V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management	4%		0%	
133	Pollution Prevention and Mitigation	24%		0%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		5%	
202	Plant Genetic Resources	0%		8%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		10%	
205	Plant Management Systems	5%		8%	
206	Basic Plant Biology	0%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		7%	
216	Integrated Pest Management Systems	6%		1%	
302	Nutrient Utilization in Animals	0%		10%	
308	Improved Animal Products (Before Harvest)	0%		4%	
311	Animal Diseases	0%		2%	
501	New and Improved Food Processing Technologies	0%		5%	
601	Economics of Agricultural Production and Farm Management	38%		16%	
602	Business Management, Finance, and Taxation	10%		0%	
604	Marketing and Distribution Practices	3%		3%	
605	Natural Resource and Environmental Economics	4%		5%	
723	Hazards to Human Health and Safety	6%		0%	
724	Healthy Lifestyle	0%		6%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		5%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	31.0	0.0	5.7	0.0
Actual Paid Professional	5.0	0.0	11.5	0.0
Actual Volunteer	5.5	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
917811	0	988812	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
2217860	0	858318	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
2574519	0	25338	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Project listed in bold followed by delivery methods

- **Beginning Farmer Initiative**. Focus groups, learning circles, workshops, mini-courses and publications
- **Ag Business Management.** Conferences, courses, consultations and farm visits.
- **Agricultural safety**. Courses, consultations and farm visits
- **Equine program.** Annual equine event, publications, workshops.
- **Farm and Forest Transfers.** Workshops, consultations, farm visits
- **Farm Viability.** Farm visits, consultations
- **Farming Alternatives**. Workshops, consultations, farm visits.
- **Forage and Pasture Management Education.** Conference, farm visits, consultations
- **Maple Program.** Conference, workshops, newsletter.
- **Nutrient Management Program**. Farm visits, consultations
- **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
- **UVM Tax School.** conference, tax book
- **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.** Research, conference.
- **Extension Master Gardener.** Course, train the trainer
- **Women's Agricultural Network.** Newsletters, website, classes, workshops, individual and small group consultations.
- **GAP**: Consultations, workshops

AES efforts.

- **Animal Manure Treatment Systems**
- **Perturbation of soil ecosystems by anthropomorphic interventions**
- **Soil nutrient effect on forest ecosystem productivity and lake water quality**
- **Soil fertility/chemistry/physical problems associated with waste disposal and bioremod faction**
- **Economics of organic dairy, crop management and alternative energy**
- **Heifer nutrition, rearing and management**
- **Dairy nutritional immunology**
- **Small ruminant production and management systems**
- **Development of strategies to address applied equine issues**
- **Biofuels from energy sources**
- **Identification of genetic traits that make species invasive**
- **Surveillance and prevention of spread of Asian Longhorned Beetle**
- **Management of thrips pests in forests and greenhouses**
- **Identification/control of fungal propagation**
- **Fungal biological plant protection, collection and management**
- **Explore microbial pesticides and fungal components as IPM strategies**
- **Innate immunity, DNA-based vaccines and mastitis prevention**
- **Hormonal regulation of glucose synthesis and milk production**
- **Functional genomics and photoperiod effects on hormonal cycles/milk production**
- **Explore ruminant lipid metabolism**

- **Impact of global climate**

- Understanding cheese crystals as a means to differentiate and add value to artisan cheese
- Health needs of Hispanic farmworkers
- Use of digital marketing to promote agricultural businesses

2. Brief description of the target audience

- 4-H: Youth
  - Adults
- Age 25 - 60 Adult
- Agriculture/Natural Resources: Watershed Based Organizations
- Agriculture: Apple Growers
- Agriculture: Beef Producers
- Agriculture: CCA & Crop Consultants
- Agriculture: Crop Producers
- Agriculture: Dairy Producers
- Agriculture: Equine Producers/Owners
- Agriculture: Farm Employees
- Agriculture: Farm Families
- Agriculture: Farm Managers
- Agriculture: Farmers
- Agriculture: Beginning Farmers
- 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

- Communities: Educators
- Communities: Local Officials/Leaders
- Communities: Non-Governmental Organizations
- Communities: Town Health Officers
- Community leaders and citizens
- Community: Health Entities
- Dairy Farmers Agricultural Labor Organizations
- Environmental Professionals: Environmental Managers
- Extension: Advisors
- Extension: Faculty/Staff
- Fiddlehead Gatherers
- Food Industry: Handlers

