

2008 University of Massachusetts Research Plan of Work

I. Plan Overview

1. Brief Summary about Plan Of Work

The Massachusetts Agricultural Experiment Station (MAES) at the University of Massachusetts Amherst is currently administered through the College of Natural Resources and the Environment. The director is Dean Cleve Willis, the Associate Director is Associate Dean Steve Goodwin and the Assistant Director is Patricia Cromack. The mission of the College of Natural Resources and the Environment (NRE) at the University of Massachusetts is to advance knowledge in core areas through teaching and research. To accomplish this, the College offers broad educational opportunities to a wide spectrum of public audiences, conducts applied and basic research that addresses the needs of citizens, businesses, and public agencies and makes numerous outreach opportunities accessible to its constituents. The College is uniquely qualified, equipped, and committed to fulfilling its land grant responsibilities by promoting and contributing to economic development, environmental quality and human capacity building. MAES continues with the restructured Plan of Work Process which was implemented for the FY2007-2011 Plan of Work and continues to explore new approaches to better meet the needs and expectations of its many constituents for our 2008-2012 Plan. Continued commitment to increase the scientific focus within a more limited number of projects is ongoing. Currently there are 116 distinct projects supported by MAES. This plan of work calls for projects to be gradually shifted into more clearly defined scientific foci and therefore six planned program areas are being put forward. It is anticipated that at the end of the five-year period there will be approximately fifty projects within the planned programs. The six planned program areas are: Enhancing the Use of Natural Resources and Restoring Ecosystem Integrity - This planned program emphasizes the areas of urban impacts on resource conservation, management of forest and estuarine ecosystems as well as plant and animal population biology and management. Improving Animal Reproduction and Health - This planned program will exploit the overlap in techniques, approaches and knowledge base that are being used to study animal health issues (e.g. understanding zoonotic diseases and developing animal vaccines) and those that are being used to solve problems in animal reproduction. Management Practices for Sustaining Agriculture in the Northeast - The overall emphasis in this planned program is low-impact, reduced-risk pest and nutrient management. Improving Human Health and Wellbeing through Food Function and Food Safety - In this planned program we will focus on four areas of emphasis: physical/chemical characterization of food, food biotechnology, food safety, and health and wellness. Developing Tools for Decision Making - The major area of emphasis of this planned program will be the development of tools for decision-making through the use of theoretical and empirical analysis including experiments, surveys, case studies, and other forms of data gathering and analysis. This analysis will be undertaken in the areas of incorporating sustainability into the planning and design process, development of land-use planning tools, environmental and natural resource economics, industrial organization economics, and consumer economics. Center for Agriculture – The concept underlying the Center for Agriculture is a single point of entry for stakeholders and users to access the land grant resources of the University of Massachusetts, and thereby the national system. The center is a primary source of information on the state of agriculture in Massachusetts and plays a pivotal role in the integration of research and extension at the university. Stakeholders are an integral part of research and extension at the University of Massachusetts, providing input in both formal and informal ways. There is continuous input and interaction between primary stakeholders and the components of UMass Extension and the Massachusetts Agricultural Experiment Station. This continues to be true for the FY08-12 period. It should be noted that the University of Massachusetts Extension POW is built around eight critical issues that address the following topics: Ecosystem Management, Protection and Restoration, Health Promotion & Disease Prevention, Land Use Management, Water Resource Protection, Natural Resource-based Economic Development, Youth Development and Engagement, Food Production, and Food Safety. This is a deliberate design to insure that the issues addressed by extension cut across all of the planned research programs of the experiment station.

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

Year	Extension		Research	
	1862	1890	1862	1890
2008	0.0	0.0	45.0	0.0
2009	0.0	0.0	45.0	0.0
2010	0.0	0.0	46.0	0.0
2011	0.0	0.0	46.0	0.0
2012	0.0	0.0	46.0	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

2. Brief Explanation

Prior to submittal, proposed projects are reviewed by the relevant department heads for approval. Submitted projects are then evaluated by an internal university panel that consists of one faculty member active in MAES, the Associate Director of MAES, and the Assistant Director for MAES. Proposed projects are judged on their relevance to the critical issues identified in the POW. Three peer reviewers selected from amongst MAES stakeholders, at least two of whom are experts in the proposed area of research will be asked to provide written reviews of the scientific merit of the proposed project. Final approval of projects will be made by the Director or Associate Director of MAES.

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 Massachusetts Experiment Station has participated fully with UMass Extension in a recent comprehensive stakeholder engagement process that resulted in the specification of eight critical issues that define the conceptual structure for our programs. These eight issues, that also serve as the UMass Extension Planned Programs in the Federal Plan of Work, are strategically important because they reflect the convergence of our USDA mission and the research and teaching capacity of University of Massachusetts while being fundamentally important to the citizen of Massachusetts. The eight critical issues encompass a host of regional concerns that are not defined, or bound by, the borders of the state of Massachusetts (e.g., food production, water and ecosystem protection, and economic development). They also cut across the matrix of all of the planned programs of MAES. Addressing these issues from a regional or multi-state perspective brings additional practical and intellectual resources to bear and creates the potential for more comprehensive and cost effective programs. The Center for Agriculture is designed to insure integration of research and educational programs. Integrating research and education programs is the key element in our strategy to address the complex of critical issues identified by our stakeholders. Academic scholarship and traditional process of scientific discovery are crucial for solving problems related to water quality, food production, ecosystem and human health. However, for scientific knowledge to be useful to our constituents, a variety of approaches, technologies, curriculum and other appropriate mechanisms are needed for translating science into practice. In many cases, research and outreach can be integrated within a single programmatic effort, operating seamlessly, rather than as distinct process, in pursuit of an organizationally defined set of goals. Representatives from both the MAES & UMEExt have been working with the Massachusetts Department of Agricultural Resources to promote an important initiative in Massachusetts. Through these efforts and along with the collaborative efforts of many of our commodity stakeholder groups a grant for an Agricultural Innovation Center has been funded at \$3.2 million. This Center shall provide a broad range of technical and business development services to the commonwealth's agricultural producers so that they may add value to the commonwealth's agricultural economy.

2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?

