

2011 University of New Hampshire Research Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

This report reviews the primary research activities from the New Hampshire Agricultural Experiment Station (NHAES). It covers federal Hatch and corresponding matching and non-matching funds. Our partner University of New Hampshire Cooperative Extension (UNHCE) is a separate administrative unit; each of us reports individually to USDA. However many of our activities are synergistic: NHAES provides split funding for a number of UNHCE Faculty; covers costs for the UNH farms, dairies, and greenhouses that are used in common; and provides direct research support for a number of UNHCE activities. Therefore, a portion of UNHCE FY2011 achievements are the result of NHAES support and, likewise, some of the achievements of NHAES are facilitated by UNHCE.

In the report that follows we have highlighted significant achievements. As recommended by previous reviews, we are working to distill technical descriptions of research outcomes to lay terms. We realize the accessibility of our reports helps USDA/NIFA make the case for the value of federal investment in the Agricultural Experiment Station system.

NHAES tests new ideas and technologies for regional agricultural operations, averting financial risk for regional agricultural producers while working towards improving their operations' bottom line and sustainability. NHAES provides many opportunities for experiential learning for undergraduates, resulting in better educational outcomes and, ultimately, producing well-qualified employees. Ongoing activities of NHAES complement the renewed public interest about regional agriculture in New England and the growing local food movement. NHAES research projects address issues central to regional agriculture and those within NIFA national priorities. New interactions created by recent faculty cluster hires in sustainable agriculture are already reaping benefits by initiating learning communities, reinvigorating graduate and undergraduate majors, and launching extensive interdisciplinary research activity.

Funds that support NHAES research activities come from a variety of sources. For Federal FY2011, 34% of funding was from federal capacity funds, 43% was from state appropriations and 23% was from other sources outside the University. With regard to the last number, this is a very conservative estimate that includes only new grants initiated in FY2011 and not on-going projects. Federal and state capacity funds are essential to the NHAES's ability to contribute to agriculture and related natural resources.

Collaboration with other New England land grants allows NHAES to leverage its resources to address regional agricultural priorities. We have ongoing cooperation with the Maine Agricultural and Forest Experiment Station (MAFES), Vermont Cooperative Extension (VTCE), and the Massachusetts Agricultural Experiment Station (MAES) among others. Last year new NHAES faculty Smith and Grandy gave invited talks at the University of Maine. Members of the aforementioned Agricultural Experiment Stations test different fruits, vegetables and grains and production practices suited to Northern New England. These crops must be adapted to a short growing season, cold winters, and increasingly greater fluctuations in temperature and rainfall. Some research on agricultural practices from other parts of the US is not directly applicable to farming in Northern New England due to the specific soil types, climate, plant pathogens, and insect problems in the region. Therefore, a substantial amount of the agricultural research and integrated activities of Northern New England are targeted to regional concerns.

There is significant interest among producers in adopting sustainable agricultural practices; again these practices have to be tailored to the climate, growing season, soils, and pests of Northern New England. The NHAES Organic Dairy Research Farm is a living laboratory in which researchers work to understand nitrogen and C cycling under different land use regimens and investigate how to generate inputs for organic dairy production (bedding, energy) while maximizing energy as well as nitrogen from manure. Outcomes will improve the bottom line for dairy farmers and, potentially, other animal farmers.

Other NHAES research focuses on the changing demography of rural New Hampshire, better understanding of the obesity epidemic among college students, improved methods to monitor for bacterial pathogens in cultured shellfish, and factors that cause surface algal blooms in freshwater lakes. The following are a few highlights of NHAES research from the 2011AY report:

- The feeding of liquid molasses or high sugar forage to lactating dairy cows improves nitrogen utilization and reduces excretion to the environment
- Variety trials for sweet potato, a nontraditional crop, generated variety and cultural methods recommendations and influenced seventy-five farmers to further diversify local food production by adding sweet potato
- A hybrid squash cultigen with a bush habit, NH65 XLIC, was shown to have superior yield (50%) and earlier maturity than the common processing varieties
- A soy protein concentrate could be used to replace 50% of the fishmeal ration for juvenile cod in aquaculture, which will decrease input costs and improve the overall sustainability of cod aquaculture. Results were communicated to aquaculturists and researchers to help the expansion of the nascent New England cod aquaculture industry.
- Several projects brought their cutting-edge research on climate change and ecosystems directly to stakeholders. Of note is cooperative extension specialist Karen Bennett's organization of a conference for 150 stakeholders on "Adapting to Climate Change in Northern New England: Developing landscape solutions for the Natural Resource Community." The conference focused on collaboration in the Natural Resources Industry and identifying broad-based "no regrets" strategies for adaption at local and region levels.

Research conducted by NHAES scientists is of highest quality. This year, results of NHEAS-funded science were published in high impact journals such as Nature Genetics and PLoS One (Public Library of Science One) as well as in leading journals for individual disciplines. NHAES scientists were invited speakers at national and international conferences and at scientific society meetings. Research results and agricultural practices recommendations are regularly communicated to regional producers through field days, workshops, email, websites, and newsletters. Cumulative royalty income for the University of New Hampshire continues to be driven by licenses on plant varieties derived from NHAES plant breeding.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	25.9	0.0
Actual	0.4	0.0	16.9	0.0

II. Merit Review Process

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

- Internal University Panel
- Expert Peer Review
- Other (Peer review of proposals, manuscripts and products)

2. Brief Explanation

The New Hampshire Agricultural Experiment Station (NHAES) carries out a formal peer review process for proposed research projects. The competition for NHAES support is announced to eligible faculty via email. Faculty are encouraged to submit a one page prospectus and discuss this with the NHAES Associate Director. If the prospectus is consistent with NHAES guidelines, the faculty member is encouraged to develop a full proposal for competitive review. All proposals are studied by an Internal Review Panel comprised of faculty members plus the Associate Director. The Internal Review Panel is selected among current NHAES project directors who have externally funded research programs. Each proposal is evaluated based on the following criteria:

- relationship to Hatch or Hatch-Multistate programs and to the NHAES mission and priorities
- scientific and technical merit
- soundness of approach, procedures, and methodology
- likelihood of significant outcomes and/or innovation
- demonstrated previous and accomplishments or potential productivity
- probability to leverage NHAES resources
- likelihood to significantly enhance NHAES research capability and competitiveness.

Evaluations are discussed by the Internal Review Panel, the members of which rank each proposal's funding priority. The Director and Associate Director use the panel evaluation, along with their own evaluations with respect to NHAES priorities and resources, to make recommendations on which projects to fund. These proposals are sent to NIFA for final approval for funding. Merit review for NHAES research outputs, e.g. scientific publications, typically come through scholarly peer review. These external reviews provide consistent, strong feedback on quality of our internal review process. In addition, evidence of the value of NHAES activities is seen in the adoption of new crop varieties, new agronomic practices, new approaches to improved transfer of immunity to newborn calves, and/or modifications to food rations for both organic or conventional dairies in ways that increase the producer's bottom line.

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

- Other (Comments from proposal and manuscript reviewers)

Brief explanation.

NHAES sought stakeholder input on activities and priorities using a variety of approaches. NHAES sponsored public presentations and meetings with traditional and non-traditional stakeholders, both as individuals and groups. These included twilight tours of UNH horticulture farms, field days at the Dairy farms, and participation of researchers at various workshops sponsored by UNH Cooperative Extension. We continue to expand our interactions with less traditional, but enthusiastic stakeholders via local farmers markets where we engaged Community Sponsored Agriculture (CSA), and Community Supported Fisheries (CSF) operations. Through these activities, we are working to better target outreach to identify and engage non-traditional stakeholders, especially those who are unaware of research generated through the NHAES. Input by stakeholders for individual NHAES projects was encouraged in variety of ways, appropriate to each project, through the use of:

- surveys (by phone, in person or web-based)
- presentations at scientific and/or general conferences
- meetings for multi-state projects
- publications and mass media
- bringing NHAES to the University classroom and to K-12 students and teachers.

Our researchers value stakeholder input and participation, and we work to demonstrate to stakeholders how their input is incorporated in NHAES activities to encourage continued broad public engagement.

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

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys
- Other (UNH Cooperative Extension)

Brief explanation.

We partner with UNH Cooperative Extension; the NH Department of Agriculture, Markets and Food; the College of Life Science and Agriculture; and NHAES advisory groups, faculty, and staff to identify both individual stakeholders and groups. The Director, Associate Director, and faculty participated in statewide initiatives and on state and regional committees. UNH participates annually in the NH Farm and Forest Expo, which draws several thousand visitors each year. All together, these gatherings and meetings facilitate direct identification and communication with very large and diverse groups of stakeholders. Meeting with, and speaking to, participants at the Expo, field days, the annual COLSA greenhouse open house, and extension conferences and workshops provides insights from grower groups, lakes monitoring associations, industry groups, professionals, home gardeners, and state and federal government agencies. NHAES partners with the UNH Diversity and Affirmative Action & Equity Offices as well as Cooperative Extension to identify other underrepresented or underserved constituents.

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

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Meeting specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

Brief explanation.

For strategic planning and the development of NHAES programs and priorities, we collected input primarily through meetings with stakeholder groups and individuals including:

- growers
- farmers
- citizens
- agricultural organizations and councils
- natural resources professionals and managers
- representatives of state and federal agencies
- regional AES and Cooperative Extension administrators
- AES and Extension regional administrators
- project directors of ongoing research projects and their graduate and undergraduate students
- extension specialists
- others.

The NHAES Director, Associate Director, and research scientists participate in cooperative extension workshops providing a way to transfer knowledge while taking a pulse of the concerns of major stakeholder groups.

The web site for NHAES was overhauled in 2010. Our goal was to make the experiment station and agriculture more prominent and accessible via the web. We are tracking "hits" to the website and found that, overall, the NHAES website was accessed 4552 times during FY11, with the Organic Dairy Research Farm section attracting the largest percentage of hits at 36%.

