% of total greenhouse gas emissions, yet Vermont's overall carbon emissions are arguably negligible in the global context. In order to mitigate the impacts of climate change at home, work in the transportation sector must extend beyond Vermont.

What has been done
The Certification for Sustainable Transportation (CST) was founded in 2012 to help improve economic, environmental, and energy efficiency within the passenger transportation sector. CST offers driver trainings and certifications designed to help companies and individuals eliminate unnecessary idling while also promoting fuel-efficient driving practices. To date, CST has worked with 70 transportation companies in 33 states and three Canadian provinces and has issued over 11,000 vehicle and/or driver eRating Vehicle Certifications to participants.

Results
As of March 2015, companies CST worked with operated approximately 3,085 motor coaches in

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	62	0	0	0

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

Patent Applications Submitted

Year:	2015
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total

2015 University of Vermont Combined Research and Extension Annual Report of Accomplishments and Results

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of individuals who implement recommended practice(s) beginning energy crop production or increasing yield and/or quality of existing crops contributing to a sustainable, cost effective energy source
2	Number of farmers who implement a new practice to begin production or to improve current oilseed production yield and quality
3	Number of research findings important in the structure of the plant cell wall during growth that will aid in the usage of using cell walls as a source of biofuels.
4	Number of research studies that access the financial and economic feasibility of converting cow manure into renewable energy products.

Outcome #1

1. Outcome Measures

Number of individuals who implement recommended practice(s) beginning energy crop production or increasing yield and/or quality of existing crops contributing to a sustainable, cost effective energy source

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of farmers who implement a new practice to begin production or to improve current oilseed production yield and quality

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Number of research findings important in the structure of the plant cell wall during growth that will aid in the usage of using cell walls as a source of biofuels.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Plant cell walls represent a renewable source of carbon for the development of biofuels and other plant based energy products. Cell walls are structures whose composition changes in response to changes in the environment. Root hairs are responsible for water and nutrient uptake from the soil and their growth is responsive to changes in the environment. Root hair expansion is a polarized process requiring endosomal pathways that deliver and recycle plasma membrane and cell wall material to the growing root hair tip.

What has been done
The research project purpose is to characterize genes important in regulating the structure of the plant wall during growth. During the past year the research extended studies by looking at VPS26C, a gene that shares a pathway with VT113 and is required for polarized growth and cell wall organization.

Results
Previously, scientists found that SNARE proteins VT113 played a unique role in trafficking pathways essential for cell wall organization. Additionally scientists found the VPS26C protein also plays a role in cell wall development. Understanding the makeup of the plant cell walls might determine if the plant can be used as biofuels.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
206	Basic Plant Biology

Outcome #4

1. Outcome Measures

Number of research studies that access the financial and economic feasibility of converting cow manure into renewable energy products.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Agricultural farmers are considering the purchase of methane digester systems that convert cow manure into renewable energy products.

What has been done
Researcher is analyzing, through Vermont dairy farms, the financial and economic feasibility of converting cow manure into renewable energy products. Additionally examining consumer preferences and willingness to pay for this and other renewable energy products.

Results

Educational material and information/recommendations to dairy farmers, legislators, consumers, and other stakeholders are being developed. Economic returns highly depend on the base electricity price, premium rate paid by customers, financial supports from government agencies and other organizations and sales of the by-products of methane generation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Government Regulations

Brief Explanation

The Vermont Sustainable Agriculture Council in February 2015 submitted an overview of some of the most pressing issues facing Vermont farmers and the communities in which they operate. http://www.uvm.edu/~susagctr/?Page=council/members.php&SM=m-council.html. The Council's goal is to "encourage the development and use of economically and ecologically sound sustainable agriculture practices."

According to the annual Vermont Poll (2008) the economy and the environment were at the top of Vermonters' concerns. In response, Vermont has enacted Act 148 in 2015 which bans disposal of recyclables. This sustainable materials management strategy focuses on using materials throughout the entire lifecycle of a product or material with the intent of preventing overall waste, increasing reusability, and increasing recycling and organics diversion. This strategy influences the local economic development, works with communities to build a working landscape and decreases Vermont's greenhouse gas emissions that contribute to climate change.