The development of this POW has been guided by the following values - respect for people, families, and communities; respect for the diversity of people, ideas, and organizations; and a dedication to active citizen involvement. The most pressing challenge for meeting these values is identifying underserved and underrepresented populations that have not traditionally been participants in our programs. The Center for Agriculture is exploring new print and electronic outlets for broadening out the participation in our programs. By collaborating with other states, UMass Extension can increase the range, number, and depth of programmatic offerings to meet a more diverse range of clientele needs. In agricultural programs in particular, producers of specialty crops such as Christmas trees, maple syrup, honey, and organic products will have increased access to educational products. In many cases the needs of underserved audiences differ substantially from those in the larger population. UMass has planned integrated research and education programs that address a variety of food safety concerns and promote personal health. We have identified specific audiences that are underserved because of their economic status or because of issues related to literacy (reading and English language proficiency). The research component of these programs and the supporting educational materials are specifically designed to meet the needs and address the concerns of these audiences.

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

Multi-state and Integrated activities will be planned, evaluated and reported within the context of our eight publicly identified critical issues and will be consistent with the planned programs of both MAES and UMass Extension. Based upon their focus and priorities, Multi-state and Integrated activities will be associated with one or more critical issues. Staff will be required at both the planning and report stages to specifically address outcomes and impacts. This explicit attention to outcomes and impacts represents a major shift of culture for MAES.

4. How will the planned programs result in improved program effectiveness and/or efficiency?

Especially within agricultural and natural-resource related program areas, multi-state activities allow us to work collaboratively with communities, industries and other organizations within the geographic, ecological and natural boundaries as defined by the issue or problem, rather than by the borders of any particular state. This will increase the efficacy of our programs and take advantage of economies of scale. Integrating research and education is essential for success in Massachusetts. The most effective programs will involve an intimate and mutually reinforcing relationship between issues of public concern and the university-based research that can help address those issues. The extent to which research and practice can become more closely aligned will result in programs that reflect sound policy, incorporate best practices and are responsive to public concerns.

IV. Stakeholder Input

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

- Targeted invitation to non-traditional stakeholder groups
- Use of media to announce public meetings and listening sessions
- Targeted invitation to selected individuals from general public
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals

Brief explanation.

MAES has strong, existing relationships with a variety of organizations representing stakeholders from throughout Massachusetts and the region. Several commodity-based organizations, such as the Massachusetts Tree Fruit Growers, the Cape Cod Cranberry Growers Association, the Golf Course Superintendent's Association of New England and the Massachusetts Vegetable and Berry Growers Association provide research facilities and grants that supplement and help to direct the research activities of the MAES. Groups such as the Massachusetts Flower Growers Association, the Massachusetts Arborists Association, the New England Sports Turf Managers Association, the Massachusetts Nursery and Landscape Association, Community In Support of Agriculture (CISA), the New England Small Farms Institute, and the Massachusetts Natural Organic Farmers Association help to set the agenda for research and educational activities. Direct consultations with these groups provide a partnership for identifying and solving problems of mutual concern. This model of including growers and other clients in participatory research to solve problems strengthens the link between the University and citizens, keeps the research relevant to real problems and speeds transfer of solutions to end-users. At its best, research is not targeted at specific subpopulations and the goals put forward in this POW are

intended to be far-reaching so that the research undertaken is anticipated to be of value to the entire population of the state and the region. The development of this POW has been guided by the following values - respect for people, families, and communities; respect for the diversity of people, ideas, and organizations; and a dedication to active citizen involvement. To insure that these values are upheld and that the research benefits all members of the broader community it is necessary to make sure that all citizens wishing to participate in the stakeholder process have more than ample opportunity. This requires holding stakeholder meetings, twilight meetings, and listening sessions in urban as well as rural settings. This also requires going beyond traditional outlets when advertising these opportunities.

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

- Open Listening Sessions
- Use Advisory Committees
- Use External Focus Groups

Brief explanation.

The College of Natural Resources and the Environment has a 20 member advisory board with representatives from across the spectrum of scientific areas within the Massachusetts Agricultural Experiment Station. There is also a state mandated Cranberry Oversight Committee that makes recommendations for all research and extension activities at the Cranberry Experiment Station. The committee consists of three cranberry growers; the Commissioner of Agriculture, currently Scott J. Soares; Massachusetts legislators, currently Representative John Quinn and Senator Teresa Murray; and the Dean of the College of Natural Resources and the Environment, Cleve Willis. These boards meet between two and five times each year and provide direct stakeholder input. They also help to identify new participants for the stakeholder process. There is an annual stakeholders roundtable that is held in conjunction with Farm Bureau. The roundtable includes participation from all of the commodity groups listed above as well as the Massachusetts Department of Agricultural Resources. It is also the policy of MAES to participate in all focus groups and listening sessions that are convened by UMass Extension.

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

Brief explanation

MAES collects input from stakeholders in direct face-to-face meetings as described previously. And while MAES does not administer surveys of stakeholders, it does utilize the results of surveys administered by UMass Extension to augment the direct collection of data. Another powerful tool, the on-site meeting, is held on sites where research is in progress, or on sites that use exemplary technology. Stakeholders can discuss practices with each other and with MAES faculty. MAES works with various organizations to plan and execute these sessions, and is generally the lead institution among the New England land-grant universities. Another important means of stakeholder input collection is the web site maintained by the Center for Agriculture. This is a collaborative endeavor between MAES, UMass Extension, and the Massachusetts Department of Agricultural Resources. The site attracts and identifies potential new stakeholders. The Center for Agriculture allows the three entities to share information about stakeholders. The site is designed to solicit electronic stakeholder input. The coordination committee meets three times per year to discuss stakeholder input.

3. A statement of how the input will be considered

- To Set Priorities
- To Identify Emerging Issues
- Redirect Research Programs

Brief explanation.

Most faculty in the College of Natural Resources and the Environment (NRE) combine research, instruction and extension activities. Thus, when faculty and staff interact with stakeholders, they represent both research and extension. Input from stakeholders concerning research needs informs implementation of research projects. Ultimately information gained both from formal stakeholder processes as well as the informal ones informs both research and extension issue identification and the resulting research projects and extension education programs. The identification of emerging issues culminates when faculty propose new research projects. These projects are evaluated through the merit review process that examines their relevance to the plan of work. The priorities for the POW are reexamined every year taking into account the totality of the stakeholder input. In addition, the critical issues identified by UMass Extension are continuously modified based on stakeholder input and this provides a cross check to insure that the research programs of MAES are directed towards areas that will have the maximum impact on the citizens of the state and the region.