- Food Industry: Processors
- Food Industry: Producers
- Health Care Clinics serving Migrant Labor
- Home Gardeners
- Non-profit State Agricultural Agencies
- Markets offering Fiddleheads
- Ornamental Perennial Growers
- Public: Women and Minorities
- Public: Master Gardeners
- Retailers
- Service Providers in New England
- Wine Producers in New England

3. How was eXtension used?

Contributed to content and served on CoP leadership. Follows is a narrative from one CoP

Issue:

Developing a sustainable regional bioenergy supply chain suffers from a "Catch-22" - Industry is reluctant to develop without a consistent supply of bioenergy feedstocks, while crop producers must have an established and reliable market in order to produce feedstocks. USDA acknowledges the complexity of this issue and has invested $146 Million over 5 years into 6 regional Coordinated Agricultural Projects (CAPs). Each Project will facilitate the development of a sustainable regional supply chain by integrating research, education and Extension/outreach/technology transfer.

What has been done? - 500 characters or less

As the national site for Extension collaborations and outreach, eXtension.org provides the logical platform to disseminate knowledge from the Bioenergy CAPs, and is encouraged by the funder. Sue Hawkins, eXtension Farm Energy Coordinator at UVM Extension, has worked with CenUSA and NEWBio Project researchers and extension educators. Resulting research-based resources and programs are produced with/under Sue's direction and published through the eXtension Farm Energy site, which provides integration with existing site materials. For an example, see CenUSA Resources.

Results: What has changed for participants as a result of this work? - 1000 characters or less

Two Bioenergy CAP Projects, CenUSA and NEWBio, involving 194 collaborators, 15 States, 16 Universities, 8 Federal and 8 Industry Partners are now using eXtension Farm Energy to share their collective knowledge. This includes articles, webinars, video, ask-an-expert specialists, enterprise budgets, decision making tools, etc., from these projects, which 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

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	24400	420000	846	300

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

Patent Applications Submitted

Year:	2013
Actual:	3

Patents listed

.U.S. Patent #8,539,712 B2 Maple Syrup Production Assembly with Backflow Check Valve, Issued September 24, 2013
.U.S. Patent #8,424,242 B2 Dual-line Spout and Maple Syrup Production System Using Same, Issued April 23, 2013
.WO 2013/130925 A1 Sap-collecting Devices, Systems and Methods for Sap-producing Saplings, Published September 6, 2013

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	7	6	13

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Class/course

Year	Actual
2013	9

Output #2

Output Measure

- Conference

Year	Actual
2013	10

Output #3

Output Measure

- Consultation

Year	Actual
2013	3532

Output #4

Output Measure

- Consumer Publication

Year	Actual
2013	7

Output #5

Output Measure

- Demonstration

Year	Actual
2013	197

Output #6

Output Measure

- Discussion group

Year	Actual
2013	105

Output #7

Output Measure

- Educational/evaluation instrument

Year	Actual
2013	2

Output #8

Output Measure

- Electronic Communication/phone

Year	Actual
2013	236

Output #9

Output Measure

- Field day/fair

Year	Actual

2013	6

Output #10

Output Measure

- Field site visit

Year	Actual
2013	83

Output #11

Output Measure

- Funding request

Year	Actual
2013	40

Output #12

Output Measure

- Presentation

Year	Actual
2013	113

Output #13

Output Measure

- Publication - Peer Reviewed

Year	Actual
2013	7

Output #14

Output Measure

- Publication - curriculum

Year	Actual
2013	11

Output #15

Output Measure

- Publication - fact sheet

Year	Actual
2013	33

Output #16

Output Measure

- Publication - magazine article

Year	Actual
2013	13

Output #17

Output Measure

- Publication - manual

Year	Actual
2013	5

Output #18

Output Measure

- Publication - newsletter

Year	Actual
2013	63

Output #19

Output Measure

- Publication - newsprint article

Year	Actual
2013	86

Output #20

Output Measure

- Research project

Year	Actual
2013	26

Output #21

Output Measure

- TV segment/ATF

Year	Actual
2013	28

Output #22

Output Measure

- Technical Publication
  Not reporting on this Output for this Annual Report

Output #23

Output Measure

- Tour(s)

