2011 University of New Hampshire Research Plan of Work

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I. Plan Overview

1. Brief Summary about Plan Of Work

The New Hampshire Agricultural Experiment Station (NHAES) resides within the University of New Hampshire College of Life Sciences and Agriculture. It has responsibility for Hatch, McIntire-Stennis, and Animal Health research programs. This Annual Report covers the federal and state partnership-funded Hatch research program. In addition to building upon the approved 2010-2013 Research Plan of Work, this year's update substantially reorganizes our projects into fewer Planned Program Areas, including the five NIFA priority areas as we have been mandated to do no later than for the 2012 Plan of Work and 2010 Annual Report. We opted to be proactive, and also to downsize our formerly ten Planned Programs into eight, to increase manageability relative to maintaining the former ten plus 5 NIFA priorities. As result of Hatch Act directives that the experiment stations are best able to prioritize specific research needs and projects for their respective states, and the fact that New Hampshire provides a majority of the combined federal-state Hatch funding, we will have many projects in some NIFA priority areas and few or perhaps none (through time) in others. For this plan we will have at least one funded project in each priority area.

The research covered in this plan of work is grouped into eight broad categories: agricultural biotechnology & genomics, agricultural & environmental products and services, nutrition & childhood obesity, climate change impacts on agriculture, food safety, global food security & hunger, rural & community development, and sustainable energy. Research in our final planned program, forest resources, is funded through McIntire-Stennis and therefore not included here. Finally, this report covers research conducted under the auspices of the NHAES, and does not include UNH Cooperative Extension, which is a separate administrative unit. However, there is effective coordination of relevant programs and activities between the two units.

We are mindful that a primary purpose of the capacity (also called formula) funding mechanism is to allow the state land-grant universities to provide funding for activities not well supported by the competitive process, including to projects targeted to the regional or local level; to support long-term research; to invest as seed money to initiate new lines of research; and to support the critical array of research and extension capacity such as agricultural research faculty and staff salaries, and our outstanding research/teaching/extension farm, dairy and greenhouse facilities. Our intent over the next five years is to strategically prioritize expenditures to maximize productivity and efficiency, and purposefully move toward a targeted set of funded projects through which we intend to excel. The overarching goal of our planned programs is to provide a balance of fundamental (foundational, development) and applied (applications oriented) research in support of state, regional and national agricultural issues. These will lead to improved opportunities for regional success in producing and marketing agricultural and natural resources products and services.

We inform our activities with knowledge about agricultural production in New Hampshire and the region. Based on the most recent data available from the USDA's National Agricultural Statistics Service (NASS), the number of NH farms increased 24% since the last census in 2002. The most growth came in farms with less than $100,000 in annual sales. Land in farms also increased, rising six percent. However, the trend continues to be more farms of smaller size; average farm size shrank by 14% over the last five years. Farm numbers grew nationally, too, but at only one-sixth of New Hampshire's rate of growth. Market value of agricultural production in NH grew 37% to over $199 million, and was nearly balanced between crop and livestock sector sales. NH ranked very high nationally in several key NASS agricultural metrics. With 173 organic farms, we were first in the nation for value of organic as percent of total sales. We were number two nationally in percent of farms with female principle operators, and number three in the nation for percent of agricultural sales from direct marketing. Finally, NH was number three nationally in percent of total value of agricultural sales from direct sales.

These statistics provide incentive to, and are consistent with, our strategies to emphasize these and related aspects of integrated agriculture, natural resources, and food health and safety that are important to NH and New England. Our research and teaching programs will both emphasize sustainable agriculture and food systems, relatively small and highly diversified operations, and will contribute to the development of a highly competitive and sustainable agricultural system for local, regional and global markets. The NH Agricultural Experiment Station supports multiple Hatch projects to create knowledge and technology for the benefit of the state, region and nation. We believe these provide highly valuable results, and excellent return on the investment of taxpayer funds. The research findings, developments and technologies will continue to be transferred through classroom, laboratory and field instruction, stakeholder workshops, a variety of publication formats, presentations at local, regional, national and international scientific and stakeholder meetings, websites, web portals and

genomic data banks, technology transfer, policy recommendations, and other venues.

The NHAES has traditionally funded research projects on 3-year cycles, meaning that those included in this plan will be active for between 1 and 3 years. We are modifying this practice so that projects will be funded for 3, 4, or 5 years depending on demonstrated productivity and impacts of the principal investigators. This should lead to greater stability and to more substantial outcomes and impacts for New Hampshire. Stated professional FTE inputs are necessarily estimates of what we expect will be allocated to each program area over the next five years.

Estimated Number of Professional FTEs/SYs total in the State.

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	25.9	0.0
2012	0.0	0.0	25.9	0.0
2013	0.0	0.0	25.9	0.0
2014	0.0	0.0	25.9	0.0
2015	0.0	0.0	25.9	0.0

II. Merit Review Process

1. The Merit Review Process that will be Employed during the 5-Year POW Cycle

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

2. Brief Explanation

For all research projects, faculty are encouraged to submit a one page description of their proposed project and to meet with the NHAES Associate Director to discuss the anticipated work. A proposal development and projects review manual was created during 2009 to help faculty prepare their full proposals. All submitted proposals are collated then critically evaluated by the NHAES Internal Review Committee consisting of six faculty members having active NHAES projects plus the Associate Director. From this, the committee develops a list of those having high, medium and low recommendation for potential approval. The NHAES Director and Associate Director use this recommendation and their own independent evaluation to make the final decision as to which projects the Experiment Station will fund based on merit and our projected support budget. Those proposals deemed both worthy of support and fitting within our projected budgets are submitted to USDA-NIFA for ultimate approval of funding. We recently modified this procedure in response to stakeholder input, with the criteria used for proposal evaluation including: 1) Relationship to the Hatch, McIntire-Stennis, and/or Hatch-Multistate programs, and to the NHAES mission and research priorities; 2) Scientific and technical merit; 3) Soundness of approach, procedures and methodology; 4) Likelihood of significant contributions and/or innovative advances; 5) Previous and current research productivity and accomplishments [or potential, for new investigators]; and 6) Likelihood of significant enhancement in research capability and competitiveness.

III. Evaluation of Multis & Joint Activities

1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?

The multistate projects to which we fund NHAES participation address topics of high concern to both NH and New England, as identified by many of our stakeholders. These include the following projects at the present time, which address aspects of animal and plant agriculture including breeding of suitable varieties for our area, and important topics of rural life that impact the state and region: NE009: Conservation and utilization of plant genetic resources;

NE1027: Ovarian influences on embryonic survival in ruminants; NE1039: Changing the health trajectory for older adults through effective diet and activity modifications; NE1029: Rural change: markets, governance and quality of life; NE1034: Genetic bases for resistance and immunity to avian diseases; NC1042: Management systems to improve the economic and environmental sustainability of dairy enterprises; NC1171: Interactions of individual, family, community, and policy contexts on the mental and physical health of diverse rural low-income families; W2001: Population dynamics and change: aging, ethnicity and land use change in rural communities; W2133: Benefits and costs of natural resources policies affecting public and private lands.

We have recently initiated an effort to increase multistate project participation, particularly among our best scientists. We will also advocate that our new faculty hires affiliate with appropriate multistate research projects, to support regional or national efforts and to concurrently accrue the accompanying benefits of interactions with scientific peers. In addition to these formal multistate committee interactions, our supported faculty participate broadly in regional, national and even international research collaborations of value to the state and region. Many of these strongly leverage their NHAES support with substantial amounts of competitive funding. The Director's Office and faculty members maintain connection to critical issues through professional contacts, through contacts with varied stakeholders and with priorities expressed by funding entities, regional and national peers, and additional means.

2. How will the planned programs address the needs of under-served and under-represented populations of the

We will work with UNH Cooperative Extension and our partner New England Experiment Stations to continually identify under-served and under-represented populations of the state. As their emerging needs are evaluated, we will be proactive in partnering with these entities through new or existing multistate and integrated projects as appropriate and feasible.

Several of our existing projects and programs address the needs of the state's under-served and under-represented populations. For example, we address the consumer and rural populations, rather than only the production aspects of agricultural research. We will work with our Extension partners to evaluate the needs of the state's urban populations within these categories. Current and recent past work includes addressing the availability and intake of healthy foods, links between environmental and dietary influences and obesity, and the viability of local products and markets. Many of the multistate projects in which we participate address priority needs that address these target groups. Among these are NC1028 which seeks to understand how issues important to young adults such as environment and quality of life affect their diet, activity, and life style choices. The ultimate outcome of this work will be educationally appropriate materials and interventions that meet the young adult groups' needs in their acquisition of healthful eating and prevention of weight gain. NC1171 will provide data for customizing programs and public policy to meet the needs of rural America. It also will inform the research and Extension programming in sociology, economics, family studies, nutrition and health offered to families and communities across the state. NE1039 designs effective physical activity and nutrition interventions for older adults emphasizing the need for fruits, vegetables and whole grains in the diet and based on factors relevant to them, and to design community-wide food and environmental policies to promote improved plant food intake and physical activity among older adults. If successful the information should improve health and vitality in this segment of the population.

The several NHAES projects that focus on small operations and home gardeners are additional examples of our meeting the needs of under-represented and under-served populations. If successfully these projects will provide information, technologies and services that assist these segments to weather the current economic downturn, identify niche and emerging opportunities, and thrive within the unique rural/urban interface with its growing interests in local agriculture and foods. NHAES has an underlying commitment to ensure that the organization and our activities, as well as our stakeholder venues, include and encourage participation by under-served and under-represented individuals and groups.

3. How will the planned programs describe the expected outcomes and impacts?

We increasingly ask the principle investigators of all NHAES projects to focus on outcomes and impacts of their proposed and active research. As we move forward with this initiative they will be progressively more aware of and able to identify these metrics and to report them during the annual cycle. Concurrently we will develop a new web-based system to facilitate supported faculty in recording, evaluating and reporting their research activities, with tutorial examples to focus on outcomes and impacts.

Changes in knowledge related to individual projects are typically described to stakeholders through publications (peer reviewed and otherwise), workshops, presentations at scientific and public meetings, websites and traditional media (radio, television, newspapers), and other venues. For many research projects, quantitative and often substantive qualitative outcomes are difficult to accurately assess, as they develop incrementally over time, and neither the scientists nor stations have effective means to obtain unambiguous information from many of the important

stakeholders. Selected changes in condition and in action can more easily be described for applied than fundamental/development research projects. For example, if a breeding program develops a new variety of more nutritious and better quality product and the variety is produced by a seed company, a measurable change in condition might be the availability of that variety to growers. A change in action might be that producers decide to grow it. These outcomes can be described, but remain difficult to accurately quantify. Changes in condition and actions from many research activities frequently take time to fully mature, and the nature of knowledge dissemination makes them very difficult to assess or quantify. We will stress the importance of these metrics to our researchers, and work more closely with UNH Extension to compile changes in condition and action.

4. How will the planned programs result in improved program effectiveness and/or efficiency?
Participation in multistate research projects provides participating faculty with multiple benefits, including the ability to undertake and accomplish projects having larger and more integrated scope. Interaction with multistate colleagues provides synergies, opportunity for professional growth and development, and ultimately the potential for enhanced individual effectiveness that will carry into all activities undertaken through the NHAES.

For all our programs, whether multistate, integrated or other, strong consideration is given to potential effectiveness and efficiency in order to maximize the aggregate benefits and impacts. We are undertaking substantive changes in the nature of our funding to strongly support and enhance productive research, and to develop more cohesive programmatic thrusts where we can utilize our relative strengths in order to provide significant advances. Scientists who do not use taxpayer funds in a productive manner will no longer be supported. We are in the midst of a comprehensive evaluation of our research facilties that includes efficiency and effectiveness of staffing, feeding operations, allocations, and other aspects. Our shared goal is to provide the greatest possible outcome within the constrained resources available to us.

IV. Stakeholder Input

1. Actions taken to seek stakeholder input that encourages 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 reveiwers)

Brief explanation.

Input from our multiple stakeholders is encouraged at every opportunity and by multiple means, including presentations and meetings with traditional and non-traditional groups or individuals. Many of these are information interactions, both opportunistic and planned, and others follow more formal routes. Traditional stakeholders are generally very interested in the work done by the NHAES and are most willing to offer input and suggestions on what the AES can do that would help them. In most cases, the only action required is to meet with them or contact them in some other way. Input from stakeholders to individual faculty and NHAES projects is encouraged in a wide variety of ways including surveys (telephone, in person, and web-based), through presentations at scientific conferences, educational workshops and field days, multistate project meetings, via mass media, publications, and through the university classroom and educational programs aimed at K-12. Nontraditional stakeholders are being increasingly engaged to inform and assist in our efforts to increase emphasis on sustainable agricultural and food systems research. Many of these folks are highly interested and supportive.

As part of our attempts to better partner with UNH Cooperative Extension following several years of poor integration between the two entities, we will work with them to develop periodic formal mechanisms to comprehensively solicit input from stakeholders throughout the state. This will augment our existing and ongoing mechanisms, and will presumably result in enhanced interactions and participation.

2(A). A brief statement of the process that will be 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.

The NHAES will continue to undertake strategies to identify and engage stakeholders from throughout New Hampshire and to collect and incorporate input from them. Resulting information will be evaluated to identify the most critical and feasible issues for which we may develop effective research and integrated programs. UNH Cooperative Extension, the NH Department of Agriculture, Markets and Food, and the various college and NHAES advisory committees have been extremely helpful in identifying traditional and non-traditional stakeholders. Meetings with groups of stakeholders often result in identification of additional potential stakeholder groups. Attendance and presentations at agricultural exhibitions, such as the annual NH Farm & Forest Expo, facilitate direct conversations with a very diverse group of stakeholders and rural citizens. Listening to and speaking with participants in field days and open houses, and commodity or Extension-sponsored conferences and workshops provides insights from grower groups, professionals, government agencies, home gardeners and many others.

2(B). A brief statement of the process that will be 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 development of NHAES programs and priorities, input is collected primarily through meetings with stakeholder groups and individuals including growers, farmers, citizens, agricultural organizations and councils, natural resources professionals and managers, state and federal agency representatives, neighboring state AES and Extension administrators, research project directors, graduate and undergraduate students, and other means. While most meetings are open discussions, some are presentations followed by questions and answer sessions. The NHAES administration also attends many Cooperative Extension workshops and meetings and takes advantage of these opportunities to participate in discussion with groups and individuals.

The NHAES and College of Life Science and Agriculture are overhauling the Agriculture and Research sections of the college website to make agriculture much more prominent, visible and accessible to encourage stakeholder interactions. NHAES research project participants obtain direct and indirect stakeholder input through varied avenues. Projects with social science components frequently use questionnaires and surveys. Stakeholder input to many basic science and some applied projects occurs in the form of reviewer inputs to proposals and manuscripts, and from questions, comments and discussions following presentations at regional, national and international

conferences. Stakeholder input is also collected directly through comments and questions at workshops and training sessions for end users.

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.

Formal and informal stakeholder input to faculty, staff and administrators is very helpful in keeping abreast of changing needs, constraints and opportunities that we might address. These influence the specific activities of supported researchers, and the NHAES goals and directions in the short and long term.

Stakeholder input is used to continually review and update research priorities, relevant existing and emerging topics, and individual and programmatic performance. The information informs activities including faculty and staff hires, and investments to facilities and programs. Our strategies, activities and priorities are dynamic and evolve with consideration of stakeholder input, institutional and social goals and funding, and additional factors. We are continually working to facilitate constituent input, to focus our resources on priority issues and to improve our delivery of research findings to end users.

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Agricultural and Environmental Products and Services

2. Brief summary about Planned Program

This Planned Program addresses agricultural research related to ornamental and landscape horticulture, and provides seed funding and capacity building resources related to integrated agroecosystem research and other aspects of our portfolio that focus on local, state and regional priorities that are not well supported by the NIFA national priority areas. Some projects were formerly listed under the Sustainable Horticulture program area.

Ornamental and landscape horticulture represent the single largest agricultural economic sector in NH, and we provide strong support through funded projects as well as supporting high quality farm and greenhouse facilities that are used for research, teaching and extension. Additional horticulture activities that address breeding and production practices for vegetables and small fruits are included in the global food security and hunger planned program.

Initial support will be provided for new faculty hires in appropriate disciplines as they initiate research activities, are mentored about state and regional priority issues and the land grant mission, are introduced to peer and stakeholder networks, and develop initial proposals for subsequent NHAES and competitive research support. This foundational support and mentoring will result in stronger research projects during early career stages, and substantially greater impacts to the state and nation aggregated over faculty careers.

Many of the supported projects involve multistate collaborations, and some are integrated research-extension efforts.

3. Program existence : New (One year or less)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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			20%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			15%	
204	Plant Product Quality and Utility (Preharvest)			20%	
205	Plant Management Systems			45%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Greenhouse owners are coping with reduced sales due to the present state of the economy and shrinking margins on the plants they produce. Any potential cost savings could be the difference between continuing operations next year and closing their doors permanently.

Environmental horticulture is the largest economic sector of N.H. agriculture, but most large plant material for landscape use is imported from other regions of the country.

New faculty hires in agriculturally related fields often do not have appropriate knowledge of the federal-state partnership which underlies land grant universities, including their context, goals, expectations, mechanisms and reporting requirements. Additionally, they will have variable level of knowledge and experience in building strong and effective research programs that are interdisciplinary and that integrate science with outreach and education.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

There is limited information available to growers on osteospermum production and what does exist has become outdated by the release of new cultivars by commercial breeders.

High energy costs will make shipping heavy plant material into New England cost prohibitive. This combined with concern over the spread of exotic pests via national distribution of nursery stock and renewed consumer demand for locally-produced agricultural products creates an opportunity for increased production and profitability of nursery stock in the northeast.

Agroecosystem science and management issues are complex and involve closely interacting biological, chemical, physical and human processes at many scales. Mentoring new faculty hires to instill an understanding of land grant, state agricultural experiment station, and USDA-NIFA history, mandates and priorities will lead to greater integration of their research, and stakeholder relevance of their career undertakings.

2. Ultimate goal(s) of this Program

To develop best management practices for the production of ostespermums, including plant nutrition, optimal temperatures, and plant growth regulator recommendations for New Hampshire and New England growers.

Increase understanding of root acclimation and cold tolerance and lead to the development of more efficient over-wintering methods for container nursery stock, allowing for expansion of this valuable sector of agriculture.

Plan, generate and disseminate unbiased, scientifically-based knowledge about diverse aspects of agro-ecosystem science and management, and to achieve integrated multi-disciplinary approaches toward understanding and managing diversified working landscapes.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.5	0.0
2012	0.0	0.0	0.5	0.0
2013	0.0	0.0	0.5	0.0

Year	Extension		Research	
	1862	1890	1862	1890
2014	0.0	0.0	0.5	0.0
2015	0.0	0.0	0.5	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct extensive greenhouse trials to develop production guidelines for Osteospermum, including nutrient sufficiencies, optimal lighting protocol, and other factors. Compare 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 who will use appropriate conceptual, theoretical, experimental, and statistical approaches as they undertake and complete targeted agricultural research activities.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● Demonstrations	● Newsletters ● Web sites

3. Description of targeted audience

Commercial nursery and greenhouse operations including those who produce bedding plants across New England and the northern tier of 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 who are grounded in the land grant mission.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	300	2000	15	50
2012	300	2500	15	50
2013	300	2500	15	50
2014	300	2500	15	50
2015	300	2500	15	50

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	1	0	1
2012	3	0	3
2013	4	0	4
2014	4	0	4
2015	2	0	2

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2011:4 **2012:**5 **2013:**5 **2014:**5 **2015:**5

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

2011:1 **2012:**2 **2013:**2 **2014:**2 **2015:**2

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

2011:2 **2012:**4 **2013:**5 **2014:**3 **2015:**3

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

2011:8 **2012:**8 **2013:**8 **2014:**8 **2015:**8

- Number of reviewed, bulletin, popular and other publications

2011:1 **2012:**1 **2013:**1 **2014:**1 **2015:**1

V(I). State Defined Outcome

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 Osteospermum production for NH and New England growers.
6	Increased knowledge about container plant overwintering techniques suitable for local conditions.

Outcome # 1

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**1	**2013:**1	**2014:**1	**2015:**1

3. Associated Knowledge Area(s)

- 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

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Number of undergraduate students involved and trained in engagement research.

2. Outcome Type : Change in Condition Outcome Measure

2011:3	**2012:**4	**2013:**4	**2014:**4	**2015:**3

3. Associated Knowledge Area(s)

- 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

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 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

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 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

4. Associated Institute Type(s)

- 1862 Research

Outcome # 5

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 6

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Competing Programmatic Challenges

Description

Weather extremes including drought and natural disasters can interfere with plant research. Changes in resource availability resulting from the economy, appropriations or other factors would impact ability to carry out the proposed work, including staffing at the NHAES farm and greenhouse facilities use for this research. Competing programmatic challenges are a factor that must be considered given our limited resources, in order to maximize productivity including outcomes and impacts.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Agricultural Biotechnology and Genomics

2. Brief summary about Planned Program

Research activities in this Planned Program advance biotechnological approaches and solutions to agricultural problems facing New Hampshire and beyond, including those related to molecular biology, genetics, genomics and other existing and emerging tools. Many of the ongoing projects were formerly listed under our Biotechnology and Genomics or Animals & Animal Systems planned programs.

The projects will combine fundamental and applied aspects of plant biology, plant-microbe and plant-nematode interactions that impact nitrogen fixation and parasitism, domesticated animal and shellfish health and diseases, and endocrine function in reproduction with particular emphasis on an invasive species. The combined contributions will help address short-term and longer-term problems, and will help develop new technologies of local and international importance.

On aggregate, this is one of our more strongly development-oriented programs. New knowledge, approaches and abilities are needed to advance agriculture and food systems research. Outputs will be rapidly adopted by other scientists and industries, with dissemination and adoption leading to outcomes and impacts that will accrue through time. Incremental advances through fundamental research, particularly related to biotechnology and genomics, form the basis for subsequent applications-oriented research, extension and teaching.

3. Program existence : New (One year or less)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
135	Aquatic and Terrestrial Wildlife			5%	
201	Plant Genome, Genetics, and Genetic Mechanisms			10%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			10%	
206	Basic Plant Biology			10%	
212	Pathogens and Nematodes Affecting Plants			8%	
301	Reproductive Performance of Animals			5%	
304	Animal Genome			10%	
305	Animal Physiological Processes			20%	
306	Environmental Stress in Animals			7%	
311	Animal Diseases			10%	
315	Animal Welfare/Well-Being and Protection			5%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Plant and animal production, along with aquaculture endeavors resulting from our location on the Gulf of Maine, comprise major components of the agricultural economy in New Hampshire. The continued health of our natural resources forms a critical basis for our quality of life, tourist industry, and access to clean water. Our location, geography, climate and relatively small agricultural operations present a series of ongoing challenges that NHAES is well positioned to address. Understanding the mechanisms, interactions and dependencies of biologic processes that impact these priority areas is needed to help our stakeholders succeed under these conditions.

Because of limited mobility plant survival requires rapid acclimation to changes in their environment both as adults and during embryogenic development. Acclimation responses and stress detection/responses are seemingly complicated, sophisticated processes involving a whole array of potential signal transduction pathways and gene activation events which can alter the biochemical, physiological, anatomical and cytological plant status from the pre-stressed condition.

Nitrogen fixation by actinorhizal plants is an important part of the nitrogen budget of the planet. The plants involved are also of economic significance with respect to land reclamation, reforestation, soil stabilization, landscaping, fuel, and as a food source for ruminant animals. Actinorhizal plants provide an excellent mechanism to restore disrupted environmental sites.

Many diseases of the eye affect both humans and many inbred strains of animals, including farm (e.g., pigs, chickens) and laboratory animals (e.g., mice, rats). For most retinal diseases, there is neither means for a cure nor prevention. Progress against these conditions depends on gaining new knowledge of the fundamental molecular and cellular processes underlying normal retinal function.

The ability to acquire large amounts of sequence data has given a powerful new dimension to the field of host-parasite interactions. Applying genomics tools to study nematode parasites of plants promises an understanding of the genetic basis of parasitism.

Disease diagnosis, treatment and prevention are significant variables in aquaculture. Investigations are needed concerning bivalve diseases in the Northeastern US in order to facilitate the optimum utilization of these harvested resources.

2. Scope of the Program

- In-State Research
- Multistate Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Resources including personnel, facilities and funding will continue to be available at sufficient levels. Advances in biotechnologies and genomic approaches will continue. Collaboration with colleagues in NH and other states will lead to productive synergies. Genetic and genomic resources will continue to be available from publicly funded entities. Plant and animal production and health, human health, aquaculture, and environmental quality will continue to be priorities in NH and New England.

2. Ultimate goal(s) of this Program

Improve our understanding and technologies related to biological, molecular and genomics processes for economically and environmentally important applications.

New knowledge, tools and approaches that can be translated into applications-oriented research and engagement that addresses New Hampshire's needs.

Support the human capital and infrastructure needed to advance frontiers of relevant science and technologies.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	1.4	0.0
2012	0.0	0.0	1.4	0.0
2013	0.0	0.0	1.4	0.0
2014	0.0	0.0	1.4	0.0
2015	0.0	0.0	1.4	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Examine leaf samples exposed to abiotic stresses to help evaluate physiological and anatomical changes and adaptations. Use a multidisciplinary approach and a myriad of 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 will be 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 that interact with PAB1 and to determine the timing of these contacts, to elucidate a number of key processes in which PAB1 is involved: ribosomal biogenesis, mRNA export, mRNA degradation, nonsense mediated decay (NMD) and quality control of mRNA production, and protein synthesis. 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. Publish peer reviewed and other articles based on the research. Present findings to professionals and stakeholders via meetings and direct contacts.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Workshop ● Other 1 (Laboratory and field research) ● Other 2 (Scientific and other meetings)	● Other 1 (Peer reviewed publications)

3. Description of targeted 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.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	300	1200	20	80
2012	300	1200	20	80
2013	300	1200	20	80
2014	300	1200	20	80
2015	300	1200	20	80

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

2011:0 **2012:**0 **2013:**1 **2014:**0 **2015:**1

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	5	0	5
2012	6	0	6
2013	5	0	5
2014	4	0	4

Year	Research Target	Extension Target	Total
2015	5	0	5

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2011:10 **2012:**12 **2013:**12 **2014:**12 **2015:**12

- Number of graduate student theses or dissertations

2011:1 **2012:**2 **2013:**2 **2014:**1 **2015:**2

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

2011:5 **2012:**5 **2013:**5 **2014:**5 **2015:**5

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

2011:2 **2012:**2 **2013:**2 **2014:**2 **2015:**2

V(I). State Defined Outcome

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

Outcome # 1

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

2011:3	**2012:**2	**2013:**3	**2014:**2	**2015:**2

3. Associated Knowledge Area(s)

- 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
- 304 - Animal Genome
- 305 - Animal Physiological Processes
- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Number of undergraduate students involved and trained in engagement research.

2. Outcome Type : Change in Condition Outcome Measure

2011:10	**2012:**8	**2013:**8	**2014:**8	**2015:**8

3. Associated Knowledge Area(s)

- 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
- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 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
- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 305 - Animal Physiological Processes

4. Associated Institute Type(s)

- 1862 Research

Outcome # 5

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 304 - Animal Genome

4. Associated Institute Type(s)

- 1862 Research

Outcome # 6

1. Outcome Target

knowledge related to how the neuroendocrine system influences reproduction.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 305 - Animal Physiological Processes

4. Associated Institute Type(s)

- 1862 Research

Outcome # 7

1. Outcome Target

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. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 306 - Environmental Stress in Animals

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

- Government Regulations
- Competing Programmatic Challenges

Description

Natural disasters, weather extremes and other climate factors may interfere with field aspects of the activities. Changes in funding or regulations as result of the economy or other factors would impact the resources available to complete the research and disseminate to stakeholders.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Nutrition & Childhood Obesity

2. Brief summary about Planned Program

Nutritional conditions and practices that impact human health, particularly those focused on obesity, are a national research priority. We currently have one project that will specifically target obesity in children and adults. The research includes participation in the NC1028 multistate research project, and addresses the role of exposure to PBDE flame retardants as well as lifestyle choices and education in impacting obesity and human health.

Additional research related to nutrition but that does not focus on obesity is housed under the global food security and hunger planned program.

3. Program existence : New (One year or less)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
723	Hazards to Human Health and Safety			100%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Obesity is a global, growing epidemic recognized as a priority area by the USDA. Despite the plethora of resources devoted to understanding the roles of diet and exercise in the obesity epidemic, this epidemic continues to escalate, suggesting that other environmental factors may be involved. These factors can include the built environment and individual behavior patterns, and at the biochemical level there is a growing body of experimental evidence suggesting certain environmental chemicals could disrupt body metabolism and contribute to the obesity epidemic.

2. Scope of the Program

- In-State Research
- Multistate Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Preventing obesity in children is related not only to observed or encouraged behaviors, but also by environmental chemicals that predispose individuals to weight gain. The biological effects of endocrine-disrupting compounds may not be limited to parent compounds, but could include in vivo metabolites. Funding and resources will continue to be available at sufficient levels. Multistate collaboration will lead to productive integrative synergies.

2. Ultimate goal(s) of this Program

To expand our understanding of environmental factors that promote the development of obesity in an animal model and in young adults, and devise ways to approach the obesity problem using community-based participatory research.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.1	0.0
2012	0.0	0.0	0.1	0.0
2013	0.0	0.0	0.1	0.0
2014	0.0	0.0	0.1	0.0
2015	0.0	0.0	0.1	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● Demonstrations	● Newsletters ● Web sites

3. Description of targeted 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.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	50	2000	20	0
2012	50	2000	20	0
2013	50	2000	20	0
2014	50	2000	20	0
2015	50	2000	20	0

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	1	0	1
2012	0	0	0
2013	1	0	1
2014	0	0	0
2015	1	0	1

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2011:100 **2012:**100 **2013:**100 **2014:**50 **2015:**50

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

2011:1 **2012:**1 **2013:**1 **2014:**1 **2015:**1

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

2011:2 **2012:**2 **2013:**2 **2014:**2 **2015:**2

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

2011:1 **2012:**0 **2013:**1 **2014:**0 **2015:**0

- Number of reviewed, bulletin, popular and other publications

2011:0 **2012:**1 **2013:**0 **2014:**1 **2015:**0

V(I). State Defined Outcome

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.

Outcome # 1

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

2011:1	**2012:**1	**2013:**0	**2014:**1	**2015:**0

3. Associated Knowledge Area(s)

- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Number of undergraduate students involved and trained in engagement research.

2. Outcome Type : Change in Condition Outcome Measure

2011:2	**2012:**2	**2013:**2	**2014:**2	**2015:**2

3. Associated Knowledge Area(s)

- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

Increased knowledge about environmental factors that affect obesity.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

Availability of methods for participatory research related to obesity.

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 723 - Hazards to Human Health and Safety

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Changes in funding and resource availability for the activities, and in policies or regulations related to research using animal and human subjects, would modify feasibility of completing the objectives. Competing programmatic challenges must be considered in prioritizing resource use.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Climate Change Impacts on Agriculture

2. Brief summary about Planned Program

Many aspects of climate, soils, landform and vegetation in New Hampshire and New England make it particularly susceptible to any changes in climate. We are near a northern temperature extreme for some forms of production. NH has the greatest proportion of forested land in the country. The vast majority of plant agriculture relies primarily on growing season rainfall rather than intensive irrigation. Our thin soils and shallow bedrock provide less buffer than for many parts of the country. All of these make the ability to anticipate, mitigate and adapt to potential changes in climate a priority. Further, we have the potential to serve as net carbon sink, which is important to the global environment.

This program addresses prediction, adaptation and mitigation of climate change impacts on agriculture. While we have previously funded some projects which addressed particular aspects of this topic, we will strive to develop a more strongly focused and integrated effort going forward. Our initial efforts comprise a team of excellent scientists having strong productivity records.

3. Program existence : New (One year or less)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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			10%	
102	Soil, Plant, Water, Nutrient Relationships			25%	
123	Management and Sustainability of Forest Resources			20%	
131	Alternative Uses of Land			10%	
132	Weather and Climate			20%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			15%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

There is overwhelming evidence that warming of the Earth's climate has been induced by the global footprint of human activities. Contributing factors include the rise of CO2 in the atmosphere, increasing emissions of N2O and other greenhouse gasses, and alteration of land surface properties through ecosystem management and land cover change. Changes in climate witnessed thus far have been as apparent in the Northeastern U.S. as elsewhere. Because natural and agricultural ecosystems are vital to the region's economic and cultural well-being, understanding the long-term effects of climate change is paramount. However, ecosystems also play an important role in climate regulation. Their influence occurs both as

regulators of carbon dioxide and other greenhouse gases, as well as through their effect on surface albedo and other biophysical properties. Although climate change policy initiatives often include incentives for land management activities that can offset warming, most have focused on enhanced storage of carbon. This can be achieved through, for example, no-till agricultural practices or forest management practices that maximize standing biomass. Often not considered is the fact that these practices also bear climate consequences through other mechanisms (N2O and CH4 emissions, altered albedo, etc.). Comprehensive studies of net climate impacts are rarely carried out, but are greatly needed for crafting effective land management policies that balance climate mitigation with food production, forest resources and many other services for which these ecosystems are relied upon.

2. Scope of the Program

- In-State Extension
- In-State Research
- Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Predicted changes in climate will have substantial implications for New England's natural and agricultural ecosystems. Changes in nutrient cycling and greenhouse gas production are likely to be equally important. Sufficient resources will continue to be available to undertake this integrated project.

2. Ultimate goal(s) of this Program

The goal of this program is to address climate change impact and mitigation issues by conducting a focused study of how agriculture and other land uses in a human-dominated landscape influence climate through a combination of carbon storage, greenhouse gas emissions (N2O and CH4) and alterations to shortwave albedo and land surface heating. Results of this activity will highlight tradeoffs among multiple land management strategies in terms of their net climate effect. Information of this nature is of critical importance for preparing sound land management policies and designing strategies to cope with changes in climate.

We anticipate that outcomes from this program will provide knowledge and opportunities for NH stakeholders to anticipate and successfully adapt to changing climatic conditions.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.5	0.0
2012	0.0	0.0	0.5	0.0
2013	0.0	0.0	0.5	0.0
2014	0.0	0.0	0.5	0.0
2015	0.0	0.0	0.5	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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 AVIRIS instrument; using the field and remote sensing data to parameterize the DNDC computer simulation model, validate and upscale model predictions; generating spatially continuous predictions of C pools, greenhouse gas emissions and shortwave surface 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, and suburban lawns); and making future projections of C, N and water balances for both agricultural and forested landscape units, using newly available CO2 and climate change projections through 2100.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Group Discussion ● Demonstrations	● Web sites

3. Description of targeted 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 this topic and therefore research outcomes.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	50	250	25	250
2012	50	500	25	250
2013	50	500	25	250
2014	50	500	25	250
2015	50	500	25	250

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	2	0	3
2012	3	0	3
2013	4	1	5

Year	Research Target	Extension Target	Total
2014	4	0	4
2015	4	0	4

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2011:5 **2012:**6 **2013:**6 **2014:**6 **2015:**6

- Number of graduate student theses or dissertations

2011:0 **2012:**1 **2013:**3 **2014:**2 **2015:**2

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

2011:1 **2012:**2 **2013:**2 **2014:**2 **2015:**2

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

2011:2 **2012:**4 **2013:**4 **2014:**5 **2015:**5

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

2011:1 **2012:**2 **2013:**2 **2014:**2 **2015:**2

- Number of websites in which project results have been incorporated

2011:1 **2012:**2 **2013:**2 **2014:**2 **2015:**2

V(I). State Defined Outcome

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.

Outcome # 1

1. Outcome Target

Number of undergraduate students involved and trained in engagement research.

2. Outcome Type : Change in Condition Outcome Measure

2011:2	**2012:**4	**2013:**4	**2014:**4	**2015:**4

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 123 - Management and Sustainability of Forest Resources
- 131 - Alternative Uses of Land
- 132 - Weather and Climate
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**1	**2013:**2	**2014:**1	**2015:**1

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 123 - Management and Sustainability of Forest Resources
- 131 - Alternative Uses of Land
- 132 - Weather and Climate
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 123 - Management and Sustainability of Forest Resources
- 131 - Alternative Uses of Land
- 132 - Weather and Climate
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Competing Public priorities
- Competing Programmatic Challenges

Description

The nature of this work means that weather extremes, natural disasters and similar factors would substantially disrupt or interfere with the field aspects. Climate change is currently a public and governmental priority. Any changes in this situation, including availability of leveraging funds and resources, remote sensing products, or similar would affect the outcomes.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Case Study
- Other (Interaction with peer scientists)

Description

The project will be evaluated through acceptance by peer scientists, feedback from all manner of information stakeholders, and success in leveraging NHAES resources with competitive grant funds.

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food Safety

2. Brief summary about Planned Program

The safety of food products is of high concern to all consumers of agricultural products within NH, and therefore within the umbrella of the NHAES. UNH does not have an academic program in food safety, so our efforts are undertaken by those having tangential expertise. We currently have one funded project in this area, with (at least) a second expected in 2012. The latter may be an integrated research and extension effort.

Supported research will target improving the safety and reliability of food products grown, harvested or produced and consumed locally, regionally and nationally. Initially we will focus on the infectious disease vibrio that affects some oysters harvested for human consumption.

3. Program existence : New (One year or less)

4. Program duration : Medium Term (One to five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies			20%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			80%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Pathogenic Vibrio species are a significant cause of shellfish-borne disease incidence in the US and worldwide. Outbreaks of illness caused by Vibrio parahaemolyticus and Vibrio vulnificus infections have been growing concerns for consumers of shellfish, especially oysters from the Gulf of Mexico. The shellfish aquaculture industry has suffered increasingly more frequent vibrio-associated disease outbreaks linked to shellfish consumption, both on a regional and a national scale. These outbreaks and individual cases of disease have had a widespread and cumulatively devastating impact on markets. Because of this, the top priority of the east coast shellfish growers industry is to reduce food-borne illnesses associated with their products.

2. Scope of the Program

- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Vibrio diseases are an important problem for shellfish harvesting and processing to ensure safety for consumers and economic viability for the shellfish aquaculture industry in New England and the rest of the world. The incidence of virulent strains in populations of otherwise benign bacterial species within microbial ecosystems also poses a threat for severe wound infections in people who swim, fish and work in coastal waters. The increased incidence of vibrio diseases associated with shellfish consumption in north temperate coastal areas of the US is emerging as a significant concern. Funding and resources will be available to complete the work. Simple models can be constructed to help in the risk analysis needed to manage shellfish harvesting in the Northeast US. The results from this work can help to refine and inform monitoring strategies for these pathogens in colder north temperate coastal waters in relation to emerging US FDA guidelines.

2. Ultimate goal(s) of this Program

The goal of the program is to help elucidate environmental and biological conditions that may be useful for reducing or avoiding exposure to elevated levels of pathogenic vibrio species. The findings should help to address the present consensus that vibrios in New Hampshire and Maine contain only rare occurrences and low levels of virulent strains of vibrio species. Further, more in-depth studies on post harvest practice strategies and harvest area conditions will help to determine the feasibility of low-cost strategies for reducing vibrio levels in contaminated shellfish.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.1	0.0
2012	0.0	0.0	0.2	0.0
2013	0.0	0.0	0.2	0.0
2014	0.0	0.0	0.2	0.0
2015	0.0	0.0	0.2	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Activity for the 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.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Group Discussion ● Demonstrations	● Web sites

3. Description of targeted 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 if 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.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	20	200	5	20
2012	50	200	10	40
2013	75	500	20	50
2014	75	500	20	50
2015	75	500	20	50

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	1	0	1
2012	0	0	0
2013	1	0	1
2014	2	0	2
2015	1	0	1

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2011:1 **2012:**4 **2013:**4 **2014:**4 **2015:**4

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

2011:0 **2012:**1 **2013:**2 **2014:**2 **2015:**2

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

2011:1 **2012:**2 **2013:**2 **2014:**2 **2015:**2

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

2011:2 **2012:**3 **2013:**5 **2014:**5 **2015:**5

V(I). State Defined Outcome

O. No.	Outcome Name
1	Increased knowledge about the incidence and detection of vibrio in oysters.
2	Knowledge of environmental and biological factorsassociated with reduced concentrations of vibrios in harvested and processed oysters.

Outcome # 1

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Natural disasters affecting the coastal areas or weather extremes could impact accurate evaluation of environmental factors that impact the incidence and detection of vibrios in oysters. Changes in funding and resource availability for the activities, and in policies or regulations related to research using animal and human subjects, would modify feasibility of completing the objectives. Competing programmatic challenges must be considered in prioritizing resource use.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Case Study
- Other ()

Description

2. Data Collection Methods

- Other (Direct contacts)

Description

Direct and indirect interactions with a wide variety of stakeholders will be used to collect information to help evaluate utility of the program. Reception of results by scientists and government agencies including the US EPA will further inform our evaluation.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Global Food Security and Hunger

2. Brief summary about Planned Program

The projects covered under this planned program all focus on maintaining and enhancing the competitiveness and sustainability of local, regional, national and international food production agriculture. Many simultaneously contribute to food security and reducing or ending the incidence of hunger. The ongoing projects funded under this area were formerly listed under Animals & Animal Products, Sustainable Horticulture, Sustainable Marine Aquaculture & Fisheries, and Agricultural Systems. They represent a mix of discovery and applications research efforts.

A group of MHAES scientists are working on multiple aspects of organic and conventional dairy production, nutrition and health of dairy calves and lactating adults, and the health and nutritional characteristics of resulting dairy products as related to their fatty acid compositions. Another focus addresses breeding and production practices for vegetables and small fruit that are particularly suited to New Hampshire and New England growing conditions and markets. This includes an ongoing breeding program in cucurbits that continues to spin off commercial varieties for stakeholder and consumer use, a strawberry breeding program with novel end uses, and off-season and season-extending opportunities for local producers and consumers. A third group of research addresses the tissue and cellular basis of animal reproduction with focus on dairy cows, and reducing the disease impact on commercial poultry production. Finally, several aquaculture projects target the potential for culturing finfish on a commercial scale on the Atlantic coast, and developing integrated multispecies aquaculture systems to maximize production efficiency while minimizing unintended environmental impacts.

NHAES scientists in this program participate in multistate research projects including NC1042 Management systems to improve the economic and environmental sustainability of dairy enterprises, NE9 Conservation and utilization of plant genetic resources, NE1034: Genetic bases for resistance and immunity to avian diseases, NE1039: Changing the health trajectory for older adults through effective diet and activity modifications, and NE1027: Ovarian influences on embryonic survival in ruminants. Some are also participants in multistate research coordinating committee and information exchange groups.

3. Program existence : New (One year or less)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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%	
201	Plant Genome, Genetics, and Genetic Mechanisms			12%	
202	Plant Genetic Resources			3%	
204	Plant Product Quality and Utility (Preharvest)			18%	
205	Plant Management Systems			8%	
301	Reproductive Performance of Animals			10%	
302	Nutrient Utilization in Animals			5%	
303	Genetic Improvement of Animals			8%	
307	Animal Management Systems			5%	
308	Improved Animal Products (Before Harvest)			8%	
311	Animal Diseases			5%	
503	Quality Maintenance in Storing and Marketing Food Products			3%	
702	Requirements and Function of Nutrients and Other Food Components			10%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

The largest segments of New Hampshire's agricultural sector excluding ornamental horticulture are dairy, vegetable and fruit production, and aquaculture. As a result, this planned program comprises our largest effort. The shared goals among many New Hampshire residents is to have a thriving small-scale agrarian sector along with a clean and healthy environment. Each brings important individual benefits, and combined they greatly support our critical tourism and related service industries. These industries need continuing research to help them adapt to changing economic, social, policy and environmental concerns.

The NHAES commitment to the dairy industry is evident through our supporting two operational research and teaching dairies - one a conventional Holstein operation based on total mixed ration feeding and the second an organic dairy-based agroecosystem using pasture-fed Jersey cows. We have recently added a cohort of Jerseys to the conventional dairy to allow direct comparisons of organically and conventionally managed cows and products. Similarly, for vegetable and fruit breeding, genetics and production we support two horticultural farms and a greenhouse complex. A portion of one farm will undergo transition to organic certification beginning this year to enable us to address issues of importance to that agricultural segment.

New England in general, and New Hampshire in particular, produces only a very small portion of the food calories it consumes. The state and region, therefore, is particularly dependent on imported food, mostly from distant locations across the United States and from many other countries. The continued supply of that food is insecure, based on the highly volatile supply and price of oil, over 60% of which is imported from overseas. Globally, the demand for seafood continues to rise while many wild fish stocks are at or beyond sustainable harvest levels. To meet rising consumer demand, much of the production will depend on continued growth of the aquaculture industry. The growth of aquaculture is, however, meeting resistance in many areas due to water quality problems and the reliance on fish meal-based diets derived from wild harvested

fish. One species with enormous potential for culture in northern New England is the Atlantic cod. Future expansion of the nascent cod industry in New England is dependent on our ability to reliably produce juveniles from locally-adapted stocks.

America's abundant and inexpensive supply of food and fiber is based on a productive and progressive agricultural system. The foundation for this productivity has been based on scientific knowledge and exploitation of useful genetic diversity for developing new, higher quality cultivars that can resist pests, diseases, and environmental stresses. The genes that are needed to provide a continued flow of new varieties that produce higher yields with better quality, and to better withstand pests, diseases, and abiotic stresses can only come from diverse plant germplasm. Most of the food crops important in the American diet have their origin in other parts of the world. Genetic diversity of plant species has evolved in centers of origin wherever this has occurred in the world. This source of different genes continues to be essential for plant breeders and other scientists to breed new varieties that are important to American consumers today. Locally adapted crop varieties are needed that serve consumer demands for high quality, locally grown produce and value-added horticultural products. A short growing season, high labor costs and high land values make fruit and vegetable production far more costly in New England than elsewhere. Further, an extremely variable and humid climate make disease and insect pests a constant threat to the profitability of NH farms. To compete with west coast and international agricultural producers, NH vegetable and fruit growers must produce unique and high-value products. To attain sustainability, NH fruit and vegetable growers must 1) reduce use of chemical pesticides, 2) minimize crop production costs, 3) maintain high crop quality and yields, and 4) have reliable and consistent markets for their products. There are many production challenges unique to NH and New England conditions. Regionally applicable agricultural research is needed to identify crops, crop varieties, and production practices that are best suited to these conditions.

Impaired reproductive performance is a major cause of reduced productivity for ruminants and of reduced profitability for dairy and meat animal producers. In the US, over 4 million replacement dairy heifers are raised annually. The cost of raising dairy replacements represents 15 to 25% of the total cost of managing a dairy operation. There is increasing interest in organic dairy production in response to higher milk prices and perceived consumer demand. Purchased feeds, including conserved forage and grains, account for an average of 36% of the total cash expenses of organic dairy farms located in northern New England. Northeast producers cited the high costs of production as one of the most challenging aspects of sustaining organic dairying in the region. Pasture-fed dairy cows produce milk having different fatty acid composition including specific conjugated linoleic acids and omega-3 fatty acids compared to cows fed total mixed rations. It is not known if these differences translate to animal and/or consumer health benefits.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Most national research on production methods is applicable to terrain and climates that are very different from those faced by NH growers. Crop varieties that are developed elsewhere may or may not be adapted to the short growing season, cold winter temperatures, specific soil types or prevalent pests of NH. As a result, varieties must be carefully evaluated for performance in this region. The attractiveness of local produce to consumers can be enhanced by developing new varieties with improved appearance, eating quality, and nutrition. In addition, improved disease resistance in vegetable crops reduces pesticide inputs and increases profitability. Supplementing high-sugars forage with molasses will optimize milk yield, and reduce feed costs and outputs of N and CH4 to the environment. We are entering an uncertain economic period and cannot continue to rely on past cheap oil supplies, both because of the depletion of remaining inexpensive oil stocks and greater competition for those stocks, and because of uncertain global economic conditions. Seasonal changes in fluid milk color and flavor, along with differences in fatty acid ratios and other health markers between grass-fed and total mixed ration-fed dairy

cows will impact potential uses of fluid milk and value-added dairy products, including consumer preference. By integrating production of a commercially important plant species (seaweed) that can utilize the waste products of other cultured species (e.g. fish, sea urchins) the total economic potential of the aquaculture site is increased, while environmental impacts are minimized

2. Ultimate goal(s) of this Program

To increase our understanding of and abilities to safely produce agricultural food products to address regional and international food security, consistent with maintaining environmental quality. To contribute to the abilities of New Hampshire and regional stakeholders to maintain viable businesses and careers. To advance scientific knowledge in related areas.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	2.0	0.0
2012	0.0	0.0	2.0	0.0
2013	0.0	0.0	2.0	0.0
2014	0.0	0.0	2.0	0.0
2015	0.0	0.0	2.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Workshop ● Group Discussion ● Demonstrations ● Other 1 (Field Days)	● Newsletters ● Web sites

3. Description of targeted 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.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	200	2000	50	200
2012	200	2000	50	200
2013	200	2000	50	200
2014	200	2000	50	200
2015	200	2000	50	200

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	3	0	3
2012	3	1	4
2013	3	0	3
2014	3	1	4
2015	3	0	3

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2011:5 **2012:**5 **2013:**5 **2014:**5 **2015:**5

- Number of graduate student theses or dissertations

2011:1 **2012:**2 **2013:**2 **2014:**2 **2015:**2

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

2011:3 **2012:**4 **2013:**4 **2014:**4 **2015:**4

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

2011:5 **2012:**5 **2013:**5 **2014:**5 **2015:**5

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

2011:8 **2012:**6 **2013:**8 **2014:**8 **2015:**8

- Number of reviewed, bulletin, popular and other publications

2011:2 **2012:**2 **2013:**2 **2014:**2 **2015:**2

- Number of websites in which project results have been incorporated

2011:1 **2012:**2 **2013:**2 **2014:**2 **2015:**2

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

2011:1 **2012:**2 **2013:**1 **2014:**1 **2015:**2

V(I). State Defined Outcome

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.

Outcome # 1

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

2011:2	**2012:**2	**2013:**2	**2014:**2	**2015:**2

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Management Systems
- 308 - Improved Animal Products (Before Harvest)
- 311 - Animal Diseases
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 702 - Requirements and Function of Nutrients and Other Food Components

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Number of undergraduate students involved and trained in engagement research.

2. Outcome Type : Change in Condition Outcome Measure

2011:6	**2012:**6	**2013:**6	**2014:**6	**2015:**6

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Management Systems
- 308 - Improved Animal Products (Before Harvest)

- 311 - Animal Diseases
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 702 - Requirements and Function of Nutrients and Other Food Components

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 702 - Requirements and Function of Nutrients and Other Food Components

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 307 - Animal Management Systems
- 308 - Improved Animal Products (Before Harvest)
- 311 - Animal Diseases

4. Associated Institute Type(s)

- 1862 Research

Outcome # 5

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 702 - Requirements and Function of Nutrients and Other Food Components

4. Associated Institute Type(s)

- 1862 Research

Outcome # 6

1. Outcome Target

Increased knowledge about integrated multispecies aquaculture systems.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 204 - Plant Product Quality and Utility (Preharvest)
- 302 - Nutrient Utilization in Animals
- 307 - Animal Management Systems
- 308 - Improved Animal Products (Before Harvest)

4. Associated Institute Type(s)

- 1862 Research

Outcome # 7

1. Outcome Target

Improved juvenile growth in cod aquaculture.

2. Outcome Type : Change in Condition Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 307 - Animal Management Systems
- 308 - Improved Animal Products (Before Harvest)

4. Associated Institute Type(s)

- 1862 Research

Outcome # 8

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1862 Research

Outcome # 9

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 204 - Plant Product Quality and Utility (Preharvest)

4. Associated Institute Type(s)

- 1862 Research

Outcome # 10

1. Outcome Target

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

2. Outcome Type : Change in Condition Outcome Measure

2011:2	**2012:**2	**2013:**3	**2014:**3	**2015:**0

3. Associated Knowledge Area(s)

- 204 - Plant Product Quality and Utility (Preharvest)
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 702 - Requirements and Function of Nutrients and Other Food Components

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Weather and climate extremes and natural disasters affect the outcomes of field research on plants and animals. Economic factors and government regulations may impact the available resources and abilities of relevance of undertaking specific research methods. Competing programmatic challenges must be weighed to ensure effective use of limited NHAES resources.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Description

{NO DATA ENTERED}

2. Data Collection Methods

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Rural and Community Development

2. Brief summary about Planned Program

New Hampshire is a rural state, as is the surrounding New England region. The vitality and wellbeing of rural communities is therefore important to our stakeholders. Ongoing challenges of rural economies, marginal agricultural profitability, employment opportunities for NH high school and college graduates and other factors, combined with the ongoing economic downturn, provide strong incentive to conduct research in these areas.

The activities listed under this planned program address myriad social and economic aspects of rural population and community concerns, in effort to help maintain and develop thriving communities throughout New Hampshire, New England and the nation. The continuing projects were formerly listed under Economics & Commerce. Most of the current projects are both multistate and integrated. Supported NHAES scientists participate in the following multistate projects: NE1029 Rural change: markets, governance and quality of life, NC1171 Interactions of individual, family, community, and policy contexts on the mental and physical health of diverse rural low-income families, and W2001 Population dynamics and change: aging, ethnicity and land use change in rural communities. Additional projects that support rural and community life and communities but are more closely aligned with specific topical areas are found in other planned programs. Our partner organization UNH Cooperative Extension also has strong programs related to this area that also serve our common stakeholders.

3. Program existence : New (One year or less)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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			15%	
605	Natural Resource and Environmental Economics			20%	
608	Community Resource Planning and Development			25%	
610	Domestic Policy Analysis			15%	
805	Community Institutions, Health, and Social Services			20%	
	Total			100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Waste management and disposal costs have more than tripled in the past two decades. State and local governments need economic analysis of various management options in order to make appropriate decisions. Rural residents are often underemployed or unemployed due to personal choice reasons or reasons beyond their control. The role that physical and

mental health plays in the lives of rural New Hampshire families and in the complex interaction among the family context, community, and policies is a critical aspect of our rural environment. The aging of the U.S. population affects rural areas in unique and geographically diverse ways, with increasing rates of retirement migration affecting some areas and aging-in-place occurring elsewhere. The changing racial and ethnic composition of rural areas produces social and economic challenges to the integration of these new racial and ethnic groups. Rapid population growth along the urban-rural periphery and in high amenity areas requires a careful examination of land use patterns.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Waste management continues to be a problem for local municipalities, especially with budget problems exacerbated by the current recession. These local governments need new information to implement policies to manage service delivery in a cost effective fashion. Regional firms and rural residents have a willingness to interact in comparing firm and retiree goals and abilities related to rural part-time employment opportunities. Labor force participation is vital for families to be financially self-sufficient. Rural mothers face numerous barriers when attempting to maintain a strong attachment to the labor force. Being employed at any job is inadequate for many rural families to become financially self-sufficient when wages were low and hours were unpredictable. Barriers such as lack of child care, transportation problems, and health (both mothers own health and health of other family members) are constant challenges to rural low-income mothers. The Earned Income Tax Credit (EITC) is an important source of income for a number of rural families, although their knowledge of the EITC is limited. Without knowledge of regional differences, policy formation within New Hampshire may be misdirected and the state would be excluded from project efforts to disseminate findings which enhance the response capabilities of local government officials, regional economic development officers, extension personnel, and other stakeholders.

2. Ultimate goal(s) of this Program

Examine problems faced by communities in implementing waste management strategies, and provide information on the economic impacts of various policy initiatives. Match firm's requirements related to skills and job classifications with the same attributes in those seeking additional part-time employment. Show how this activity could reduce the drain on the Social Security Trust Fund. Improve understanding of the experiences of diverse rural low-income New Hampshire families. Improve policy for strengthening the mental and physical health and economic well-being of diverse rural low-income New Hampshire families based upon their unique community needs. Inform county-based extension educators and their community partners regarding rural low-income families' physical and mental health and economic well-being. Develop local curricula by county-based extension educators and their community partners to inform other professionals about rural low-income families' physical and mental health needs and strengths of diverse rural low-income families, and strategies to help them meet their needs. Improve understanding of the interrelationships among community structure, family mental and physical health outcomes and economic well-being.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.4	0.0

Year	Extension		Research	
	1862	1890	1862	1890
2012	0.0	0.0	0.4	0.0
2013	0.0	0.0	0.4	0.0
2014	0.0	0.0	0.4	0.0
2015	0.0	0.0	0.4	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research related to solid waste management and provide useful economic information to guide effective management decisions. 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. Investigate the changing organizational structure, tax policy and fiscal standing of local governments and the impact of tax and/or expenditure limitations on local government fiscal stress and economic growth in rural areas. 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. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● Group Discussion	● Web sites

3. Description of targeted 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.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	200	2000	50	500
2012	200	2000	50	500
2013	200	2000	50	500
2014	200	2000	50	500
2015	200	2000	50	500

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	2	0	2
2012	3	0	3
2013	2	0	2
2014	2	0	2
2015	2	0	2

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2011:2 **2012:**3 **2013:**3 **2014:**3 **2015:**3

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

2011:2 **2012:**3 **2013:**2 **2014:**2 **2015:**2

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

2011:10 **2012:**15 **2013:**15 **2014:**15 **2015:**15

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

2011:25 **2012:**20 **2013:**10 **2014:**10 **2015:**10

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

2011:1 **2012:**1 **2013:**1 **2014:**1 **2015:**1

V(I). State Defined Outcome

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 Target

Number of undergraduate students involved and trained in engagement research.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:3	**2012:**3	**2013:**3	**2014:**3	**2015:**3

3. Associated Knowledge Area(s)

- 133 - Pollution Prevention and Mitigation
- 403 - Waste Disposal, Recycling, and Reuse
- 605 - Natural Resource and Environmental Economics
- 608 - Community Resource Planning and Development
- 610 - Domestic Policy Analysis
- 805 - Community Institutions, Health, and Social Services

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

Increased knowledge about economics and policy related to waste management.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

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

4. Associated Institute Type(s)

- 1862 Research

Outcome # 3

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 610 - Domestic Policy Analysis
- 805 - Community Institutions, Health, and Social Services

4. Associated Institute Type(s)

- 1862 Research

Outcome # 4

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 608 - Community Resource Planning and Development
- 610 - Domestic Policy Analysis
- 805 - Community Institutions, Health, and Social Services

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

Economic and public policy changes affect rural economies and choices related to lifestyle and social services. Natural disasters are another factor that can have unanticipated and often localized influences on rural populations. Population changes through migration, immigration, cultural groupings and other factors are the target of one research project.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)
- Comparisons between program participants (individuals, group, organizations) and non-participants

Description

{NO DATA ENTERED}

2. Data Collection Methods

- Sampling
- Structured
- Observation
- Other (Internet surveys)

Description

Feedback from audiences and discussants at international and regional conferences and workshops, through direct interactions via questionnaires and presentations, and responses via web and social support programs will be used to evaluate the utility and adoption of research results. After testing the results of more expensive mail surveys to a similar internet survey, internet survey techniques will be used as they were statistically validated. Direct interactions with stakeholders, monitoring of media coverage and responses, and peer review of outputs will also be used.

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Sustainable Energy

2. Brief summary about Planned Program

The cost of energy is a major input to NH agricultural operations, and rising energy costs challenge the viability of our producers, many of whom operate on a thin margin. Renewable and sustainable energy are thereby important areas of concern and potential development for the state and region. The typically small size of our farms means that renewable and sustainable energy schemes which are appropriate for this operational scale are of greatest interest.

The primary biological resource for potential conversion to energy in New England is trees. New Hampshire has the greatest proportion of forested land area of any state. Our marginal climate and poor soils make growth of other major crop biofuels less feasible. The northern latitude also reduces photosynthetic opportunity for algae production, though each of these may hold promise at smaller scales.

Research and engagement under this program area address renewable and sustainable energy sources and approaches, particularly but not exclusively those well suited to the unique geographic, environmental, biophysical and social conditions in New England.

Initially we have a single project under this program area. At about the same time as the project was initiated, the investigator was named to a central UNH administrative position, with a very large administrative workload. Progress on the very novel research will therefore be more limited than would otherwise be the case.

3. Program existence : New (One year or less)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

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 (Situation and Scope)

1. Situation and priorities

The dairy industry in NH is second to ornamental horticulture in economic impact. The dairies throughout NH and New England are critical aspects of the renowned pastoral environment that attracts tourists and residents alike. Many dairies in the region are going out of business under the current economic situation. The higher prices available for organic dairy products is incentive to some producers who are able to absorb the higher production requirements (costs, management, compliance).

The biggest challenges facing organic dairy producers in the northeast is the cost of inputs including grain, other feedstocks, energy, bedding and other materials from off-farm. These same demands are important in the economics of the NHAES

Organic Dairy Research Farm, where this research will occur. At the same time, there are important material and energy resources produced on many New England farms that are currently under-utilized. The two major resources are woodlot trees and manure. The development of knowledge and technologies for helping to close the energy and material budgets of operations through an integrated, multi-stage usage of wood and manure resources would be highly relevant and beneficial to many regional dairy producers who have similarly diversified operations.

2. Scope of the Program

- In-State Research

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

Sustaining organic dairy agriculture in the Northeast will require creative solutions to the needs for bedding, energy and soil amendments. The potential for revenue through carbon sequestration offers another potential revenue stream. There are solutions that can be developed that will use the carbon stored in woody biomass at the Burley-Demeritt farm, and most other dairy farms in northern New England that can alleviate the need to import materials for all of these purposes, thereby reducing costs and dependence on uncontrollable prices and supplies of off-farm materials. Funding and resources to the NHAES will remain sufficient.

2. Ultimate goal(s) of this Program

The research is intended to develop an integrated system for using wood from Farm woodlots as a renewable resource for bedding for the barns, and then using the combined bedding/manure resource to produce energy for on-farm use through aerobic composting with integrated heat exchange system. Description of an engineered system meeting a moderate-sized farm's requirements for bedding, manure handling, and energy is a final goal.

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2011	0.0	0.0	0.1	0.0
2012	0.0	0.0	0.1	0.0
2013	0.0	0.0	0.1	0.0
2014	0.0	0.0	0.1	0.0
2015	0.0	0.0	0.1	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

We will measure temperature and trace gas (CO2, CH4, H2S, NH4) and oxygen concentrations in both operational and experimental bedding/manure piles with and without different degrees of aeration. We will begin to develop best practices around optimizing the production of energy while minimizing the generation of greenhouse gases.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods

● Group Discussion ● Demonstrations	● Web sites

3. Description of targeted audience

Dairy farmers in the Northeastern US, and those interested in sustainable energy solutions that are feasible for small diversified operations.

V(G). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons(contacts) to be reached through direct and indirect contact methods

	Direct Contact Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2011	100	400	20	80
2012	100	400	20	80
2013	100	400	40	80
2014	100	400	40	80
2015	100	400	40	80

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

2011:0 **2012:**0 **2013:**0 **2014:**0 **2015:**0

3. Expected Peer Review Publications

Year	Research Target	Extension Target	Total
2011	0	0	0
2012	1	0	1
2013	0	0	0
2014	1	0	1
2015	0	0	0

V(H). State Defined Outputs

1. Output Target

- Number of undergraduate students directly involved in the projects

2011:2 **2012:**2 **2013:**2 **2014:**2 **2015:**2

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

2011:1 **2012:**2 **2013:**2 **2014:**3 **2015:**3

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

2011:1 **2012:**2 **2013:**2 **2014:**2 **2015:**2

- Number of websites in which project results have been incorporated

2011:1 **2012:**1 **2013:**1 **2014:**1 **2015:**1

V(I). State Defined Outcome

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 Target

Number of undergraduate students involved and trained in engagement research.

2. Outcome Type : Change in Knowledge Outcome Measure

2011:2	**2012:**3	**2013:**3	**2014:**3	**2015:**3

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 403 - Waste Disposal, Recycling, and Reuse

4. Associated Institute Type(s)

- 1862 Research

Outcome # 2

1. Outcome Target

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

2. Outcome Type : Change in Knowledge Outcome Measure

2011:0	**2012:**0	**2013:**0	**2014:**0	**2015:**0

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 403 - Waste Disposal, Recycling, and Reuse

4. Associated Institute Type(s)

- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Competing Programmatic Challenges
- Other (Competing time demands)

Description

The work will be conducted at our ODRF field facility, so natural disasters and weather extremes would affect progress toward meeting objectives. Allocation of limited resources to competing programs must be considered, particularly if funds decrease or costs increase. Competing demands for time and attention of the principal investigator may affect the ability to progress in a timely manner.

V(K). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- During (during program)
- Other (Direct feedback)

Description

In the initial stages we are seeking feedback from farmers, citizens and producers who visit the farm and evaluate the research in progress. As results become available, we will reach out to operating dairies and assess the potential for acceptance of the procedures developed.

2. Data Collection Methods

- Other ()

Description

{NO DATA ENTERED}