V. Planned Program Table of Content

S. NO.	PROGRAM NAME
1	Center for Agriculture
2	Developing Tools for Decision-Making
3	Enhancing the Use of Natural Resources and Restoring Ecosystem Integrity
4	Improving Animal Reproduction and Health
5	Improving Human Health and Wellbeing through Food Function and Food Safety
6	Management Practices for Sustaining Agriculture in the Northeast

V(A). Planned Program (Summary)

1. Name of the Planned Program

Center for Agriculture

2. Brief summary about Planned Program

The concept underlying the Center for Agriculture is a single point of entry for stakeholders and users to access the land grant resources of the University of Massachusetts, and thereby the national system. The center is a primary source of information on the state of agriculture in Massachusetts and plays a pivotal role in the integration of research and extension at the university. The center provides an analysis and interpretation of the pertinent portions of the census of U.S. agriculture that is conducted by USDA. The objective is to provide as complete and up-to-date a picture as possible of agriculture in the state. The center also maintains a unique website with the dual goal of providing information to stakeholders and soliciting continuous feedback from stakeholders. In addition, the center provides a venue for expanded collaboration between MAES, UMass Extension, and the Massachusetts Department of Agricultural Resources.

3. Program existence : Intermediate (One to five years)

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

- 216 10% Integrated Pest Management Systems
- 502 20% New and Improved Food Products
- 601 40% Economics of Agricultural Production and Farm Management
- 902 30% Administration of Projects and Programs

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

1. Situation and priorities

Massachusetts is an urban state with 6 million people, yet 64% of the population lives within 10 miles of a farm and 22% lives within a mile of a farm. It is important for people to appreciate the positive aspects that managed land can have on the environment. Land grant institutions have a lead role in educating the public regarding the benefits as well as the perceived risks of local agriculture and other managed environments. Enhancing public knowledge allows the public and policy makers to make better-informed decisions about agricultural and environmental regulations. In addition, the university facilitates the dialogue between agricultural producers and the public. In order to insure that the research projects support by MAES continue to be targeted at high-priority issues in agriculture there must be a continuous exchange of ideas and information among key agencies and between those agencies and the stakeholders. It will be the responsibility of the center to insure that the research performed by MAES actively addresses the needs of under-served and under-represented populations of the state.

2. Scope of the Program

- Integrated Research and Extension
- In-State Research

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

1. Assumptions made for the Program

There is a need for a more integrated approach to addressing issues facing agriculture in Massachusetts and the region. In the past, high profile agricultural summits followed by periods during which stakeholders have not been able to observe the response to their input, have left many stakeholders feeling that their input is not valued. The opportunity to provide electronic feedback and to get continuous and timely responses will help stakeholders to realize that their input is invaluable and will increase their willingness to stay engaged.

2. Ultimate goal(s) of this Program

/To be a source of information on the state of agriculture in Massachusetts /to provide all constituencies within the state access to

agricultural resources and to allow for direct stakeholder feedback through electronic communications /to insure that the research performed by MAES actively addresses the needs of under-served and under-represented populations of the state /to facilitate continuous identification and discussion of the issues critical to agriculture in Massachusetts /to provide agricultural leaders a direct electronic communication forum for the timely exchange of information on activities and issues

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
2008	0.0	0.0	0.2	0.0
2009	0.0	0.0	0.2	0.0
2010	0.0	0.0	0.2	0.0
2011	0.0	0.0	0.2	0.0
2012	0.0	0.0	0.2	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Maintain website for stakeholder information and feed back and an electronic forum for agricultural leaders. Hold three coordination meetings with MAES, UMass Extension and Massachusetts Department of Agricultural Resources yearly. Hold one yearly public forum on a critical issue to agriculture in Massachusetts.

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

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> {NO DATA ENTERED} 	<ul style="list-style-type: none"> {NO DATA ENTERED}

3. Description of targeted audience

{NO DATA ENTERED}

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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

2. (Standard Research Target) Number of Patents

Expected Patents

2008 :0 2009 :0 2010 :0 2011 :0 2012 :0

3. Expected Peer Review Publications

Year	Research Target	Extension Target
2008	0	0
2009	0	0
2010	0	0
2011	0	0
2012	0	0

V(H). State Defined Outputs

1. Output Target

- # of stakeholders using Center for Agriculture website

2008 :250 2009 :300 2010 :350 2011 :400 2012 :400

- # of participants in critical issues for agriculture in Massachusetts forum

2008 :150 2009 :175 2010 :200 2011 :200 2012 :200

V(I). State Defined Outcome

1. Outcome Target

of new stakeholders participating in the activities of MAES

2. Outcome Type : Change in Knowledge Outcome Measure

2008 :25 2009 :50 2010 :50 2011 :50 2012 :50

3. Associated Knowledge Area(s)

- 216 - Integrated Pest Management Systems
- 502 - New and Improved Food Products
- 601 - Economics of Agricultural Production and Farm Management

- 902 - Administration of Projects and Programs

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Public Policy changes

Description

{NO DATA ENTERED}

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

1. Evaluation Studies Planned

- Before-After (before and after program)

Description

{NO DATA ENTERED}

2. Data Collection Methods

- Journals
- Other (Websites)

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)**1. Name of the Planned Program**

Developing Tools for Decision-Making

2. Brief summary about Planned Program

The major area of emphasis of this planned program will be the development of tools for decision-making through the use of theoretical and empirical analysis including experiments, surveys, case studies, and other forms of data gathering and analysis. This analysis will be undertaken in the areas of incorporating sustainability into the planning and design process, development of land-use planning tools, environmental and natural resource economics, industrial organization economics, and consumer economics. Integral with the program will be the testing and application of these new tools in communities in the region. This planned program represents a true transdisciplinary effort with participation from stakeholders, decision makers, and researchers. In the planning area we will focus on developing common platforms for planning initiatives and decision-making processes to guide and inform change. The approach is to examine economic development by assessing existing physical, environmental, social and economic opportunities and limitations in order to prescribe coordinated strategic actions to generate new economic activities. In the applied economics area, we will conduct research to inform the decision making of governments, companies, organizations, and individuals in the areas of industrial organization, competition policy, food safety, environmental health, environmental policy, natural resource management, and consumer economics. Theoretical, empirical, and experimental methods will be applied to public policy issues in these areas. In the natural resources area we will combine landscape ecology, GIS, and land-use modeling techniques into an open source approach examining the impact of regulations and incentive programs. In the design area we will research post-industrial landscapes, with under used brownfields and vacant land parcels, which provide opportunities for the re/introduction of ecological infrastructure. Using landscape ecological principals, spatial modeling methods will be explored and developed to aid policy and decision makers in locating and prioritizing ecological infrastructure interventions. These models will analyze spatial patterns for ecologic, hydrologic, economic, and social health. They will be adaptable and fully able to model different scenarios of uncertainty and stochasticity. In conjunction with other studies, these models could be used to aid in decision making for large-scale infrastructure projects such as combined sewer overflow remediation and water quality planning. Ecological infrastructure models would be especially useful in the analysis of our region, which has core post-industrial cities and rapidly urbanizing rural landscapes.