Improved knowledge and skills leading to the adoption of new practices can promote economic sustainability of farms, forests, natural-resource based enterprises and communities. The Vermont Agriculture Experiment Station (VT-AES) is uniquely positioned to integrate the latest research on agriculture, forestry, and enterprise development at the community and business level.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Converting cow manure into renewable energy prevents harmful methane from reaching the atmosphere. Methane on dairy farms accounts for the majority of agriculture's greenhouse gas emissions. According to Renewable Energy Atlas of Vermont (http://www.vtenergyatlas-info.com/biomass/methane-digesters) one cow produces about 30 gallons of manure a day which, in turn, can generate enough electricity to power two 100-watt

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
219478	0	199578	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
293182	0	373906	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
813200	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Public: Childcare Workers
- Public: Daycare Providers
- Public: Families with Limited Resources
- Public: General
- Public: Nonprofit Organizations
- Train-the-Trainer recipients (Adults)
- Public: Age 6-12 (Children)
- Nutrition Educators
- Culinary Instructors
- College Students
- Public Health Researchers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	625	25	0	0

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

Patent Applications Submitted

Year:	2015
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	0	9	9

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Consultation

Year	Actual
2015	125

Output #2

Output Measure

- Consumer Publication

Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Curriculum

Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Fact Sheets

Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Publication - Newprint

Year	Actual
2015	6

Output #6

Output Measure

- Train the trainer program

Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Workshop Series

Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Workshop - single session

Year	Actual
2015	21

Output #15

Output Measure

- Field Site Visits

Year	Actual
2015	24

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of individuals who incorporate one or more healthful eating practices and/or physical activity to prevent/manage disease and/or obesity
2	Number of individuals who use food planning and wise shopping behaviors improve diet and the supply of food
3	The number of individuals who select and prepare a variety of produce to help prevent/manage disease and/or obesity
4	Number of research methodologies used to help men with weight loss.

Outcome #1

1. Outcome Measures

Number of individuals who incorporate one or more healthful eating practices and/or physical activity to prevent/manage disease and/or obesity

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	102

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
607	Consumer Economics
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
805	Community Institutions and Social Services

Outcome #2

1. Outcome Measures

Number of individuals who use food planning and wise shopping behaviors improve diet and the supply of food

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

The number of individuals who select and prepare a variety of produce to help prevent/manage disease and/or obesity

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	264

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The Vermont Senior Farm Share Program (SFSP) is a community supported agriculture (CSA) program that provides older and disabled adults living in subsidized housing in Vermont with fresh, locally-grown produce from July through October. Lifestyle changes that include more healthful eating (encouraging consumption of whole grains, vegetables, and fruits - especially those locally grown), can have a positive influence on reducing and managing chronic conditions to increase chances for a longer life.

What has been done
Research was conducted over the past year to determine what factors correlated to a greater intention of older adults, who are served by the SFSP, to consume fresh produce during the off season when SFSP is not in operation. A survey was sent to approximately 900 SFSP participants, and asked about perceived social influence, perceived control of lifestyle factors, and attitudes regarding their SFSP experience. Out of 641 respondents, 264 indicated that they participate in the program because it makes them feel healthier.

Results

Analysis of the survey results revealed that none of the three key factors evaluated (social influence, control of lifestyle factors, attitudes) predicted a greater likelihood of purchasing fresh produce during the off season. However, this research did find that the respondents living in rural communities placed greater importance on the social aspects of the Senior Farm Share program compared to respondents in more populated geographic areas. Additionally, those living in certain counties placed greater importance on the convenience of the program, i.e., the value of having the fresh produce delivered directly to the housing site where they lived. These results can help program administrators better understand what older adults value in the program, and how to make the program best meet their needs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
703	Nutrition Education and Behavior

Outcome #4

1. Outcome Measures

Number of research methodologies used to help men with weight loss.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Men are underrepresented in the obesity treatment literature. They are less likely to go for treatment and when they do, they lose less weight than women do. Better understanding of the barriers and beliefs men have about weight loss is needed. Using this information can help to plan an intervention.