NHAES projects obtained direct and indirect stakeholder input in various ways. Projects with social science components used interviews, questionnaires, and some online surveys. Basic science projects received input in the form of reviewer comments to proposals and manuscripts. Additional inputs were obtained during discussion at regional, national, and international meetings. For other projects, end users were able to ask questions of, and provide comments to, researchers during workshops and training sessions.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities
- Other (Strategic Initiatives Development)

Brief explanation.

Stakeholder input was incorporated into ongoing activities and in strategic planning. We continue to look both at ongoing needs and to anticipate changes in demands for NHAES activities as the agricultural landscape changes on a regional basis. For example, we are responding to requests to support research, training, and outreach for integrated activities for diversified small farms as well as traditional interests in dairy and horticultural production. Ongoing field days at research farms and greenhouses are aimed to engage and communicate NHAES research activities.

Brief Explanation of what you learned from your Stakeholders

NHAES has received ongoing input and interest in moving to focus on sustainable agricultural and food systems as well as local food and opportunities to increase the nutrition and healthfulness of regionally produced food. NHAES has completed the seven strategic hires in agroecology that will further support changes in regional agriculture. The number of undergraduates in the new Sustainable Agriculture and Food Systems major has more than doubled in a year, consistent with the net increase in the number of farms in NH in the last decade. Local food production is gaining momentum in the state, with increases in the number of farmers markets and the popularity of restaurants that feature locally sourced foods.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	1832869	0

2. Totaled Actual dollars from Planned Programs Inputs				
Extension			Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	1938581	0
Actual Matching	0	0	2288033	0
Actual All Other	0	0	1098220	0
Total Actual Expended	0	0	5324834	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	256597	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Agricultural and Environmental Products and Services
2	Agricultural Biotechnology and Genomics
3	Nutrition & Childhood Obesity
4	Climate Change Impacts on Agriculture
5	Food Safety
6	Global Food Security and Hunger
7	Rural and Community Development
8	Sustainable Energy

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Agricultural and Environmental Products and Services

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			13%	
112	Watershed Protection and Management			5%	
123	Management and Sustainability of Forest Resources			5%	
136	Conservation of Biological Diversity			4%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			33%	
204	Plant Product Quality and Utility (Preharvest)			17%	
205	Plant Management Systems			13%	
212	Pathogens and Nematodes Affecting Plants			5%	
213	Weeds Affecting Plants			5%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.5	0.0
Actual Paid Professional	0.0	0.0	0.9	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	127191	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	110120	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

- Conduct extensive greenhouse trials to develop production guidelines for *Osteospermum*, including nutrient sufficiencies, optimal lighting protocol, and other factors.
- Design experiments to test differences in root cold tolerance, winter survival, root and shoot growth, and morphology of woody plants in various nursery production systems.
- Test plant responses to container types and over-wintering techniques that will have a broad base of inference over a wide range of winter conditions.
- Support new faculty in their first two years as they use appropriate conceptual, theoretical, experimental, and statistical approaches to undertake and complete targeted agricultural research activities.

2. Brief description of the target audience

- Commercial nursery and greenhouse operations, including those who produce bedding plants across New England and the northern tier of the states, consumers of young and matured ornamental plants, and those interested in sustainable greenhouse production methods.
- Current and potential nursery and garden center owners, managers and employees in New England, and associated green industry professionals.
- State and regional stakeholders who desire effective, well trained scientists that are grounded in the land grant mission.

3. How was eXtension used?

Two of the principal investigators in the program area have partial appointments in extension. They relate research outputs and outcomes through growers meetings, extension fact sheets, and interactions with growers in New Hampshire and New England.

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	240	2000	0	46

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

Year: 2011
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	12	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of undergraduate students directly involved in the projects

Year	Actual
2011	6

Output #2

Output Measure

- Number of university courses in which project results have been incorporated

Year	Actual
2011	8

Output #3

Output Measure

- Number of presentations at regional, national, or international scientific meetings

Year	Actual
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2011 8

Output #4

Output Measure

- Number of workshops, training sessions and presentations to non-scientific stakeholders

Year	Actual
2011	8

Output #5

Output Measure

- Number of reviewed, bulletin, popular and other publications

Year	Actual
2011	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of graduate students trained and ready to enter the workforce.
2	Number of undergraduate students involved and trained in engagement research.
3	New and improved knowledge, products and services available to peers and stakeholders.
4	Stakeholders educated about new ornamental and landscape horticulture practices suitable for NH and the region.
5	Best management practices for <i>Osteospermum</i> production for NH and New England growers.
6	Increased knowledge about container plant overwintering techniques suitable for local conditions.
7	Peer reviewed publications.
8	To support new faculty in developing individual and collaborative competitive research programs in sustainable agriculture and ecosystem science and management.

Outcome #1

1. Outcome Measures

Number of graduate students trained and ready to enter the workforce.

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Number of undergraduate students involved and trained in engagement research.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
213	Weeds Affecting Plants

Outcome #3

1. Outcome Measures

New and improved knowledge, products and services available to peers and stakeholders.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Recent hire of seven faculty in an agrosystem ecosystem cluster provides a unique opportunity for interdisciplinary research to develop new sustainable agricultural practices for New England.

Land managers that are concerned about soil quality and fertilizer N use efficiency. frequently use N fertilizer. There continues to be uncertainty over the mechanisms that form and stabilize soil organic matter, and understanding these mechanisms is critical to developing sustainable agricultural systems.

What has been done

Several field experiments were established at the NHAES Kingman and Organic Dairy Research Farms in summer 2011 to test the effects of cropping system diversification and other sustainable agricultural practices on agro-ecosystem performance indicators, including weed and pathogen suppression, and crop productivity. Additional experiments were initiated to study the contributions of microbial communities to production and turn over of soil organic matter (SOM). The latter is critical to the availability of soil N for crops.

Results

Data from field experiments were collected over the summer and are currently being analyzed. These experiments will be repeated over several seasons.

New agro-ecosystem faculty have participated in in-service training for Maine Cooperative Extension Services, and in farm days.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

Stakeholders educated about new ornamental and landscape horticulture practices suitable for NH and the region.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Horticulture and landscaping comprise the largest agricultural section in NH. Updated production methods will help these sectors remain competitive

What has been done

New recommendations were prepared for improved growth and survival of American Cranberrybush (*Viburnum trilobum*)

Results

New production recommendation for American Cranberrybush and production techniques for landscaping trees were shared with stakeholders at several conferences.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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Outcome #5

1. Outcome Measures

Best management practices for Osteospermum production for NH and New England growers.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Owners/operators of greenhouses need information about how best to bring new cultivars to market while reducing production costs. New Osteospermum cultivars have been released to the trade since culture recommendations have been published. Improvements that were made to cultivars have made current recommendations obsolete.

What has been done

Experiments were in the greenhouse to improve quality of Osteospermum bedding plants. One experiment was to explore the affects temperature has on the flowering and the second experiment was to determine optimal concentration of several plant growth regulators to control the crop height.

Results

Research conducted over the past year will give growers more up-to-date information on plant growth regulator application (product and concentration) to apply to newer cultivars to obtain the desired height control for a crop. Greenhouse heating costs have been rising over the last several years and growers are constantly looking for strategies to save fuel. Research was conducted to determine if these new cultivars are adversely affected by lower growing temperatures for different durations during production. Revised recommendations for Osteospermum production are being prepared for the regional greenhouse industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)

205 Plant Management Systems

Outcome #6

1. Outcome Measures

Increased knowledge about container plant overwintering techniques suitable for local conditions.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

New England nurseries are at a competitive disadvantage in the national market for landscape plants. Most plants are imported from other areas and are not always well-adapted to our climate and soils. By developing better production systems and over-wintering techniques, production costs can be reduced and profitability increased, resulting in better local availability of appropriate landscape plants. The potential value of over-wintering nursery crops in-situ could be in the millions.

What has been done

Reviewed the scientific literature pertaining to root cold tolerance and methodologies used to compare cold tolerance under controlled conditions. Obtained container liners of tree and shrub species representative of different cold tolerance ranges and constructed over-wintering shelter to allow access to plants for root sampling during winter months. Began testing protocols for testing root cold tolerance using programmable refrigerated glycol bath and electrolyte leakage assays.

Results

The initial work this year (the first year of the project) has resulted in lab protocols for use next season in determining relative root cold hardiness of woody plant species.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

Outcome #7

1. Outcome Measures

Peer reviewed publications.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	17

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
136	Conservation of Biological Diversity
213	Weeds Affecting Plants

Outcome #8

1. Outcome Measures

To support new faculty in developing individual and collaborative competitive research programs in sustainable agriculture and ecosystem science and management.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

New faculty hires come from a variety of educational backgrounds and experiences. Many have little knowledge of the land grant mission and state-federal partnership that underlies agricultural experiment station research.

What has been done

This project will support new faculty hired during their initial two years, to provide training and mentoring in these areas, to help them become familiar with state and regional agricultural conditions and priorities, and to interact with regional stakeholders and peers in developing their initial individual NHAES research proposals.

Results

The new faculty in the cluster hire have begun to function as an interdisciplinary learning community, leveraging start-up funds to be competitive for multidisciplinary research and working with Cooperative Extension to bring new perspectives on sustainable practices to stakeholders across the region.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Competing Programmatic Challenges

Brief Explanation

The continued impact of the recession means that there is reduced discretionary spending for landscaping. The weak market impacts growers' ability to incorporate new production procedures. The NH State Legislature made significant cuts to Cooperative Extension budgets, which impacts extension activities. Limited resources must cover competing extension research and outreach.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The completion of a seven faculty cluster hire in agroecosystems has brought together a dynamic group of young investigators who are engaging with fellow academic members to build collaborations and develop interdisciplinary working groups. The integration of these faculty into NHAES programs was enhanced through supported faculty participation in the Sustainable Ecosystem Learning Community and the Research and Engagement Academy, both at UNH.