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**

- 603 13% Market Economics
- 605 48% Natural Resource and Environmental Economics
- 606 3% International Trade and Development
- 607 1% Consumer Economics
- 610 3% Domestic Policy Analysis
- 801 1% Individual and Family Resource Management
- 803 8% Sociological and Technological Change Affecting Individuals, Families and Communities
- 804 6% Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
- 805 10% Community Institutions, Health, and Social Services
- 901 7% Program and Project Design, and Statistics

V(C). Planned Program (Situation and Scope)**1. Situation and priorities**

The life, physical and social science research that policy and decision makers rely on is often not integrated or presented in a manner that contributes to effective decision making. For example, the science may have uncertainty limits that impact its direct applicability. This program will address the need for adaptive approaches in planning, design and management. This can be

accomplished through well-conceived, and scientifically-rigorous hypotheses, which then can be implemented and monitored to learn if and how various alternatives were successful. Science-based decision-making can have immediate benefits for citizens, businesses, communities and governments by providing new technologies and analyses that improve human health, environmental protection, natural resources use, tourism, and family well-being. Nationwide, interest in sustainable community design is significant, as expressed in a range of issues and programs including: smart growth and community character, urban ecology, storm-water management and green infrastructure. The impacts of development can be ameliorated to a large extent by the use of innovative land use planning, sustainable development concepts, and best management practices. Nationally and internationally, there is strong interest in the design of policies that take private (individual, group, and company) incentives into consideration in order to yield the most effective outcomes. These incentives may stem from physical, economic, or social factors. All of the following groups need tools for science-based decision making: government agencies, natural resource professionals (including agency personnel, foresters, wildlife biologists, regional planners, environmental consultants, and land managers), natural resource based businesses (loggers, commercial fisherman, farmers, pesticide applicators, development and site design professionals), agricultural and food-based businesses, local land use officials (members of boards of health, planning boards, conservation commissions and other volunteer governance committees), local departments of public works and water departments, community opinion leaders, environmental and conservation organizations (non-profit environmental organizations, land trusts, watershed groups and conservation districts), K-12 educators (public and private school teachers and environmental educators) and families. These groups need up-to-date information that contributes to public health, resource conservation, strong communities, environmental protection, biosecurity, and family well-being.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Government and private decision makers rely on scientific research to develop defensible guidelines and rules to inform their decisions. Planning and decision making often require collaboration between multiple jurisdictions and parties. A transdisciplinary approach can achieve highly integrated research, planning, and management. Scientific-based decision-making needs to rely on evidence and findings from across the physical, life, and social sciences. Private and public decision making can be informed by, and its effectiveness can be improved by, understanding of the economic incentives facing individuals and organizations. These issues of sustainable design and regional planning are important even in the best of economic times, to bring opportunities to disadvantaged cities, to capitalize on aging infrastructure and to (re)build better communities. Responsibility for managing land use and development, and mitigating its impacts, falls principally on local officials who enforce state and local statutes related to zoning, planning, wetlands, public health and water supply.

2. Ultimate goal(s) of this Program

to develop platforms for science-based decision making by municipal, state, and regional, federal, and international authorities, to assist town officials, state regulators, and regional planning groups while engaging citizens in integrated decision making, to optimize the planning process for community and regional development

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
2008	0.0	0.0	1.7	0.0
2009	0.0	0.0	1.7	0.0
2010	0.0	0.0	1.7	0.0
2011	0.0	0.0	1.7	0.0
2012	0.0	0.0	1.7	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research and produce refereed publications in the scientific literature.

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

Extension	
Direct Methods	Indirect Methods
● {NO DATA ENTERED}	● {NO DATA ENTERED}

3. Description of targeted audience

{NO DATA ENTERED}

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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

2. (Standard Research Target) Number of Patents

Expected Patents

2008 :0 2009 :0 2010 :0 2011 :1 2012 :1

3. Expected Peer Review Publications

Year	Research Target	Extension Target
2008	45	0
2009	0	0
2010	0	0
2011	0	0
2012	0	0

V(H). State Defined Outputs

1. Output Target

- # of refereed manuscripts

2008 :4

2009 :4

2010 :5

2011 :5

2012 :5

V(I). State Defined Outcome

1. Outcome Target

Accurate research made available and shared

2. Outcome Type : Change in Knowledge Outcome Measure

2008 :0

2009 : 0

2010 : 0

2011 :0

2012 : 0

3. Associated Knowledge Area(s)

- 603 - Market Economics
- 605 - Natural Resource and Environmental Economics
- 606 - International Trade and Development
- 607 - Consumer Economics
- 610 - Domestic Policy Analysis
- 801 - Individual and Family Resource Management
- 803 - Sociological and Technological Change Affecting Individuals, Families and Communities
- 804 - Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures
- 805 - Community Institutions, Health, and Social Services
- 901 - Program and Project Design, and Statistics

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Public Policy changes

Description

The research conducted in this planned program will influence public policy but it also needs to adapt to changes in existing public policy.

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

1. Evaluation Studies Planned

- Other (scientific peer review)

Description

Evaluation will be done through the established scientific review process in the open literature and the merit review process.

2. Data Collection Methods

- Journals

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)**1. Name of the Planned Program**

Enhancing the Use of Natural Resources and Restoring Ecosystem Integrity

2. Brief summary about Planned Program

This planned program emphasizes the areas of urban impacts on resource conservation, management of forest and estuarine ecosystems as well as plant and animal population biology and management. The major focus is on restoring and maintaining natural communities and ecosystems, providing environmental services, and more fully incorporating social and economic concerns into management decisions. Sustainable harvest of fish, timber, and wildlife are recognized as only one part of a complex set of objectives. Important research topics will include the effects on native fish communities of changes in hydrology and water quality (from urbanization and other land use changes in the watershed, water withdrawals, and riparian zone management), of waterway fragmentation (caused by dams and road culverts), and of exotic species (including fish, invertebrate, and aquatic plant species). This planned program will also continue applied research into the issues of controlling invasive plant and insect species, restoring environmentally degraded sites, establishing and managing ecological reserves, managing habitat for rare species, creation of urban greenbelts, and reducing risk of forest fires at the rural-urban interface.