Year	Actual
2013	4

Output #24

Output Measure

- Train the Trainer trainings

Year	Actual
2013	107

Output #25

Output Measure

- Website development and updates

Year	Actual
2013	156

Output #26

Output Measure

- Workshop - series

Year	Actual
2013	11

Output #27

Output Measure

- Workshop - single session

Year	Actual

2013	164

Output #28

Output Measure

- Electronic publications

Year	Actual
2013	4

Output #29

Output Measure

- Radio

Year	Actual
2013	2

Output #30

Output Measure

- Interviews

Year	Actual
2013	11

Output #31

Output Measure

- Regular news columns

Year	Actual
2013	3

Output #32

Output Measure

- Featured article

Year	Actual
2013	2

Output #33

Output Measure

- Educational video

Year	Actual
2013	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase and maintain collaboration on events with agency and industry personnel to address safety (farm, food, etc.) and emergency preparedness
2	number of farmers that develop a nutrient management plan protecting water and soil
3	number of Master Gardener participants earning certification
4	number of farmers who implement best field management practices(s) (crop/pasture) improving crop and/or soil productivity while protecting water, air and/or soil
5	Number of individuals who implement IPM practice(s) increasing the protection of water, air and/or soil
6	Number of individuals and business owners who implement recommended practice(s)that accomplish owner values and goals to improve/protect business sustainability
7	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
8	The number of growers who adopt new crop/plant variety(ies) resulting in maintaining or increasing sales
9	number of individuals who complete a business plan, start a business (within 18 months of planning) based on personal values, goals and business viability
10	number of participants who make an intentional, informed decision regarding starting a business based on feasibility, personal goals and values
11	Number passing the USDA GAPs audit to gain or maintain a market for their locally grown crop(s)
12	The number of growers growing organic crops increase revenues improving business sustainability
13	The number of producers who implement produce safety/food safety plans/practices to gain or maintain a market for their locally grown crop(s)
14	number of farmers who implement key element(s) of their nutrient management plan protecting water and soil
15	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
16	Number of individuals who implement recommended gardening practice(s) protecting water, air, and/or soil
17	Number of challenges that health care providers face as they seek to meet the needs of Vermont's migrant dairy workers.

18	Number of research results which increase the understanding of a plants response to their environment.
19	Number of studies that enhance assessment of evolutionary potential of plants to adapt to climate change.
20	Number of research results that help farmers capacity to produce high quality organic wheat.
21	Number of evaluation methods to determine the use of social media for marketing with winery producers in Vermont.
22	Number of new or improved innovations developed for safety/quality for maple producers.
23	Number of research trials to manage insect populations in greenhouse ornamentals(plants).
24	Number of research results that identifies which breeds of dairy cows that are likely to produce less methane per kilogram of fluid milk or milk solids.

Outcome #1

1. **Outcome Measures**

   Increase and maintain collaboration on events with agency and industry personnel to address safety (farm, food, etc.) and emergency preparedness

   Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

   number of farmers that develop a nutrient management plan protecting water and soil

2. **Associated Institution Types**

   - 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	11

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nutrient Management plans (NMP) are completed by farmers to protect soils and water. Record keeping is an important element to developing, implementing and updating NMP but many farmers find this a challenge. They are frequently in the field or barn where a big binder or keeping track of notes can be a problem.

What has been done
Noting this record keeping challenge and that most farmers carried smart phones or other devices UVM Extension developed the goCrop web and mobile app. Then a 5 week class was held for farmers to learn how to develop and document their NMP using GoCrop software. This met the NRCS 590 standard for nutrient management. Farmers attended workshops completing farm NMPs and follow up post surveys were conducted.

Results
Results from NMP course work indicate 43% implemented cover cropping, 42% reduced tillage, and 14% implemented new crop rotation elements of their NMPs preventing tons of soil erosion and contamination of ground and surface water. In addition the goCrop project was awarded about $400,000 from USDA this spring to expand the app for use around the Northeast and California, where soil conditions are different, and add functions for mapping, grazing and pest management. This technology will support farmers in their efforts to keep accurate records to implement and maintain their NMPs protecting our natural resources.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #3

1. Outcome Measures

number of Master Gardener participants earning certification

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

number of farmers who implement best field management practices(s) (crop/pasture) improving crop 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
2013	158

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Water quality degradation is problematic in Lake Champlain. Often this is the result of erosion and runoff of nutrients from agricultural soils. Soils left without growing plants are often at higher risk for erosion, many of these fields are fall harvested corn fields or are on heavy clay, in flood plains and are highly erodible. Another issue is direct access to streams by livestock. Methods are available which reduce erosion and contaminants entering water but time appropriate tools, and experience can be barriers.

What has been done
UVM proposed aerial seeding of cover crops prior to harvest allowing cover crops to establish earlier and to address the time element for farmers. No-till grain drills benefit some fields with decreased soil erosion, phosphorus runoff, increased soil organic matter and reduced fuel costs. Two no-till drills were outfitted with a GPS monitor and receiver were offered, transported and demonstrated to farmers. Livestock exclusion projects were also offered with financial support. Field demonstrations, factsheets, newsletters, Youtube and other educational outreach were completed during the year.

Results
Though cover cropping has become more popular over the last 5 years with acreage increasing from 500 acres in 2007 to 6000 acres in 2011, in 2012 over 2000 acres of land that would have been bare were aerial seeded and had ground cover heading into winter. In 2012 farmers retrofitted planters to no-till with GPS and thousands of acres were planted without plowing preventing an average soil loss from erosion at 2 tons per acre. Over 27,000 linear feet of stream bank were protected with exclusion projects. With over 150 farmers implementing these practices tons of contaminants have been prevented from impairing our waters.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
601	Economics of Agricultural Production and Farm Management

Outcome #5

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
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	99

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Home gardeners want to garden more economically and are sensitive to contaminants to their food and natural environment. With a double digit increase in the percent of households growing their own edible plants within the past 5 years, home gardeners need and desire information on these topics. Greenhouse growers and garden supply owners want the latest information to be responsive to home gardeners and are themselves interested in using best practices to reduce costs and protect the environment.

What has been done
The annual Vermont Flower Show offers home gardeners talks on a variety of topics with standing room only at many sessions. Greenhouse growers and garden retailers meet annually and access Extension expertise with on-line resources and consultations. In 2012 an estimated 562 unique individuals attended educational sessions at the 2013 Show, attending an average of 4.3 sessions. A majority, 83%, of the participants have been to previous conferences consistent with the 3 year average of 85%. The series of 26 sessions is done by local, regional and national experts. A biennial Northeast Greenhouse conference was held in Massachusetts, its 40th year with approximately 1100 attendees this year also with educational sessions. Participants are asked if they have attended previously, if so did they implement something they learned.

Results
Sixty-six percent of the attending home gardeners report using more environmentally friendly practices. This year 53% reported using less pesticides and more IPM, and 62% purchased new or appropriate plants. A separate market survey found on average they each spent $300 per year on gardening. Previous greenhouse conference attendees reported 74% made changes in pest management practices such as using biologicals, 38% incorporated more sustainable production practices and 31% realized energy savings and improved marketing. Cost savings for industry

keeps down costs passed on to home gardeners and viable businesses. Both industry and home gardeners are using IPM practices. Judicious use of chemicals and pesticides minimizing the negative impacts to people, animals, and the environment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
216	Integrated Pest Management Systems
723	Hazards to Human Health and Safety

Outcome #6

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
2013	860

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Strong demand for fresh local food is booming in the region and that is reflected in the growth of greenhouse and high tunnel (unheated greenhouse) vegetable production in Vermont. The 2007 Census of Agriculture notes that Vermont produced in 425,083 sq ft. of greenhouse totaling $3.95 million in sales. Since then, production has more than doubled evidenced by USDA NRCS-VT funding for 209 new high tunnels on vegetable farms from 2010-12. Managing crop nutrition in this situation is challenging. Typical soil tests do not meet their needs.

What has been done
The saturated media extract (SME) test has been used to test soilless potting mixes to grow bedding plants and flowers and is described as a soil test for in-ground greenhouse tomatoes. UVM Extension compared traditional soil test and SME results from the same greenhouse soils, refined the Michigan greenhouse tomato nutrient recommendations based on SME and adapted them from conventional fertilizers to organically- allowed fertilizers. This new information was presented at conferences, on-line fact sheets and at a regional research symposium.

Results
Since 2007, approximately 300 greenhouse soil samples have been submitted to labs, then forwarded to UVM Extension for interpretation and recommendations. A December 2012 anonymous survey of 50 growers, 43 who responded had 179 greenhouses and tunnels with 569,330 sq. ft. of growing area producing $1.99 million in annual sales. 98% said they followed the recommendations with 21 of the 43 responding giving a estimated value of the recommendations on their greenhouse crop production. The 21 estimated $166,250 or $7,197 per farm in additional revenue. Extrapolating this to the 43 respondents would total over $1.2 million. A significant boost to these farms viability and importantly a significant increase in public access to local fresh food.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
605	Natural Resource and Environmental Economics
723	Hazards to Human Health and Safety

Outcome #7

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
2013	39

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Vermont controls approximately 35% of all U.S. maple syrup production or distribution.1 The maple industry is not only an important contributor economically, about $40 million each year, but also for its contribution to the Vermont landscape, important to Vermont's tourism industry. Protecting the Vermont brand and public health, buyers and resellers of bulk Vermont syrup

asked for a regulatory program. 1 Maple Syrup UVM Libraries library.uvm.edu/maple/faq/

What has been done
A voluntary certification program for Sugarmakers was developed with input from industry leaders, food safety specialists and others in the maple industry. A letter explaining the voluntary program was shared with 700 Sugarmakers. At the Vermont maple conferences, held around the state, 2-1 hour long sessions for producers were held explaining the certification guidelines. While we considered this might be a 'bitter pill' and of interest to the only the largest producers, many producers under the 2000 tap number attended.

Results
Eighty percent of those attending the sessions, over 230 producers, rated this session as the "most informative and useful" session of the day supported with comments like, "I'm glad we sugarmakers are on top of this; certification is coming -good to get ahead of the curve." The person in charge of the inspection team currently accrediting the Vermont maple operations said, "One of the things that is very evident is that producers attended the maple conference and listened to the presentation on the certification guidelines. Most have taken the information that you provided and upgraded their operations...some small producers that, while they may not sign up for certification, have taken advice given and made changes regarding food safety. I think this is a big win for the Vermont maple industry."

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
723	Hazards to Human Health and Safety

Outcome #8

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

number of individuals who complete a business plan, start a business (within 18 months of planning) based on personal values, goals and business viability

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Half of Vermont's 6900 farms have at least one woman operator. The most recent USDA Census of Ag shows the number of female principal operators in Vermont increased from 967 to 1466 in five years. Data shows that women tend to have smaller farms, to farm using sustainable practices with the goal of producing safe, healthy food. As a growing segment of the farming population, they will be looked to to maintain Vermont's productive landscape and to provide access to local, healthy food. They will need a strong network, education and technical assistance.

What has been done
For the last four years VT Women's Ag Network (VT WAgN) and the VT New Farmer Project (VT NEP) of UVM Extension partnered with Holistic Management International to offer a unique curriculum in Whole Farm Planning funded by USDA Beginning Farmer and Rancher Development grant. Each year since 2010 a class of 15 attended a 10 day-long session on holistic farm management with one farmer receiving training to become a certified educator in Holistic management.

Results
Of the 60 participants 46, 76.6% are still managing farm businesses. This success rate deviates from the expectation that over 56% will fail after 4 years. Others made the decision not to farm or pursued other careers. Recognizing the contribution of women and the challenges they bring to agricultural careers has grown the ag sector in Vermont creating jobs, economic stimulus to communities and access to local, healthy food. This group of farmers is critical to Vermont's long term agricultural economy.

4. Associated Knowledge Areas

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

Outcome #10

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
2013	3

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

Outcome #11

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
2013	35

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
723	Hazards to Human Health and Safety

Outcome #12

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
2013	91

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The local food movement has increased the demand on farmers to produce new crops such as cereal grains for human consumption and hops for the brewing industry. These crops have not been grown in Vermont for many decades so there is little to no information. Farmers were demanding information on how to best grow and harvest an economically viable product on their farm to have the opportunity to grow a high value crop, important to their farms viability.

What has been done
Resources were developed and made accessible in various formats. Research sites, consultations, field days, and conferences were held. Wiki's (working model and designs) were posted for a hops harvester, drier (oast), and a mechanical and hand operated baler. From June 2011 - August 2012 information was delivered to 708 farmers and service providers on grain production and 645 on hop production. The mobile hops harvester is used by multiple farms allowing timely harvest for small producers. 100 growers were surveyed to determine impact on their farms.

Results
Survey results for grain growers reflect 68% have improved networking; 29% have increased their grain acreage; 29% have improved markets and processing infrastructure. At least 3 brewers, 2 distillers, and 2 maltsters are now purchasing local grains. Hops results reflect 95% were helped to start or expand their hopyard; 68% used our research to improve yields; 100% stated the research helped them improve hop quality; 60% reported the project helped them find markets. As a direct result of the UVM networking events, 13 local breweries are now purchasing hops from Vermont growers. In 2012, 91 farms report as a result of growing grains or hops they have improved the viability of their farms, protecting businesses in Vermont communities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #13

1. Outcome Measures

The number of producers who implement produce safety/food safety plans/practices 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

2013	23

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
723	Hazards to Human Health and Safety

Outcome #14

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	24

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 #15

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 #16

1. Outcome Measures

Number of individuals who implement recommended gardening practice(s) 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
2013	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
205	Plant Management Systems
216	Integrated Pest Management Systems

Outcome #17

1. Outcome Measures

Number of challenges that health care providers face as they seek to meet the needs of Vermont's migrant dairy workers.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In the past ten years Hispanic workers have arrived in Vermont and have become a significant portion of the Vermont dairy labor force. In 2007 the Vermont Department of Health studied the health status and found a number of problems; primary care for childhood was inconsistent, for some there were no vaccinations, workers were not screened for tuberculosis, limited dental care, skin problems, and pain and injuries related to work.

What has been done
Research includes an assessment of the challenges rural health care providers face with this new foreign population.

Results
Information in this research will be used in law enforcement, outreach to farmers, public opinion, supported environments, and policy development.

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #18

1. Outcome Measures

Number of research results which increase the understanding of a plants response to their environment.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Plants are rooted to one spot their entire life. In order to survive, plants must sense even the smallest environmental change and respond rapidly, changing their physiology and modifying further development.

What has been done
Plants produce reactive oxygen species (ROS) in response to environmental stress. The research lies with understanding how plants respond to environmental stress by understanding how ROW is regulated. The research tests the GIRAFFE gene involved in ROS in the plants roots to see if plants have abnormal levels of ROS.

Results
The research has found that the GIRAFFE gene alters the expression of certain enzymes that are required for oxidative stress on plants. Understanding the rapid molecular changes that underlie plant's responses to the environment can help optimize conditions or treatments that maximize plant yields under stressful conditions.

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 #19

1. Outcome Measures

Number of studies that enhance assessment of evolutionary potential of plants to adapt to climate change.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The understanding of how climate change affects plants development will enable agricultural farmers and researchers to better understand how to improve crops.

What has been done
The studies that were performed; phylogenetic, geo-climatic, gene expression and functional tools. With these studies, the researcher is determining the genetic basis for losses of vernalization responsiveness and assessing the evolutionary potential of plants to adapt to climate change.

Results
Vernalization responsiveness plants are winter cold and are accustomed to harsh temperatures. It was determined that extended period of cold makes plants able to respond to long days and warm temperatures.

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 #20

1. Outcome Measures

Number of research results that help farmers capacity to produce high quality organic wheat.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Demand for local organic food continues to rise throughout Vermont and the Northeast.

What has been done
Develop viable organic bread wheat production strategies by addressing production constraints, determine the impact of spring wheat cultivar selection and planting date on weed biomass, determine the impact of winter wheat cultivar selection and harvest timing on grain yields and end-use quality.

Results
The researcher has determined that mid to late April planting dates produced significantly higher yields compared to mid to end of May planting dates. Varieties with taller stature competed better with weeds. Weed biomass was significantly higher as planting dates became later. Taller varieties should be planted later. Highest yields were obtained at wheat physiological maturity (30% moisture).

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #21

1. Outcome Measures

Number of evaluation methods to determine the use of social media for marketing with winery producers in Vermont.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	2

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
A survey/interview with winery owners in Vermont to collect information regarding demographics and characteristics of farm and farm operators, such as farm size and farm operations.

Results
Evaluation methods were developed to assess network impacts on promotional strategies for winery producers in the Northeast region. The first one was a scale-level ranking system to evaluate social media applications and effectiveness for various public supported websites and the second was a survey instrument to collect winery producers perceptions of using social media to promote wines. Research will help farmers to maintain existing market shares while also expanding into new business areas, even as they face growing challenges from global competition.

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 #22

1. Outcome Measures

Number of new or improved innovations developed for safety/quality for maple producers.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Vermont maple producers face increasing challenges to maintain economically sustainable operations. Rising fuel prices and costs to implement the practices to meet the demands for heightened assurance of product safety and quality have increased.

What has been done
The project will be accomplished in two phases. Currently the project is in phase one. Phase one will will focus on establishing whether a sufficient quantity of sugar can be extracted annually using alternative systems of maple crop management. If found to be sufficient, Phase II will take place in Years 4 and 5, and will determine the optimum alternative system and develop and optimize techniques and equipment for this system.

Results
The result is an estimation of the quantity of sugar that can be extracted repeatedly using the alternative systems of maple crop management, and to accommodate for year-to-year variation in sapflow conditions. It is important to maple production operations to develop ecologically sustainable mechanism to increase the productivity and enable producers to continue to thrive and provide affordable high quality product to consumers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
206	Basic Plant Biology

Outcome #23

1. Outcome Measures

Number of research trials to manage insect populations in greenhouse ornamentals(plants).

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The greenhouse industry is a vital and dynamic component of New England's changing agricultural economy. Pest control strategies are heavily reliant on chemical pesticides, a situation that is neither sustainable nor desirable, and novel approaches that increase opportunities to utilize biological controls are badly needed. This project seeks to generate information and novel technologies that will provide growers with the tools they need to increase their use of natural enemies, and enhance the activity of biological and reduced-risk pesticides.

What has been done
Marigolds are highly attractive to thrips and can be used for early detection and because they produce pollen can serve as habitat for mites by providing an alternative food source. The goal of the experiment is to see what plants attract mites and thrips.

Results
The results were found that in all locations there was more damage on the marigolds than on the crops. On many occasions, marigolds had ratings exceeding 50% foliar damage whereas nearby crop plants had less than 10 percent damage. When averaged over the entire experimental period, in general, more thrips were found on marigolds with not mites or fungal treatment than on those treated with mites and/or fungi. Two of the five sites had very low overall numbers of thrips making it difficult to make conclusions on treatment efficacy. Thrip numbers increased rapidly on some of the marigolds without the fungal or mite treatments and had to be removed 2-4 weeks before the end of the experiment to avoid reinfesting the crop. On these plants foliar damage of over 75 percent was observed. No significant differences in the number of thrips on marigolds with or without the lures.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems

Outcome #24

1. Outcome Measures

Number of research results that identifies which breeds of dairy cows that are likely to produce less methane per kilogram of fluid milk or milk solids.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Methane production is of concern for its waste of feed energy for the cow as well as its contribution to the accumulation of greenhouse gases. As methane is exhaled into the atmosphere, the cow suffers a loss of ingested feed-derived energy. The dairy and beef industries are continually challenged to adopt mitigation strategies that reduce production of greenhouse gases while incorporating best husbandry practices.

What has been done
Five lactating dairy cows from each breed; Holstein, Jerseys, HolstenXJersey crosses were studied.

Results
Holstein and Jersey breeds account for the vast majority of animals used in the dairy cattle industry within the US. Holstein cow is on the average larger and produces greater amounts of milk, while a Jersey cow has better fertility, produces milk with higher solids content, is better at maintaining its body condition during lactation, and has a greater feed efficiency, which is known to result in lower methane production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Post event evaluation's via survey and on-site visits are standard practice of faculty and staff assessing if the expected outcomes are realized. Additional efforts such as a survey on bedded pack technology was done with the goal of establishing a one-day workshop to instruct new and existing farmers into a properly managed bedded pack.

Other strategies use annual events to ask attendees if they attended the previous year(s) and if and what they implemented as a result of the information gained.

Key Items of Evaluation