What has been done
The methodology of this research involves the use of crowdsourcing technology. Crowdsourcing is a strategic model used to draw a responsive, motivated group of individuals who are able to provide solutions beyond those that traditional forms of research can.

Results

2015 University of Vermont Combined Research and Extension Annual Report of Accomplishments and Results

Outcome #7

1. Outcome Measures

Number of individuals who take steps to meet daily needs for health, education, social and personal wellbeing

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	296

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Roughly 300 refugees from other countries settle in the Burlington, Vermont area each year. Resettled refugees look to community gardening not only as a way to continue the traditions of their homeland, but also as a way to improve lifestyle and achieve daily needs of personal health. However, new American farmers are at a significant disadvantage, with English as a distant second language and being unfamiliar with the cultural norms of selling or adapting production systems to the Vermont climate.

What has been done
In 2015, The New American Farmer and Gardener Program (NAFGP) worked with the Association of Africans Living in Vermont (AALV) to help design an irrigation system for a new community garden. The team also addressed an existing community garden's ongoing issue: a water system that needed repairs and transition from a gas powered system to city water. In addition, hands-on irrigation workshops enabled participants to access, manage and maintain water systems; key skills to successful establishment of gardens and healthy wellness routines.

Results
As a result of the team effort, AALV was able to offer community garden access to over 100 people across five or more ethnic groups recently settled in the U.S. Participants were able to access garden plots in a timely manner and successfully transplant seedlings into the field. This was during a below-average rainfall period when water was absolutely critical in establishing starts; the two gardens could not have been opened this year without adequate water. 14 acres were planted to healthy food, representing significant strides for Burlington's resettled refugee population to achieve balanced diets, wellness goals and financial savings from growing their own food.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
704	Nutrition and Hunger in the Population
724	Healthy Lifestyle
805	Community Institutions and Social Services

V(H). Planned Program (External Factors)

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Food Safety

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
311	Animal Diseases	0%		11%	
503	Quality Maintenance in Storing and Marketing Food Products	0%		15%	
604	Marketing and Distribution Practices	0%		6%	
607	Consumer Economics	0%		6%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	0%		56%	
722	Zoonotic Diseases and Parasites Affecting Humans	0%		6%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	0.2	0.0	7.0	0.0
Actual Paid	0.0	0.0	7.5	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**
0	0	324442	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	378968	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

Vermont leads the nation in direct sales of local and specialty foods production on a per capita basis. Ensuring the safety of locally produced and processed food products is critical to protecting the state's reputation and markets.

Researchers work with producers to ensure food safety by evaluating the conditions and practices that preserve the quality of food to prevent contamination and food borne illnesses. Specifically VT-AES researchers are looking at methods for detection and evaluation of potential growth and survival of pathogens that are of concern to Vermont artisan cheese makers. From looking at the farm operations, from milking to marketing, integration of best practices are helping agricultural producers ensure the safety of their food products.

2. Brief description of the target audience

- Adults
- Public: Consumers
- Agricultural Producers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2015	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:	2015
Actual:	1

Patents listed
Polymerized whey protein based microencapsulation of ginsenosides and the method for the same. Patent No. 201410109127.7

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	0	5	5

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Consultations
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Newsprint Article
  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Presentations

Year	Actual
2015	2

Output #4

Output Measure

- Research Projects

Year	Actual
2015	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of people who show improvement in food safety and preservation practices
2	Number of research results to characterize the occurrence of visible crystals in long aged cheese differentiating long-aged artisanal cheese from conventional cheaper alternatives.
3	Number of approaches to identify food safety concerns from milking to marketing Vermont artisan cheeses.