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**

- 101 53% Appraisal of Soil Resources
- 102 12% Soil, Plant, Water, Nutrient Relationships
- 112 10% Watershed Protection and Management
- 131 4% Alternative Uses of Land
- 133 11% Pollution Prevention and Mitigation
- 135 2% Aquatic and Terrestrial Wildlife
- 306 1% Environmental Stress in Animals
- 403 7% Waste Disposal, Recycling, and Reuse

V(C). Planned Program (Situation and Scope)**1. Situation and priorities**

Ecosystem management, conservation biology, and sustainable resource management are the terms used to describe several new approaches to resource management. One of the rapidly developing areas in conservation science deals with the effects of urbanization on ecosystems. The effects of urban and suburban expansion have now become highly important environmental concerns, with impacts on watersheds, biodiversity, climate, recreation, and overall quality of life. These issues initially were associated only with major metropolitan areas, but increasingly the effects of land conversion to residential or commercial development are felt throughout large parts of industrialized countries and in developing countries as well. Wildlife managers must address problems such as human conflicts with key predators (e.g., coyotes) at the same time that species once regulated by predators (e.g., deer and beaver) are overpopulating and becoming pests. The increasing fragmentation of rural open spaces requires management of habitat for wildlife in the places where people live, in yards, parks, and urban greenbelts. Even in areas far from cities, roads and highways have damaging impacts on wildlife populations; opportunities exist for working with highway departments to mitigate these impacts with passage structures to allow wildlife to cross more safely. There is increasing concern about the impacts of timber harvesting and other forestry practices on wetlands, surface water quality and wildlife habitat. The impact of commercial fishing and shellfish harvesting on replacement stocks is of critical concern and is a source of on-going controversy. The introduction of non-native animals and management of habitat for game species has been questioned for its potential impacts on biodiversity. Land-use and natural resources decisions are made by a variety of state and federal agencies and private organizations on parks and recreation land, wildlife sanctuaries and refuges, state forests, reservations, watersheds and conservation land. In addition, many private landowners and land trusts (there are 235,000 forest landowners in Massachusetts) manage their land to protect natural resources through Chapter 61 (forest land classification), forest stewardship

and conservation restrictions. Proper stewardship of natural resources depends, in part, on educating those who own and manage much of the land.

2. Scope of the Program

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

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

1. Assumptions made for the Program

In the past, cities and suburbs tended to be overlooked by natural resource managers (with the notable exception of the urban forestry field). The landscape of Massachusetts, although severely altered in the past, is currently 66% forested. Management of watershed lands for increased water yields creates conflict with other desired values. The Commonwealth's form of strong town governance has led to a populace strongly interested in the quality of their physical environment. The efficient utilization of plants, animals and marine resources and the wise use of forests, land and water resources are necessary to preserve open space, maintain a green living environment, protect water quality and maintain biodiversity.

2. Ultimate goal(s) of this Program

To develop wildlife and fishery management guidelines that account for the increase urbanization and suburbanization of the region /to increase the understanding of woodlot and other landowners of the interconnectivity of these managed ecosystems, to assist municipalities, state, and regional agencies to use science-based research to restore damaged ecosystems

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
2008	0.0	0.0	2.1	0.0
2009	0.0	0.0	2.1	0.0
2010	0.0	0.0	2.1	0.0
2011	0.0	0.0	2.1	0.0
2012	0.0	0.0	2.1	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research and produce refereed publications in the scientific literature. Maintain an interactive, internet tool (ACORN) for connecting woodlot owners

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

Extension	
Direct Methods	Indirect Methods
● {NO DATA ENTERED}	● {NO DATA ENTERED}

3. Description of targeted audience

{NO DATA ENTERED}

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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

2. (Standard Research Target) Number of Patents

Expected Patents

2008 :1 2009 :0 2010 :0 2011 :0 2012 :0

3. Expected Peer Review Publications

Year	Research Target	Extension Target
2008	30	0
2009	0	0
2010	0	0
2011	0	0
2012	0	0

V(H). State Defined Outputs

1. Output Target

- # of refereed manuscripts

2008 :5 2009 :5 2010 :5 2011 :5 2012 :5

V(I). State Defined Outcome

1. Outcome Target

Accurate research on wildlife management made available and shared

2. Outcome Type : Change in Knowledge Outcome Measure

2008 :0 2009 : 0 2010 : 0 2011 :0 2012 : 0

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources

- 102 - Soil, Plant, Water, Nutrient Relationships
- 112 - Watershed Protection and Management
- 131 - Alternative Uses of Land
- 133 - Pollution Prevention and Mitigation
- 135 - Aquatic and Terrestrial Wildlife
- 306 - Environmental Stress in Animals
- 403 - Waste Disposal, Recycling, and Reuse

1. Outcome Target

Accurate research on woodlot management made available and shared

2. Outcome Type : Change in Knowledge Outcome Measure

2008 :0 2009 : 0 2010 : 0 2011 :0 2012 : 0

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 112 - Watershed Protection and Management
- 131 - Alternative Uses of Land
- 133 - Pollution Prevention and Mitigation
- 135 - Aquatic and Terrestrial Wildlife
- 306 - Environmental Stress in Animals
- 403 - Waste Disposal, Recycling, and Reuse

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Competing Public priorities

Description

Competing pressures for alternative land uses due to increased suburbanization may drive the economics of these processes

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

1. Evaluation Studies Planned

- Other (scientific peer review)

Description

Evaluation will be done through the established scientific review process in the open literature and the merit review process.

2. Data Collection Methods

- Journals

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)**1. Name of the Planned Program**

Improving Animal Reproduction and Health

2. Brief summary about Planned Program

This planned program will exploit the overlap in techniques, approaches and knowledge base that are being used to study animal health issues (e.g. understanding zoonotic diseases and developing animal vaccines) and those that are being used to solve problems in animal reproduction. The concepts of gamete biology will be used to develop hormone free contraception, understand nuclear reprogramming and increase nuclear transfer efficiency. We will develop embryonic stem cell lines and investigate the molecular basis of somatic cell nuclear reprogramming in model systems. We will also investigate oocyte-associated reprogramming factors, embryonic stem cell line establishment and propagation, and stem cell differentiation with preferential interest in the development of hematopoietic cell lineages. We will develop novel methods to enhance the efficiency of nuclear transplant cloning both for establishment of embryonic stem cell lines and for the development of healthy, genetically-engineered livestock. We will develop medical countermeasures (vaccines for prophylaxis) and strategic interventions (cytokines to stop rapid threat of unknown infections) in food animal species. We will explore tissue remodeling and the remediation of tissue pathology in diseases such as laminitis.

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**

- 301 35% Reproductive Performance of Animals
- 303 33% Genetic Improvement of Animals
- 304 2% Animal Genome
- 305 4% Animal Physiological Processes
- 311 15% Animal Diseases
- 313 1% Internal Parasites in Animals
- 314 5% Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and Other Hazards Affecting Animals
- 315 3% Animal Welfare/Well-Being and Protection
- 722 2% Zoonotic Diseases and Parasites Affecting Humans

V(C). Planned Program (Situation and Scope)**1. Situation and priorities**

Infectious diseases are still the leading cause of death worldwide and we face a continual challenge from newly emerging and re-emerging infectious diseases considering this new era of globalization. Many of these threats are zoonotic diseases (West Nile virus, smallpox, avian influenza). Seventy percent of emerging human diseases come from animals. Zoonotic diseases are those that humans acquire from infected animals. In some cases they can then be spread human-to-human (flu) while in others the human is the end-host (brucellosis) with no human-to-human transmission but nevertheless they can cause serious disease, even life-threatening infections. Current threats include: West Nile virus (carried in mosquitoes, reservoir in horses), eastern equine encephalitis (reservoir in horses), avian influenza (adapted through poultry and pigs), foot and mouth disease (spreads rapidly in swine and cattle), brucellosis (reservoir in US in caribou and bison, spreads to cattle). There are also many infectious diseases that pose food safety risks for humans. These include salmonellosis (caused by a bacteria carried chronically in some poultry and transmissible through eggs) and prion disease (mad cow disease). We are entering the post-genomics era since the genomes of many of the food animals are now known or in the process of being completed (cattle-done, chicken-done, swine and horses in process, fish-done) as well as the genomes of many infectious disease-causing viruses and bacteria. The genome of a virus can now be done in days rather than years. This opens the possibility of rapid vaccine development using cutting-edge technology. In order to make the new reproductive technologies practical, it is imperative that the underlying biological/biochemical processes that allow an oocyte to successfully reprogram a somatic cell nucleus be elucidated so that patient-specific stem cells can be

easily engineered thus allowing regeneration of damaged nerves, regrowth of limbs, scar-free wound healing, or immune system replenishment. The processes of dedifferentiation and subsequent differentiation of a somatic cell into a therapeutically useful tissue will require a complement of many specialized areas of biology and engineering including expertise in stem cell biology, biochemistry, molecular biology, genomics/proteomics, cellular and tissue engineering, and animal and veterinary science, the latter providing large animal models for regenerative tissue research as well as expertise in reproductive biology and nuclear transplant cloning of mammals.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Tackling zoonotic diseases necessitates an interdisciplinary program of research to fully comprehend the complex interactions of humans, pathogens, reservoirs, and arthropod vectors. There is now a resurgence of interest in virus-cell and virus-host interactions, and viral pathogenesis and immunity that can be brought to bear on problems in animal health. At the genetic, immunological and molecular levels there are often strong correspondences between human and animal health issues. The emergence of new infectious diseases and antibiotic resistant strains of bacteria, the re-emergence of previously controlled infectious diseases and the threat of biological terrorism has increased the need for new vaccines as well as development of broad-acting immunopotentiators for agricultural animals as well as for humans. Understanding the biology of fertility can reduce the risk of infertility in valuable animals.

2. Ultimate goal(s) of this Program

to produce research that results in increased understanding of disease processes, control of disease, reproduction and development, development of new animal models or animals with new genetic capabilities, and effect of toxins on animal and human health and on control of disease. To promote the use of research to improve animal health and well-being, increase food safety, and prevent the spread of disease between humans and animals, to increase consumer confidence in animal products, while sustaining public health and decreasing economic loss for producers, to improve reproductive efficiency in large domestic animals, to develop vaccines and immunological interventions to protect large domestic animals from disease

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
2008	0.0	0.0	4.8	0.0
2009	0.0	0.0	4.8	0.0
2010	0.0	0.0	4.8	0.0
2011	0.0	0.0	4.8	0.0
2012	0.0	0.0	4.8	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research and produce refereed publications in the scientific literature.

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

Extension	
Direct Methods	Indirect Methods
● {NO DATA ENTERED}	● {NO DATA ENTERED}

3. Description of targeted audience

{NO DATA ENTERED}

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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

2. (Standard Research Target) Number of Patents

Expected Patents

2008 :0 2009 :0 2010 :1 2011 :1 2012 :0

3. Expected Peer Review Publications

Year	Research Target	Extension Target
2008	40	0
2009	0	0
2010	0	0
2011	0	0
2012	0	0

V(H). State Defined Outputs

1. Output Target

- # of refereed manuscripts

2008 :12 2009 :12 2010 :12 2011 :12 2012 :12

V(I). State Defined Outcome

1. Outcome Target

Accurate research on animal reproduction and health made available and shared

2. Outcome Type : Change in Knowledge Outcome Measure

2008 :0

2009 : 0

2010 : 0

2011 :0

2012 : 0

3. Associated Knowledge Area(s)

- 301 - Reproductive Performance of Animals
- 303 - Genetic Improvement of Animals
- 304 - Animal Genome
- 305 - Animal Physiological Processes
- 311 - Animal Diseases
- 313 - Internal Parasites in Animals
- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occuring Toxins, and Other Hazards Affecting Animals
- 315 - Animal Welfare/Well-Being and Protection
- 722 - Zoonotic Diseases and Parasites Affecting Humans

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

New outbreaks of diseases will impact public perception of the safety of the food supply. A deliberate bioterrorist attack will increase the pressure for more research in this area.

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

1. Evaluation Studies Planned

- Other (peer scientific review)

Description

Evaluation will be done through the established scientific review process in the open literature and the merit review process.

2. Data Collection Methods

- Journals

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)**1. Name of the Planned Program**

Improving Human Health and Wellbeing through Food Function and Food Safety

2. Brief summary about Planned Program

In this planned program we will focus on four areas of emphasis: physical chemical characterization of food, food biotechnology, food safety, and health and wellness. We will emphasize fundamental research to elucidate the molecular basis of the health and functional properties of these components in food. We will investigate the development and production of functional foods specifically designed to maintain or improve human health and wellness. There is an urgent need for basic research in this area to identify, extract, process, incorporate and deliver bioactive food components, as well as to establish the physicochemical basis of their functional properties. There will be fundamental research on the physicochemical basis of bioactive food components, e.g., identification, extraction, incorporation, delivery and biological activity. Emphasis will also be placed on improving the yield of desirable compounds in herbs, spices and medicinal plants. We will explore how novel bioactive delivery systems can be designed and fabricated based on recent advances in fundamental soft matter physics and chemistry. We also intend to develop technologies to deliver micronutrients into water in a form where they are soluble, stable and bioavailable. This approach could be used to deliver important micronutrients to malnourished populations in under-developed populations. Work will focus on scaling up laboratory production processes of encapsulated compounds to pilot plant scale. We will also focus at the molecular level to investigate the mode of action of pathogens and toxins, mechanisms of control and rapid methods of detection and analysis. An essential aspect of maintaining a safe and healthy food supply requires rapid identification of food-borne pathogens and detection of potentially lethal toxins that may have been produced by the pathogens. The impact of food policy on decision making in the areas of food safety, food quality and food security is expected to be a growing emphasis for the program over the next few years.