In FY2011 members in the new agroecosystems cluster had 11 peer-reviewed publications, including one in the Proceedings of the National Academy of Science USA. Twelve other publications from book chapters to peer reviewed papers are in press. Synergies between members of the cluster have already resulted in the initiation of externally funded interdisciplinary research on improved cropping systems for forage to enhance the competitiveness of organic dairies.

Key Items of Evaluation

This year, the College of Life Science and Agriculture research cluster hires in Sustainable Agriculture and Sustainable Ecosystem Science and Management were completed. Together this group will plan, generate, and disseminate unbiased, scientifically-based knowledge about diverse aspects of agroecosystem science and management to achieve integrated multi-disciplinary approaches toward understanding and managing diversified working landscapes.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Agricultural Biotechnology and Genomics

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation			9%	
135	Aquatic and Terrestrial Wildlife			9%	
201	Plant Genome, Genetics, and Genetic Mechanisms			4%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			27%	
206	Basic Plant Biology			5%	
212	Pathogens and Nematodes Affecting Plants			10%	
301	Reproductive Performance of Animals			5%	
304	Animal Genome			9%	
305	Animal Physiological Processes			11%	
306	Environmental Stress in Animals			9%	
307	Animal Management Systems			2%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.4	0.0
Actual Paid Professional	0.0	0.0	3.7	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	490931	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	535075	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

- Examine leaf samples exposed to abiotic stresses to help evaluate physiological and anatomical changes and adaptations.
 - Use a multidisciplinary approach and diverse molecular, endocrinology and biochemical techniques to determine the structure and function of brain and pituitary hormones in controlling reproduction.
 - Functional genomics and proteomic studies of the bacterial system were used to identify the interactions of Frankia with its host plants.
 - Examine the molecular basis of visual signaling and to determine how the biochemical pathways that regulate rod photoreceptor vision (night vision) differ from those that control the light response in cone photoreceptors (daytime and color vision), emphasizing analysis of the structural and functional differences in key enzymes in the signaling pathway.
 - Global proteomic studies to identify the proteins responsible for DNA repair. Specifically those proteins that interact with poly A binding protein which is involved in messenger RNA formation and breakdown. These various processes are important to understanding how genes are regulated.
 - Study leukemia in soft-shell clams at the molecular level and its implications for the New England shellfish industry. Generate data on clam hemocyte cancer throughout New England New for dissemination to the shellfish industry.
 - Sequence and organize genomes from selected representatives of Tylenchina nematodes toward investigating the parasitic relationship of these nematodes with their hosts (plants and animals).

2. Brief description of the target audience

The target audience includes research scientists, graduate, and undergraduate students, plant physiologists, plant breeders, scientists interested in addressing the potential impacts of climate change, aquaculturists, shellfish biologists, healthcare professionals, veterinarians, those interested in human and animal vision and visual diseases, local, state and federal agencies and managers.

3. How was eXtension used?

eXtension was not used in this program.

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	820	610	0	52

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

Year: 2011
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	9	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of undergraduate students directly involved in the projects

Year	Actual
2011	25

Output #2

Output Measure

- Number of graduate student theses or dissertations

Year	Actual
2011	3

Output #3

Output Measure

- Number of presentations at regional, national, or international scientific meetings

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

2011

27

Output #4

Output Measure

- Number of workshops, training sessions and presentations to non-scientific stakeholders

Year

Actual

2011

1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of graduate students trained and ready to enter the workforce.
2	Number of undergraduate students involved and trained in engagement research.
3	Advances in knowledge related to biological, molecular and genomic processes.
4	Increased understanding of retinal function including responses of the rod and cone photoreceptors.
5	Increased knowledge of the character and control of yeast regulatory genes..
6	knowledge related to how the neuroendocrine system influences reproduction.
7	A catalog of the incidence of leukemia in the waters of the Northeastern United States and Canada for use in providing recommendations about places where aquaculture of healthy soft shelled clams is likely to be successful
8	Blue mussels hybridize with a related, commercially less desirable species. One of the outcomes of this project is to evaluate how frequently hybridization is occurring in mussel aquaculture sites in the Gulf of Maine.

Outcome #1

1. Outcome Measures

Number of graduate students trained and ready to enter the workforce.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

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 #2

1. Outcome Measures

Number of undergraduate students involved and trained in engagement research.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	26

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Han

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
201	Plant Genome, Genetics, and Genetic Mechanisms
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
206	Basic Plant Biology
212	Pathogens and Nematodes Affecting Plants
301	Reproductive Performance of Animals
304	Animal Genome
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems

Outcome #3

1. Outcome Measures

Advances in knowledge related to biological, molecular and genomic processes.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nematodes are part of the soil biota; some are important pathogens of plants and animals. Research scientists, graduate students, and undergraduates are interested in comparative genomics of nematodes, with the expectation that discoveries will be applied to the control of plant health and production.

What has been done

Genome sequences for five species of nematodes (*Aphelenchus avenae*, *Psuedaphenlenchus yukiae*, PS1159, *Plectus aquatilis* and *Oncholaimus* sp.) were completed in February and are being analyzed.

Results

Predicted gene sets are now available for five species of nematodes (<http://genome.cs.unh.edu/index.php/login>). Comparison of the nematode genome assemblies suggest these animals may have bacterial associates, and other endosymbionts, not previously

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
212	Pathogens and Nematodes Affecting Plants

Outcome #4

1. Outcome Measures

Increased understanding of retinal function including responses of the rod and cone photoreceptors.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The target audience include research scientists and students, health care professionals, and veterinarians and pharmaceutical companies interested in human and animal vision, visual diseases, and cardiovascular diseases. This project focuses on Class 5 phosphodiesterases which are target enzymes for regulation of vision and the vascular system. Breeders are seeking to avoid inherited visual disorders effecting some of these enzymes in certain breeds of dogs and other domestic animals.

What has been done

Laboratory studies have been complete to compare the molecular basis of visual signaling that regulate rod photoreceptors (night vision) as compared to cone photoreceptors (daytime and color vision). The molecular structure of class 5 phosphodiesterases from rod and cone cells has been studied in comparison to closely related enzymes that are involved in cardiovascular disease.

Results

Many diseases of impacting vision affect both humans and inbred strains of domestic animals. The cost of these diseases, in economic terms, is billions of dollars each in the US alone. Progress against these conditions depends on gaining more knowledge of the fundamental molecular and cellular processes underlying normal vision perception. This study assessed whether there were differences in rod and cone class 5 phosphodiesterases that influence the way the retina responds to light. No differences were identified between rod and cone class 5 phosphodiesterases, but drug-binding sites for these enzymes were identified that could be used to develop new drugs that avoid effects on vision while specifically targeting similar enzymes controlling cardiovascular disease.

4. Associated Knowledge Areas

KA Code	Knowledge Area
304	Animal Genome
305	Animal Physiological Processes

Outcome #5

1. Outcome Measures

Increased knowledge of the character and control of yeast regulatory genes..

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Researchers need better tools to study the processes of translational regulation. A very significant component of the regulation of our genes occurs as RNA copies are translated into proteins, which carry out the chemistry of metabolism.

What has been done

The single cell model organism, *Sacchromyces cerevisiae* or baker's yeast, was used to examine the complexes that are required to initiate translation of RNA to protein. A new analytical method, Analytical ultracentrifugation with fluorescent detection (AUD-FDS), was used to dissect the structures and regulation of complexes that form to initiate translation of RNA to protein.

Results

Experiments demonstrated that the new technology AUD-FDS can be used to identify complexes that form during RNA translation to protein. One novel translational initiation complex, 77S, was identified. It was determined that several types of environmental stress act directly on this complex to change protein synthesis.

4. Associated Knowledge Areas

KA Code	Knowledge Area
304	Animal Genome

Outcome #6

1. Outcome Measures

knowledge related to how the neuroendocrine system influences reproduction.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Controlling animal reproduction is important, either to improve harvests of commercially important species or to prevent increases of non-indigenous nuisance species. How animal reproduction is controlled by the neuroendocrine system is therefore important to scientists, farmers, resource managers, and fish and wildlife biologists.

What has been done

Molecular, biochemical, and endocrinology techniques have been combined to study the structure and function of brain and pituitary hormones in controlling reproduction. Most of the research has been done with the ancient vertebrate fish, the lamprey eel.

Results

Major findings include the identification and functional studies of three neuroendocrine hormones, GnRH-I, -II and -III in the ancient vertebrate fish, the lamprey. Two new GnRH receptors have been characterized, and a novel pituitary glycoprotein has been identified. All of these become tools to develop new strategies to improve/control animal reproduction.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
305	Animal Physiological Processes
307	Animal Management Systems

Outcome #7

1. Outcome Measures

A catalog of the incidence of leukemia in the waters of the Northeastern United States and Canada for use in providing recommendations about places where aquaculture of healthy soft shelled clams is likely to be successful

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Invertebrate Biologists, cancer researchers, shellfish aquaculture firms, and resource managers are interested in the clam leukemic model. This system has parallels to human leukemia. Prevalence of leukemic clams in coastal waters is inversely correlated with water quality.

What has been done

p53 is an important tumor suppressor. In clam leukemia this protein is sequestered in the cytoplasm rather than the nucleus. The cell biology of p53 from normal and leukemic clam blood cells is being used to inform studies of human cancers with similar malfunctions of the p53 transcription factor (neuroblastoma, breast cancer, and acute myloid leukemia (AML)).

Results

i) This project determined that human AML, neuroblastoma, and breast cancer cells from commercially available cell lines are characterized by cytoplasmic sequestration of wild type p53 protein. ii) 200 clam samples were processed to assess stages of hemocyte cancer, for Normandeau Associates, an environmental consultant company.

4. Associated Knowledge Areas

KA Code	Knowledge Area
306	Environmental Stress in Animals

Outcome #8

1. Outcome Measures

Blue mussels hybridize with a related, commercially less desirable species. One of the outcomes of this project is to evaluate how frequently hybridization is occurring in mussel aquaculture sites in the Gulf of Maine.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The mussel aquaculture industry in the Gulf of Maine is concerned as to whether cultured mussels are hybridizing with less valuable wild mussels.

What has been done

Collected wild and rope-cultured blue mussels from three localities in the Gulf of Maine. Confirmed species identity, determined genotypes of about 75% of samples and evaluated genetic diversity of wild vs. cultured mussels. Conducted field and laboratory trials to determine attachment strengths and motility. Disseminated results through presentations at scientific meetings and in undergraduate lectures.

Results

To date, no hybrid mussels were found in the cultures examined. Analyses regarding correlations of increased genetic diversity with increased growth rates, and with increased attachment strength, are underway.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Public Policy changes
- Other (Mechanical problems with a controlled environment chamber has delayed one of the projects.)

Brief Explanation

Equipment problems, with a controlled environment chamber, delayed ongoing research "Potential phase I short term generalized stress responses at the cellular and tissue level for sunflower leaves exposed to high and low temperature condition". A major overhaul of the chamber was completed at the beginning of FY2012.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The research in this planned program was very successful as measured in the number of peer reviewed publications and invited seminar presentations. The significant results include the:

- determination of genome sequences for 5 plant parasitic nematodes
- identification and functional studies of components of the neuroendocrine system that regulates reproduction in the ancient vertebrate lamprey eel (changes of GnRH-I, -II, and -III during final maturation of lampreys; functional and pharmacological studies of two novel GnRH receptors; and the identification of a novel pituitary glycoprotein hormone in lampreys)
- site-directed mutagenesis of the drug-binding site-identified differences in drug selectivity of two phosphodiesterase families, which can be used to develop novel drugs to avoid adverse effects on vision when treating certain cardiovascular diseases.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Nutrition & Childhood Obesity

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
305	Animal Physiological Processes			30%	
702	Requirements and Function of Nutrients and Other Food Components			25%	
704	Nutrition and Hunger in the Population			25%	
723	Hazards to Human Health and Safety			20%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.1	0.0
Actual Paid Professional	0.0	0.0	0.8	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	73277	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	110530	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

Project activities will focus on characterizing glucose transporter capacity in tissues of animals exposed to environmental obesogens; determining the oxidative stress impact of environmental obesogens on key glucose-metabolizing tissues of animals; enhancing researchers' skills in participatory research techniques and building partnerships among researchers, extension and outreach educators, and populations of young adults to develop cooperative intervention programs; and developing community-based applications that can be refined and evaluated in future projects.

2. Brief description of the target audience

This project is intended to benefit the health of people across the region, while making the conduct of scientific research more transparent to community partners, stakeholders, and the public.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1192	0	0	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	2	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of undergraduate students directly involved in the projects

Year	Actual
2011	12

Output #2

Output Measure

- Number of university courses in which project results have been incorporated

Year	Actual
2011	2

Output #3

Output Measure

- Number of presentations at regional, national, or international scientific meetings

Year	Actual
2011	1

Output #4

Output Measure

- Number of surveys or other means of gathering information and data from participants

Year	Actual
2011	3

Output #5

Output Measure

- Number of reviewed, bulletin, popular and other publications

Year	Actual
2011	2

Output #6

Output Measure

- MS thesis on the effects of flame retardants on liver enzyme kinetics.

Year	Actual
2011	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of graduate students trained and ready to enter the workforce.
2	Number of undergraduate students involved and trained in engagement research.
3	Increased knowledge about environmental factors that affect obesity.
4	Availability of methods for participatory research related to obesity.
5	Changing the Health Trajectory for Older Adults through Effective Diet and Activity Modification

Outcome #1

1. Outcome Measures

Number of graduate students trained and ready to enter the workforce.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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
723	Hazards to Human Health and Safety

Outcome #2

1. Outcome Measures

Number of undergraduate students involved and trained in engagement research.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	12

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
723	Hazards to Human Health and Safety

Outcome #3

1. Outcome Measures

Increased knowledge about environmental factors that affect obesity.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The goal of this research is to evaluate brominated flame retardants as contributors to the obesity epidemic.

What has been done

The metabolic effects of two classes of brominated flame retardants - polybrominated diphenyl ethers (PBDEs) and hexabromocyclododecane (HBCDs) on liver metabolism were evaluated in

the rat model.

Results

The PBDE study demonstrates that just 3 days of treatment significantly decreases the activity of a key enzymes in gluconeogenesis and PEPCK, and increases liver weight and drug metabolizing capacity. The results also suggest that 28 days of treatment may influence insulin sensitivity. The HBCD study demonstrates that although glucose production from lactate and pyruvate are lowered by HBCD treatment, gluconeogenesis from alanine is increased. These data are consistent with the notion that brominated flame retardants alter liver glucose metabolism. The research demonstrates that brominated flame retardants alter liver metabolism, which could contribute to increased fat levels and hence contribute to obesity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #4

1. Outcome Measures

Availability of methods for participatory research related to obesity.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

The activities of this reporting period include (1) continued data collection on young adults as part of YAHRSl, the on-going health assessment of UNH students (n = ~700), (2) initiated YEAH, the web-based nutrition and health education project (n=163), and collected baseline data and biochemical measures, (3) completed an audit of the UNH nutrition environment using a modified Nutrition Environment Measures Survey, (4) completed a UNH health messaging survey, (5) held meetings of steering committee and community partners, (6) communicated regularly with partner universities through teleconferences and annual meeting.

Results

Our YAHRSI findings demonstrated that one-third of UNH students are overweight/obese (one-half of men and one-quarter of women), and 10% of male and 3% of female students meet the clinical definition of the metabolic syndrome. Our web site (<http://www.nutrition.unh.edu/research/YAHRSI>) shares these findings with the UNH community and the public. Our YEAH project was launched at UNH and 14 other partner universities, and biochemical data on 163 students was collected at UNH and 2 partner universities. Our findings demonstrate that metabolic syndrome appears on all three campuses, that it varies with region, and that ethnicity is a key consideration when examining metabolic syndrome incidence.

4. Associated Knowledge Areas

KA Code	Knowledge Area
{No Data}	null

Outcome #5

1. Outcome Measures

Changing the Health Trajectory for Older Adults through Effective Diet and Activity Modification

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Older Americans face increased health problems as they age. The focus of this effort is to provide evidence that improved diet and exercise behaviors in older Americans will decrease disease risk and to address health disparities that exist among the elderly, especially those from minority groups of lower socioeconomic status.

What has been done

1. Using the measurement of macular pigment (MP) density as a biomarker of retinal health and diet we plan to monitor, prospectively, how lifestyle modifications (weight loss and increased physical activity) influence changes in MP in an elderly, low income population in RI.

2. We are also testing the hypothesis that life style factors at an early age influence risk factors for

eye health in later years when evaluated in a high risk population by retrospective review of medical records of ophthalmology patients with markers of AMD (age-related macular degeneration) at the Pennington Research Center at LSU in Louisiana.

3. A whole Grain tutorial developed by the multistate collaborators on changes in behavior for older adults was evaluated

Results

The efficacy of interventions, designed to improve understanding of the importance of good nutrition (fruit, vegetables, and whole grains) and the role of physical activity, are being tested for their ability to decrease health risk behaviors in the target audience

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
704	Nutrition and Hunger in the Population

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Progress has been towards evaluating experimental hypothesis correlating brominated flame retardants with changes in liver function.

Various surveys and behavioral interventions are being tested for efficacy for lifestyle changes with target audiences

Key Items of Evaluation

Fire retardents have been tied to changes in liver metabolism, consistent with their potential role in promoting obesity.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Climate Change Impacts on Agriculture

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			50%	
131	Alternative Uses of Land			50%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.5	0.0
Actual Paid Professional	0.0	0.0	0.4	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	236170	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	74827	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	1065688	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Activity for the program includes:

- measuring C pools and greenhouse gas emissions (CO₂, CH₄, N₂O) in agricultural and suburban

landscapes and comparing these data with data previously collected from forest plots in the same area

- using the combined data set data to calibrate a high spectral resolution remote sensing image acquired in 2009 for the Durham, NH area from NASA's Airborne Visible/InfraRed Imaging Spectrometer (AVIRIS) instrument
- using the field and remote sensing data to parameterize the denitrification decomposition (DNDC) computer simulation model, validate and upscale model predictions
- generating spatially continuous predictions of C pools, greenhouse gas emissions and reflection of solar radiation (short wave albedo), and determine the net radiative forcing values (in W m⁻²) for the major components of the landscape (mowed versus grazed pasture, corn fields, forest, snow cover and suburban lawns)
- making future projections of C, N, and water balances for both agricultural and forested landscape, using newly available CO₂ and climate change projections through 2100.

2. Brief description of the target audience

Target audiences include agricultural and natural resource producers and consumers, those involved in the related food products and marketing webs, land managers, scientists, public policy makers, and those who rely on agricultural and forest products currently and in the future. Ultimately, all citizens in NH, New England and the US have a strong stake in the causes and consequence of climate and, therefore, the research outcomes in this planned program.

3. How was eXtension used?

Extesion programing in climate change and climate change adaptation is still relatively new. Extension made direct contacts with stakeholders in agriculture, forestry, wildlife, recreation, and economic development including foresters, widlife biologists, planners, landowners, and representatives of governmental agencies and non-governmental organizations, and others. Extension ran multiple workshops related to research in climate change impact.

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	40	110	15	0

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

Patent Applications Submitted

Year: 2011
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	2	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of undergraduate students directly involved in the projects

Year	Actual
2011	5

Output #2

Output Measure

- Number of graduate student theses or dissertations

Year	Actual
2011	0

Output #3

Output Measure

- Number of university courses in which project results have been incorporated

Year	Actual
2011	0

Output #4

Output Measure

- Number of presentations at regional, national, or international scientific meetings

Year	Actual
2011	0

Output #5

Output Measure

- Number of workshops, training sessions and presentations to non-scientific stakeholders

Year	Actual
2011	2

Output #6

Output Measure

- Number of websites in which project results have been incorporated

Year	Actual
2011	0

Output #7

Output Measure

- Increase in knowledge by natural resources based sectors. Conference: Adapting to climate change in Northern New England - Developing Landscape Solutions for the Natural Resource Community.

Year	Actual
2011	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of undergraduate students involved and trained in engagement research.
2	Number of graduate students trained and ready to enter the workforce.
3	Information relayed to non-scientific stakeholders through integrated research and extension partnerships.
4	Provide a mechanism for evaluating tradeoffs among multiple land uses in their ability to either contribute to or mitigate climate change.

Outcome #1

1. Outcome Measures

Number of undergraduate students involved and trained in engagement research.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land

Outcome #2

1. Outcome Measures

Number of graduate students trained and ready to enter the workforce.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Information relayed to non-scientific stakeholders through integrated research and extension partnerships.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Stakeholders in the agricultural, forestry, wildlife, recreation and economic development including foresters, wildlife biologists, planners, landowners, and representatives of governmental agencies and non-governmental organizations, and others will need to adapt to the consequences of climate change.

What has been done

Extension programming in climate change and climate-change adaptation is still relatively new. This project increases New Hampshire's Extension 's capacity in climate change and climate-change adaptation programming.

The Conference: "Adapting to Climate Change in Northern New England: Developing Landscape Solutions for the Natural Resource Community" brought 150 stakeholders together to (1) Foster greater collaboration on climate change adaptation across natural resource sectors, scales and institutions; (2) Identify key broad-based "no regrets" strategies for adaptation at local and regional levels; and (3) Inform State Adaptation Plan efforts in a day-long participatory conference. Small groups used case studies based on real New England landscapes to identify potential impacts of climate change and possible actions to mitigate these impacts.

Results

150 stakeholders increased their knowledge about climate adaptation strategies in multiple natural-resources-based sectors. Key broad-based "no regrets" strategies were identified for adaptation at local and regional levels. Conference results are being synthesized for use by stakeholders. For example, one such use is to inform state adaptation plans.

Prior to the conference, the Extension member participated on the team that drafted the case study assessment for the upper Connecticut River Valley (in New Hampshire and Vermont).

During the conference she facilitated the work group that further developed the assessment.

Following this conference, a smaller group of outreach professionals met to share successes and barriers to educating various audiences, especially those with an interest in natural resources, about Climate Change.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land

Outcome #4

1. Outcome Measures

Provide a mechanism for evaluating tradeoffs among multiple land uses in their ability to either contribute to or mitigate climate change.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Comprehensive studies of net climate impacts of agricultural, residential, and forested landscapes are rarely carried out, but are greatly needed for crafting effective policies that balance climate mitigation with food production, forest resources and the many other services that our local ecosystems provide.

What has been done

Soil sampling has been completed at the organic dairy, is halfway finished at the conventional dairy, and forest soils data have already been compiled from a previous AES project. Emissions of greenhouse gases from different agricultural and forest sites are being monitored

Results

Biomass, carbon and nitrogen pools from different landscapes have been determined. Monitoring of greenhouse gases from these landscapes is ongoing. This comparative information is critical in making informed decisions about land use management as New Hampshire tries to reduce

greenhouse gas emissions through programs such as the Regional Greenhouse Gas Initiative.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
131	Alternative Uses of Land

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Competing Programmatic Challenges

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The projects covered in this Program area are still relatively new. Qualitative assessment, based on self-reporting, indicates a high level of interaction between basic research and the extension component of this project.

Key Items of Evaluation

Research on tradeoffs among multiple land uses in their ability to contribute to or mitigate climate changes is closely tied to the stakeholder's (e.g., foresters, wildlife biologists, planners, landowners, and representatives of governmental agencies) development of broad-based "no regrets" strategies for adaptation at local and regional levels.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food Safety

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals			50%	
501	New and Improved Food Processing Technologies			25%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			25%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.1	0.0
Actual Paid Professional	0.0	0.0	0.4	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	94121	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	140854	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

- In natural habitats and aquaculture facilities oysters and other shellfish accumulate pathogenic microbes that may represent threats to human health. Activity for this program will include developing, refining, and applying methods for detection and enumeration of *Vibrio parahaemolyticus* and *Vibrio vulnificus* and their virulence genes in the Great Bay Estuary. The program will also determine environmental and biological factors associated with reduced concentrations of pathogenic vibrios in freshly harvested and post-harvest processed oysters.

- Factors that cause surface blooms of toxic cyanobacteria (blue-green algae) were examined to determine whether these result in "toxic footprints" in the aquatic food web. New monitoring methods for toxic cyanobacteria were developed.

2. Brief description of the target audience

- The project findings will be used to inform regional and state shellfish and beach managers about the conditions that are associated with reduced vibrio concentrations. This will help them to refine their vibrio control plans and better protect public health from the risks of vibrio disease. The study findings will be discussed with the UNH Cooperative Extension, and NH Sea Grant Program extension and communication staff, involved in fisheries and food safety issues. Results will be presented as educational information in local and regional forums where interaction with the public can occur. Press releases covering the overall project topic area will also be published. Feedback from all constituents will be obtained directly and indirectly.

- Primary audiences for the toxic cyanobacteria project includes the State Watershed and Drinking Water Divisions of the NH Department of Environmental Services, towns, and lake associations in Northern New England. College students were trained in assessing water quality.

3. How was eXtension used?

The toxic cyanobacteria project worked closely with the UNH Lakes Lay Monitoring Program, an extension program in which cyanobacteria monitoring techniques were developed to be employed by citizens in monitoring lake water quality. The UNH Lakes Monitoring Program is run by UNH Cooperative Extension and services over 100 lakes in New England.

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	600	1650	15	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	40	6	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of undergraduate students directly involved in the projects

Year	Actual
2011	13

Output #2

Output Measure

- Number of university courses in which project results have been incorporated

Year	Actual
2011	2

Output #3

Output Measure

- Number of presentations at regional, national, or international scientific meetings

Year	Actual
2011	4

Output #4

Output Measure

- Number of workshops, training sessions and presentations to non-scientific and regulatory stakeholders

Year	Actual
2011	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increased knowledge about the incidence and detection of vibrio in oysters.
2	Knowledge of environmental and biological factors associated with reduced concentrations of vibrios in harvested and processed oysters.
3	Inference of how the abundance of cyanobacteria corresponds to the accumulation of microcystin in freshwater lakes and their food webs.
4	Number of graduate students trained and ready to enter the workforce

Outcome #1

1. Outcome Measures

Increased knowledge about the incidence and detection of vibrio in oysters.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The target audience is shellfish industry and state/federal public health agency personnel who are concerned about shellfish safety and ways to minimize Vibrio-related diseases in shellfish consumers. The target audience is also research scientists and students interested in the basic science and ecology of Vibrios in estuarine ecosystems and, particularly, shellfish.

What has been done

The effectiveness of optimized relay strategies for removing Vibrios from shellfish were assessed in monthly experiments at a local commercial shellfish purification facility. Newly modified detection methods were used to detect concentrations of *Vibrio parahaemolyticus* in tissue from treated oysters harvested from the Piscataqua River and environmental conditions were monitored with new monitoring equipment. We intend to characterize the microbial communities in shellfish from different treatments using DNA sequencing, and continue with further optimized relaying experiments.

Results

This project just completed its first field season. The research design requires a second field season and the ensuing off-seasons to fully test and understand the research challenge we have undertaken to address.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Knowledge of environmental and biological factors associated with reduced concentrations of vibrios in harvested and processed oysters.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The target audience is shellfish industry and state/federal public health agency personnel who are concerned about shellfish safety and ways to minimize Vibrio-related diseases in shellfish consumers. The target audience is also research scientists and students interested in the basic science and ecology of Vibrios in estuarine ecosystems and, particularly, shellfish.

What has been done

Environmental conditions were monitored during relay procedures in a local commercial shellfish purification facility. Levels of *V. parahaemolyticus* were determined using a qPCR-MPN approach. (Quantitative PCR-most probable number).

Results

The incidence and abundance of pathogenic Vibrios in the Great Bay Estuary were determined over the course of one summer, to begin to determine how environmental conditions impact population sizes of these pathogenic microbes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #3

1. Outcome Measures

Inference of how the abundance of cyanobacteria corresponds to the accumulation of microcystin in freshwater lakes and their food webs.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Cyanobacterial (blue green algae) have become more frequent in New England Lakes. These blooms produce toxic microcystins. Primary audiences include the State Watershed and Drinking Water Divisions of the NH Department of Environmental Services, towns, and lake associations. Other audiences include the US Environmental Protection Agency.

What has been done

The overall aim of this proposed project is to examine the factors that cause localized surface blooms of toxic cyanobacteria, determine to what extent the toxin accumulates in the aquatic food web, and develop monitoring techniques that help predict blooms and managerial methods to assist in the management of such blooms. Technology transfer of results and monitoring techniques were provided to water supply managers, state water quality agencies, and volunteer monitoring programs.

Results

Synoptic, horizontal sampling revealed significant variability in the spatial distributions of cyanobacteria and the toxin microcystin in five New Hampshire lakes of varying trophic status. Microcystin concentrations within the water flea *Daphnia*, lake sediments, and whole lake water varied significantly between sampling sites. Additionally, net cyanobacteria also differed significantly between sampling sites. Cyanobacteria concentrations measured by phycocyanin fluorometry were not consistently higher in regions that were down-wind and/or down-current. However, the more eutrophic of the lakes had higher cyanobacteria along the shoreline (shoreline dominance) than at the deep-site of the lake. More oligotrophic lakes had the highest shoreline dominance of cyanobacteria. Microcystin concentrations were also positively correlated with trophic parameters, such as total phosphorus and total nitrogen, and negatively correlated with Secchi disk transparency (a screening method).

4. Associated Knowledge Areas

KA Code	Knowledge Area
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals

Outcome #4

1. Outcome Measures

Number of graduate students trained and ready to enter the workforce

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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
501	New and Improved Food Processing Technologies
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

1. One project examines factors that cause localized blooms of toxic cyanobacteria in freshwater lakes, evaluates their long term impact in the food web and assesses possible links to neurodegenerative diseases in humans. This project emphasizes technology transfer to state and watershed associations to monitor and manage algal blooms.
2. A second project addresses the occurrence of potentially pathogenic vibrios in cultivated oysters. Methods to detect, monitor changing microbial communities, and remove pathogens in a shellfish purification facility are being developed.

Key Items of Evaluation

1. Enhance knowledge about the accumulation of microcystins from toxic algal blooms, in freshwater lakes and improve management of blooms.
 2. Progress towards controlling potentially pathogenic vibrios in harvested shellfish in the Great Bay Estuary, to support a growing aquaculture industry.
- Both projects have excellent engagement with Cooperative Extension and Regional Stakeholders.**

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Global Food Security and Hunger

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms			2%	
202	Plant Genetic Resources			6%	
204	Plant Product Quality and Utility (Preharvest)			11%	
205	Plant Management Systems			6%	
212	Pathogens and Nematodes Affecting Plants			1%	
302	Nutrient Utilization in Animals			14%	
303	Genetic Improvement of Animals			6%	
305	Animal Physiological Processes			3%	
307	Animal Management Systems			21%	
308	Improved Animal Products (Before Harvest)			3%	
311	Animal Diseases			6%	
601	Economics of Agricultural Production and Farm Management			1%	
608	Community Resource Planning and Development			6%	
701	Nutrient Composition of Food			2%	
702	Requirements and Function of Nutrients and Other Food Components			2%	
903	Communication, Education, and Information Delivery			10%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0

Actual Paid Professional	0.0	0.0	6.0	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	769908	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	1093672	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	32532	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Conduct research and undertake engagement with stakeholders in multiple aspects of plant biology, genetics and breeding; animal production systems, including nutrition, reproduction and health; and integrated aquaculture involving shellfish, finfish, invertebrates, and seaweed.

2. Brief description of the target audience

The target audience of this work includes scientists, agricultural researchers, agricultural teachers, graduate and undergraduate students, producers and their clientele, those engaged in local food endeavors, and the faculty and staff of the region's land grant universities. It also includes dairy farmers, dairy nutrition scientists, veterinarians, organic farmers, dairy product manufacturers, Cooperative Extension dairy specialists, master gardeners, home gardener associations, consumers, and legislators. In addition, audiences include wholesale growers of squash and pumpkins, and seed companies marketing processing varieties, and the frozen food and canning processing industries.

3. How was eXtension used?

Extension was used to communicate results of several projects to local farmers, through Twilight meetings, inservice education, and via the Sustainable Agriculture newsletter. In another project, Extension transferred results to interested stakeholders, including oyster farms.

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1044	3835	323	50

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

Patent Applications Submitted

Year: 2011
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	12	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of undergraduate students directly involved in the projects

Year	Actual
2011	34

Output #2

Output Measure

- Number of graduate student theses or dissertations

Year	Actual
2011	2

Output #3

Output Measure

- Number of university courses in which project results have been incorporated

Year	Actual
2011	15

Output #4

Output Measure

- Number of presentations at regional, national, or international scientific meetings

Year	Actual
2011	26

Output #5

Output Measure

- Number of workshops, training sessions and presentations to non-scientific stakeholders

Year	Actual
2011	4

Output #6

Output Measure

- Number of reviewed, bulletin, popular and other publications

Year	Actual
2011	2

Output #7

Output Measure

- Number of websites in which project results have been incorporated

Year	Actual
2011	8

Output #8

Output Measure

- Number of surveys or other means of gathering information and data from participants

Year	Actual
2011	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of graduate students trained and ready to enter the workforce.
2	Number of undergraduate students involved and trained in engagement research.
3	Increased knowledge about plant production practices suited to the state and region.
4	Increased knowledge about dairy production, nutrition, animal health and dairy products important to regional producers.
5	Advances in squash varieties having enhanced nutritional benefits through carotenoid concentrations.
6	Increased knowledge about integrated multispecies aquaculture systems.
7	Improved juvenile growth in cod aquaculture.
8	Knowledge about fatty acid composition in pasture fed and total mixed ration fed Jersey cows, and in their milk.
9	New genomic knowledge translated into tools and strategies to facilitate varietal selection through marker assisted breeding.
10	New commercialized varieties of cucurbit vegetables suited to state and region growing conditions.
11	Stress hormone levels in grazing organic versus conventional dairy cows.

Outcome #1

1. Outcome Measures

Number of graduate students trained and ready to enter the workforce.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources

Outcome #2

1. Outcome Measures

Number of undergraduate students involved and trained in engagement research.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
205	Plant Management Systems
302	Nutrient Utilization in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
311	Animal Diseases
702	Requirements and Function of Nutrients and Other Food Components

Outcome #3

1. Outcome Measures

Increased knowledge about plant production practices suited to the state and region.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	20000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

This research is important to fruit and vegetable growers in NH, New England, and other regions with similar climates, and home gardeners in New England. The use of vegetable crop varieties that are adapted to local environments and growing practices increases yields and grower profits.

What has been done

Field variety trials were conducted for several vegetable crops (sweet potato, cucumber, zucchini, summer squash) to evaluate yield, quality, and susceptibility to insects and diseases. Field experiments were conducted to evaluate the feasibility and expense of using various season extension techniques for fall establishment and spring harvest of mustard greens, kale, and spinach. Multiple workshops were held for growers, and research project reports were developed.

Results

Variety trials and cultural experiments have enabled the PI and Extension Educators from NH and neighboring states to provide commercial farmers and gardeners with regionally accurate information about specialty vegetable crop production. During the reporting year, at least 250 farmers in NH and neighboring states learned about the relative performance of different varieties of several vegetable crops including high tunnel cucumber, tomato, zucchini and summer squash. Because varieties differ in yields, resistance to pests and diseases, and market desirability, variety choice can greatly impact profits. For a single high tunnel (10x32m), switching from a poorly-adapted to a well-adapted variety could increase market value of a cucumber crop by \$1,000 or more.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
702	Requirements and Function of Nutrients and Other Food Components

Outcome #4

1. Outcome Measures

Increased knowledge about dairy production, nutrition, animal health and dairy products important to regional producers.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The target audiences for this project include organic dairy farmers, dairy industry personnel, veterinarians, scientists and students across the Northeast. Targets include improvement of cost effectiveness of nitrogen utilization in milk production, and the transfer of immunity to newborn calves, which in the long term increases overall efficiency of farms.

What has been done

In two projects, feeding experiments were conducted with the overall goal of improving nitrogen utilization in lactating dairy cows fed supplements of liquid molasses, corn meal or red clover baleage harvested to optimize sugar levels. Other feeding trials included feeding Kelp, a seaweed.

Another project involved evaluation of the addition of sodium bicarbonate to colostrum replacer and its impact on IgG uptake by the newborn calves.

Results

Preliminary results showed that feeding liquid molasses, a high source of sucrose, or high-nonstructural carbohydrate (NSC) red clover baleage improved nitrogen utilization in lactating dairy cows. Organic and conventional dairy farmers in the Northeast and beyond can now make informed decisions about the feasibility of incorporating molasses and/or high-NSC forages in their enterprises. Our data also showed that feeding kelp meal increased average daily weight gain in organic calves.

Experiments continue to pin down the optimum way to feed colostrum to newborn calves, to maximize the transfer of IgG and achieve the highest levels of immunity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
311	Animal Diseases

Outcome #5

1. Outcome Measures

Advances in squash varieties having enhanced nutritional benefits through carotenoid concentrations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The primary target audiences for processing varieties are wholesale growers of squash (or pumpkin) for the processing industry in the Northeast, the Northwest and the Midwest (chiefly Illinois and Wisconsin), seed companies marketing processing varieties, and the frozen food and canning processing industries. For fresh market squash, home gardeners and farmers with retail outlets would be the immediate beneficiaries of interspecific hybrids. The introduction of novel fresh market squash varieties that are both high yielding and possess good eating quality and nutrition may eventually attract wholesale vegetable producers and distributors, as well as large supermarket chains.

What has been done

In Cucurbita, the focus is on eating quality and nutrition in three species of squash, on developing breeding lines carrying the bush habit of growth, on incorporation of powdery mildew resistance into breeding lines, on developing interspecific hybrids of *C. maxima* x *C. moschata*, and on developing suitable hybrids for the seed industry in squash, ornamental pumpkin, and gourds.

Results

Because of low pricing for processing squash and pumpkin, new processing varieties must offer advantages of either higher fresh weight yields or equal fresh weight yields together with other favorable traits such as higher dry matter and better pest resistance. Interspecific hybrids between bush lines of *C. maxima* crossed to *C. moschata* offer many potential benefits for growers, including a semi-bush growth habit for more efficient culture, higher yields combined with consistent quality, greater adaptability to environmental extremes, and multiple pest resistance.

In replicated field trials, the hybrid NH65xLIC had fresh weight yields equal to the processing

squash Dickinson Field, and had significantly higher flesh dry matter, so that the biomass yield of edible flesh was 50% higher than that of Dickinson Field. The semi-bush growth habit of interspecific hybrids was more uniform than the vining open-pollinated cultivars, resulting in rapid leaf canopy development for maximum ground cover and shading of potential weed problems. NH65xLIC had earlier maturity than DF, and should be adapted to a wider latitude of growing conditions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
702	Requirements and Function of Nutrients and Other Food Components

Outcome #6

1. Outcome Measures

Increased knowledge about integrated multispecies aquaculture systems.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

{No Data Entered}

What has been done

{No Data Entered}

Results

{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
302	Nutrient Utilization in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)

Outcome #7

1. Outcome Measures

Improved juvenile growth in cod aquaculture.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Finfish aquaculture in the Atlantic is currently limited to a few species. Expansion of finfish aquaculture in New England will replace the depleted natural fishery, provide new job opportunities and contribute to critical needs to expand protein production for a growing human populations. In order expand a nascent cod aquaculture industry, methods and stocks are needed to reliably produce juveniles that are adapted to local growing conditions. New sustainable sources of protein to be used as fishfood will help this industry become cost competitive.

What has been done

The population structure of North Atlantic cod was evaluated using various molecular genetic markers. Spring- and winter-spawning juvenile cod stocks were evaluated for stock-specific adaptive traits (hemaglobin type, growth rates, egg bouyancy) and for opportunities to replace the fishmeal in feed for more sustainable feedstocks.

Results

Historically North Atlantic Cod has been managed as two populations. However in this project, molecular population genetics provided evidence for three North Atlantic cod populations: (1) a northern spring-spawning coastal complex in the Gulf of Maine (GOM), (2) a southern complex consisting of winter-spawning inshore GOM, offshore GOM and sites south of Cape Cod,

Massachusetts, and (3) a Georges Bank population. Similarities in cold-tolerance were observed in populations of Atlantic cod from the Gulf of Maine.

Soy protein concentrates (SPC) were demonstrated to support normal rates of juvenile cod growth. Other feeding trials for juvenile cod showed that 50% of the typical fishmeal ration could be replaced by SPC.

Working with Extension specialists results of stock adaptations and feeding studies with SPC were communicated to active and potential cod culturists. The results of population genetic studies were communicated via publications and presentations to New England fisheries scientists.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)

Outcome #8

1. Outcome Measures

Knowledge about fatty acid composition in pasture fed and total mixed ration fed Jersey cows, and in their milk.

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

New genomic knowledge translated into tools and strategies to facilitate varietal selection through marker assisted breeding.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Molecular markers as an aid to plant breeding (marker assisted selection = MAS), will efficiently exploit wild related species as gene sources for improvement of cultivated strawberries and mints, and to aid in the ultimate production of superior varieties that will benefit growers and consumers.

What has been done

Extensive new information about strawberry genome structure and DNA sequence developed by the completion of the first strawberry genome sequence. New plant germplasm resources, including hybrids and breeding populations continue to be developed.

Results

UNH researchers collaborated on the sequencing and assembly of the first strawberry genome. They are collaborating to use this sequence to design a microarray chip for rapid genotyping of hybrid plants. As part of the RosBREED (USDA-SCRI) Project, UNH scientists also gathered phenotypic data from a field trial involving a diverse collection of strawberry wild germplasm and cultivars.

A participatory breeding experiment carried out UNH researchers in collaboration with a local grower, and made superior plant selections on the grower's field site.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)

Outcome #10

1. Outcome Measures

New commercialized varieties of cucurbit vegetables suited to state and region growing conditions.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Wholesale growers of squash and pumpkin for the processing industry in the Northeast, Northwest and Midwest, seed companies, and the frozen food and canning processing industries, are interested in inter-specific hybrid cultivars with better nutritional and agronomic traits. The introduction of novel fresh market squash varieties that are both high yielding and possess good eating quality and nutrition may eventually attract wholesale vegetable producers and distributors, as well as large supermarket chains.

What has been done

Based on knowledge gleaned from preliminary research on inter-specific hybridization, breeding work has commenced to develop additional bush *C. maxima* lines and suitable *C. moschata* lines for inter-specific hybridization. For developing processing varieties, known strains of *C. moschata* used for processing, such as Long Island Cheese (LIC) and Dickinson Field (DF) are being used both as parents for interspecific hybrids and in a breeding program to expand breeding lines with higher quality and better pest resistance.

Results

Because of low pricing for processing squash and pumpkin, new processing varieties must offer advantages of either higher fresh weight yields or equal fresh weight yields together with other favorable traits such as higher dry matter and better pest resistance. Interspecific hybrids between bush lines of *C. maxima* crossed to *C. moschata* offers some of these qualities.

In summer of 2011, vegetative and reproductive growth and yield of the best interspecific hybrids were compared to two standard processing varieties of *C. maxima* and *C. moschata*.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
702	Requirements and Function of Nutrients and Other Food Components

Outcome #11

1. Outcome Measures

Stress hormone levels in grazing organic versus conventional dairy cows.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Animal health is important to dairy farmers, veterinarians and cooperative extension dairy specialists. Milk and dairy products from organic dairy cows (pasture and forage fed) has been shown to have better ratios of healthy anti-inflammatory fatty acids to pro-inflammatory fatty acids than dairy from conventional grain fed animals. However there is no information available as to whether pasture-fed versus conventional grain fed diets are healthier for the cows.

What has been done

Milk and blood samples were collected from organic (grazed) and conventional dairy (grain fed) dairy cows over the summer months. Samples were evaluated for markers of inflammation and health.

Results

Stress hormone cortisol levels were significantly higher in the organic cows prior to going out on pasture, were lower than those for the grain-fed confined cows during the pasture season but the difference was not statistically significant, and the organic cows had significantly higher levels when taken off pasture in the fall. Haptoglobin levels were not different between dairies at any time point. Cortisol levels in both groups were higher during times of heat stress in late summer. Preliminary results from these studies have been communicated to stakeholders at field days and regional conferences.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)

Brief Explanation

Organic dairy feeding experiments had to be modified, as weather interfered with efforts to harvest organic forage with contrasting amounts of nonstructural carbohydrates (sugars). In addition, there was a lower than needed number of lactating cows at the organic dairy. However, two additional experiments were conducted: (1) The effects of feeding molasses or cornmeal on the performance and nitrogen utilization of grazing organic dairy cows, and (2) the effects of feeding high- vs. low-nonstructural carbohydrates red clover baleage on the performance of conventional lactating dairy cow.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

This planned program area covers very diverse research and integrated projects.

- Ongoing studies are examining way to supplement dairy cow feed with sugars (either from molasses or from specially hayerested forage) to improve nitrogen utilization. These have the potential to improve milk quality, while decreasing nitrogen excretion to the environment. Outcomes would include higher milk value and improved sustainability.
- NHAES scientists were part of the consortium that analyzed the first draft genome sequence of strawberry. This genome sequences provides for the first time, the resources and tools needed to initiate Marker Assisted Breeding in Strawberry and related members of the *Rosaceae* (apples, plums, cherries, raspberries, etc.)
- Sweetpotatoes are a high-value warm-season crop that is not traditionally grown in the Northeastern U.S. Through field research to evaluate varieties and cultural methods, in conjunction with evaluation of postharvest practices, recommendations for how to produce and store this crop were developed for cool climate growing areas. Adoption of sweet potato in Northern New England is still in its very early stages but has already has a financial impact of at least \$ 20,000.
- Strategies to increase the potential for winter and early spring harvest is in demand by farmers due to recent explosion in retail outlets such as winter CSAs and winter farmers' markets. One such strategy is the use of very low cost season extension structures such as low tunnels. Preliminary research has shown that low-cost low tunnels can be used to protect hardy crops (mustard greens, kale, spinach) over the winter for early spring harvest. At least 270 farmers learned about the feasibility of using low tunnels for overwinter protection. An estimated 10 growers in NH have used the results of this research to guide their own experimentation with low tunnels on their farms, to produce additional income during the off-season.
- The Great Bay Estuary is a fertile and productive ecosystem but has been identified as a nitrogen impaired system. As a result, marine fish aquaculture will not be permitted without the demonstration that integrated multi-trophic aquaculture, IMTA, strategies will mitigate not only nitrogen from fish production but has the capacity to mitigate total nitrogen in the Great bay via bio-remediation. Extension and NHAES scientists are working towards facilitating the permitting process for commercial fishermen and entrepreneurs interested in pursuing fish and shellfish aquaculture in the Great Bay Estuary as well as working with the EPA to demonstrate the ability of mussel, oyster and macro-algae culture techniques to be combined with fish culture to mitigate nitrogen loading to surrounding waters.

Key Items of Evaluation

- Productivity is for several basic research projects in terms of peer reviewed publications in such high impact journals as Nature Genetics and PLOS ONE.
- New crops (sweet potato) and production methods (low tunner) have been introduced that directly impact small diversified farms that are prominent in Northern New England.
- Outreach to stakeholders groups is strong across multiple projects. Changes in feeding strategies for both conventional and organic dairy farmers are likely to improve milk quality and reduce Nitrogen waste.

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Rural and Community Development

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation			5%	
403	Waste Disposal, Recycling, and Reuse			12%	
605	Natural Resource and Environmental Economics			4%	
608	Community Resource Planning and Development			23%	
610	Domestic Policy Analysis			6%	
801	Individual and Family Resource Management			10%	
802	Human Development and Family Well-Being			10%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities			25%	
805	Community Institutions, Health, and Social Services			5%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.4	0.0
Actual Paid Professional	0.0	0.0	0.9	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	110135	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	211501	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

- Conduct research related to solid waste management and provide useful economic information to guide effective management decisions for municipal governments.
- Identify and analyze ongoing and potential changes in rural labor markets and the impacts of migration, commuting, and workforce development policies on rural labor markets.
- Investigate the potential for rural development policies based on entrepreneurship, industrial clustering, value-added and nontraditional agricultural businesses and analyze the spatial implications of industrial restructuring on employment and earnings.
- Develop a better understanding of the role of amenities in rural development and the impact of economic and social changes on the quality of life in rural communities.
- Examine individual and family level characteristics and policies which impact physical and mental health in diverse rural low-income families.
- Examine the aging of the rural population within the context of overall U.S. population aging, and describe how in-migration, aging-in-place, and other demographic forces shape the spatial distribution and composition of rural populations.

2. Brief description of the target audience

- State, local, and regional waste management professionals, scientists, undergraduate and graduate students, citizens, land use professionals, homeowners, sustainable energy associations, legislators, contractors, firms and rural residents, demographers, social and natural scientists as well as policy-makers and the media.
- New England retirees, corporations interested in hiring retirees on a part-time basis, and the academic community interested providing input to models designed to bridge the "job information-gap" between the corporate community and retirees.
- Rural, low-income families, and private and governmental social services personnel and entities especially in terms of employment and health care.
- State policy makers, planners and concerned citizens that will facilitate actions to enhance the social and economic development of the state, aid in developing comprehensive plans to guide future landscape development, and protect the state's abundant natural resources.

3. How was eXtension used?

Results from Rural Families Speak and ongoing research on rural families and work are being used to inform Cooperative Extension work and publications. A sub-project, to be distributed through state cooperative extension, will focus on developing core health messages for rural families.

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3475	500	2	15

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	5	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of undergraduate students directly involved in the projects

Year	Actual
2011	3

Output #2

Output Measure

- Number of presentations at regional, national, or international scientific meetings

Year	Actual
2011	4

Output #3

Output Measure

- Number of workshops, training sessions and presentations to non-scientific stakeholders

Year	Actual
2011	16

Output #4

Output Measure

- Number of reviewed, bulletin, popular, news and other publications

Year	Actual
2011	2

Output #5

Output Measure

- Number of surveys or other means of gathering information and data from participants

Year	Actual
2011	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of undergraduate students involved and trained in engagement research.
2	Increased knowledge about economics and policy related to waste management.
3	Increased knowledge among rural individuals and families related to employment and health care.
4	Increased understanding of demographics and migration in the region and nation.

Outcome #1

1. Outcome Measures

Number of undergraduate students involved and trained in engagement research.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	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
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development

Outcome #2

1. Outcome Measures

Increased knowledge about economics and policy related to waste management.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Municipal governments are faced with the problem of managing solid waste in an environmentally sound way while also keeping budgets (and property taxes) under control. Target audiences include policy makers, town officials responsible for local solid waste managements, nonprofit groups, the State Department of Environmental Services and academic researchers.

What has been done

Many towns and cities in the U.S. have adopted pay as you throw (PAYT) or unit based pricing. The primary ongoing activity is a set of surveys regarding towns' use of the new technique of "single stream" recycling. Main survey effort is directed at the towns of Nottingham, Lee, and Northwood, New Hampshire. These towns differ in demographic composition, waste management structure, and government structure.

Results

The survey is collecting data on both willingness to pay for additional recycling services and attempting isolate individual features of waste management programs (e.g. collection, single vs. multiple stream, dropoff vs. curbside pickup). We are seeing considerable enthusiasm on the part of respondents as they are availing themselves of the "additional comments" section to a great degree. This information will be of great use to non profit groups working with towns to make decisions on single stream, the towns themselves, and state governments.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
403	Waste Disposal, Recycling, and Reuse
605	Natural Resource and Environmental Economics

Outcome #3

1. Outcome Measures

Increased knowledge among rural individuals and families related to employment and health care.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

State and national policy makers, non-profit organizations, community leaders are interest in the unique challenges facing Rural communities regarding access to health care and employment.

What has been done

Health: Participants were recruited for interviews for the Rural Families Speak- Health project
Economics: Surveys were conduct of firms and retirees across the New England Region regarding wages that could be offered and wages retirees were willing to accept.

Results

Health: Six mothers from Coos county were interviewed as part of the data collection phase of this project.

Employment: The December 2010 business survey indicated that employers in the New England states were moderately to very enthusiastic about hiring retirees full or part-time. Employers valued the "work ethic" of retirees above all other attributes. Experience, motivation, and the potential of reduced cost of health care (because of Medicaid availability for 65+ age groups) were frequently cited as being major reasons to hire retirees. Seventy five percent of retirees indicated a mild to extremely interested enthusiasm to return to at least part-time employment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
610	Domestic Policy Analysis
801	Individual and Family Resource Management

802	Human Development and Family Well-Being
805	Community Institutions, Health, and Social Services

Outcome #4

1. Outcome Measures

Increased understanding of demographics and migration in the region and nation.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

This research tackles social and economic issues facing rural communities as rural communities adjust to broad forces affecting their futures, such as social welfare policy, immigration reform, an aging population, and rapid population growth in communities near major cities.

What has been done

Demographics: Demographic studies are being conducted to see how populations are changing (number, age distribution) in rural communities.

Results

Demographics: There is evidence for a slowing of growth and aging of populations in rural areas of the NH and the US. This is caused by the aging in place of the existing population and by the out-migration of young adults. It has significant implications for future fertility patterns including a sharp increase in the number of counties in which more people die than are born. At the same time there increased racial/Hispanic diversity in rural areas.

4. Associated Knowledge Areas

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

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

The economic recession, led to changes in allocation of resources, and ultimately reduced overall support for some of these studies. This slowed progress in several studies.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

- Demographic trends in rural and urban populations in NH and across the country were investigated. Major findings included losses in rural population as older citizens age in place but younger citizens migrate, and increased levels of Hispanic diversity in those rural population, especially among children. These findings have implications for state and local government, charitable organizations health care providers and schools, who must meet the needs of a much more diverse rural population.
- Surveys of retired workers in Northern NH indicated that 75% were interested in returning to work on a full or part time basis. Surveys of potential employers were also very enthusiastic about hiring retirees for their perceived good work ethic and ability to mentor younger workers.

Key Items of Evaluation

- Increased ethnic diversity of rural populations represent new challenges to provide services for a more diverse rural population.
- There is substantial Interest among retirees in continuing to work, at least part time, and employer demonstrated enthusiasm to hire retirees. These results have important ramifications for rural development issues and even spill over to national economic policies. A key topic is social security. The ramifications are sobering but if effective incentives can be identified to motivate business to keep the "55+ age group" in the workforce (or entice retirees to re-enter), the burgeoning baby boomer segment could support (instead of drain) the national social security pool.

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Sustainable Energy

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources			30%	
403	Waste Disposal, Recycling, and Reuse			70%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.1	0.0
Actual Paid Professional	0.0	0.0	0.5	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	36848	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	11454	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

The purpose of the research project is to develop an integrated system for using wood from the farm woodlots as a resource for bedding for the barns and, subsequently, using the combined bedding/manure resource to produce energy for on-farm use. During FY2011, activities included:

- developing an inventory of farm woodlot biomass
- studying various methods for composting of bedding and manure to capture energy
- studying systems to optimize the production of energy while minimizing the generation of greenhouse gases in composting
- Analyzing the economics of the wood-bedding-compost-energy system

2. Brief description of the target audience

Organic dairy farmers in the Northeast are an underserved population. Among the major challenges they face are the cost of imports to the farm for bedding and energy.

3. How was eXtension used?

eXtension was not used in this program.

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	410	0	524	0

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

Patent Applications Submitted

Year: 2011

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of undergraduate students directly involved in the projects

Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of university courses in which project results have been incorporated

Year	Actual
2011	13

Output #3

Output Measure

- Number of workshops, training sessions and presentations to non-scientific stakeholders

Year	Actual
2011	14

Output #4

Output Measure

- Number of websites in which project results have been incorporated

Year	Actual
2011	1

Output #5

Output Measure

- Jointly with USDA-SARE project, this work is providing data on the energy budget of the Burley-Demerrit farm agroecosystem.

Year	Actual
2011	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of undergraduate students involved and trained in engagement research.
2	New and improved knowledge about renewable energy systems for organic dairies available to peers and stakeholders.

Outcome #1

1. Outcome Measures

Number of undergraduate students involved and trained in engagement research.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
403	Waste Disposal, Recycling, and Reuse

Outcome #2

1. Outcome Measures

New and improved knowledge about renewable energy systems for organic dairies available to peers and stakeholders.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Dairy farmers and the Organic Dairy industry in the Northeast are seeking ways to reduce costs for animal bedding and for energy for farm operations. Most farms have under-utilized resources in woodlots which could be harnessed to bring down farm import costs. The overall purpose of this research is to develop an integrated system for using wood from the Farm woodlots as a resource for bedding for the barns, and then using the combined bedding/manure resource to produce energy for on-farm use.

What has been done

An inventory of farm woodlots at the Burley-Demerritt/Bartlett-Dudley complex has been completed.

Machines for wood chipping suitable for bedding production were tested.

Several composting systems were tested for energy production, and for emission of greenhouse gases.

Results

This past year, a number of conversations were held with industry representatives - both potential suppliers of equipment and processors of raw organic milk - to gather information on needs and possible processes. In-depth discussions were also held with a small number of practicing farmers who share an interest in this process. A general description of this process, and its potential, is part of every tour given at the demonstration site, the Burley-Demerritt Organic Dairy Research farm.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
403	Waste Disposal, Recycling, and Reuse

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Competing Public priorities
- Competing Programmatic Challenges
- Other (Competing time demands)

Brief Explanation

- Donors are being sought to fund the purchase of specialized machinery and raise building funds for a facility to house the model bedding/manure composting system that will harvest energy for on-farm uses.
 - The PI serving as University of New Hampshire Provost, so is only able to spend a small portion of his time on this project.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Dairy farmers cite the cost of bedding and energy as two of the largest financial challenges to their operation. This project goal is to design an integrated system: use farm woodlots to produce wood chip bedding, then aerobically compost the bedding and manure to produce energy for on farm use. Donor funding will allow this project to move forward from design-build to a working demonstration system in FY2012. This project continues to generate enthusiasm from stakeholders, including Stonyfield Farm and Organic Valley Dairy processors as well as regional dairy farmers.

Key Items of Evaluation

The key item of the evaluation is the progress from concept to design and modeling of this demonstration project that focuses on integrated solutions to the bedding, energy, and manure management on an organic dairy farm.