Outcome #1

1. Outcome Measures

Number of people who show improvement in food safety and preservation practices

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of research results to characterize the occurrence of visible crystals in long aged cheese differentiating long-aged artisanal cheese from conventional cheaper alternatives.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Artisanal cheese making has become a vibrant and highly visible component of the Vermont dairy industry. Artisanal cheese must command premium prices in the marketplace in order to be economically sustainable, therefore, they must be readily differentiated from lower cost conventional cheeses through quality attributes that render them more interesting and satisfying.

What has been done
The research objective is to characterize the occurrence of visible crystals in long aged cheeses, identify factors that predispose specific cheeses to specific forms of crystallization, and establish relationships between predisposing factors and traditional practices used in artisanal cheese making.

Results
Researcher has determined that the crystals that form on surface of bloomy rind cheese consist of brushite, a form of calcium phosphate; linked crystallization to internal softening of the brushite cheese during ripening; identified two crystals ikaite and struvite on the surfaces of washed rind cheeses which warrants more research, and demonstrated that these crystals, ikaite and struvite are likely associated with gritty mouthfeel, which may be viewed as a positive or negative quality

attribute, depending on the market.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
607	Consumer Economics
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
722	Zoonotic Diseases and Parasites Affecting Humans

Outcome #3

1. Outcome Measures

Number of approaches to identify food safety concerns from milking to marketing Vermont artisan cheeses.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A vibrant artisanal cheese sector benefits Vermont's economy and working landscape. Demand for artisanal cheese, including raw milk cheeses, is increasing in the United States, and Vermont is a leader in on-farm artisanal cheese production. Vermont's recently enacted legislation allows direct to consumer sales of unpasteurized milk. Consumers are interested in unpasteurized milk and there is confusion among consumers regarding food safety risks associated with raw milk products.

What has been done
Objective of this project is to support Vermont's growing artisanal cheese production regional food chain with food safety microbiology, epidemiology and consumer research directly related to human health concerns.

Results
Identify pathogen epidemiology and testing, food safety concerns and practical risk management practices at the site of the dairy product production. This included a field study molecular

epidemiologic testing of materials from diverse sources across the farm and cheese production system, second approach seeks to understand consumer attitudes, beliefs, and practices related to raw milk products, and the third approach integrates the findings from the research efforts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
604	

Food safety pathogen epidemiology and detection research is addressed across the entire on-farm cheese production chain. Integration of detection technologies and an improved understanding of pathogen epidemiology mitigate food safety risk on dairy farms producing cheese or other raw milk products.

Key Items of Evaluation

Consumer interest in artisan and farmstead cheeses is driving explosive growth of on-farm cheese operations throughout the United States and in Vermont. Many of Vermont enterprises are small to very small establishments. Researchers are addressing the need to focus on assuring the microbiological safety of cheeses produced on the farm. With 38 artisan cheese producers, Vermont boasts the highest number of artisan cheese makers per capita in the United States. In order to allow this industry to grow and prosper, it is essential that the safety of artisan cheese be assured.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Urban Non Point Source Pollution

☐ Reporting on this Program

Reason for not reporting

Efforts addressing water are captured in other planned programs especially Global Foods. Sea Grant is not supported by any Smith Lever dollars so should not be captured in this reporting system.

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	2.8	0.0	0.5	0.0
Actual Paid	0.0	0.0	0.0	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**
0	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

This planned program is not supported by any Smith Lever dollars, therefore not appropriate for Extension's reporting in this system.

2. Brief description of the target audience

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2015	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:	2015
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Consultation