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**

- 501 13% New and Improved Food Processing Technologies
- 502 10% New and Improved Food Products
- 503 35% Quality Maintenance in Storing and Marketing Food Products
- 701 3% Nutrient Composition of Food
- 702 18% Requirements and Function of Nutrients and Other Food Components
- 703 5% Nutrition Education and Behavior
- 711 3% Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources.
- 712 7% Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins
- 723 6% Hazards to Human Health and Safety

V(C). Planned Program (Situation and Scope)**1. Situation and priorities**

Each year the U.S. medical costs for cardiovascular disease, diabetes, cancer and obesity exceed 400 billion dollars. A common thread among these diseases is that diet is very important in their prevention. Caloric intake is obviously a major consideration in obesity and an understanding of the type and ratio of macromolecules, fat, protein and carbohydrates, which are the source of calories, is essential to providing a healthy diet with optimal opportunities for weight control and control of diabetes. Thus, foods represent a critical tool that individuals can use to decrease their risk of cardiovascular disease, diabetes, cancer and obesity. Because convenience foods are now an integral part of our life and many of our health concerns are diet related, the food industry has a major challenge in producing healthy, nutritious convenience foods with high consumer acceptability. This challenge can be met by developing physiologically functional foods, which are foods that provide health benefits beyond normal nutrition. The functional food market is one of the fastest growing sectors of the food industry, with current sales in excess of \$10 billion/year. However, in order to produce functional foods that are both acceptable to consumers and efficacious, we need to further identify

and characterize the properties and biochemical functionalities of bioactive food components as well as to develop cost-effective technologies that allow for their incorporation and stabilization in formulated foods. There are a huge number of minor and major food components that contribute to both the quality and healthfulness of food products, e.g., phytochemicals, dietary fiber, bioactive lipids. In addition, the effectiveness of bioactive food components is strongly dependent on how they are delivered to consumers, and so there is a need to develop food-based delivery systems for bioactive food components that will enable them to be successfully incorporated into foods (without adversely influencing product quality) and delivering them intact to the appropriate active site in the human digestive system. Successful development of functional foods requires a multidisciplinary approach to optimize the nutritional activity and stability of food components in formulated foods. Developments in bioengineering and biomedicine have recently led to breakthrough discoveries in terms of instrumentation, imaging, biotransport and biomechanics with great implications for the field of food microbiology. Hence, there is an urgent need for basic research in food safety and food microbiology to integrate molecular and nanotechnological approaches to extract, identify, and subsequently remediate toxins and pathogens that may have been introduced in food products. These efforts range from analysis of the impact of food safety and nutritional attributes on consumer preferences to techniques for monitoring for the presence of pathogenic bacteria on specific food items.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Today's society places increasing emphasis on health and health products. Our understanding of the health values of medicinal and food crops is limited by a lack of hypothesis based research. With the advent of globalization and the rising threat of bioterrorism, the safety of the U.S. food supply has been of increasing concern. The opportunities of introducing pathogens or toxins into our food supply either accidentally or as an act of terrorism are an ever-present danger to our citizens. Nationally and internationally, obesity and diabetes have become major contributors to ill health in a majority of the population. Research in food safety and quality is undergoing dramatic changes due to a new scientific base, new definitions of total quality and heightened consumer awareness. An integrated multidisciplinary approach involving researchers from food science, nutrition, chemistry, physics and engineering is essential for making important advances in this area.

2. Ultimate goal(s) of this Program

To produce functional foods that are both acceptable to consumers and efficacious, to protect consumers from food-borne pathogens, to enable foods to be designed with optimal health benefits in a rational and systematic fashion.

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
2008	0.0	0.0	7.8	0.0
2009	0.0	0.0	7.8	0.0
2010	0.0	0.0	7.8	0.0
2011	0.0	0.0	7.8	0.0
2012	0.0	0.0	7.8	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research and produce refereed publications in the scientific literature. Hold international scientific symposia

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

Extension	
Direct Methods	Indirect Methods
● {NO DATA ENTERED}	● {NO DATA ENTERED}

3. Description of targeted audience

{NO DATA ENTERED}

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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

2. (Standard Research Target) Number of Patents

Expected Patents

2008 :0 2009 :0 2010 :1 2011 :1 2012 :1

3. Expected Peer Review Publications

Year	Research Target	Extension Target
2008	40	0
2009	0	0
2010	0	0
2011	0	0
2012	0	0

V(H). State Defined Outputs

1. Output Target

- # of refereed publications

2008 :10 2009 :10 2010 :10 2011 :10 2012 :10

- # of international symposia

2008 :1 2009 :1 2010 :1 2011 :1 2012 :1

V(I). State Defined Outcome

1. Outcome Target

Accurate research on functional foods made available and shared

2. Outcome Type : Change in Knowledge Outcome Measure

2008 :0 2009 : 0 2010 : 0 2011 :0 2012 : 0

3. Associated Knowledge Area(s)

- 501 - New and Improved Food Processing Technologies
- 502 - New and Improved Food Products
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 701 - Nutrient Composition of Food
- 702 - Requirements and Function of Nutrients and Other Food Components
- 703 - Nutrition Education and Behavior
- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources.
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins
- 723 - Hazards to Human Health and Safety

1. Outcome Target

Accurate research on food safety made availalbe and shared

2. Outcome Type : Change in Knowledge Outcome Measure

2008 :0 2009 : 0 2010 : 0 2011 :0 2012 : 0

3. Associated Knowledge Area(s)

- 501 - New and Improved Food Processing Technologies
- 502 - New and Improved Food Products
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 701 - Nutrient Composition of Food
- 702 - Requirements and Function of Nutrients and Other Food Components
- 703 - Nutrition Education and Behavior
- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources.
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occuring Toxins
- 723 - Hazards to Human Health and Safety

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Competing Public priorities

Description

In the absence of direct threats to the food supply, public concern over food safety may diminish over time.

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

1. Evaluation Studies Planned

- Other (scientific peer review)

Description

Evaluation will be done through the established scientific review process in the open literature and the merit review process.

2. Data Collection Methods

- Journals

Description

{NO DATA ENTERED}

V(A). Planned Program (Summary)**1. Name of the Planned Program**

Management Practices for Sustaining Agriculture in the Northeast

2. Brief summary about Planned Program

The overall emphasis in this planned program is low-impact, reduced-risk pest and nutrient management. This will include further refinements of IPM practices, development of biological control agents, new forays into organic production, and expansion of efforts within the green industry. One area of emphasis will be using molecular methods for identifying and detecting microbial plant pathogens and applying these methods to plant disease management. The focus will be on the population ecology of plant microbes. The research will utilize genetic analysis of microbes to study the evolution and function of microbial plant pathogens on plant hosts, and study applications of genetic probes to identify plant pathogens in situ. Similar analysis will be done on pathogens of arthropods, vectoring of pathogens by arthropods, and the ecology and evolution of parasitic microbes. Insect genomes will be explored to improve our knowledge of gene products and the molecular basis of all aspects of insect physiology and behavior. This knowledge will enable future breakthroughs and novel techniques for solving the various problems that insects create for human beings. Additional focus areas include horticultural products related to increased urbanization, the production of high value specialty crops, and value-added processing of food products. Integrated plant and animal production systems will be based on research in biological control of insects and weeds, integrated pest management, long term rotation effects, nutrient cycling and complex crop, pest, animal and environmental interactions.

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**

- 201 18% Plant Genome, Genetics, and Genetic Mechanisms
- 202 9% Plant Genetic Resources
- 203 2% Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 17% Plant Product Quality and Utility (Preharvest)
- 205 23% Plant Management Systems
- 211 18% Insects, Mites, and Other Arthropods Affecting Plants
- 212 6% Pathogens and Nematodes Affecting Plants
- 215 2% Biological Control of Pests Affecting Plants
- 216 2% Integrated Pest Management Systems
- 312 1% External Parasites and Pests of Animals
- 601 2% Economics of Agricultural Production and Farm Management

V(C). Planned Program (Situation and Scope)**1. Situation and priorities**

Massachusetts is the fourth most densely populated state in the U. S., and is bordered by states ranked two and three (Rhode Island and Connecticut) in population density. And yet, the vitality of the economy and the quality of life in Massachusetts are heavily dependent on agriculture. Even though Massachusetts is a highly urbanized state, it produces 15% of its food and retains a significant amount of open land, much of it in farmland. Farms occupy nearly one-half million acres, 11% of the state's land. In many parts of the state, agriculture accounts for most of the remaining, privately held, undeveloped land, providing important habitat for wildlife, recharge zones for water supplies, and open vistas and recreational spaces for residents and tourists. On the other hand, Massachusetts currently imports 85% of its food. This can create problems from both an economic and ecological perspective. Direct marketing of agricultural products to a largely urban and suburban population is certain to become more important to the region. Identifying and developing specialty products and integrating production with agrotourism will play a role in farm viability. The proximity of farms to cities means that large numbers of people can directly see how food and ornamentals are grown. Massachusetts' agriculture has a heavy horticultural component, including fruits, vegetables, and ornamentals. Ornamental

horticulture in particular has evolved rapidly to become a significant component of the state's economy. Beyond providing jobs in turf, nurseries, landscaping and greenhouses, these enterprises contribute to environmental protection and enhancement, effective use of municipal budgets, and improved quality of life. A large number of farms provide recreational activities such as cross-country skiing, bed-and-breakfast accommodations, farm tours, and harvest festivals. Such new business is strongly related to Massachusetts' mix of urban and rural environments. Finally, the development and re-use of land for residential, commercial and industrial purposes places tremendous stress on natural resources such as wetlands, groundwater, surface water, wildlife habitat, coastal resources and agricultural land.

2. Scope of the Program

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

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

1. Assumptions made for the Program

Agriculture in Massachusetts will become increasing more oriented to direct marketing and value-added products. Local production and utilization of food crops provides important benefits to the economy, the environment, and the citizens of Massachusetts. Massachusetts has land and soil resources that would allow the state to produce 35% of its food needs. Plants resistant to pests and diseases, weeds and stresses will increase productivity and improve the quality of our environment by decreasing the use of agricultural chemicals. Efficient production of food, fiber and polymers will be increased by adoption of new techniques in biotechnology. Genomics will vastly increase our understanding of the myriad ways in which plants defend themselves against insects and insects overcome plant defenses.

2. Ultimate goal(s) of this Program

/to exploit natural products to create desirable biorational insecticides, modify plant growth and develop new foods and food ingredients /to present local farmers with techniques that results in reduced toxic exposure to agricultural workers and consumers while maintaining high product quality /to increase the economic viability of small farms in New England /to increase the nutritional value of produce /to develop plants that are less susceptible to pests because of changes in their defensive array of natural products /to develop more conservative nutrient management strategies that make production more competitive while reducing impacts on the environment

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
2008	0.0	0.0	9.5	0.0
2009	0.0	0.0	9.5	0.0
2010	0.0	0.0	9.5	0.0
2011	0.0	0.0	9.5	0.0
2012	0.0	0.0	9.5	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Conduct research and produce refereed publications in the scientific literature. Present on-site research meetings.

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

Extension	
Direct Methods	Indirect Methods
● {NO DATA ENTERED}	● {NO DATA ENTERED}

3. Description of targeted audience

{NO DATA ENTERED}

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 Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
2008	0	0	0	0
2009	0	0	0	0
2010	0	0	0	0
2011	0	0	0	0
2012	0	0	0	0

2. (Standard Research Target) Number of Patents

Expected Patents

2008 :0 2009 :0 2010 :0 2011 :1 2012 :0

3. Expected Peer Review Publications

Year	Research Target	Extension Target
2008	50	0
2009	0	0
2010	0	0
2011	0	0
2012	0	0

V(H). State Defined Outputs

1. Output Target

- # of refereed manuscripts

2008 :12 2009 :12 2010 :12 2011 :12 2012 :12

- # of on-site research meetings per year

2008 :9

2009 :9

2010 :9

2011 :9

2012 :9

V(I). State Defined Outcome

1. Outcome Target

Accurate research on low impact pest and nutrient management made available and shared

2. Outcome Type : Change in Knowledge Outcome Measure

2008 :0

2009 : 0

2010 : 0

2011 :0

2012 : 0

3. Associated Knowledge Area(s)

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems
- 312 - External Parasites and Pests of Animals
- 601 - Economics of Agricultural Production and Farm Management

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

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

Description

The management practices that are most appropriate are strongly influenced by extremes of weather.

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

1. Evaluation Studies Planned

- Other (scientific peer review)

Description

Evaluation will be done through the established scientific review process in the open literature and the merit review process.

2. Data Collection Methods

- Journals

Description

{NO DATA ENTERED}