  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Demonstration

  Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Field day/Fair

Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Presentation

Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Fact Sheet

Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Tour

Not reporting on this Output for this Annual Report

Output #7

Output Measure

- Train the Trainer

Not reporting on this Output for this Annual Report

Output #8

Output Measure

- Web page updating

Not reporting on this Output for this Annual Report

Output #9

Output Measure

- Workshop series

Not reporting on this Output for this Annual Report

Output #10

Output Measure

- Workshop - single session

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	Number of landowners annually aware of Agriculturally productive Buffers
2	no new AIS species recorded from Lake Champlain basin
3	Number basin stakeholders and managers use invasive smelt and other AIS research results to manage sports fisheries.
4	Lake Champlain bass tournament organizers adopt aquatic invasive species (AIS) spread prevention BMP/HACCP tournament protocols
5	The number of Lake Champlain bass tournament organizers adopt aquatic invasive species (AIS) spread prevention BMP/HACCP tournament protocols.
6	Number marina users join their marina?s Clean Boating program each year
7	Number of Black bass conservation plan developed for City/Town of Plattsburgh, NY
8	Number of town plans annually include ordinances, polices, or other support for sustainable coastal development
9	Number municipalities annually with new or updated shoreline/riparian vegetation protection or restoration ordinances
10	Number basin municipalities annually apply BMP for climate change related shoreline erosion and bank stabilization
11	Number bioengineering plan adopted for planned Burlington bike path restoration
12	Number fish culture facilities annually in NY and VT adopt NRAC recommended biosecurity BMP practices
13	Number households annually reduce consumption of fish or fish products with high mercury content
14	Number [illegible] annually with management watershed/lake protection and restoration activities

Number of organizations using LCSG curricula for T

18	The number of boaters and anglers using AIS spread prevention techniques
19	Number of organizations support sustainable development of lake-based tourism and recreation
20	Communities annually adopt BMP, policies and ordinances to protect local water quality
21	Number of communities annually adopt practices that mitigate the impact of climate change
22	Number of property owners apply for technical and financial incentives through Let it Rain program
23	The number basin municipalities annually apply BMP

Outcome #1

1. **Outcome Measures**

   Number of landowners annually aware of Agriculturally productive Buffers

   Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

   no new AIS species recorded from Lake Champlain basin

   Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

   Number basin stakeholders and managers use invasive smelt and other AIS research results to manage sports fisheries.

   Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Lake Champlain bass tournament organizers adopt aquatic invasive species (AIS) spread prevention BMP/HACCP tournament protocols

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

The number of Lake Champlain bass tournament organizers adopt aquatic invasive species (AIS) spread prevention BMP/HACCP tournament protocols.

Not Reporting on this Outcome Measure

Outcome #6

1. **Outcome Measures**

Number marina users join their marina?s Clean Boating program each year

Not Reporting on this Outcome Measure

Outcome #7

1. **Outcome Measures**

Number of Black bass conservation plan developed for City/Town of Plattsburgh, NY

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

Number of town plans annually include ordinances, polices, or other support for sustainable coastal development

Not Reporting on this Outcome Measure

Outcome #9

1. **Outcome Measures**

Number municipalities annually with new or updated shoreline/riparian vegetation protection or restoration ordinances

Not Reporting on this Outcome Measure

Outcome #10

1. **Outcome Measures**

Number basin municipalities annually apply BMP for climate change related shoreline erosion and bank stabilization

Not Reporting on this Outcome Measure

Outcome #11

1. **Outcome Measures**

Number bioengineering plan adopted for planned Burlington bike path restoration

Not Reporting on this Outcome Measure

Outcome #12

1. **Outcome Measures**

Number fish culture facilities annually in NY and VT adopt NRAC recommended biosecurity BMP practices

Not Reporting on this Outcome Measure

Outcome #13

1. **Outcome Measures**

Number households annually reduce consumption of fish or fish products with high mercury content

Not Reporting on this Outcome Measure

Outcome #14

1. **Outcome Measures**

Number Lifelong learners (non-youth) annually implement watershed/lake protection and restoration activities

Not Reporting on this Outcome Measure

Outcome #15

1. **Outcome Measures**

Number of organizations using LCSG curricula for watershed stewardship

Not Reporting on this Outcome Measure

Outcome #16

1. **Outcome Measures**

Members of sports fishing angler organization annually participate actively in annual sports fisheries protection, enhancement and habitat conservation efforts

Not Reporting on this Outcome Measure

Outcome #17

1. **Outcome Measures**

The number of feet of shoreline protected or restored annually

Not Reporting on this Outcome Measure

Outcome #18

1. **Outcome Measures**

The number of boaters and anglers using AIS spread prevention techniques

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
- Other ()

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators