Massachusetts Agricultural Experiment Station & UMASS Extension

FY 2004 Annual Report

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2004 Plan of Work Addendum

Certification:

_____ _____

Dr. Steve Goodwin, Associate Director Date
Massachusetts Agricultural Experiment Station

_____ _____

Mr. Robert Schrader, Interim Director Date
UMass Extension

Summary

The Massachusetts Agricultural Experiment Station at the University of Massachusetts in Amherst is currently administered through the College of Natural Resources and the Environment. The director is Dean of the College Cleve Willis and the Associate Director is Steve Goodwin who oversees the day to day management of the station. The Massachusetts Agricultural Experiment Station at the University of Massachusetts in Amherst is reporting on 21 Multistate Research Projects, which have an integrated component to Extension. Several other projects are not reported on in this annual report due to the fact that they have not yet reached a degree of maturity and will be reported on in subsequent years. The stakeholder input on research projects derives from integration with Extension and the past year has seen extensive efforts to more fully incorporate that input into the research efforts. Stakeholder issues include those elements such as land use, marketing and economic development use of chemicals, production and management technologies, labor, child and elder care, food safety, food sanitation, regulations and good manufacturing practices, poverty, hunger, agrochemicals, public knowledge and education, global markets and the environment, land vs. population, and children, youth and families at risk. While all of the projects presented have some impact on the needs of the under-served and under-represented populations of the Commonwealth, several projects, MAS00807, MAS00850, NE-1012, NE-172, MAS00870, MAS00854, MAS00876, NC-1002, NC-1011 and MAS00886 specifically targeted the under-served and under-represented populations of the State.

*Please note that goals were chosen for projects using the crosswalk designed for CRIS.

UMass Extension is currently administered through the office of the Vice-Provost for University Outreach and Continuing Education, Sharon Fross. Robert Schrader is Interim Director for UMass Extension. Faculty and staff are located in the School of Public Health and Health Sciences, and the College of Natural Resources and the Environment.

UMass Extension is reporting on selected programs, as described by Program Directors, team and project leaders. UMass Extension was particularly challenged in FY04 by University-wide budget cuts and a 55% reduction in state funding, as a result of the overall Commonwealth budget situation. The UMass Extension Board of Public Overseers continues to give leadership to overall program direction. Appointed by the Governor, this Board meets four times each year.

Planned Programs

Programs and Project Impacts Listed by Goal

Goal 1
An agricultural system that is highly competitive in the global economy

Key Themes:

Adding Value to New and Old Agricultural Products
Agricultural Competitiveness
Agricultural Profitability
Animal Genomics
Animal Health
Animal Production Efficiency
Aquaculture
Biobased Products
Biofuels
Biotechnology
Bioterrorism
Diversified/Alternative Agriculture
Emerging Infectious Diseases
GIS/GPS
Grazing
Home Lawn and Gardening
Innovative Farming
Invasive Species
Managing Change in Agriculture
New Uses for Agricultural Products
Niche Market
Organic Agriculture
Ornamental/Green Agriculture
Plant Genomics
Plant Germplasm
Plant Health
Plant Production Efficiency
Precision Agriculture
Rangeland/Pasture Management
Risk Management
Small Farm Viability
Tropical Agriculture
Urban Gardening

Agency	Total Dollars	FTEs	MSR Projects/Programs	MSR Dollars
MAES	$1,085,140	7.6	9	$323,334
UMEXT	$598,655	8.5	14	$44,361

Goal 1 Executive Summary –

Emphasis in goal 1 remains directed towards apple and cranberry production. Significant progress has been made towards reducing the reliance on pesticides for the production of these crops. This progress includes a 70% reduction in pesticide use due to the reduced canopy volume of dwarf tree-fruit rootstock. New flooding management techniques are reducing herbicide usage to control dodder in cranberry bogs by 60%. Additional work on cranberry production is leading towards more conservative nutrient management strategies that both make cranberry production more competitive and reduce pollution to surrounding areas. Finally, basic research on livestock vaccines are leading to new approaches for protecting against bioterrorism.

Key Theme: Adding Value to New and Old Agricultural Products
Title of Program/Project: Multidisciplinary evaluation of new apple cultivars
Contact Person: Greene, D. W., Autio, W. R., Cooley, D. R.
Brief Description of Program/Project: The apple industry in the US needs timely information on the attributes and regional adaptability of new cultivars order to avoid wasting. Plant Pathologists, entomologists and horticulturalists are cooperating to identify the best and most

adaptable apple cultivars.

Short Impact: This is the fourth year that we have harvested fruit from the second NE-183 planting. At this time we have enough information to make recommendations to growers about the best cultivars to plant in Massachusetts and the best cultivars to fit into a specific harvest period. Hampshire, Silken and Zestar emerged as clear and outstanding cultivars. Since growers now know what cultivars are best and are adapted to this area they can plant these cultivars with reasonable assurance that they will be profitable investments. Conversely, we have identified a number of cultivars that do not do well here. Since it requires thousands of dollar to plant just one acre of apples, such knowledge will save the growers in Massachusetts and New England potentially hundreds of thousands of dollars. Consumers will benefit greatly from this work since they will have available the best tasting apples that are available for growers to plant. Two of the three cultivars recommended, Zestar and Silken, were among the least afflicted by disease, indicating that growers may benefit from having to apply fewer pesticides while consumers will benefit by having available to them apples that potentially received fewer fungicide sprays.

FTE's: 1.3

Source of Funding: Hatch, Grower funds, Smith Lever

Scope of Impact: Multistate Research/Extension: MA, RI, NH, VT, ME, CT

Key Theme: Agricultural Competitiveness; Agricultural Profitability

Title of Program/Project: Education/outreach activities for commercial small fruit growers in Massachusetts

Contact Person: Sonia G. Schloemann; Wesley R. Autio

Brief Description of Program/Project:

Nine 'On-Farm' or 'Twilight' meetings were held in FY04 around southern New England to update small fruit growers on current integrated (pest and horticulture) management strategies. Key role in planning and execution of the 2003 New England Vegetable & Berry Conference (registration chair, session chair for 3 sessions, moderator and speaker). The 'Massachusetts Berry Notes' (17 issues) and 'Massachusetts Berry Briefs' (10 issues) newsletters were published and distributed during in FY04 with timely production and integrated management information. The UMass 'Fruit Advisor' website was continuously updated with meeting notices, publications, articles, fact sheets. Individual grower contacts (visits, email, phone) were made on an as-needed basis for problem diagnosis and horticulture/pest consulting or recommendations.

Short Impact: It is estimated that over 75% of the 1,500+ commercial berry growers (New England total) were recipients of program/project information via education/outreach activities. Total of over 470 in attendance at on-farm meetings with 140 pesticide recertification credit hours awarded. The New England Vegetable & Berry Conference held in December 2003 was attended by over 1,300 people w/ over 900 attending the six small fruit sessions and over 2,000 pesticide credit contact hours awarded for these sessions (New England wide). 'Berry Notes' (17 issues, circulation of 125) and 'Berry Briefs' (10 issues, circulation of 450) were published in FY04. Visits to UMass 'Fruit Advisor' website are not tabulated, however, increasing grower contacts using email and referrals to internet sources for information suggests grower use of technology as an information resource is increasing. Individual grower contacts (587) (site visits, email, phone) were important to impact specific, local practices and to respond to local

needs. Strong grower participation in meetings and publication subscriptions document the importance of program/project information to Massachusetts fruit growers for making integrated management decisions to protect the environment and human health while remaining profitable. Fruit growers in Massachusetts have consistently cited UMass Extension programs as vital to the continued sustainability of the local industry.

Source of Funding: State, Smith-Lever, user fees

FTE's: 0.7

Scope of Impact: Integrated research and extension, Multi-state (CT, ME, MA, NH, RI, VT)

Key Theme: Agricultural Competitiveness; Agricultural Profitability

Title of Program/Project: Education/outreach activities for commercial tree fruit growers in Massachusetts

Contact Person: Jon M. Clements; Wesley R. Autio

Brief Description of Program/Project:

'Twilight' meetings were held on a seasonal basis throughout Massachusetts to update tree fruit growers on current integrated (pest and horticulture) orchard management strategies. An annual 'New England Fruit & Vegetable Conference' was held that included invited speakers with expertise in horticulture, pest management, and marketing. The 'Healthy Fruit' newsletter was published and distributed 22 times during the growing season with timely integrated orchard management information. The periodical 'Fruit Notes' was published with research results pertinent to Massachusetts and New England fruit growers. The '2003-2004 New England Pest Apple Pest Management Guide' was updated in collaboration with New England fruit specialists. The UMass 'Fruit Advisor' website was continuously updated with meeting notices, publications, articles, fact sheets, and video. Approximately 1,000 grower contacts (email, mail, telephone, on-site) were made on an as-needed basis for problem diagnosis and horticulture/pest consulting or recommendations.

Short Impact:

It is estimated that over 90% of the 200+ commercial tree-fruit growers (Massachusetts and regional) were recipients of program/project information via education/outreach activities. Total meeting attendance was over 1,500. 'Healthy Fruit' and 'Fruit Notes' have subscriptions of 180 and 250 respectively. Site/grower visits were important to analyze and advise on specific, local needs. No data are available on use of the UMass 'Fruit Advisor' website, however, increasing e-mail subscriptions to 'Healthy Fruit' suggests grower use of technology as an information resource is increasing. Altogether, as evidenced by strong meeting attendance and publication subscriptions, the importance of program/project information to Massachusetts fruit growers to make integrated orchard management decisions to protect the environment and human health while remaining profitable is clear. Tree fruit growers in Massachusetts have consistently cited extension as vital to the continued sustainability of the local industry.

Source of Funding: State, Smith-Lever, Grant, user fees

FTE's: 0.7

Scope of Impact: Integrated research and extension, multi-state (CT, ME, MA, NH, RI, VT)

Key Theme: Agricultural Profitability

Title of Program/Project: Rootstock and Interstem effects on pome and stone fruit trees

Contact Person: Autio, W., Greene, D., Cooley, D.

Brief Description of Program/Project: Global competition increases the need for enhanced efficiency of orchard businesses. Rootstocks dramatically affect efficiency and fruit quality, but results vary greatly with climate and pest pressure. Further, new rootstocks are becoming available regularly, thus potentially enhancing efficiency. This project evaluates the performance of tree-fruit rootstocks with a variety of climates, pest pressures, cultivars, and training system in order to enable orchardists to develop orchards with the greatest likelihood of economic success and least likelihood of environmental damage.
Short Impact: Approximately 250 acres were planted to dwarfing rootstocks during the last year. These rootstocks, as defined and recommended by this project, will reduce pruning and harvest labor by 50%, increase fruit quality, increase size by 10-20%, and enhance the economic return on this acreage by as much as 50%. Further, smaller trees require 70% less pesticide because of reduced canopy volume. The net effect of the planting in 2004 is to reduce the amount of spray material in total by about 250,000 gallons per year in Massachusetts.
FTE's: 1.3
Source of Funding: Massachusetts Fruit Growers' Association, Inc., International Dwarf Fruit Tree Association, Hatch Multistate NC-140, Smith-Lever 3b & c
Scope of Impact: Multistate Extension/Research: MA, RI, NH, VT, ME, CT at other growing areas of Northeastern US and Eastern Canada

Key Theme: Agricultural Profitability
Title of Program/Project: Determinants of Food System Performance: Product Quality and Prices
Contact Person: Caswell, J. A., Lass, D. A., Lavoie, N.
Brief Description of Program/Project: The combinations of quality attributes and prices offered to consumers in food products are changing, affecting the performance of the food system. This project uses case studies to examine the factors the influence the quality and price combinations offered to food consumers.
Short Impact: This project provides current analysis of the performance of the domestic and international food system. It analyzes how the system operates domestically, the prices and values it offers to consumers and producers, its competitiveness in international markets, and its ability to assure food quality, particularly food safety and nutrition. The results of this project were used in decision making by the private and public sectors, including being cited by the GAO.
FTE's: 1.1
Source of Funding: Hatch, Grant
Scope of Impact: State

Key Theme: Agricultural Profitability, Plant Production Efficiency
Title of Program/Project: Early prediction of chemical thinning response on apples
Contact Person: Duane W. Greene
Brief Description of Program/Project: Growth of fruit slows well in advance of the time they ultimately abscise. A method is being developed where fruit on representative spur are selected and fruit growth measured. Fruit are predicted to abscise if growth rate falls below 50% of the growth rate of fruit that persist to harvest. The percent fruit predicted to abscise 7 days after thinner application is used as a basis for deciding whether to apply a supplemental thinner.

Short Impact:
If apple trees are allowed to overset fruit will be small and return bloom will be reduced, thus drastically reducing returns for two years. Thinners are applied to reduce crop load but results are not known, at the earliest 2.5 to 3 weeks after application, and this is too late to chemically reduce crop load. This method will allow growers to predict and apply supplemental thinners early enough so that fruit can be chemically thinner while fruit are still susceptible to thinning treatments.

Source of Funding: State, Washington State Tree Fruit Research Commission

FTE's: 0.15

Scope of Impact: Multi-state (MA, NY)

Key Theme: Agricultural Profitability

Title of Program/Project: Soils and Plant Nutrition/Phytoremediation of Metal-Contaminated Soils

Contact Person: Allen V. Barker

Brief Description of Program/Project:
Phytoremediation is a system that uses plants to absorb and accumulate metals in harvestable portions to cleanse contaminated soils. The value of plants in the cleaning of metal-contaminated sites depends on plant growth and plant accumulation of metals. Studies in 2003 and 2004 of plant nutrition and zinc accumulation with Indian mustard (*Brassic juncea*) and tall fescue (*Festuca arundinacea*) were conducted in a series of zinc-contaminated soil developed under laboratory conditions. The soil was Hadley silt loam. The results suggest that different nitrogen fertilizers affect zinc accumulation in Indian mustard and in fescue, with the fertilizers (calcium nitrate, urea) that stimulated the most growth leading to the highest accumulation. Urea and calcium nitrate also led to a 50% increase in the concentrations of zinc in plants compared to accumulation with compost or farm manure. Fescue because of its robust root system and perennial growth may be superior to Indian mustard in accumulation of zinc and hence in phytoremediation. Fescue was easier to establish in contaminated soils than Indian mustard due to the fact that fescue seed germinated well in zinc-contaminated soil and the germination of Indian mustard seed was inhibited in contaminated soil.

Short Impact:
This research and its accompanying outreach will assist nursery growers in the production of liners or transplants that may be more competitive in out-plantings than plants grown conventionally in containers with conventional media of soil or peat-based products. Nutritional enrichment of the liners may be central in increasing their competition against weeds and establishment upon out-planting. The decline of coniferous forests in northern regions has been attributed to nutritional difficulties that arise from acidification of soils and loss of calcium and magnesium from the soil. This research will address systems of assessing nutritional problems in forests and may lead to methods of improving nutrition of forest trees.

Source of Funding: State, Smith-Lever, Massachusetts Agricultural Experiment Station

FTE's: 0.15

Scope of Impact: Integrated research and extension, State

Key Theme: Agricultural Profitability; Agricultural Competitiveness

Title of Program/Project: Reduced-Risk Cropping Systems for Pioneer Valley Apples: a

Development and Marketing Pilot Project

Contact Person: Daniel Cooley, Arthur Tuttle

Brief Description of Program/Project:
This project compared standard pesticide programs in apples in MA to a reduced-risk program. The term reduced-risk refers here to the relative toxicity of pesticides used in agricultural systems and is an aggregate of risks to consumers of the produce, agricultural workers, and the environment (air, water, and organisms), and the program was developed as part of the project. The comparison was done in economic terms, in order to determine the premium necessary for growers to implement the reduced-risk approach. A private-sector marketing specialist will develop a first-stage approach for marketing the more expensive, reduced-risk fruit.

Short Impact:
Based on the economic analysis and discussions with growers, the project has project has identified key issues in developing a marketing campaign for reduced-risk produce.

- "Organic" is easily identifiable by the public and is interpreted (somewhat inaccurately) as "no pesticides";
- "Reduced-risk" is a difficult concept to use in marketing because consumers want "no risk";
- Ecologically friendly and locally produced are good marketing concepts that need to be stressed above the reduced-risk idea;
- Developing these concepts and implementing them in Massachusetts will require a long-term, steady effort on the order of 5 years.

We have used this project as part of an effort to successfully apply for SARE grant funds to continue the marketing efforts.

Source of Funding: State, UMass Amherst Public Service Endowment Grant

FTE's: 0.2

Scope of Impact: State

Key Theme: Agricultural Profitability, Agricultural Competitiveness

Title of Program/Project: Adaptive research in support of an economically viable MA cranberry industry

Contact Person: Frank Caruso

Brief Description of Program/Project: Infection biology of key cranberry fruit rot fungal pathogens. The objective of this project was to determine the timing of infections by fruit rot fungi that lead to fruit rot in the field and in storage. This would test the hypothesis that cranberry fruit exhibit a distinct and limited period of susceptibility around the time of fruit set. Field plots were established in the susceptible cranberry cultivars 'Ben Lear' and 'Early Black'. One treatment was unsprayed with fungicides. One treatment received three fungicide applications, with the first applied at 5% bloom, and subsequent applications at 10 day intervals. Seven treatments received two fungicide applications, with the first treatment receiving an initial spray at 5% bloom followed by the second spray seven days later. Each additional treatment was staggered so the first spray was applied seven days deeper into bloom or fruit set. Field and storage rot were assessed. A second control was used for sampling in the Ben Lear plots. Plot areas were utilized for two successive growing seasons. Flowers and fruits were sampled each week, and half were cultured on acidified cornmeal agar, while the other half was stored in the freezer. These latter samples were eventually sent to Dr. C. A. Levesque at Agriculture Canada for DNA dot blot analyses. The focus in this project was placed on four fruit rot fungi present in all cranberry growing areas: *Coleophoma*, *Colletotrichum*, *Phyllosticta* and *Physalospora*.

Phenological data were collected during the duration of the project, so an exact plant growth stage could be utilized for timing purposes.

Short Impact: Fungicide timing studies found that fungi infect the fruit in a long duration, beginning at the onset of bloom through early fruit set. Excellent field and storage rot control were achieved by these earlier fungicide applications. Fungicides applied after fruit set were far less effective, resulting in higher levels of rot, especially storage rot. In Massachusetts, the key fruit rot fungal pathogens were *Coleophoma*, *Fusicoccum*, *Phomopsis*, *Phyllosticta* and *Physalospora*, as indicated by culturing and dot blot analyses. The most important information for growers is that there is a six week period where fungicides must be applied for optimal control of fruit rot. Two fungicide applications spaced two weeks apart will probably work well, except in those years when poor fruit keeping quality is predicted. This has the potential of benefiting the environment and public safety, without sacrificing fruit quality for the farmer. Economic savings can also be realized by the farmer in a time when the price of cranberries just barely surpasses the break-even point for most growers.

Source of Funding: State, USDA/CSREES Northeast IPM Program, Cranberry Institute

FTE's: 0.6

Scope of Impact: Integrated research and extension, Multi-state (MA, ME, MI, NJ, OR, WA, WI)

Key Theme: Agricultural Profitability

Title of Program/Project: Soil application of gypsum can reduce calcium deficiency symptoms in 'Cortland' apple

Contact Person: Sarah Weis

Brief Description of Program/Project:

This is a long-term project whose goal is to determine the extent to which soil applied gypsum can alleviate calcium deficiency symptoms in apple fruit, specifically in Cortland, a cultivar which is especially prone to demonstration of calcium deficiency. Since 1992, various amounts of gypsum have been applied beneath 'Redcort' trees at the UMass research facility in Belchertown, MA, annually, biennially, triennially, or not at all. Since then, fruit have been stored each year, and, following cold storage, have been assessed for presence of bitter pit and senescent breakdown, two disorders associated with calcium deficiency. All of the gypsum treatments have consistently reduced development of bitter pit. In 2004, eight commercial orchards entered a gypsum trial. Soils were sampled for initial calcium concentration, and gypsum was applied. In upcoming years effects of continued gypsum application on fruit quality will be assessed if funding is forthcoming.

Short Impact:

Application of gypsum to soil beneath apple trees can reduce calcium deficiency in fruit, resulting in higher quality fruit for consumers and reduction of need for postharvest calcium dips (with the accompanying fungicide in the dips).

Source of Funding: Smith-Lever, Hatch, Massachusetts Fruit Growers' Association

FTE's: 0.7

Scope of Impact: Integrated research and extension, State

Key Theme: Agricultural Profitability

Title of Program/Project: Integrated and Sustainable Wine Grape Production in Southern New England

Contact Person: William Coli; Sonia Schloemann; Hilary Sandler

Brief Description of Program/Project:
The principle goal of this project is to work with commercial wine grape growers on research and demonstration of components of a crop and pest management system that will, when adopted, improve economic viability, maintain and enhance environmental quality, and protect worker and consumer health. Growers have expressed a strong interest in field-testing a number of specific, sustainable tactics. In order to meet this need, the project conducted a baseline survey from which to measure change, implemented on-farm trial of reflective mulches for enhancing interception of solar radiation and thereby accelerating fruit ripening, and conducting grower meetings to deliver needed training to growers on better management practices.

Short Impact: This project has documented baseline practices for New England Wine Grape Growers in order to establish a benchmark from which to measure changes by collecting detailed information from 77% of total commercial wine grape growers in the region providing clear direction for impact potential for the project in FY05. This project has held 3 vineyard meetings to deliver current information on sustainable practices to local wine grape growers (total attendance190 w/ 50 pesticide recertification contact hours awarded). Reflective mulch trials indicate potential for enhancing phenolic development and other ripening parameters in 3 varieties of wine grapes (Merlot, Chardonnay and Pinot Noir). Further refined studies are planned for FY05. This project has initiated the convening of a New England Wine Grape Growers' Association to represent this industry regionally (113 Vineyard/Wineries included). This project has secured funding to establish a website for the purpose of delivering locally useful production information and enhanced communication among growers and between growers and resource providers (www.newenglandwinegrapes.org)

Source of Funding: State, Smith-Lever, USDA Northeast SARE

FTE's: 0.35

Scope of Impact: Integrated research and extension, Multi-state (MA, RI, NH, VT, ME, CT)

Key Theme: Agricultural Profitability

Title of Program/Project: Last-chance Chemical Thinning of Apples

Contact Person: Wesley R. Autio

Brief Description of Program/Project:
Apple growers utilize chemical approaches to remove significant portions of bloom or young fruitlets each year, allowing for annual production and the development of acceptable fruit size. This process is fraught with difficulty caused by annual variation in trees' susceptibility to the plant growth regulators as well as weather. Existing approaches can work for up to three weeks after bloom, but after that point, growers are limited to hand removal of fruitlets, a very time-consuming and expensive process. One chemical approach (ethephon) is used in other climates more than three weeks after bloom, but our weather conditions have made it very difficult to develop recommendations for the use of this chemical in New England. This project aims to study new approaches to the use of ethephon in New England to provide growers with a late alternative chemical-thinning treatment.

Short Impact: It is estimated that approximately 1,000 acres of apples are hand thinned in Massachusetts each year. The cost of hand thinning, therefore, is approximately $700,000 annually. The successful use of ethephon as an alternative could reduce this cost by about $600,000 annually.

Source of Funding: State, Smith-Lever, Massachusetts Fruit Growers' Association
FTE's: 0.3
Scope of Impact: Integrated research and extension, State

Key Theme: Agricultural Profitability, Risk Management, Small Farm Viability
Title of Program/Project: Pest Identification Supplement for the 2004-2005 New England Vegetable Management Guide
Contact Person: Richard Bonanno, Robert Wick, Ruth Hazzard
Brief Description of Program/Project: The Pest Identification Supplement is a glossy 28 page publication containing 207 images of weeds, insects, and diseases that are referred to in the New England Vegetable Management Guide. The Guide is a 137-page comprehensive guide for vegetable growers with information on current production and pest management techniques. The Supplement was designed so that growers could refer to images of pest problems in an effort to confirm the pest (weed, insect, or disease) and make improved decisions on control strategies. This Supplement is part of a strategy to help growers feel more comfortable in using biopesticides and reduced-risk pesticides. Newer pesticides, which are considered safer to the user, beneficial pests, and the environment, often do not control as wide of a range of pests and older pesticides. Because of this, proper identification of the pest is critical in selecting pesticides and obtaining control. This supplement is a compilation of input from many members of the New England Vegetable Programs of the Universities of Maine, New Hampshire, Vermont, Massachusetts, and Connecticut. Section editors included Richard Bonanno (weeds), Ruth Hazzard (insects), and Robert Wick (diseases). This supplement will be updated as needed. Because this is a publication written by professionals from throughout New England, it reflects the current collective knowledge for vegetable production in the region. The creation of the Pest ID Supplement is part of a multi faceted grant awarded to the New England Vegetable and Berry Growers Association by the US EPA which also included the last update of the New England Vegetable Management Guide, collection of pesticide residue data from US FDA, two grower surveys to document adoption of biopesticides and reduced-risk pesticides, and improvements to a new England Vegetable web site which will include the images printed in the Supplement. The impact of the Pest ID Supplement will be evaluated in surveys conducted in winter 2004, 2005, and 2006.
Short Impact: 1500 copies of the Pest ID Supplement were printed and distributed free to growers who had previously purchased copies the New England Vegetable Management Guide. 1400 copies of the Guide were printed and distributed in the 6-state New England region. Additional copies are given free to anyone who purchases the Guide and stand alone copies are available at a cost. Vegetable growers throughout the region had access to up to date information on pest identification, reduced-risk pesticides, and all aspects of vegetable crop management.
FTE's: .50
Source of Funding: Federal and State, EPA Regional Strategic Agricultural Initiative Grant Program.
Scope of Impact: Multi State (MA, NH, VT, ME, CT, RI)

Key Theme: Animal Health

Title of Program/Project: Runx1 in Hematopoiesis

Contact Person: Telfer, J.

Brief Description of Program/Project: Mammals make different kind of T cells, with differing functions. It is not understood how the production of these different types of T cells is regulated. This project examines the mechanisms by which one protein turns genes off and on during T cell development, which has the potential to regulate T cell production.

Short Impact: My research addresses how important genes are turned off during white blood cell development. White blood cells protect both humans and livestock against disease. Structural analysis of Runx proteins helps us predict how different forms of Runx act during white blood cell development, which is important to understand for both livestock transplanted with the human immune system to serve as models for human blood cell diseases or engineered to express human antibodies for use in treating human disease. In addition, basic research in gene regulation like this is important to help us understand how genes are properly turned off and on in the process of livestock cloning. The research described above has the potential to help many thousands of human patients as well as generating millions of dollars in economic development. Use of livestock models of human disease as well as bio-reactors represents a new avenue of revenue in livestock management.

FTE's: .6

Source of Funding: Hatch

Scope of Impact: State

Key Theme: Aquaculture, Animal Health, Diversified/Alternative Agriculture

Title of Program/Project: Southeastern Massachusetts Aquaculture Center (SEMAC)

Contact Person: William Burt

Brief Description of Program/Project: The Marine Resources Office and SEMAC continue to support the sustainable development of aquaculture within the five counties of the southeast region of the state. The center coordinates the activities of various agencies, and partners to provide educational programs, research initiatives, demonstration projects, technical assistance, and financial support for the aquaculture industry. As in previous years, the center continues to expand its library resource network, hold informational and technical workshops, monitor marine water quality at pre-selected sites, and investigate disease and growth issues.

Short Impact:

- 11.5 Million 1.5mm quahaug seed were purchased for 12 towns of the County. It is estimated that ~ 80% of that seed survived and was field planted or over-wintered in the fall of 2004
- Nine towns participated in a remote set oyster project. Each town received ~200 bags of cultch material on which it is estimated between 800 to 1500 juvenile oysters per bag were set. Towns will use these oysters to help replenish or start an oyster fishery in selected water bodiesFifty-seven people were trained in restoration of submerged aquatic vegetation as part of a scallop restoration program. Several pilot sites were chosen and planted with submerged aquatic vegetation.
- Using a standard measure of growth and survival, the Shellfish Site Assessment Program continued in the summer of FY 04 and into FY 05. Marine staff worked with and provided this site assessment methodology to four Barnstable County private growers, the Town of Truro, and the Cape Cod National Seashore. CCNS sites included the newly

restored areas of Hatches Harbor in Provincetown and Pilgrim Lake in North Truro. Work was also done in Herring River in Wellfleet. Staff also assisted in setting up site assessment at the off-Cape locations of Rowley on the North shore, Cohasset, Duxbury, and Westport. Data has been collected and analyzed for most of the locations. Presentations of the results were made at several meetings.Mapping of Aquaculture sites with associated data layers began in FY 2003

- $800.00 per town was set aside/encumbered to assist with disease testing of shellfish required by DMF when shellfish is moved from one location to another.

Source of Funding: Smith-Lever, County, Grant

FTE's: 2.0

Scope of Impact: State

Key Theme: Aquaculture, Animal Health, Diversified/Alternative Agriculture

Title of Program/Project: Southeastern Massachusetts Aquaculture Center (SEMAC)

Contact Person: William Burt

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FTE's: 2.0

Scope of Impact: State

Key Theme: Aquaculture, Animal Health, Diversified/Alternative Agriculture

Title of Program/Project: Southeastern Massachusetts Aquaculture Center (SEMAC)

Contact Person: William Burt

Brief Description of Program/Project: The Marine Resources Office and SEMAC continue to support the sustainable development of aquaculture within the five counties of the southeast region of the state. The center coordinates the activities of various agencies, and partners to provide educational programs, research initiatives, demonstration projects, technical assistance, and financial support for the aquaculture industry. As in previous years, the center continues to expand its library resource network, hold informational and technical workshops, monitor marine water quality at pre-selected sites, and investigate disease and growth issues.

Short Impact:

- 11.5 Million 1.5mm quahaug seed were purchased for 12 towns of the County. It is estimated that ~ 80% of that seed survived and was field planted or over-wintered in the fall of 2004
- Nine towns participated in a remote set oyster project. Each town received ~200 bags of cultch material on which it is estimated between 800 to 1500 juvenile oysters per bag were set. Towns will use these oysters to help replenish or start an oyster fishery in selected water bodiesFifty-seven people were trained in restoration of submerged aquatic vegetation as part of a scallop restoration program. Several pilot sites were chosen and planted with submerged aquatic vegetation.
- Using a standard measure of growth and survival, the Shellfish Site Assessment Program continued in the summer of FY 04 and into FY 05. Marine staff worked with and provided this site assessment methodology to four Barnstable County private growers, the Town of Truro, and the Cape Cod National Seashore. CCNS sites included the newly restored areas of Hatches Harbor in Provincetown and Pilgrim Lake in North Truro. Work was also done in Herring River in Wellfleet. Staff also assisted in setting up site assessment at the off-Cape locations of Rowley on the North shore, Cohasset, Duxbury, and Westport. Data has been collected and analyzed for most of the locations. Presentations of the results were made at several meetings.Mapping of Aquaculture sites with associated data layers began in FY 2003
- $800.00 per town was set aside/encumbered to assist with disease testing of shellfish required by DMF when shellfish is moved from one location to another.

Source of Funding: Smith-Lever, County, Grant

FTE's: 2.0

Scope of Impact: State

Key Theme: Biotechnology

Title of Program/Project: MEMORY RESPONSES OF BOVINE WC1 + YO T CELLS

Contact Person: Baldwin, C. L.
Brief Description of Program/Project: As new infectious diseases emerge and antibiotic resistant strains of bacteria develop, the need for new vaccines increases. It would also be advantageous to have methods to stimulate the immune system in a global manner to prevent infections that occur due to suppression of the immune system resulting from stress and to combat infections caused by unknown agents. Our goal is to understand the role of these cells in protective immunity in ruminants. "Memory" is a hallmark of responses by the other major type of T lymphoctyes known as alpha beta T cells and B lymphocytes that produce antibodies. Their ability to remember is the keystone of vaccination. The studies proposed here will help us determine whether gamma delta T cells undergo physiological changes akin to establishment of memory cells. If so, vaccines that stimulate these cells may be generated thus prevent or alleviate infectious disease and increasing animal health and well-being.
Short Impact: The results of these studies suggest bovine gamma delta T cells do have a memory response and thus could be exploited for generating vaccines. This is a new paradigm for vaccination. The threat of bioterrorism makes generating vaccines for livestock important for protecting the health of humans who are susceptible as a result of contact with infected livestock.
FTE's: .8
Source of Funding: Grant, Hatch
Scope of Impact: State

Key Theme: Innovative Farming
Title of Program/Project: Refinement of Wooden Pesticide- Treated Spheres for Apple Maggot Control
Contact Person: Prokopy, R., Cooley, D.
Brief Description of Program/Project: Apple maggot is a key insect pest of apples in eastern and midwestern North America. Attractive odor-baited pesticide-treated 8cm spheres ringing perimeters of commercial orchards offer a viable behavioral-control alternative to pesticide sprays against apple maggot. Current pesticide-treated spheres are inadequate for season-long control. This proposal aims to finalize a superior pesticide-treated sphere.
Short Impact: Our 2003 findings paved the way for a new type of PTS for direct control of apple maggot. This new PTS is termed CurveBall and will be available to commercial apple growers at a relatively inexpensive cost possibly as early as 2005. Because Entrust is labeled for use in organic agriculture, we strongly believe that CurveBalls will receive approval by EPA for direct control of AMF. This behavioral approach for controlling AM has not only proven as effective but also as affordable as insecticide sprays. These findings will impact at least 500 apple growers throughout the Northeast and in other regions where AM is a problem. The simple and inexpensive trapping system developed by Ron Prokopy for directly controlling AMF without need of any insecticide spray, and under a wide range of orchard architectures and conditions, is currently in place in Massachusetts orchards. The set of cooperators on this project are working in blocks, not whole orchards. In Massachusetts, we have 14 blocks with 8 growers (Chandler, A. Clarke, Tougas, Broderick, Carlson, Martin, Davis and Lincoln) while we have at least two blocks each in 6 other states (NY, VT, CT, NH, ME and RI).
FTE's: .7
Source of Funding: Grant (MAS00200105108), Hatch, Extension
Scope of Impact: Multistate, Integrated Research & Extension

Key Theme: Invasive Species
Title of Program/Project: Integrated weed management for Cranberry production
Contact Person: Caruso, F., Sandler, H.
Brief Description of Program/Project: Screen selected herbicides for crop safety and efficacy against target weeds. Identify potential biological herbicides and screen them for pathogenicity against target weeds. Develop models of weed emergence based on growing degree day accumulation that will lead to timely application of pre-emergence controls. Determine action thresholds for population densities of selected weeds. Examine factors that make some plant species invasive to commercial cranberry bogs.
Short Impact: At least 800 acres in MA will be flooded for dodder control on commercial cranberry farms per annum. The management technique of flooding is done in lieu of herbicide applications for dodder control (in that year). One large cranberry company has integrated this technique into their dodder management program and has reduced their herbicide usage for dodder control by at least 60% through the use of short-term floods. As cranberry growers continue to struggle to remain economically viable, information from the vine density/nitrogen study will provide immediate cost-saving benefits for growers opting to renovate underproductive beds. This information will also be valuable to growers opting to plant with new high-yielding varieties. Dichlobenil is an important component of weed management for cranberry growers. To remain economically competitive, growers must use all possible tools to their maximum effectiveness. Concerns of direct crop loss or chronic crop injury were not substantiated. Thus, this compound can be safely used to manage weeds within the context of a viable weed management program without compromising fruit production. Information gathered from all research projects will be transmitted to cranberry growers through UMass Cranberry Station newsletters, UMass Extension fact sheets, and the UMass Cranberry Station Web Site. In addition, results will be or have been published in scientific journals.
FTE's: .4
Source of Funding: Hatch, Extension
Scope of Impact: State Specific

Key Theme: Managing Change in Agriculture
Title of Program/Project: Integration of Agricultural Research and Extension in a Center for Agriculture
Contact Person: Goodwin, S., Cromack, P.
Brief Description of Program/Project: This proposal is part of the operational plan for the Center, and formalizes funding that targets high-priority issues in agriculture, integrating both research and Extension components, and where possible involves other states. Funding through the Experiment Station will be matched by funding from Extension, and the money will be used to initiate joint sub-projects.
Short Impact: More than eighty agricultural stakeholders from across the state had the opportunity to voice their concerns and aspirations for the agricultural program at the University of Massachusetts. In particular, they were able to represent the ways in which integrated activities impact the viability of agriculture in the state. The activities of the Center have directly addressed the concerns that were expressed by the agricultural community last year. The perception that the Center acts directly on stakeholder feedback has created a greater willingness on the part of stakeholders to provide additional feedback. In addition, the Center for Agriculture at the University integrated Extension and Experiment Station resources to promote research and

education projects that impact agriculture. This process has resulted in the creation of three new projects that are focused on integrated research and extension activities.
FTE's: .1
Source of Funding: Hatch, Extension
Scope of Impact: State

Key Theme: New Uses for Agricultural Products
Title of Program/Project: The Role of Nitric Oxide Synthese and peroxynitrite on Oxidative Stability of Muscle Foods
Contact Person: Decker, E.
Brief Description of Program/Project: The development of novel muscle food products is often limited by the development of rancidity. A potential promoter of rancidity in muscle foods is nitric oxide. Nitric oxide is a radical that has little prooxidant potential. Nitric oxide can react with superoxide anion, to produce peroxynitrite. Peroxynitrite is a strong oxidizing agent that can promote rancidity by decomposing fatty acids & antioxidants. Peroxynitrite could be an important initiator & promoter of rancidity since nitric oxide & superoxide anion are both found in the skeletal muscle from which muscle foods are derived. The first obj. of this research is to determine the potential for nitric oxide by measuring the activity of the enzyme responsible for its production in muscle foods. Enzyme activity will be evaluated in different animal species & muscle types under conditions typical to muscle foods. The second objective will be to measure the formation of specific peroxynitrite oxidation biomarkers in raw, salted and cooked muscle foods to directly assess the role of peroxynitrite in muscle food quality. Formation of rancidity products will also be determined in these meat systems to evaluate how peroxynitrite contributes to the oxidation of fatty acids. Peroxynitrite represents a potential factor that could limit the production, utilization and shelf-life of muscle foods through its ability to promote rancidity. Therefore, understanding the properties of peroxynitrite could provide new information that could be used to increase the shelf-life and utilization of muscle foods.
Short Impact: Formation of off-flavors and colors is a common defect in muscle foods. The cause of off-flavor and discoloration of muscle foods is not clearly understood. Peroxynitrite is a newly discovered compound that could cause quality degradation in meat and poultry. This research shows that peroxynitrite can accelerate the decomposition of flavor and color in muscle foods. Peroxynitrite impact muscle food color more than flavor through its higher reactivity with myoglobin than muscle lipids. Developing markers of peroxynitrite induced myoglobin oxidation should help determine if this is a pathway that leads muscle food degradation and thus loss of the economic value of meat products.
FTE's: .9
Source of Funding: Grant (MAS00200101667), Hatch
Scope of Impact: State

Key Theme: Niche Market, Adding Value to New and Old Agricultural Products
Title of Program/Project: Farm to School; Farm to Hospital; Farm to Table
Contact Person: Anne Carter
Brief Description of Program/Project: The project is working to get local fruits, small fruits, and vegetables into the school lunch programs in the Pioneer Valley of Massachusetts. This involves collaboration with School Food service Directors, school nurses, school business offices, and farmers.

Short Impact: Local food is going to the Hampshire Regional; Amherst-Pelham; Granby; and Chicopee School Districts. This allows approximately 14,294 children access to fresh, local fruits, and vegetables. Approximately six farmers participated in the providing produce to schools. The program has generated $13,996.50 in new produce sales from July 1, 2004 to Dec. 31, 2004. We are negotiating with three other school districts and 1 college so the sales should increase. Four talks have been given throughout New England, one NPR radio program, two magazine articles, and three newspaper articles. This ties into new school lunch legislation at the national and state level and this program is working with three local school committees to improve the wellness and nutrition policies in the schools.

Source of Funding: State, Hatch Funds, Public Service Endowment funds, Project Bread Funds

FTE's: 0.50

Scope of Impact: Integrated research and extension, State

Key Theme: Niche Market

Title of Program/Project: Biology and management of flea beetle species in traditional and newly introduced Brassica crops

Contact Person: Ferro, F., Hazzard, R., Van Driesche, R., Mangan, F.

Brief Description of Program/Project: Expanded production of new Brassica crops that are highly susceptible to flea beetle damage has increased the pest status of flea beetles and created a need for better understanding and management of this pest. The purpose of this study is to understand more about the biology of flea beetles in relation to brassica crops and develop effective and safe ways to manage them.

We conducted research on Clubroot disease which is a soil born disease and that is a disease that attacks exclusively brassica crops, and research on flea beetle life history and management in brassica. The result of this research has been available to the cooperating growers and other growers through news letters, meetings, twilight meetings, workshops and in our website "umassvegetable.org". From September to November 2004, we conducted a survey of cooperating growers to evaluate the project.

Short Impact: More than 420 farms in Massachusetts grow at least one form of brassica. This project will benefit both organic and conventional brassica growers in the Northeast region through improved control of flea beetles, resulting in higher-quality traditional and newly introduced Brassica crops. A more thorough understanding of the biology of flea beetles in Massachusetts will provide growers the information necessary to develop a comprehensive pest management strategy that will reduce reliance on frequent applications of high-risk pesticides. We interviewed 50 brassica growers in Massachusetts all 50 expect to adopt new pest management strategies for flea beetles, including better use of crop rotation and field design, improved use of row covers to exclude beetles from their crops, and the incorporation of reduced-risk pesticides. Through interviews done this past fall we learned that 21 of these growers adopted a new brassica species and 11 growers adopted a new management strategy for flea beetle management.

FTE's: .7

Source of Funding: Hatch, Grant, Smith Lever

Scope of Impact: Integrated Research and Extension, Multi-state (MA, CT)

Key Theme: Plant Genomics
Title of Program/Project: Genetic Improvement of Floricultural Crops
Contact Person: Boyle, T. H.
Brief Description of Program/Project: Continued growth in sales of floricultural crops requires the introduction of improved cultivars of existing crops. The purpose of the project is to utilize three Schlumbergera species in an interspecific hybridization program with S. truncata (Thanksgiving cactus) to increase the genetic diversity of the gene pool.
Short Impact: Successful intergeneric hybridization between Hatiora and Schlumbergera may permit desirable characters from both genera to be combined in the intergeneric hybrids. The identification of self-incompatibility groups will aid ornamental plant breeders in their selection of Schlumbergera and Hatiora clones for crosses. Considerable time and effort can be wasted in making crosses for the development of new varieties of Christmas cactus and Easter cactus. For example, no fruit will set when two cross-incompatible clones are crossed. Knowing the incompatibility group that each cultivar is assigned to will allow breeders to increase the efficiency of crosses.
FTE's: .3
Source of Funding: Hatch, Industry
Scope of Impact: State

Key Theme: Plant Health
Title of Program/Project: Etiology, epidemiology, and management of Cranberry diseases
Contact Person: Caruso, F.
Brief Description of Program/Project: Determine populations of fruit rot pathogens and evaluate the pathogenicity of selected fungi. Evaluate biological, chemical, and cultural strategies for control of fruit rot. Assess the economic impact of upright dieback on cranberry yield. Evaluate the incidence and pathogenicity of fungi isolated from affected uprights. Evaluate cranberry cultivars for resistance to upright dieback pathogens.
Short Impact: Abound was used by approximately 75 growers for the first two years beginning in 2003 and it is hoped that Indar will also receive a registration in 2005. So far, fruit rot fungi have not shown reduced sensitivity to either fungicide; however, growers will still be encouraged to use the fungicides judiciously. Fungicide timing studies have shown that there is a large window when infection occurs, but that fungicides applied after fruit has set are useless. It is finally known that Phomopsis and Fusicoccum are indeed causal agents of upright dieback, in addition to blueberry cane diseases. A good spectrum of the sequence fruit rot fungi in rotted berries has been obtained and can be used in conjunction to other knowledge gained on the timing of infection using fungicide timing trials. It is possible that fungal antagonists and compost teas may supplement fungicide programs in the future for fruit rot control.
FTE's: .8
Source of Funding: Hatch, Grant
Scope of Impact: State Specific

Key Theme: Precision Agriculture
Title of Program/Project: Validation of a Reduced Fungicide Strategy for Management of Cranberry Fruit Rot
Contact Person: Caruso, F. L.
Brief Description of Program/Project: Cranberry growers should be able to manage fruit rot

with fewer fungicide applications. This project will attempt to show growers that fungicide effects carry over from one growing season to the next. To prove this concept, field trials and demonstration plots will be employed.
Short Impact: Fungicide use will be reduced with no loss in fruit quality in all states. The keeping quality forecast will be evaluated for its historical accuracy. It will be refitted for the 21st century in Massachusetts, and tested in the other growing areas to see whether it can be utilized effectively. It will be compared to a forecast model devised by Skybit, Inc. to assess its accuracy.
FTE's: .4
Source of Funding: Grant (MAS00203777), Hatch
Scope of Impact: State Specific

Key Theme: Precision Agriculture
Title of Program/Project: Nutrition, development physiology, and flood management in the culture of the American Cranberry
Contact Person: Demoranville, C., Vanden Heuvel, J.
Brief Description of Program/Project: 1. Determine the optimum range of rates for phosphorus and potassium fertilizer for cranberry production. Compare the use of an NPK combination fertilizer with applying the elements separately (different timing schedules). 2. Define the relationship among soil pH, cranberry yield, and bog weed populations. Evaluate yield and plant nutrient content in bog areas treated with several sulfur regimes. 3. Establish field trials to study the effects of chloride-containing fertilizers and high rates of potassium-magnesium soil amendments on cranberry productivity. 4. Examine the effect of flooding for pest management on cranberry productivity. Determine if pre-flood plant carbohydrate status is related to post-flood yield. 5. Investigate cranberry winter hardiness, chilling requirement, and breaking of dormancy. Compare by cultivar, nitrogen fertilization, and stand age.
Short Impact: Based on these findings, >80% of MA cranberry acreage (14,500 acres total) have adopted conservative nutrient management regimes. Growers continue to use N-P-K materials based on required N rate but have reduced N rates (and thus P and K rates). In addition growers have begun to introduce materials with lower P:N ratios. Supplemental use of P and K has declined. Based on the following estimates, growers will experience an overall reduction in fertilizer and frost management costs. Reduced use of K fertilizers: 100 lb/a less material $15/a savings in material, $20/a in application cost Reduced use of N materials: 100 lb/a less material $12-15/a savings in material, $20/a in application cost Total savings in fertilizer: 200 lb/a less material (~10 lb/a less N, ~40 lb/a less K) total savings in fertilizer = $65-70/a Based on less fertilizer use, most can now wait later in the spring to start frost protecting. If they have to protect one less time the savings would be about $20/a in labor and fuel.
FTE's: .9
Source of Funding: Hatch, Grant
Scope of Impact: State

Goal 2
A safe and secure food and fiber system

Key Themes:

Food Accessibility and Affordability
Food Handling
Food Quality
Food Recovery/Gleaning
Food Resource Management
HACCP
Food Safety
Food Security
Foodborne Illness
Foodborne Pathogen Protection

Agency	Total Dollars	FTEs	MSR Projects/Programs	MSR Dollars
MAES	$141,921	.4	2	$33,475
UMEXT	$165,510	2.35	3	$27,562

Goal 2 Executive Summary --

Food safety continues to be an important emphasis within Goal 2. 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. 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. The impacts reported here set the stage for this growth. Of particular importance are our educational efforts in the realm of food safety education. These efforts have been very successful with food producers, food processors and food service professionals.

Key Theme: Food Quality
Title of Program/Project: Postharvest Biology of Fruit
Contact Person: Greene, D. W., Weis, S. A.
Brief Description of Program/Project: Fruits which are of high quality at the time of harvest are often reduced to poorer or even unacceptable quality by the time they reach the consumer. This project seeks to find ways to extend storage life of fruit and to contribute to providing consumers with attractive, nutritious, and flavorful food.
Short Impact: Using 1-MCP to control superficial scald eliminates the need for postharvest drenches in diphenylamine (the "standard" scald control measure). Elimination of dipping/drenching fruit eliminates the fungicide which must be included in any dip/drench, and

that is beneficial to everyone. If 1-MCP treatment can improve fruit quality and packout, waste is reduced. Ground gypsum applied to soil benefits soil structure and increases calcium concentration in fruit without the negative side affects associated with calcium chloride sprays (corrosion of spray equipment) or postharvest calcium drenches (need to include fungicide in the drench).
FTE's: .3
Source of Funding: Hatch Multistate
Scope of Impact: MI, NC, Ontario, British Columbia, ME, MN, NY (Cornell), MD, MA, WA, CA

Key Theme: Food Safety
Title of Program/Project: Bacterial Adhesion and Growth at Phase Interfaces
Contact Person: McLandsborough, L. A.
Brief Description of Program/Project: Although most research is performed in liquid systems, microorganisms can be found in foods and processing environments at solid-liquid, gas-liquid, and solid-gas interfaces. The purpose of this project is to study bacterial growth at solid surfaces-liquid and liquid-liquid interfaces. Our efforts will be using Listeria monocytogenes and Escherichia coli O157:H7 in each of these interfacial systems, respectively.
Short Impact: We have identified a genetic determinant needed for adhesion and biofilm formation of L. innocua that is also present in L. monocytogenes. Knowledge of the molecular events will be used to design unique strategies for biofilm prevention and removal from processing plants, leading to large economic savings for the food industry.
FTE's: .3
Source of Funding: Hatch, Grant
Scope of Impact: State

Key Theme: Food Safety
Title of Program/Project: Characterization of the Transfer of Listeria Monocytogenes Between Processing Surfaces and Foods
Contact Person: McLandsborough, L.
Brief Description of Program/Project: L. monocytogenes contamination is responsible for the majority of Class I recalls of processed foods. The presence of L. monocytogenes in processed foods is thought to be due to post-processing contamination from established organisms in the processing environment. Although research has focused upon adhesion and biofilm formation by Listeria monocytogenes, no one has studied the potential of bacterial transfer from food processing surfaces to foods, and from foods to processing surfaces. The overall purpose of this research is to obtain a more precise understanding of the potential for Listeria monocytogenes transfer and the influence of moisture on this transfer. Ultimately, the results of this research will answer the question: should food safety advice specify drying of food contact surfaces after cleaning and sanitizing?
Short Impact: Post processing contamination with Listeria monocytogenes from the processing environment is a major public health and economic problem. Understanding mechanisms of bacterial transfer is important in designing safer food processing.
FTE's: .3

Source of Funding: Hatch, Grant (MAS0200303112)
Scope of Impact: State

Key Theme: Food Safety
Title of Program/Project: Seafood Safety
Contact Person: Levin, R., McLandsborough, L., Shetty, K., Labbe, R., Chinachoti, P., Decker, E.
Brief Description of Program/Project: Seafood products can carry bacteria, which are pathogenic to humans. Bacteria can cause spoilage of fish products. There are many fish species that are not used for human food since they can contain high levels of environmental contaminants. The American diet is deficient in omega-3 fatty acids. This program will address the bacteriological and nutritive aspects of seafood safety by providing useful, science based tracking of pathogenic bacteria from seafoods and within seafood processing environments, increasing fish shelf life, allowing increased consumption of underutilized fish species, and development of a stable forms omega-3 fatty acids to increase intake of these required fats into the American diet.
Short Impact: Identifying strains of L. monocytogenes in fish processing plants that have taken up permanent residence in the plants for eventual elimination by optimization of sanitary practices. Enhanced preservation of seafood using GRAS phytochemicals. Incorporation of stabilized microencapsulated omega-3 fatty acids into a variety of food products. Production of high quality fish protein from underutilized fish species.
FTE's: 1.6
Source of Funding: Hatch**,** Grant (MAS0200206165)
Scope of Impact: State

Key Theme: Food Resource Management
Title of Program/Project: Competitiveness and Value-Added in the U.S. Grain and Oilseed Industry
Contact Person: Lavoie, N.
Brief Description of Program/Project: My research examines various aspects of the impact of product differentiation in the wheat industry on international trade, market power, and on the validity of empirical tests of market power. It also examines the impact of state-trading enterprises and marketing boards on world wheat trade.
Short Impact: Exporting and importing state trading enterprises are a topic of negotiation during the current round of the WTO negotiations; more specifically the United States hopes to eliminate those enterprises. These projects examine the impact of those enterprises on the domestic and international performance of the wheat markets, in particular their value to domestic producers, their impact on trade patterns and on the quality of wheat imported and therefore grown domestically. The results of this project are used to inform policy makers on the likely domestic impact of privatizing foreign wheat imports and exports.
FTE's: .1
Source of Funding: Hatch Multistate, Grant
Scope of Impact: AK, ID, IL, GA, KS, LA, MA, MN, MS, NB, ND, OH, OK

Key Theme: Foodborne Pathogen Protection

Title of Program/Project: Isoflavonoid Synthesis and Pathogen Control in Sprouts in response to Rosemary Phenolic Clonal Extracts

Contact Person: Shetty, K.

Brief Description of Program/Project:
Sprouted soybean is potentially an excellent source of iso-flavonoid genistein that has implications for diet-based therapeutic applications. Sprouted legumes are also potentially susceptible to bacterial pathogens like Salmonella and E.coli. This project will utilize elite clonal extracts of high phenolic rosemary generated via tissue culture to stimulate genistein as well as simultaneously control bacterial pathogens in sprouted soybean

Short Impact:
Consumption of soybean has been linked to reduced risk of coronary heart disease and cancers such as breast and prostate cancers. Studies from this project also indicate the antimicrobial potential against bacterial pathogens and chemopreventive potential for managing glycemic index linked to diabetes and hypertension linked to cardiovascular disease. The chemopreventive health benefits of soybean and other legumes are due to their phenolic metabolites. The functional phenolic phytochemicals can be effectively released and optimized by herb-extract based elicitation during sprouting and by fungal bioprocessing using food-grade fungi such as Tempeh fungus, Rhizopus oliogosporus and shiitake fungal mycelial stage, Lentinus edodes. Such natural bioprocessing approaches by sprouting and solid-state bioprocessing improved health-relevant

FTE's: .3

Source of Funding: Hatch (MAS00835)

Scope of Impact: State

Key Theme: Food Safety

Title of Program/Project: Food Safety Education for High Risk Groups

Contact Person: Rita Brennan Olson

Brief Description of Program/Project:
These programs provide training and resources on safe food handling to food workers, regulatory officials, educators and volunteers serving children, the elderly and other vulnerable groups to: increase knowledge about the causes of food-borne illness and the practices needed to reduce it in high-risk groups and improve safe food practices of program participants. Food Manager Certification courses such as ServSafe® describe food hazards, recommended food safety practices and introduce the Hazard Analysis Critical Control Points (HACCP) system as a method of preventing food borne illness and prepare participants for completing a national recognized certification examination.

Short Impact:
17 Food Manager Certification courses (including 5 ETE Food Manager Certification courses for 79 CACFP personnel) were conducted for 306 food service personnel, volunteers and regulatory officials serving over 100,000 children and consumers. Average passing score for the certification exam for non ETE participants ranged from 83.38 to 91.73.

- 82% of participants planned to change food practices to prevent at work.
- 67% indicated they plan to teach other employees about food safety procedures
- 68% indicated they plan to check temperatures
- 56% indicated they plan to use temperature logs

Follow-up surveys from ETE participants indicated that

- 68% of participants had changed food practices at work.
- 76% indicated they teach other employees about food safety procedures
- 57% indicated they check temperatures
- 64% indicated they use temperature logs

16 "Food Handling as a Risky Business" workshops were conducted for 250 High Risk Consumers (Shelter residents) and Care givers (Home Health Aids, Child Care, Rachel's Table volunteers) impacting over 200 elderly and high risk families.

- 80% of participants planned to change food practices to prevent food borne illness).
- 88% indicated they plan to improve food storage practices
- 81% indicated they plan to improve practices such as hand washing
- 78% indicated they plan to improve thawing practices
- 51% indicated they plan to cook foods thoroughly
- 65% indicated they plan to clean utensils more thoroughly

3 Food Safety from Farm to Table workshops were conducted for 288 WIC nutritionists, school food service staff , and Head Start Staff impacting over 10,000 children and families

Source of Funding: Smith-Lever, Grant, Fees

FTE's: 0.25

Scope of Impact: State

Key Theme: Food Safety

Title of Program/Project: Food Safety Education for Producers and Processors

Contact Person: Rita Brennan Olson

Brief Description of Program/Project:

Resources and training materials designed by the New England Extension Food Safety Consortium to meet the resource needs of the region's small food producers and specialty food industry.

Good Agricultural Practices for Small Food Producers in New England (NE GAP Project) features fact sheets and materials to ensure good farming practices to reduce food-borne illness. Topics include basic information on sources of bacterial contamination and guidelines for training, worker health and hygiene, field sanitation, use of sanitizers, temperature control, and manure application.

Online Support for New England Food Entrepreneurs is a gateway website designed by the New England Extension Food Safety Consortium to meet the information and resource needs of the region's specialty food industry.

Short Impact:

NE GAP materials were distributed to over 40 growers through MA Association of Farm Stands and Farmers Market Federation

Online Support for New England Food Entrepreneurs website (http://www.umass.edu/nefe/) was launched with assistance in distribution of over 400 promotional postcards and information through the MA Department of Agricultural Resources and UMExt Vegetable Notes.

Source of Funding: Smith-Lever, NE GAP USDA URI, NE Extension Consortium Directors Grant

FTE's: 0.15

Scope of Impact: Multi-state (CT, NH, RI, ME, VT)

Key Theme: Food Safety

Title of Program/Project: Examining the Exam

Contact Person: Rita Brennan Olson

Brief Description of Program/Project:

This goal of this program is to improve food safety comprehension, efficacy, training and assessment for under-educated and limited English proficient school food service workers who participate in food manager certification training programs and examinations. This project assesses and addresses the needs of under-educated and limited English proficient food handlers who participate in food manager certification training programs and examinations. It is an integrative approach to food safety education, incorporating: 1) research on barriers to successful completion of food safety certification of food handlers with limited education and English proficiency, 2) Extension education through designing and testing of teaching materials and examination questions, and 3) education of K-12 school personnel through dissemination of revised educational materials by Food Safe Schools and other national food safety education networks.

Short Impact:

One meeting of the National Sanitation and Training Advisory Committee was convened including members of the UMass faculty and professional staff, and Univ. of CT and Univ. of Rhode Island collaborators, Conference on Food Protection Manager Training, Testing and Certification Committee, the National Registry of Food Safety Professionals, the National Environmental Health Association Food Safe Schools Program – Kids First, Indiana University, World Education, Mass Partnership for Food Safety Education representatives: US Food and Drug Administration, the Mass Department of Public Health, the Mass Environmental Health Association and Mass Department of Education Nutrition Programs & Services. Thirteen certification courses were conducted in Mass, Conn and RI for food service personnel in Child and Adult Care Food Programs (CACFP) ; baseline and follow-up surveys were administered to 209 participants to gather data on demographics, food service experience, and basic food safety practices. Information on learning styles and reading ability was also collected. Of CACFP personnel surveyed most were female (92.2%), English speaking (79.0%), and 30-49 years old (64.5%); 80% identified themselves as food workers, 11.3% as managers. One-third of participants failed the exam; of these, 30% failed by more than 5 points. A majority of those who failed did not complete high school (61.9%). The mean reading level of those who passed the exam was a grade equivalent of 9.5, compared to grade 4.0 for those who failed. Cognitive interviews revealed that participants found selected exam items unclear/confusing, lacking in detail, irrelevant to their jobs, or inconsistent with instructional materials.

The project approach provides insight to addressing needs of diverse audiences on issues critical for food safety and protection.

Source of Funding: Smith-Lever, State, Grant

FTE's: .9

Scope of Impact: Integrated research and extension, Multi-state (MA, CT, RI)

Key Theme: Food Safety

Title of Program/Project: Food Safety FIRST

Contact Person: Rita Brennan Olson

Brief Description of Program/Project:

The goal of Food Safety FIRST is to promote and enhance food safety education for teachers and youth by: 1) determining attitudes, knowledge and behaviors of secondary level science teachers, and relate health belief, stage of change, and other factors to the use of food safety education in the classroom, 2) developing an online food safety education course geared to the learning needs of secondary level science teachers and their students, and 3) developing learning experiences in food safety for secondary level youth.

Short Impact:

Food Safety FIRST (Food Science, Inquiry, Resources, Science Education Standards, Teaching Critical Thinking) an Internet-based training program was developed and pilot tested: the Food Safety FIRST website (http://foodsafetyfirst.org) with food safety links, inquiry-based learning, and science education standards, three online modules (Bacteria Are Everywhere, Food Handling is a Risky Business and Current Controversies in Food Science), each involving 15 hours of web-based instruction, interactive asynchronous discussions, directions and tools to conduct food science experiments, or critical evaluation projects and a companion CD with videos demonstrating proper laboratory techniques, interactive activities, lab reports for use with students and PowerPoint presentations to use in classrooms. In addition to these resources, a lab kit was made available with supplies to complete the module activities. The Food Safety FIRST Program was pilot tested in the spring of 2004, with 16 teachers completing all three modules and 13 participants completing a post-program evaluation. Evaluation results indicated that as a result of this program, participants were motivated to teach food safety with 69% responding “yes, definitely” and (31%) responding “yes possibly”, with 940 students expected to be reached. Most teachers were comfortable teaching students about food safety, confident answering students’ food safety questions, confident in their students’ interest in food safety as a result of their teaching, , and confident that the food safety concepts taught would meet the national science standards. They felt more able to critically evaluate food safety information on the Internet. Overall, participants found the program valuable and enjoyed learning about food safety in an online format.

Posttest knowledge was high, with most respondents knowing the correct temperature to cook hamburgers (85%) and hold hot foods (77%); and demonstrating knowledge of the danger zone (85%), hemorrhagic colitis (62%), potentially hazardous foods (77%), and conditions for bacterial growth (77%). Almost all participants (92%) agreed or strongly agreed that they would change their food safety habits after completing the program. Posttest respondents reported high adoption of recommended practices such as washing hands after opening eggs, washing cantaloupes before consumption, thawing foods safely, serving well-cooked meats, washing cutting boards to avoid cross-contamination, and using sanitizers. Results indicate that an online Food Safety course is an effective means of improving teacher food safety knowledge and behaviors, and increasing food safety education in the classroom.

Source of Funding: Smith-Lever, Grant

FTE's: .90

Scope of Impact: Integrated research and extension, State

Key Theme: Food Safety

Title of Program/Project: Massachusetts Partnership for Food Safety Education

Contact Person: Rita Brennan Olson

Brief Description of Program/Project:

The Massachusetts Partnership for Food Safety Education represents state, regional and federal agencies and associations that work with consumers, regulators and food workers in food production, processing, food service and retail establishments to reduce food-borne illness in Massachusetts by improving food safety knowledge and skills

Short Impact:

Three Partnership Meeting were held representing over 100 hours volunteer contributions to activities and material development

The Partnership

- sponsored an exhibit at the Annual North East Foodservice & Lodging Conference in Boston with an estimated 30,000 show attendees, distributing food safety materials to over 500 conference visitors. In-kind contributions included over $2000 for exhibit space and registration fees by the MA Restaurant Association; over 100 hours for volunteer staffing of exhibit)
- coordinated two visits from the national USDA Food Safety Mobile to Rutland and Natick. In-kind contributions included over 50 hours promotion and staffing of event by Partnership members and collaborators reaching 150 1-3 grade students (Rutland) and over 500 Natick residents.
- co-sponsored the Massachusetts Food Safety and Security Coalition meeting with 55 representatives from state, regional and federal agencies and food industry representatives to explore ways to improve communication about/in food safety and security among food and consumer industries and organizations throughout the Commonwealth. Additional activities are planned to develop a mechanism for networking among groups.

Source of Funding: Smith-Lever, Nutrition Education Trust Fund and in-kind support

FTE's: 0.15

Scope of Impact: Massachusetts only

Goal 3
A healthy, well-nourished population

Key Themes:

Birth Weight
Health Care
Human Health
Human Nutrition
Infant Mortality
Medicinal Plants
Nutricueticals

Agency	Total Dollars	FTEs	MSR Projects/Programs	MSR Dollars
MAES	$197,508	.5	2	$67,398
UMEXT	$10,564	.15	0	0

Goal 3 Executive Summary –

Goal three efforts emphasize improved youth health through research and education projects focused on training for day care providers and secondary school teachers respectively. In addition, research seeks to increase the use and availability of omega-3 fatty acids in food products, providing health benefits. Research also continues to focus on understanding the importance of biological products such as genistein and carnosine on human health.

Key Theme: Human Health
Title of Program/Project: Nutrient Bioavailability--Phytonutrients and Beyond
Contact Person: Decker, E., Clydesdale, F.
Brief Description of Program/Project: Many components in foods can have positive effects on health yet little is know about how they work. This project will investigate how non-essential nutrients from foods improve health.
Short Impact: Using this emulsion technology we have developed a food ingredient omega-3 fatty acid delivery system that contains either algae or fish oil. This omega-3 fatty acid ingredient system has a shelf-life of over 6 months and can be incorporated into foods without altering the original flavor of the product. Such products will soon be used to determine the bioavailability of the omega-3 fatty acids in humans. This research project will impact the citizens of the U.S. in several ways. First, the development of foods containing omega-3 fatty acids could provide an easy vehicle to increase the incorporation of beneficial fatty acids into the diet. These foods would be beneficial to the general population but in particular to populations at risk for coronary heart disease and pregnant and lactating women who must provide high levels of omega-3 fatty acids to their infants. A second benefit would be to fishing communities. Underutilized fish species such as herring, mackerel and menhaden are naturally high in omega-3 fatty acids. If technologies can be developed to stabilize the oil from these fish, an increased market would be developed thus increasing the value of the fish stock which would provide new harvesting opportunities.
FTE's: .3
Source of Funding: Hatch Multistate
Scope of Impact: OK, IA, ME, MA, MI, CT, KS, AZ, OR, NM, CA, WA, ARS

Key Theme: Human Nutrition
Title of Program/Project: Nutritional Risk and Antioxidant Status in the Elderly
Contact Person: Cohen, N. L., Laus, M. J.
Brief Description of Program/Project: Issues of chronic diseases that often accompany the aging process are associated with poor nutrition. Valid and reliable methods to assess the nutritional status and dietary intake in older adults are needed in order to screen and evaluate the population's health status. This project examines the methodologies used to elicit dietary intake information among older adults, targeting the growing population of elderly blacks, with particular emphasis on fruit and vegetable antioxidant intake.
Short Impact: This study helps to identify nutritional needs in older adults who use food pantries. Food pantries are a major source of energy in older adults who use pantries. Nutrition

interventions for food pantry recipients who are men, consumers age 55-70, and food insecure are needed.

FTE's: .2

Source of Funding: Extension, Grant, Hatch Multistate

Scope of Impact: MD, RI, MA, NH, CT, NYC, WDC,

Key Theme: Human Nutrition

Title of Program/Project: Online Education for Secondary Science Teachers: An Integrated Approach to Food Safety Training

Contact Person: Cohen, N., Olson, R., Mclandsborough, L

Brief Description of Program/Project: Food borne illness continues to plague American health and economy. While many children are responsible for food preparation, they do not learn safe food preparation practices from their parents or at school. Few teacher training institutions offer courses in food safety to educators. This collaboration will promote and enhance food safety education by developing an online training program for teachers to use with students, parents and other school community members.

Short Impact: Through the collaboration between the University of Massachusetts and NSTA, the Food Safety FIRST program (Online Education for Teachers: An Integrated Approach to Food Safety Training) has increased knowledge and improve food safety practices of science teachers. This project will also increase knowledge and improve food safety practices of youth, thus reducing the risks of foodborne illness for themselves, their families, and other consumers.

FTE's: .5

Source of Funding: Extension, Hatch Grant (MAS00203912)

Scope of Impact: State

Key Theme: Human Nutrition

Title of Program/Project: ABC's of Good Nutrition for Young Children

Contact Person: Rita Brennan Olson

Brief Description of Program/Project: This learn-at-home program is designed to improve nutrition knowledge and child feeding practices of childcare providers as they relate to the U.S. Dietary Guidelines and current nutrition issues.

Short Impact:

35 child care providers participated in mail and web-based ABC for Good Nutrition courses serving over 1,000 young children. As a result of this course:

- 90% of participants planned to change physical activity practices with the children in their care
- 79% of participants planned to change meals and snacks provided to children in their care
- 55% indicated they plan to cut down on fat-rich foods
- 50% indicated they plan to increase use of whole-grain bread and cereals
- 40% indicated they plan to increase use of fruits
- 37% indicated they plan to increase use of vegetables
- 70% indicated they plan to read labels more often

All participants were awarded a certificate for 2 training credits from the MA Department of Education

Source of Funding: Fee
FTE's: 0.15
Scope of Impact: State

Key Theme: Nutraceuticals
Title of Program/Project: Isoflavonoid Synthesis and Pathogen Control in Sprouts in response to Rosemary Phenolic Clonal Extracts
Contact Person: Shetty, K.
Brief Description of Program/Project: Sprouted soybean is potentially an excellent source of iso-flavonoid genistein that has implications for diet-based therapeutic applications. Sprouted legumes are also potentially susceptible to bacterial pathogens like Salmonella and E.coli. This project will utilize elite clonal extracts of high phenolic rosemary generated via tissue culture to stimulate genistein as well as simultaneously control bacterial pathogens in sprouted soybean.
Short Impact: Consumption of soybean has been linked to reduced risk of coronary heart disease and cancers such as breast and prostate cancers. Studies from this project also indicate the antimicrobial potential against bacterial pathogens and chemopreventive potential for managing glycemic index linked to diabetes and hypertension linked to cardiovascular disease. The chemopreventive health benefits of soybean and other legumes are due to their phenolic metabolites. The functional phenolic phytochemicals can be effectively released and optimized by herb-extract based elicitation during sprouting and by fungal bioprocessing using food-grade fungi such as Tempeh fungus, Rhizopus oliogosporus and shiitake fungal mycelial stage, Lentinus edodes. Such natural bioprocessing approaches by sprouting and solid-state bioprocessing improved health-relevant nutritional value of soybean and this is linked to their phenolic metabolites. Further, it is clear that phenolics from soybean could be a source of additional antimicrobial hurdle in a food processing systems like in case of Listeria monocytogenes or potentially when ingested like in case of Helicobacter pylori.
FTE's: .3
Source of Funding: Hatch (MAS00835)
Scope of Impact: State

Goal 4
Greater harmony between agriculture and the environment

Key Themes:

Agricultural Waste Management
Air Quality
Biodiversity
Biological Control
Drought Prevention and Mitigation
Endangered Species
Energy Conservation
Forest Crops
Forest Resource Management
Pesticide Application
Recycling
Riparian Management
Soil Erosion
Soil Quality
Sustainable Agriculture
Water Quality
Weather and Climate

Global Change and Climate Change
Hazardous Materials
Integrated Pest Management
Land Use
Natural Resources Management
Nutrient Management
Wetlands Restoration and Protection

Agency	Total Dollars	FTEs	MSR Projects/Programs	MSR Dollars
MAES	$454,498	1.2	6	$81,173
UMEXT	$746,588	10.6	9	$148,811

Goal 4 Executive Summary –

Our effort under goal 4 has targeted pests that are critical to Massachusetts and the northeast. Some of the targeted pest include: Coleophoma, Colletotrichum, Phyloosticta, and Physalospora (cranberry fruit rot); apple maggot flies and plum curculio (key pests of apples); and strawberry sap beetle (primary pest of strawberries and other crops). We continue to develop integrated approaches to pest management. For instance the perimeter trap cropping approach is leading to 90% reduction in pesticide use and grower enthusiasm for adoption is high. Significantly, the development efforts for the bio-based corn oil/Bt approach to caterpillar control in sweet corn has now been commercialized nationally.

Key Theme: Biodiversity
Title of Program/Project: Microbial conversion of agricultural wastes to electricity
Contact Person: Lovley, D. R.
Brief Description of Program/Project: Agricultural wastes from farm animals are often ascetic and environmental problems, but they also represent a large source of potential energy. The purpose of these studies is to determine whether a microbe-electrode system could be used to degrade compounds that are an odor or environmental concern in animal wastes and at the same time provide electrical power that could be applied to farm operations.
Short Impact: These results suggest a novel strategy for swine waste treatment which eliminates odors, organic loading and produces electricity.
FTE's: 1.4
Source of Funding: Grant, Hatch
Scope of Impact: State

Key Theme: Biological Control
Title of Program/Project: Molecular Dissection of Bacterial Resistance Mechanisms to Plant-Derived Bacteriostatic Compounds by Functional Genomics
Contact Person: Pomposiello, P
Brief Description of Program/Project: The interaction between plants and microbes in the

environment is essential for a wide range of processes, from nitrogen fixation to plant disease. This project examines the global responses of a bacterial species to plant-derived toxic compounds, and aims at identifying novel genes with roles in bacterial resistance to environmental toxins.

Short Impact: We now know that glucose transport, iron trafficking and LPS metabolism is limiting processes for growth under oxidative stress. Since many soluble plant compounds induce oxidative stress in bacteria, the knowledge on the genetic determinants of bacterial resistance to oxidation will result in more predictive power for plant-microbe interaction models.

FTE's: .4

Source of Funding: Hatch

Scope of Impact: State

Key Theme: Global Change and Climate Change

Title of Program/Project: Characterization and mechanisms of plant responses to ozone in the Northeast

Contact Person: Manning, W. J.

Brief Description of Program/Project: Our results are fundamental to understanding factors that affect O3 uptake and plant injury. This has direct bearing on air quality standards for plants and people. We are also identifying new bio-indicators for O3 that will increase public awareness of the O3 problem.

Short Impact: We have conclusively shown that there is an alternative way to accurately and effectively assess the impact of ozone, at pollution levels, on crop plant growth and productivity. This will allow the development of a biologically relevant air quality standard for ambient ozone that will protect both plants and humans. The EDU method has world-wide significance and utility and will lead to significant cooperative research on an international level.

FTE's: .2

Source of Funding: Industry Grant, Hatch Multistate

Scope of Impact: ARS, CA, NJ, NYC, VPI, MN, PA, MA

Key Theme: Hazardous Materials, Water Quality

Title of Program/Project: Hazardous Material and Water Quality Education

Contact Person: Marilyn Lopes

Brief Description of Program/Project:

This program increases consumer knowledge and understanding of groundwater as a resource and the effects of solid and hazardous material disposal to water quality issues. The Barnstable County Hazardous Materials Program and Hazardous Hot Line offers technical assistance and educational support to town household hazardous waste coordinators for household hazardous waste collections and the implementation of permanent collection programs for recyclable hazardous materials. Staff specialists also provide the public easy access to up-to-date information on the proper disposal of household hazardous materials on Cape Cod. Questions answered include what is hazardous waste, how to package hazardous waste for disposal, where and when these items may be safely disposed and how to reduce the use of hazardous materials in homes and businesses.

Short Impact:

- Leadership and technical assistance was provided to the five-community Upper Cape

Household Hazardous Products Collections for the fifth year of collections. Six collections were held in FY2004. The amount of materials collected increased 140% from 1999 to 2004. Per household cost declined 24% from 1999 to 2004, and participation increased 48% from 1999 to 2004.

- Leadership and technical assistance was provided for the fourth year of Outer Cape Household Hazardous Products Collections for Provincetown, Truro and Wellfleet. Three collections were held in FY2004, which were open to residents and small businesses of the three towns. The amount of materials collected increased 92% from 2000 to 2004. Per household cost increased 6% from 2000 to 2004, and participation increased 110% from 2000 to 2004.
- Leadership and technical assistance was provided for the third year of the Brewster, Harwich and Chatham Six collections were held in FY2004, which were open to residents and small businesses of the three towns. The amount of materials collected increased 121% from 2001 to 2004. Per household cost increased by 22% from 2001 to 2004, and participation decreased 12.5% from 2001 to 2004.
- Leadership and technical assistance was provided for the second year of the Barnstable and Yarmouth Eight collections were held in FY2004, which were open to residents and small businesses of the two towns. The amount of materials collected increased by 517% from 2002 to 2004. Per household cost decreased by 29% from 2002 to 2004, and participation increased 461% from 2002 to 2004.
- The Barnstable County Hazardous Materials Program sponsored Mercury Thermometer, Thermostat and Switch Collections in cooperation with SEMASS, town and county hazardous waste coordinators. All Cape Cod towns participate in this statewide effort to eliminate toxic mercury from the waste stream. More than 124 pounds of elemental mercury were collected in FY04 and removed from the solid waste stream. Since the inception of the program in 2001, more than 330 pounds of mercury have been removed from the solid waste stream.
- Outreach to small businesses that generate hazardous materials explained the HHP collection program and encourage them to participate in town-sponsored HHP collections. This project focused on painters, paint and hardware stores, artists, and pesticide applicators, and resulted in participation of more than 250 small businesses in the HHP collections.
- As a result of homeowner and small business participation in scheduled household hazardous products collections, more than 155 tons of toxic and hazardous materials were removed from the waste stream in FY2004.

Source of Funding: Smith-Lever, County, USDA Sec. 406 funds

FTE's: 1.0

Scope of Impact: Multi-state (MA, ME, CT, RI, NH, VT)

Key Theme: Integrated Pest Management, Nutrient Management, Pesticide Application

Title of Program/Project: Demonstration & Evaluation of Cucurbit Pest and Crop Management Systems

Contact Person: Ruth Hazzard

Brief Description of Program/Project: This project uses demonstration sites on farms, farmer meetings, and the UMass Vegetable Notes newsletter to promote IPM/ICM production techniques by growers of cucurbits in Massachusetts. We worked with growers in the adoption of new materials to replace FQPA threatened pesticides, in new production practices to address soil, water, and weed management problems, in trying new mildew resistant cultivars, and in applying appropriate amounts of nutrients to maximize crop uptake while minimizing waste.

Short Impact: -Of the ten growers we worked with in pumpkin, zucchini, and cucumber crops, all but the two organic growers tried a new systemic insecticide that can be used in small quantities and is applied in a pre-transplant drench or as a drench at planting in place of difficult to time insecticidal foliar sprays.
All of these growers will continue to use the new product.
-Seven of the ten growers tried new cultivars; all seven will consider using them again in the future.
-Seven of the growers tried new herbicides; all will continue to use them.
-Four of the growers grew no-till pumpkins, a new production method in pumpkins to conserve water and minimize soil problems; three of them were encouraged enough with the results to continue to grow pumpkins using no-till; all three have made progress in cover-crop management and weed control in this system.
-Twilight meetings for growers and extension personnel were held on two of the farms where no-till demonstration plots were shown and their cucurbit management practices were discussed. These meetings collectively reached approximately 80 growers.
-Particulars learned about the various management practices demonstrated on these farms were shared in the UMass Vegetable Notes newsletter.

FTE's: .60

Source of Funding: USDA/CSREES/RAMP

Scope of Impact: Integrated research and Extension, Multi-state (MA, NY, OH)

Key Theme: Integrated pest management, Sustainable agriculture

Title of Program/Project: Elimination of broad spectrum organophosphate sprays for cranberry weevil (*Anthonomus musculus*) control.

Contact Person: Anne Averill

Brief Description of Program/Project:
In this fifth and final year, we have completed work to identify and introduce a new reduced risk compound, indoxacarb (Avaunt) for cranberry weevil control in Massachusetts.

Short Impact: Prior to our work, the entire industry was affected by organophosphate- resistant populations of cranberry weevil and control was poor or non-existent. Further, growers were spraying twice/year with these broad-spectrum organophosphates (mode of action = nerve poison). As a result of our work, the MA industry has eliminated use of these sprays for cranberry weevil and substituted the reduced-risk compound Avaunt, resulting in minimal impact on non-targets in the cranberry system.

Source of Funding: Smith-Lever, State, Cranberry Institute, Cape Cod Cranberry Grower's Association

FTE's: 0.4

Scope of Impact: State

Key Theme: Integrated pest management, Sustainable agriculture

Title of Program/Project: Identification of reduced risk options for oriental beetle (*Exonomala orientalis*) management in cranberry.

Contact Person: Anne Averill

Brief Description of Program/Project:
We evaluated mating disruption of adults with sex pheromone over two years with excellent results in both years. In addition, a reduced risk compound, imadacloprid (Admire 2F) was labeled two years ago and we worked to introduce it to growers for control of the immatures. This required meetings, training, and newsletters since the application is specific to the newly hatched larvae in the soil.

Short Impact: Prior to our work, no control for the root-attacking oriental beetle larvae was available to MA cranberry growers. Infested bog was non-productive. In the past, such bogs would often be sold along with adjacent uplands for housing developments, removing parcels of cranberry farmland from the dwindling open space roster in MA. Other growers resorted to expensive renovation (40K/acre) and three years to come back into production following replanting. The mating disruption technique is scheduled to be available for growers in 2005, and along with applications of a reduced-risk application of Admire, growers now have access to a dual-pronged approach for management with minimal impact on non-targets or the environment.

Source of Funding: State, USDA-PMAP, Cranberry Institute, Cape Cod Cranberry Grower's Association

FTE's: 0.5

Scope of Impact: Integrated research and extension, multi-state (MA and NJ)

Key Theme: Integrated pest management, Sustainable agriculture

Title of Program/Project: Infection biology of key cranberry fruit rot fungal pathogens

Contact Person: Frank Caruso

Brief Description of Program/Project: The objective of this project was to determine the timing of infections by fruit rot fungi that lead to fruit rot in the field and in storage. This would test the hypothesis that cranberry fruit exhibit a distinct and limited period of susceptibility around the time of fruit set. Field plots were established in the susceptible cranberry cultivars 'Ben Lear' and 'Early Black'. One treatment was unsprayed with fungicides. One treatment received three fungicide applications, with the first applied at 5% bloom, and subsequent applications at 10 day intervals. Seven treatments received two fungicide applications, with the first treatment receiving an initial spray at 5% bloom followed by the second spray seven days later. Each additional treatment was staggered so the first spray was applied seven days deeper into bloom or fruit set. Field and storage rot were assessed. A second control was used for sampling in the Ben Lear plots. Plot areas were utilized for two successive growing seasons. Flowers and fruits were sampled each week, and half were cultured on acidified cornmeal agar, while the other half was stored in the freezer. These latter samples were eventually sent to Dr. C. A. Levesque at Agriculture Canada for DNA dot blot analyses. The focus in this project was placed on four fruit rot fungi present in all cranberry growing areas: *Coleophoma*, *Colletotrichum*, *Phyllosticta* and *Physalospora*. Phenological data were collected during the duration of the project, so an exact plant growth stage could be utilized for timing purposes.

Short Impact: Fungicide timing studies found that fungi infect the fruit in a long duration, beginning at the onset of bloom through early fruit set. Excellent field and storage rot control were achieved by these earlier fungicide applications. Fungicides applied after fruit set were far

less effective, resulting in higher levels of rot, especially storage rot. In Massachusetts, the key fruit rot fungal pathogens were *Coleophoma*, *Fusicoccum*, *Phomopsis, Phyllosticta* and *Physalospora,* as indicated by culturing and dot blot analyses. The most important information for growers is that there is a six week period where fungicides must be applied for optimal control of fruit rot. Two fungicide applications spaced two weeks apart will probably work well, except in those years when poor fruit keeping quality is predicted. This has the potential of benefiting the environment and public safety, without sacrificing fruit quality for the farmer. Economic savings can also be realized by the farmer in a time when the price of cranberries just barely surpasses the break-even point for most growers.
Source of Funding: Smith-Lever, State, CSREES Northeast IPM Program, Cranberry Institute, Grant
FTE's: 1.0
Scope of Impact: Integrated research and extension, Multi-state(MA, ME, MI, NJ, OR, WA, WI)

Key Theme: Integrated Pest Management
Title of Program/Project: Toward Bio-based Management of Key Apple Pests
Contact Person: Prokopy, R. J., Cooley, D.
Brief Description of Program/Project: Apple maggot flies and plum curculio are key pests of apples whose control by current pesticides is threatened under the Food Quality Protection Act. Our ultimate intent is to optimize types and deployment patterns of traps that can substitute for current insecticides in directly controlling these pests.
Short Impact: 2004 results, when combined with 2003 findings, reveal that presence of PCs within orchard blocks can be explained by successful overwintering and by penetration of adults into interior trees, particularly if trees are small. More injury by PC can be expected in interior-rows in those orchard blocks having small trees. A full block spray at petal fall is justified. This information will impact 150 apple growers in MA growing 4,500 acres. At least as many growers in neighboring states will also be impacted.
FTE's: .2
Source of Funding: Grant, Extension, Hatch
Scope of Impact: State

Key Theme: Integrated Pest Management
Title of Program/Project: New Multi-Tactic Alternatives to Current Pesticides Against Key Apple Pests
Contact Person: Cooley, D. R
Brief Description of Program/Project: Three key apple pests currently are controlled by pesticides facing elimination or reduction under the Food Quality Protection Act. Our purpose is to develop new multi-tactic alternatives for controlling these three key pests: the insects plum curculio and apple maggot and the disease flyspeck. Alternatives will involve evaluation of new and safer pesticides alone or in conjunction with behavioral and cultural control methods.
Short Impact: Growers can eliminate 1-2 summer fungicide sprays in blocks that have low amounts of flyspeck inoculum in nearby border areas. Summer fungicide spray costs vary quite a bit, depending on the material and rate used and who is held accountable for the labor and the equipment. Over the last couple of years, data has indicated that the cost per acre for material

increases from $10 to $20 per acre. Application costs also vary, but range around $25/acre, +/- $10. Altogether, this amounts to $25 to $55 per acre. Of course, this does not take into account the environmental costs. Manipulation of the border can further contribute to fungicide reduction. The odor-baited trap tree approach succeeded in monitoring the seasonal course of egg-laying by plum curculio and determining need and timing of sprays. After a whole-orchard application of insecticide shortly after petal fall, later sprays can be confined to peripheral-row trees driven by a pre-set threshold. Growers using this approach can expect to reduce insecticide against PC by approximately 35 %. In addition, a trap tree may hold PCs in perimeter-row trees, thus preventing penetration into interior trees. Growers could achieve 100 % reduction in apple maggot sprays and have good and affordable control by using the new pesticide-treated sphere and the new placement method. This could be true particularly for large blocks of apple trees that are on dwarfing rootstock and are well-pruned. These results will impact 125 apple growers in MA growing 4,500 acres. At least twice this number will be influenced in neighboring states.

FTE's: .4

Source of Funding: Hatch, Grant (MAS005559)

Scope of Impact: State

Key Theme: Integrated Pest Management, Sustainable Agriculture.

Title of Program/Project: Perimeter Trap Cropping (PTC) for Winter Squash & Vine Crops

Contact Person: Ruth Hazzard

Brief Description of Program/Project:

Developing perimeter trap cropping systems to control cucumber beetle in winter squash & other cucurbit crops. Research was done both in small experimental plots and in commercial fields. PTC is a systems approach, which reduces the costs and risks associated with traditional pest management practices while maintaining or enhancing their effectiveness. Hundreds of growers across New England learned about these systems through on farm trials, conferences, newsletter articles, and other venues. Many of them have expressed interest in adopting these practices.

Short Impact:

The PTC systems we tested both in small plots and in on-farm experiments (~24 acres) controlled the target pest at least as well as conventional full field sprays did. There were no statistical differences between the numbers of beetles or the defoliation in any of our PTC fields compared with the control fields, in either the small plot or on farm experiments. This control was achieved with at least a 90% reduction in pesticide rates/acre and cost/acre.

Survey results from the growers who participated in our experiments were also extremely encouraging:

- 100% of surveyed growers found the PTC system to be good or excellent overall.
- Six out of seven said that using PTC saved them money. One grower said it cost him about the same.
- Six out of seven of the growers we surveyed were very satisfied or thrilled with the way PTC worked for them. The remaining grower was satisfied and would continue using PTC.
- 100% said using PTC took less or the same amount of time as using conventional methods.
- 100% said they used less pesticide.
- Six out of seven growers said that using PTC was simpler or much simpler than conventional pest control strategies. The seventh grower said he thought it was about

even.

- Six out of seven growers said they will certainly use PTC again. The sixth grower said that he probably would as well.

Four additional growers who used PTC in other vine crops (~50 acres) also plan to continue using it.

Source of Funding: State, Smith-Lever, USDA/NESARE

FTE's: 0.7

Scope of Impact: Integrated research and extension, multi-state (MA, CT)

Key Theme: Integrated pest management; Sustainable Agriculture

Title of Program/Project: Developing and implementing an organic IPM system for sweet corn on diversified vegetable farms

Contact Person: Ruth Hazzard, Pam Westgate, Anne Carter

Brief Description of Program/Project: Sweet corn is grown on one third of vegetable acreage and by about 57% of vegetable farmers, totaling about 8000 acres in MA. In New England, the majority of sweet corn is grown on diversified farms that grow <20 acres of sweet corn. Despite widespread use of IPM, broad-spectrum insecticides are widely used for control of ear-invading caterpillars. The lack of adequate pest management methods has been a critical barrier to successful sweet corn production by organic farmers. This project has developed a bio-based method using direct silk applications of corn oil mixed with *Bacillus thuringiensis* (Bt), combined with foliar sprays of Bt, to control the caterpillar complex. Research seeks to achieve the highest possible ear quality by evaluating timing, materials, and rates of application using materials approved for organic farming. Experiments were conducted at the UMass Agronomy Farm and on cooperating farms from 1993-2004.

Short Impact: An oil applicator (the Zealater ™) was designed and patented as a joint effort of the University of Massachusetts and Hampshire College. Eight farms in five states tested the method in commercial fields from 1999-2001. Educational programs and publications assist growers in learning and adopting the method. 19 presentations or workshops were given, to total of 791 farmers and researchers, over the course of 3 years (January 2000 to Jan 2003) on using the oil method as part of an organic IPM system. In 2004, an eight page fact sheet with color photos was published and >300 copies were distributed Extension and Sustainable Agriculture educators throughout the US. Approximately 50 farmers have requested information directly from our office.

Of 8 farms who participated in the 3-year trials (from RI, VT, CT, ME and MA), 6 continue to grow corn and use the oil method and the Zea-later in their pest management. The overall mean improvement in the percentage of clean ears between the untreated and the oiled ears for all plantings on all of the farms was 21.6%, with the highest levels of improvement generally occurring on farms with the greatest pest pressure. Of the eight farms that participated, five were able to achieve a 3-year average of over 80% clean ears with the oiling.

As a result of this project, the Zea-later oil applicator has been commercialized, and is currently available from an independent agricultural supplier (Johnny's Selected Seeds). In the first two years of distribution, 150 farmers nationwide purchased Zea-later oil applicators to implement the method. These were from 29 states including west, Midwest, southwest, mid-Atlantic, and Northeast. 50% of sales were from farms in the Northeast region. CA, MA, PA, ME, WI, NY,

CT, MI, NJ and VT were the states with the highest rates of sales (in descending order).

Three refereed publications were published as a result of the project:

Hazzard, R. V, B. B Schultz, E. Groden, E. D. Ngollo, and E. Siedlecki. 2003. Evaluation of oils and microbial pathogens for control of Lepidopteran pests of sweet corn in New England. Journal of Econ. Ent. 96(6): 1653-1661.

Cook, R., A. Carter, P. Westgate, and R. Hazzard. 2003. Direct silk applications of corn oil and *Bacillus thuringiensis* as a barrier to corn earworm larvae in sweet corn. HortTechnology 13(3):509-514.

Cook, R., A. Carter, P. Westgate, and R. Hazzard. Optimum timing of an application of corn oil and *Bacillus thuringiensis* to control Lepidopteran pests in sweet corn. HortTechnology

Farmers who wish to grow sweet corn using organic methods and without use of high risk pesticides are able to produce high quality ears throughout the growing season

FTE's: .25

Source of Funding: Smith Lever, USDA (Northeast SARE), Organic Farming Research Foundation

Scope of Impact: State

Key Theme: Integrated Pest Management; Sustainable Agriculture

Title of Program/Project: Use of short and long-term floods for weed control in commercial cranberry production.

Contact Person: Hilary A. Sandler

Brief Description of Program/Project:

In this project, we evaluated two different methods of assessing dodder response to short-term (24-48 hr) spring (mid-May) floods over a 2-year period. Year 1 (using collection of field dodder biomass) indicated lower biomass in 3 out of 7 paired locations. At least 2 other flooded sites were paired with pieces that historically had lower infestations of dodder than the flooded piece, so treatment effects were difficult to measure. This could bring the number of successful flooding events up to 5. The biomass collection method was advantageous because we could actually harvest dodder seedlings that germinated and made successful attachments to the host.

In the second year, pouches with equal amounts of dodder seeds were placed in each test location. Unlike the first year, no differences in dodder germination (viability) were detected between the flooded and nonflooded paired sites in the second year. The study sites were evaluated visually during the summer, and the flooded sites did not seem to have performed as well as in Year 1. The long wet spring may have delayed germination past the timing of the floods, and may have lead to the lack of suppression of the dodder populations. We believe the timing of the flood is critical to adversely affect the dodder population. Even though the floods went out around the same calendar date in Year 1 and Year 2, the dodder population varied in its temporal germination patterns. Even though applied around the same calendar date, the floods in Year 1were put on about 3 weeks after first germination and in Year 2, the floods were put on about 1 week after first germination. It is possible the floods were too early in Year 2 and did not reach a large percentage of the susceptible dodder population.

Further research is warranted to ascertain the susceptible time frame of the parasite's life cycle. Even though the precise details of the cultural practice are not yet known, this practice has been

adopted by some Massachusetts growers. Given the ease of application, short-term floods are an economic nonpesticide alternative that should be considered as part of an integrated program to control dodder populations on commercial cranberry farms. Future research includes (additional funding provided by EPA Region 1 FQPA/Strategic Agricultural Initiative Grants Program) controlled studies on flood timing, flood duration, and temperature effects. In addition, a survey will be distributed to the grower community to ascertain adoption of this alternative practice.

Short Impact:
This project demonstrated that the negative impact of the flooding event on dodder germination was substantial enough for the grower to consistently adopt the practice during 3 recent growing seasons. Compared to the previous 3-yr period, herbicide inputs for the control of dodder decreased 65% to 89%. Short-term flooding may be a viable option that can be integrated into the overall management plan for dodder. Research results have been presented at grower workshops, scientific meetings, and incorporated into management recommendations for growers.

Source of Funding: Smith-Lever, EPA Region 1 Agricultural Initiative Grants Funds Program

FTE's: 0.2

Scope of Impact: State

Key Theme: Integrated Pest Management

Title of Program/Project: Landscape Ecology and Management of Strawberry Sap Beetle in the Northeast

Contact Person: Sonia Schloemann

Brief Description of Program/Project:
Strawberry Sap beetle is of great concern to strawberry growers in the Northeast because 1) adult feeding and larval infestation of harvestable fruit cause significant economic losses where beetles are abundant, 2) pesticides need to be applied just prior to harvest and are generally not effective, and 3) grower and consumer complaints about damage and contamination of fruit from SSB are on the rise. Although primarily a pest of strawberry, SSB feeds and reproduces on the un-harvested fruits of a number of other crops. We propose to 1) assess quality of over-wintering habitat in the vicinity of strawberry plantings; 2) quantify SSB use of, and population growth on alternative food sources; and 3) evaluate resistance/susceptibility of different strawberry cultivars and timing of renovation as management tactics to reduce SSB populations in strawberry fields.

Short Impact: Results of FY04 study on 1) over-wintering habitat for SSB, 2) SSB use of alternative food sources, 3) evaluation effect of cultivars and renovation practices on SSB populations, and information disseminated to growers via print (Massachusetts Berry Notes) and verbal presentation (New England Fruit & Vegetable Conference Strawberry Session); minimum of 225 growers educated. Improved management recommendations incorporated into Extension publications (New England Small Fruit Pest Management Guide).

Source of Funding: State, Smith-Lever, USDA Northeast IPM

FTE's: 0.1

Scope of Impact: Integrated research and extension, multi-state (MA, NY, PA)

Key Theme: Integrated Pest Management; Sustainable Agriculture

Title of Program/Project: New Multi-tactic Alternatives to Current Pesticides Against Key Apple Pests

Contact Person: Arthur Tuttle, Daniel Cooley

Brief Description of Program/Project:

By studying the relationships between 3 key apple pests (flyspeck disease, plum curculio beetle and apple maggot fly) and the wooded or hedgerow habitats bordering blocks of apple trees, new reduced-pesticide strategies were developed. Fungicide reductions were achieved in flyspeck disease management with border habitat surveys, flyspeck risk assessments, judicious use of Flint fungicide, and border sprays. Blocks judged to be high risk received 3 summer sprays and had 1-3% fruit infected at harvest. Blocks that were low risk received either 2 summer sprays (4.5% fruit infected) or 1 summer spray and 2 summer border sprays (1-3% fruit infected). These levels were acceptable: 2004 was, like 2003, a very wet year, with fruit in control plots more than 50% infected. Insecticide reductions were achieved in plum curculio management by timing the sprays according to beetle egg laying activity in "trap trees" located in the perimeter row of apple trees next to a wooded or hedgerow border. Use of pheromone lures and host plant volatiles greatly increased the efficiency of this monitoring method. Injury levels were low (1-1.4 % injury at harvest), compared with calendar-based spraying, and 38% less insecticide was used. Apple maggot flies were managed with an improved version of our odor-baited pesticide treated spheres placed around the periphery of the blocks. A new method for calculating the number of spheres needed per acre resulted in successful control (0-0.28% injury) in 12 blocks with far fewer spheres than in the past and a significant reduction in insecticide as compared to the standard of 3 full block sprays.

Short Impact:

The study demonstrated new successful pesticide-reduction methods for 3 key pests of apples to 12 apple growers directly and to at least 150 others who have heard about them at grower meetings. Many other growers and industry professionals have been reached by publications.

Source of Funding: State, Smith-Lever, CSREES Crops at Risk

FTE's: 1.0

Scope of Impact: State

Key Theme: Integrated Pest Management; Biological Control; Sustainable Agriculture

Title of Program/Project: Refinement and Delivery of Bio-Based Approaches to Reducing Insecticide Against Two Key Apple Pests

Contact Person: Arthur Tuttle, Daniel Cooley

Brief Description of Program/Project:

In 2004, new approaches for managing plum curculio and apple maggot were successfully tested. For plum curculio (PC), perimeter-row trap trees were baited with grandisoic acid plus benzaldehyde to indicate fresh injury levels by PC and to determine need and timing of sprays against over-wintered PCs. The combined bait resulted in 20 times more damage by PC to fruit on a single perimeter-row sentinel tree than on un-baited trees, thereby greatly reducing sampling time. The effectiveness of the trap tree approach was compared with existing approaches based on calendar-driven sprays or heat-unit-accumulation models. Each of the 14 orchard blocks in MA was divided into 3 plots. Plot A received 3 whole-block applications of insecticide (at petal fall + 2 covers). Plot B received a whole-plot spray at petal fall, followed by one whole-plot cover. A second whole-plot cover was dependent upon a Degree-Day model. For

plot C, after a whole-plot spray at petal fall, any later sprays were applied only to peripheral rows 1 and 2, based on the presence of 1 fresh PC injury in 25 fruit sampled on a trap tree. Efficacy was assessed by extensive fruit sampling in July and at harvest. PC injury was similarly low for plots A, B, and C (1.0-1.4 % injury). A 35% reduction in insecticide use was achieved in Plot C for PC compared to Plot A. For apple maggot (AM), an improved pesticide treated sphere and a method for calculating how many spheres to place on the perimeter of a block of trees were tested. The placement method used an index developed from 4 variables: size of orchard trees, quality of pruning, cultivar composition and nature of bordering habitat. This approach reduced the number of spheres needed by 40 %. All plots received 4 un-baited sticky spheres to estimate penetration of AM adults into the block. These spheres were inspected weekly. At harvest, 900 fruit per plot were sampled for AM injury. Management of AM in Plot A consisted of 3 calendar-driven applications of insecticide to entire plot. Insecticide application in plot B to entire plot was driven by accumulation of AM on the 4 un-baited sticky red monitoring traps (threshold: 8 AM/4 traps). For direct trap-out control of AM in Plot C odor-baited pesticide-treated (Spinosad/ Entrust) spheres were deployed on perimeter trees of all 4 sides. Using the new placement system, an average of 22 PTS, each baited with attractive odor (a 5-component blend), were deployed per plot. In the 14 MA blocks, injury at harvest was low and similar for all 3 management methods (0.11-0.28 % fruit injured). In addition to the 14 blocks in MA, there were 10 blocks distributed among all the states bordering MA. With the exception of a few C plots which had higher levels of AM due to pre-existing resident populations, the results were similar and will be presented in the next report.

Short Impact:

The odor-baited trap tree approach succeeded in monitoring the seasonal course of egg-laying by plum curculio and determining need and timing of sprays. After a whole-orchard application of insecticide shortly after petal fall, later sprays can be confined to peripheral-row trees driven by a pre-set threshold. Growers using this approach can expect to reduce insecticide against PC by approximately 35 %. In addition, a trap tree may hold PCs in perimeter-row trees, thus preventing penetration into interior trees. Growers could achieve 100 % reduction in apple maggot sprays and have good and affordable control by using the new pesticide-treated sphere and the new placement method. This could be true particularly for large blocks of apple trees that are on dwarfing rootstock and are well-pruned. These results will impact 125 apple growers in MA growing 4,500 acres. At least twice this number will be influenced in neighboring states.

Source of Funding: State, Smith-Lever, NE Region IPM Special Grant

FTE's: 2.5

Scope of Impact: Integrated research and extension, multi-state (MA, CT, RI, NY, NH, VT)

Key Theme: Natural Resources Management

Title of Program/Project: Benefits and Costs of Resource Policies Affecting Public and Private Land

Contact Person: Stevens, T.

Brief Description of Program/Project: Recreational fees are being increased but little is known about the impact on low income users. Forest ecosystem management programs are being proposed but little is known about how landowners will respond.

Short Impact: This research indicates that traditional linear tradeoffs associated with conjoint analyses may often be misleading. Alternatives to higher fees for recreation on public lands, like

donations and corporate sponsorship appear to be preferred by the general public.
FTE's: .5
Source of Funding: Hatch Multistate
Scope of Impact: CA, AZ, TX, LA, GA, NYC, IA, KY, WA, MA, OR, CO, PA, OH, WV, NH, MI, ND, ME, UT, NC

Key Theme: Natural Resources Management
Title of Program/Project: Mitigating Hypothetical Bias in Natural Resource and Environmental Decision Making
Contact Person: Stevens, T. H., Murphy, J., Allen, G., Lass, D.
Brief Description of Program/Project: Respondents to contingent valuation surveys often overstate the amount they would actually pay. This has motivated development of several techniques designed to either eliminate or reduce this problem. This project examines and compares alternative ways of reducing hypothetical bias and an improved method for dealing with this problem will be developed.
Short Impact: This research suggests that (1) cheap talk may only reduce hypothetical bias for respondents facing relatively high payment amounts, and (2) the problem of hypothetical bias appears to increase with larger dollar amounts. Consequently, current guidelines for adjusting for hypothetical bias may produce misleading results.
FTE's: .4
Source of Funding: Grant, Hatch (MAS00858)
Scope of Impact: State

Key Theme: Pesticide Application, Integrated Pest Management
Title of Program/Project: New England Pest Management Surveys, Crop Profiles, and Pest Management Strategic Plans
Contact Person: Patricia J. Vittum
Brief Description of Program/Project: The primary objective of this activity is to understand the impact of current and future changes to the registration of pesticides on the management of pests in certain important New England crops. Final reports and summaries were generated for pest management surveys on peas, beans, carrots and winter squash. A pest management survey for apples was developed and distributed throughout New England to 619 apple growers. A pest management survey on sweet corn was developed and will be distributed in Winter 2004 to 754 sweet corn growers. A pest management strategic planning meeting for winter squash and tomato was held in cooperation with the University of Rhode Island. A pest management strategic meeting for peas, beans and carrots will be held in Winter 2004 in cooperation with University of Rhode Island. Additional assistance was provided to the University of New Hampshire in the development of a strawberry survey. In addition, UMass is a member of a New England wide network set up to gather information on pest management and pesticide use issues.
Short Impact: 1. A pest management survey template was developed in cooperation with University of Maine. 2. A pest management survey was completed and summarized for 750 growers of New England pea, bean and carrot crops

3. A pest management survey was completed and summarized for 759 New England winter squash
4. a pest management survey was developed and distributed to 619 growers in New England.
5. a New England pest management strategic planning meeting was held for winter squash and tomato crops in cooperation with University of Rhode Island.

Source of Funding: State, Smith-Lever, USDA Pest Management Center Grant

FTE's: 0.25

Scope of Impact: Integrated research and extension, multi-state (CT, RI,VT,NH, ME)

Key Theme: Soil Quality

Title of Program/Project: Spatial Structure and Activity of Microbial Communities in Agricultural Soils

Contact Person: Nuesslein, K.

Brief Description of Program/Project: Recent work in ecology has demonstrated that the spatial structure of habitats and landscapes is important to population dynamics and ecosystem function (Tilman and Kareiva, 1997). Soil, with its highly structured nature, would seem a logical model system for studying spatial relationships, but soil microbiology has yet to address this issue. The purpose of this research is to analyze the importance of microstructure in soils in order to better understand factors which influence microbial distribution and activity at the level of microhabitats in agricultural soils.

Short Impact: Through our research, we have been able to show that different soil aggregate fractions provide different environments for the communities that regulate one of the most essential processes in soil biology, nitrogen fixation. We are currently in the process of obtaining similar information using nitrate reductase and ammonia monooxygenase genes as molecular markers to obtain a complete picture of the effect of different soil microenvironments on the microbial communities regulating input and loss of nitrogen in soils. The apparent release of nifH sequences that resulted after tillage will be of great significance to standard views on tillage, if activity measurements confirm higher nitrogen fixation in these plots.

FTE's: .1

Source of Funding: Industry Grant**,** Hatch

Scope of Impact: State

Key Theme: Water Quality

Title of Program/Project: Integrated Watershed Management to protect Water Quality and Ecological Integrity

Contact Person: Randhir, T.

Brief Description of Program/Project: Safe drinking water and sustaining healthy aquatic ecosystems through watershed planning will be the direct issue involved.

Short Impact: The preliminary results could be used to identify sensitive areas of the watershed that impact water quality. Based on loading vulnerable aquatic ecosystems could be identified for protection. The impact of various temperature regimes on watershed processes can be used by farmers and policy makers to evaluate mitigating climate induced changes in water quality. Minority communities who are impacted by the research include Asian and Hispanic communities in the lower portions of the watershed and farming communities in the valley. Under-served communities can benefit through landscape-based solutions to water quality and

aquatic ecosystem problems. Specific beneficiaries include farmers, resource managers, water managers, scientists, nonprofits, and educators in Chicopee and Westfield watershed region. The scalable model in Chicopee will help several communities in protecting their natural resources.
FTE's: .1
Source of Funding: Hatch
Scope of Impact: State

Goal 5
Enhanced economic opportunity and quality of life for Americans

Key Themes:

Aging
Agricultural Financial Management
Character/Ethics Education
Child Care/Dependent Care
Children, Youth, and Families at Risk
Communications Skills
Community Development
Conflict Management
Consumer Management
Estate Planning
Family Resource Management
Farm Safety
Fire Safety
Home Safety
Home-based Business Education
Impact of Change on Rural Communities
Jobs/Employment
Leadership Training and Development
Literacy
Parenting
Promoting Business Programs
Promoting Housing Programs
Retirement Planning
Supplemental Income Strategies
Tourism
Workforce Preparation - Youth and Adult
Workforce Safety
Youth Development/4-H
Youth Farm Safety

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Agency	Total Dollars	FTEs	MSR Projects/Programs	MSR Dollars
MAES	$85,190	.2	2	$6,188
UMEXT	$743,036	10.55	1	$6,080

Goal 5 Executive Summary –

Goal five projects focus on youth development, principally via the 4-H program as well as research and education projects targeted to improving rural communities through planning and access to software routinely used for community planning. Youth development impacts focused

on animal science, general science literacy, leadership development and communications skills. Specific efforts focused on at risk youth audiences.

Key Theme: Agricultural Financial Management; Farm Safety; Jobs/Employment; Workforce Safety
Title of Program/Project: New Entry Sustainable farming project
Contact Person: Ruth Hazzard, Touria El-Jaoual
Brief Description of Program/Project: In collaboration with Tufts University, we are working with immigrants in Massachusetts who wish to transition from farming as a supplement to family food into farming as a business and source of income. The focus of our component of the project has been providing classroom as well as on site training in crop production, soil stewardship, pest management and pesticide use and safety, disease control, weed management, value added enterprise and food safety; and harvest and post harvest handling. We also conduct a weekly visit to the farms and assist growers with problems related to plant nutrition, pest, disease, weeds etc… These farmers are interested in growing crops that are familiar to their culture and will serve both ethnic and mainstream markets. Among the Hmong and Cambodian farmers, these crops include many brassicas, Cucurbit, Solanaceous, Convolvulaceae (water spinach and sweet potato) and fabaceae (Long bean). From October 2003 to October 2004, we gave a total of 5 classroom workshops (Soil stewardship, pest management, pesticide safety, disease control, harvest and post harvest). We also gave one on site workshop on pest management and pesticide use and safety. We provided 4 posters on pest management of 1. Colorado potato beetle, striped cucumber beetle, tarnished plant bug and Flea beetle. We also published these posters on our website "umassvegetable.org" to allow other farmers to benefit from them. We also provides a chart on *Key Vegetable Pests in New England* and a chart on *Low-Risk Insecticides for market Growers and Insecticide Rates and Low-Risk Insecticides for market Growers and Insecticide Rates for Gardeners.* We also worked with a videographer and completed a video entitled *Meet the Pest*. This video includes footage and text on the crops of interest to these farmers, the pests that attack them and ways (cultural and chemical) to manage them. We conducted a weekly visit to the farms to assist growers and continue to advise and teach them about crop production, weed, pest and disease management and other issues related to farming.
Short Impact: Since the beginning of the project, approximately 100 farmers that attended the training, and other farmers that have accessed our website, posters, pest chart and pest vide, learned about how to recognize key pests and their damage, what cultural practice and pesticide could be used to manage them, and how to mix and spray these materials. As a result, they handle pesticides more safely and achieved better control over the pests. In addition, these farmers learned about soil management and plant nutrition. As a result, they are able to recognize a nutrient deficiency or toxicity when it occurs and are able to send their soil to be analyzed and follow the recommendations to fix the situation. The farmers also learned about harvest and post harvest handling and as a result their produce stays fresh and healthy from the farm to the market. This project allowed these farmers to increase yield and profitability and improve the marketability of their crops.
FTE's: 0.7
Source of Funding: Smith-Lever, State, USDA (Risk Management Agency)

Scope of Impact: Integrated Research and Extension, State

Key Theme: Agricultural Management Systems

Title of Program/Project: Investigating Open-Source Concepts for the enhancement of Environmental Research

Contact Person: Schweik, C.

Brief Description of Program/Project: Environmental researchers are constantly faced with complex problems that cannot easily be solved by one research group. This project examines the open source phenomenon in computer science and investigates factors that led to successful and unsuccessful applications. The purpose is to analyze how open-source endeavors can be applied outside of computer science to create Internet-based collaborations for solving complex environmental problems.

Short Impact: Through the conference and workshop presentations and the published papers, I have been getting the word out on the importance of the open source collaborative paradigm and the emerging open content movement for the future of scientific research. The ideas being developed here are influencing how collaborative work is being organized at the USDA Forest Service, the Urban Ecology Collaborative centered at Boston College, the Baltimore Ecosystem Study NSF LTER group, and people involved in landuse change modeling and in particular, people using and developing the UrbanSim model at the University of Washington.

FTE's: .1

Source of Funding: Hatch

Scope of Impact: State

Key Theme: Communications Skills

Title of Program/Project: 4-H Communications Programs

Contact Person: Sherrie Guyott

Brief Description of Program/Project: Communication skills are important life and work skills that young people need to develop in order to be successful. This area is one of three focus areas of the Massachusetts 4-H program.

Short Impact: The Massachusetts 4-H Visual Presentation program gives young people the opportunity to develop and practice oral communication skills. Last year students and staff from the UMass Department of Communications assisted with the state event. We plan to expand their participation this year. A committee of staff has spent the last 18 months reviewing the program and planning additional opportunities for youth. The plan includes the addition of extemporaneous speaking, action exhibits and public speaking. Staff developed additional resources to support these new categories. Last year 637 youth participated in eight Visual Presentation competitions held across the state.

In addition, a new communications section was added to the 4-H website. This section includes information on opportunities in written and oral communication skills development available to 4-H members.

In the area of written communications, youth are now able to select a portfolio option in addition to the more traditional 4-H records. A resume packet is used for the selection of delegates to National 4-H Conference and National 4-H Congress.

Source of Funding: Smith-Lever, Mass. 4-H Foundation, Fees

FTE's: 3.0
Scope of Impact: State

Key Theme: Impact of Change on Rural Communities
Title of Program/Project: Opportunities and Constraints for Interstate Greenway Planning in New England
Contact Person: Ryan, R., Lindhult, M., Fabos, J.
Brief Description of Program/Project: There is a need to coordinate greenway and open space planning across politically fragmented New England, in order to preserve the region's unique natural, cultural, and environmental resources. This project will explore the physical and institutional barriers to creating a New England-wide greenway network.
Short Impact: This study has provided valuable new strategies for collaborative greenway planning across multiple political jurisdictions. These strategies have been presented to numerous stakeholder groups in New England who plan greenways including the Rails-to-Trails, East Coast Greenway Alliance, and greenway planners in the New England states. On-going work to develop a New England- wide greenway network developed by our research team and over 200 greenway planners in the region has helped to inform state-wide greenway plan in Massachusetts as well as other states.
FTE's: .2
Source of Funding: Hatch
Scope of Impact: State

Key Theme: Impact of Change on Rural Communities; Youth Development/4-H
Title of Program/Project: Youth development training for out of school providers in rural and other MA communities.
Contact Person: Gretchen May
Brief Description of Program/Project: The CFY program was awarded Rural Youth Development funding sponsored by CSRESS and National 4-H Council with the intent of supporting out-of-school programming for youth in rural communities by training staff, volunteers and teen leaders. The MA project focused on rural Franklin and Berkshire counties and was facilitated by two CFY educators. Additionally, CFY staff provided youth development trainings for 4-H volunteers and out-of-school providers in other MA communities. Youth from Cape Cod were active participants in a babysitting curriculum.
Short Impact: Eighty five youth and adults from the rural communities of Franklin and Berkshire counties participated in ten training sessions that focused on youth development and working with children in groups. Participants also were informed of various 4-H curricula that can be utilized in out of school programs. A 29% return on evaluations sent to the earliest 70 participants indicated that 90% of the participants increased their understanding of child development while 85% reported an increase in their confidence in working with children as a result of these trainings. The majority of the participants also indicated using 4-H materials and resources in their out-of-school settings. Sixty-two 4-H teen leaders, volunteers, staff and collaborators increased their understanding of

brain based learning and concepts through their participation in a CFY training session.

Four hundred–twenty youth from thirteen towns on Cape Cod participated in a 12 hour 4-H Babysitting curriculum where they learned to make decisions about their personal safety and became responsible babysitters.

Source of Funding: State, Smith-Lever, county, CSREES

FTE's: 0.7

Scope of Impact: State

Key Theme: Impact of Change on Rural Communities

Title of Program/Project: Development of a Gradient-Based Landscape Pattern Analysis Methodology

Contact Person: Mcgarigal, K.

Brief Description of Program/Project: The analysis of landscape patterns to aid land management is currently constrained by the lack of accessible methods for quantifying surface patterns. The purpose of this project is to develop and incorporate a suite of surface pattern metrics into the existing landscape pattern analysis software program, FRAGSTATS.

Short Impact: My lab is exclusively responsible for the development, distribution, and support of FRAGSTATS. The initial version was released in 1995. Our latest version and significant update was released in 2002. As evidenced by the listserve membership demographics (several hundreds worldwide) and the frequency of use in scientific publications in the field of landscape ecology (I estimate that 10-20% of the papers published in the discipline's leading journal, Landscape Ecology over the last 5 years used FRAGSTATS), it is clear that FRAGSTATS is being used by hundreds of scientists, managers, and conservationists from academia, agencies, industry, and NGO's from around the world. There is no question that FRAGSTATS has had a major impact on the field of quantitative landscape ecology and has led to significant disciplinary progress and stimulated new directions in the state-of-the-art of landscape pattern analysis. FRAGSTATS has become the world's leading software package for the calculation of landscape metrics and has greatly facilitated landscape level approaches to the understanding and management of natural resources. The ease of use of the software and efficient access to technical assistance has allowed landscape-level research and management activities to progress at a much faster rate than would be otherwise possible.

FTE's: .5

Source of Funding: USDA Grant, Industry Grant, Hatch

Scope of Impact: State

Key Theme: Leadership Training and Development

Title of Program/Project: 4-H Leadership and Community Service

Contact Person: Sherrie Guyott

Brief Description of Program/Project:
One of the three focus areas of the Massachusetts 4-H program is community service and leadership. Community service has always been an important part of the 4-H program as demonstrated in the 4-H pledge, “I pledge my hands to larger service.” 4-H also provides the opportunity for members to develop and practice leadership skills.

Short Impact:

Massachusetts continues to participate in the annual New England Teen Leadership Conference. This is an effort on the part of several New England states to work together to provide a leadership conference for teens. A group of teens and volunteers worked together over an 8 month period to plan and implement the conference.

Planning began with the Director of the Massachusetts FFA program to implement a winter leadership camp for 4-H and FFA members. We were successful in securing funds from MA FFA and the MA 4-H Foundation to hire a Leadership Trainer from out-of-state. The conference will be implemented in Dec. 2004.

In the fall of 2003 we began an Ambassador training program for teens ages 14-18. The program includes training in public speaking skills, basic manners, writing speeches and press releases and setting up promotional displays. Trained Ambassadors then develop a personal plan to assist with the promotion of 4-H in their local area.

4-H clubs have always been involved in community service on a local level. In Massachusetts, we conducted our first annual statewide community service project in the spring of 2004. Over 200 backpacks were collected for distribution to needy children for the 2004-2005 school year. Many of these backpacks were distributed by one of our Massachusetts 4-H members who started a non-profit organization to assist foster children as part of her 4-H project.

Source of Funding: Smith-Lever, MA 4-H Foundation, fees

FTE's: 0.5

Scope of Impact: State

Key Theme: Workforce Preparation – Youth and Adult; Children, Youth and Families at Risk

Title of Program/Project: New Communities Project in North Adams and South Roxbury

Contact Person: Karen Barshefsky

Brief Description of Program/Project:

MA has received the third generation of CYFAR funding to support programming efforts that focus on high risk and diverse youth in isolated rural and/or highly urban communities. In North Adams, youth offenders participate in an eight-week character education series; a percentage of the participants are then recommended to participate in a four -week workforce preparation series; these youth are then placed in businesses for employment. In South Roxbury, youth leaders from youth serving organizations participate in workforce preparation and youth development sessions; they, in turn, work with the younger children of their organizations as a stipend position.

Short Impact:

North Adams:
Eighty-four percent of the 37 youth offenders participated in an eight week session that focused on decision making, conflict resolution, communication, character building, and drug, alcohol and other related health issues. A 94% return on evaluations indicated that 83% of the participants had a better knowledge of sexually transmitted diseases; 66% had a better knowledge of drug and alcohol use; 79% said that they had a better idea of what it means to be a

good citizen; and 76% indicated that they intended to take more responsibility for their own actions. Six months following the sessions, the probation officer was asked to rate any positive changes in the youth. He rated 12 of the youth as follows: 67% were more cooperative; 75% were acting more responsibly; and 92% were showing more respect for others.

Nine of these youth offenders also participated in a four-week readiness series; five of them were involved in summer employment. The supervisors at the places of employment rated all five youth as average or above average with regard to politeness, professional conduct, completing assigned task and punctuality; all indicated that they would hire the youth again.

South Roxbury:
Fourteen youth leaders from three youth serving organizations participated in workforce readiness and working with younger children sessions. These youth leaders in turn, offered 45 days of after-school programming with small groups of younger children at four sites reaching a total of 250 as paid employment. Approximately 182 activities throughout the year were offered by the 14 youth participants. Comments from evaluations indicated that some of the youth developed a clearer picture of what is involved in being a child care/youth worker or teacher; many referred back to the materials shared during the training.

Source of Funding: Smith-Lever, State funding, Smith-Lever, CYFAR

FTE's: 1.3

Scope of Impact: State

Key Theme: Youth Development/4-H

Title of Program/Project: Animal Science

Contact Person: Sherrie Guyott and Carrie Chickering Sears

Brief Description of Program/Project:
After drastic downsizing of the 4-H program in Massachusetts it was decided to concentrate remaining resources on the support of three focus areas. One of these areas is animal science. This area was selected because over 60% of 4-H membership was in one of the animal science areas and because 4-H is unique in its ability to offer this science based program to young people.

Short Impact: Plans were made to organize programs in the areas of Horse, Dairy, Dog, Rabbit, Livestock and Companion Animals. Statewide Advisory groups existed in each area except Livestock and Companion Animals. At the local level, 94 adults and 8 youth served on Horse Program Councils, which organize and conduct horse programs and competitions.

Three programs were identified as priorities for grant funding; one was the area of animal assisted activities. Several people worked this year to develop a proposal for grant funds to be used to start a program in Massachusetts. To prepare for program implementation one staff member received training in the area of animal assisted activities using the 4-H curricula "Petpals".

Our State Animal Science Specialist instituted several brand new activities. First, an Equine Day was held on campus, attended by 37 youth. In addition, 93 youth participated in a Dairy Cattle and Sheep Camp which took place on campus during the summer. As a result of these

activities, youth are requesting more training in animal science. Feedback from these programs is being used to plan activities for the next program year.

Source of Funding: Smith-Lever, Massachusetts 4-H Foundation, fees

FTE's: 3.0

Scope of Impact: State

Key Theme: Youth Development/4-H

Title of Program/Project: Building Science Skills in Youth and Adults

Contact Person: Kim Pond, Rita Renee Toll Dubois

Brief Description of Program/Project:

Science literacy is critical to a well-prepared workforce in our technology-oriented society and is central to keeping pace with global competitors. Unfortunately, the US continues to fall behind other industrialized countries in math and science scores. Research shows that in school and out of school efforts both can enhance the ability of youth to increase their proficiency, interest and competence in the science arena. This lead CFY educators to design educational programs that increase the knowledge and skill levels of the non-scientist adults who conduct these out of school programs and the youth recruited for after school programming. Our initiatives include the Green Genes-DNA curriculum, the Boston Urban Stewards program, the Learn About Forests program, and CFY/4-H sponsored after school programs.

Short Impact:

Forty-eight out-of-school providers, science teachers, and 4-H volunteer leaders participated in the Green Genes DNA training. Of those who returned the evaluations, 100% indicated that they would use the DNA activities with their youth and rated the fit of the training to the MA Science Frameworks and age appropriateness as very high. The potential outreach for this training was 1,609 youth.

Forty-nine youth of color, ages 13-17, participated in the year round "Boston Urban Stewards" program learning about (a) basic urban forestry skills including tree identification, tree health and maintenance, and tree measurement; (b) the value of green spaces to the urban environment; (c) invasive identification and removal: (d) planting and maintaining annuals and perennials; (e) proper tool use and maintenance; and (f) planning and implementing environmental stewardship events. Their activities reached at least 750 local community residents. Evaluation results indicated that 60% of the youth were more concerned about local environmental problems and what was happening in their city; 70% were more aware of the impact of their actions on the environment, especially trees; and 70% reported a higher level of confidence in their ability to explain why trees are valuable to people in Boston.

Fifty-five people, including 47 youth of color, from the cities of Lowell, Worcester and Boston participated in a one-day Learn About Forest program held at Mt. Toby and Harvard Forest where they increased their knowledge in tree identification and health, learned about the value of the forests to the environment and demonstrated their skills in identifying various insects, plant life and birds.

One hundred twenty youth on Cape Cod participated in various CFY/4-H sponsored activities during the after school hours and increased their science inquiry and processing skills.

Source of Funding: Smith-Lever, State , CYFAR, private foundation, county
FTE's: 1.35
Scope of Impact: State

Stakeholder Input Process –

Overview:

The stakeholder input process is similar to the past year. Approximately 700 individuals function as stakeholders involved in providing input and advice on extension and research programs in Massachusetts. Since the majority of college faculty and staff are involved in both research and extension, input from stakeholders is considered for both research and extension work. While some individuals provide input on a one-by-one basis, such as through surveys, interviews and unsolicited material, the large majority of stakeholder input is through organized groups. These are generally:

a. groups organized by Extension, either on an on-going basis, or convened for a one- time interaction.
b. existing groups, such as community councils, commodity associations, professional societies and foundations
c. groups formed by legislative mandate

The Agriculture Program reports input from 150 individuals and 12 organized groups. Several comprehensive grower associations, such as the Massachusetts Flower Growers Association, through their elected board of directors, also serve as stakeholder groups. In other commodity areas, individuals are invited to participate in advisory committees to provide input. Finally, one time focus groups used at times to provide input of specific themes.

The 4-H YFD program area involved more than 400 individuals in county-wide, program, event-specific or other topical advisory groups. Staff also participate on various local coalitions and youth serving boards to gain input on concerns facing today's youth, families and communities.

Within the Natural Resources and Environmental Conservation Program, the NREC Advisory Committee serves a primary advisory function. It is made up of 24 educators, scientists, planners, local officials, and natural resource professionals from a variety of federal, state, town, and private organizations involved in conservation. Members of this committee represent a wide variety of viewpoints yet have broad perspectives on conservation issues. All have distinguished themselves as leaders in the fields of conservation and conservation/environmental education. Within NREC there are Boards of Directors for two program-supported Centers (20 members, total). Specific projects within the NREC program are guided by advisory committees, technical advisory committees, or steering committees (45 members). Additionally, the Natural Resources Conservation Advisory Board has been active in identifying our areas of emphasis, and identifying outreach needs and approaches. The board has 3 charges: 1. to provide us with advice in structuring our teaching, research, and outreach programs, 2. be an advocate for our programs as new initiatives are developed to advance natural resources management, education and research within the UMass system and regionally, 3. to assist us in raising funds which provide a 'margin of excellence' that funds beyond the state/federal allocations. The following organizations are represented on the Board: Mass Dep. of Environmental Management; Mass Watersheds Commission; US Fish and Wildlife Service; National Marine Fisheries Service; US

Environmental Protection Agency; Mass. Department of Fisheries and Wildlife; US Forest Service; Forest Management and Arboriculture Industry; Forest Products Industry; National Park Service; Natural Resources NGO and Public Utilities Industry. Both of these departmental advisory groups provide stakeholder input on all aspects our "program of research" (McIntire-Stennis, Hatch, and contracts with agencies) as well.

The Nutrition program uses two primary advisory groups with 30 stakeholders. For food safety the Partnership for Food Safety Education provides input from state and federal state food regulatory and educational agencies in order to provide maximum impact of our efforts at all stages in the food system from farm to table. An advisory group for the Adult Day Health project, including MA DOE, MA Executive Office of Elder Affairs and practitioners from ADH programs also provide an advisory function.

For Extension as a whole, the UMass Extension Board of Public Overseers, created by the legislature and comprised of representatives of agriculture commodity groups, state agencies, natural resources groups, the state nutrition board and several state-wide 4-H advisory groups, meets regularly with Program Directors, the Director and Assistant Director. The legislation mandates the composition of the Board. Over the past six years, this group has addressed funding in general, as well as specifically how resources are allocated by program to meet the needs of the Commonwealth. The Board also provides input for overall program direction.

Actions taken to seek stakeholder input that encourages their participation:

As described in the overview, stakeholder input is encouraged through regular meetings, existing organizations, one-time focus groups and other strategies. Surveys, feedback forms, e-mail and the Web are also used to elicit input, as is personal contact.

A brief statement of the process used by the institution to identify individuals and groups who are stakeholders and to collect input from them:

Each program area seeks and identifies stakeholders appropriate to their program area. The process includes asking for volunteers; using criteria such as geographic representation, diversity and length of participation (long term participants as well as stakeholders less involved). Environmental scanning as part of strategic planning is also used to identify potential stakeholders. We also continue to stress the importance of listening to stakeholders at meetings of commodity groups, trade shows, twilight meetings and on-site visits.

A statement of how input was considered.

Input from the stakeholder group, is considered, in conjunction with the faculty and staff who are responsible for the program. Results of surveys, focus groups, discussion about reports and proposals are part of the information mix, along with the goals of the University, the mission of Extension and research, and the five USDA goals.

Program Review Process

No significant changes have been made to the review process since the 5-Year Plan of Work was written.

Evaluation of the success of Multi and Joint Activities –

The Massachusetts Agricultural Experiment Station is combining the brief statement of progress with the response to the four evaluation criteria for each activity described.

Infection Biology of Key Cranberry Fruit Rot Fungal Pathogens
(Multistate Integrated Research and Extension (MA, ME, MI, NJ, OR, WA, WI))

The objectives of this project are to define inoculum sources of four fungi that cause field rot and storage rot of cranberries and to pinpoint the precise time that these fungi infect the flowers or developing berries. We have determined during the first year of the project that each of the four fungi has a different primary over-wintering source. Timing studies employing different fungicide schedules indicated that sprays applied earlier in the bloom period and fruit development offer the best control, indicating that this is the likely time of infection of the fungi.

1. This planned program addressed the number one issue identified by cranberry growers.
2. This planned program did not address the needs of under-served and under-represented populations in the Commonwealth.
3. Description of outcomes and impacts from planned programs included understanding of the biology of pest organisms and their interactions with environmental factors and the agricultural systems.
4. The planned programs did improve the responsiveness of the activity to an industry under financial stress with limited state resources.

Commodities, Consumers and Communities: Local Food Systems in a Globalizing Environment
(Multistate Integrated Research and Extension
(MA, RI, NY,VT, NH, ME, CA, KS, WI, MS,))

Research and Extension activities benefited farmers who are interested in producing new crops for the growing immigrant communities in the Northeast. A focus of this work has been with growers who sell at farmers' markets. There are over 100 farmers' markets in the state and many are located in urban areas where large immigrant communities live. Research identified cultivars of crops that can be successfully grown and marketed in New England. Much of this information was made available in languages other than English. At least five new crops were grown and marketed by at least 40 farmers that they had not grown in the past, thus increasing their profitability.

1. This planned program addressed an important issue of a newly identified stakeholder group
2. This planned program directly addresses the needs of rapidly growing ethnic minorities, which are both under-served and under-represented populations in the Commonwealth.
3. Description of outcomes and impacts from planned programs included identify new cultivars that enhance profitability.
4. The planned programs did benefit from information exchange provided by both multi and joint activities.

Nutrient Bioavailability – A Key to Human Nutrition
(Multistate Integrated Research & Extension
(AZ, CA-B, CA-D, CO, CTS, IN, KS, MA, MI, NE, NM, OR, WA))

To develop methods for determining bioavailability of dietary factors including calcium, iron and other food components. We will examine *in vitro* techniques to maximize potential mineral bioavailability and other physiological effects through processing with other added food components, such as ligands. Foods contain many nonessential nutrients that could have health benefits. This research shows that wheat contains antioxidants that can protect biological lipids from damage. These antioxidants are primarily found in wheat products made from bran or whole grains. During the digestion process, the health protecting activity of wheat antioxidants increases. Muscle foods also contain an antioxidant known as carnosine. Consumption of beef results in carnosine being absorbed into our blood. This dietary carnosine can protect our blood lipids and thus could be beneficial to health.

1. This planned program is targeted for increased input from stakeholder groups.
2. This planned program did not address the needs of under-served and under-represented populations in the Commonwealth.
3. Description of outcomes and impacts from planned programs included bioavailability of vitamins and minerals. This planned program expands on that impact.
4. The planned programs did benefit from information exchange provided by both multi and joint activities

Environmental and Economic Impacts of Nutrient Flows in Dairy Forage Systems
(Multistate Research and Extension
IL, IN, MA, MD, MI, NJ, NYC, OR, PA, UT, WA, WI, WVA, U of Penn, USDA-ARS/Pennsylvania, USDA-ARS/Wisconsin)

Our objective has been to develop and implement the use of a decision aid (FarmSoft) for use in "comprehensive" nutrient management planning. This has been done to meet outreach needs of University of Massachusetts Extension and Massachusetts USDA Agencies with concerns and obligations regarding nonpoint source pollution control from animal feeding operations. The decision aid FarmSoft has proven to be comprehensive in terms of meeting most if not all of the needs of comprehensive nutrient management planning. The introduction of the corn stalk nitrate test provides farmers with an evaluation method to determine whether they are applying sufficient or too much N fertilizer. The amino-sugar nitrogen soil test if found suitable for corn would eliminate the need for a separate soil sampling operation to test for N as is required in the pre-sidedress N test.

1. This planned program addresses concerns and obligations regarding nonpoint source pollution.
2. This planned program did not address the needs of under-served and under-represented populations in the Commonwealth.

3. Description of outcomes and impacts from planned programs included determining the effect of crop management on nutrient, pesticide and sediment pollution.
4. The planned programs did benefit from information exchange provided by both multi and joint activities

Nutritional Risk and Antioxidant Status in the Elderly

Researchers at the University of Massachusetts (MA) have been collaborating with the food banks in both the western and the central regions of the state to quantify food insecurity, food choice, and health indicators particularly of older clients receiving food assistance through these sites. Results not previously reported show a low frequency of consumption of fruits and vegetables (F&V) by these same participants, 1.39 times per day for fruit and 2.06 times per day for vegetables. Improving fruit and vegetable availability at food pantries can increase fruit and vegetable and concomitant antioxidant intake in at risk populations such as the low-income elderly.

1. This planned program addressed an issue that has been of paramount importance to multiple stakeholder groups.
2. This planned program did address the needs of low-income elderly, an under-served and under-represented population in the Commonwealth.
3. Description of outcomes and impacts from planned programs included assessing nutritional risk on the elderly.
4. The planned programs provided resources that would not have been available in the absence of the multi and joint activities.

Enhancing Adoption of New Rootstock Cultivars for Fruit Trees in Massachusetts (Multistate Integrated Research and Extension (RI, CT, MA, ME, NJ, NH, NY, VT))

A number of apple and peach rootstocks have been under trial at the University of Massachusetts Cold Spring Orchard Research & Education Center and at a few commercial orchards for several years. Particular attention has been paid to rootstocks that provide a reduction in tree size, thus reducing labor required to prune and harvest and reducing the amount of pesticide needed per acre. Also, rootstocks have been selected that are well adapted to our weather conditions and are resistant to normal pest pressures. Approximately 150 acres of new dwarfing apple rootstocks were planted by commercial orchardists. Current year's planting, and planting during the previous four years resulted in overall pesticide-use reduction of approximately 10%. Current year's planting and planting during the previous four years resulted in approximately a 10% increase in profitability.

1. This planned program addressed an issue that has been identified by interactions with stakeholders over a number of years.
2. This planned program did not address the needs of under-served and under-represented populations in the Commonwealth.
3. Description of outcomes and impacts from planned programs included understanding of the biology of pest organisms and their interactions with environmental factors and the agricultural systems and bio-intensive strategies.
4. The planned programs did benefit from information exchange provided by both multi and joint activities.

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multistate Extension Activities and Integrated Activities
(Attach Brief Summaries)

Check one: **X_ _ Multistate Extension Activities**
Integrated Activities (Hatch Act Funds)
Integrated Activities (Smith-Lever Act)

Title of Planned Program/ Activity	Actual Expenditures FY2004
NC140 Evaluation of pome and stone-fruit cultivars	$ 6,498
Land, habitat and biodiversity conservation	$87,530
Infection biology of key cranberry fruit rot fungal pathogens	$ 5,211
Total	$99,239

_____ _____
Director Date

Form CSREES-REPT (2/00)

FY04 Multi State Project Descriptions
(Smith Lever Act Funds)

1. Evaluation of Pome and Stone-fruit Rootstocks

Research is conducted at the local, regional, national, and international level to assess apple and peach rootstock characteristics and determine best practices rootstock utilization. Massachusetts participates in 10 long-term rootstock experiments. Nine are located at the University of Massachusetts Cold Spring Orchard Research & Education Center in Belchertown, MA, and one is at Clarkdale Fruit Farm in Deerfield, MA.

2. Land, Habitat, and Biodiversity Conservation

This initiative provides education, training and technical assistance covering a variety of topics, including: wildlife and wildlife habitat requirements, wildlife habitat evaluation, protection strategies for conservation of rare species, the importance of biodiversity, strategies and techniques for conserving biodiversity, landscape assessment, land conservation planning, and involving volunteers in wildlife inventory and monitoring. A particular focus of this program is assessing and mitigating highway impacts on wildlife.

3. Infection Biology of Key Cranberry Fruit Rot Fungal Pathogens

The objective of this project was to determine the timing of infections by fruit rot fungi that lead to fruit rot in the field and in storage. This would test the hypothesis that cranberry fruit exhibit a distinct and limited period of susceptibility around the time of fruit set. Field plots were established in the susceptible cranberry cultivars ‘Ben Lear’ and ‘Early Black’. One treatment was unsprayed with fungicides. The focus in this project was placed on four fruit rot fungi present in all cranberry growing areas: *Coleophoma*, *Colletotrichum*, *Phyllosticta* and *Physalospora*. Phenological data were collected during the duration of the project, so an exact plant growth stage could be utilized for timing purposes.

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multistate Extension Activities and Integrated Activities
(Attach Brief Summaries)

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Integrated Activities
for the MA Agricultural Experiment Station

Revised February 14, 2005 by PDC

U.S. Department of Agriculture
Cooperative State Research, Education and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multi-State Extension Activities and Integrated Activities

Institution: University of Massachusetts
State: Massachusetts

Check one:
_____ Multi-State Extension Activities
__X___ Integrated Activities (Hatch Act Funds)
_____ Integrated Activities (Smith-Lever Act Funds)

Research Project Number	Title	Affiliated Goal/s	2004 Expenditures/FTE's
MAS00815	Plant Parasitic Nematodes	Goal 1	$2,705/0.1
MAS00826	Best Management Practices for Turf Systems in the East	Goal 1	$80310/3.9
MAS00539	Rootstock and Interstem effects on Pome and Stone Fruit Trees	Goal 1	$2704/.2
MAS00763	Environmental and Economic Impacts of Nutrient Flows in Dairy Forage	Goal 1	$74,958 /.6
MAS00747	Multidisciplinary Evaluation of New Apple Cultivars	Goal 1	$18,220/1.3

MAS00850	Eradication, Containment and/or Management of Plum Pox,	Goal 1	$3,944/.1
MAS00873	Interpreting Cattle Genomic Data: Biology, Applications and Outreach	Goal 1	$50,244/.8
MAS00878	Ovarian and Environmental influences on Embryonic/Fetal Mortality in Reminants	Goal 1	$85,314/.5
MAS00880	Characterization and Mechanisms of Plant Responses to Ozone in the Northeast	Goal 1	$4934/.1
MAS00895	Postharvest Biology of Fruit	Goal 2	$33,480/.3
MAS00663	Nutritional Risk and Antioxidant Status in the Elderly	Goal 3	$31,127/.2
MAS00881	Nutrient Bioavailability--Phytonutrients and Beyond	Goal 3	$39,932/.3
MAS00496	The National Atmospheric Deposition Program	Goal 4	$8,949 /.2
MAS00841	Application of Sewage Biosolids to Agricultural Soils in the Northeast: Long-term impacts, benefits & uses	Goal 4	$6,428/.2
MAS00877	Benefits and Costs of Resource Policies Affecting Public and Private Land	Goal 4	$38,567/.5
MAS00880	Characterization and Mechanisms of Plant Responses to Ozone in the	Goal 4	$4,935/.1

	Northeast		
MAS00896	Biological Improvement, Habitat Restoration, and Horticultural Development of Chestnut by Management of Populations, Pathogens, and Pests	Goal 4	$31,449/.2
MAS00886	Rural Low-Income Families: Tracking Their Well-Being and Function in an Era of Welfare Reform	Goal 5	$8,019/.1

_____ _____
Associate Director Date

Integrated Research Projects

MAS00815 1. Identify and evaluate biological control agents for plant-parasitic nematodes. 2. Assess the impact of rotational crops and organic matter management on plant-parasitic nematodes and their microbial biocontrol agents. 3. Integrate tactics developed in objectives 1 and 2 with those currently available to attain acceptable nematode management.

MAS00826 Turfgrass areas are perceived to contribute significantly to the pollution of surface water (phosphorus, nitrates and pesticides) and groundwater (nitrate and pesticides). Management strategies that integrate pest resistant germplasm, cultural practices, biological agents, biorational compounds and the judicious use of pesticides constitute (BMPs). A better understanding of the fate of fertilizers and pesticides in turfgrass systems is needed to evaluate and develop BMPs that minimize any potentially adverse effects on humans and the environment.

MAS00539 Global competition increases the need for enhanced efficiency of orchard businesses. Rootstocks dramatically affect efficiency and fruit quality, but results vary greatly with climate and pest pressure. Further, new rootstocks are becoming available regularly, thus potentially enhancing efficiency. This project evaluates the performance of tree-fruit rootstocks with a variety of climates, pest pressures, cultivars, and training system in order to enable orchardists to develop orchards with the greatest likelihood of economic success and least likelihood of environmental damage.

MAS00763 Global competition increases the need for enhanced efficiency of orchard businesses. Rootstocks dramatically affect efficiency and fruit quality, but results vary greatly with climate and pest pressure. Further, new rootstocks are becoming available regularly, thus potentially enhancing efficiency. This project evaluates the performance of tree-fruit rootstocks with a variety of climates, pest pressures, cultivars, and training system in order to enable orchardists to develop orchards with the greatest likelihood of economic success and least likelihood of environmental damage.

MAS00747 The apple industry in the US needs timely information on the attributes and regional adaptability of new cultivars order to avoid wasting. Plant Pathologists, entomologists and horticulturalists are cooperating to identify the best and most adaptable apple cultivars.

MAS00850 Plum pox disease or "Sharka" is one of the most devastating and economically important diseases of stonefruit worldwide. Surveys are being undertaken to determine the extent of incursion into new areas.

MAS00873 Nuclear transplantation provides robust means to create transgenic livestock rapidly. However, facile methods to introduce targeted alterations in the bovine genome are needed to take full advantage of this technical advance. Toward this goal we are developing strategies to interrupt cellular pathways that inhibit homologous recombination. Using these methods it should be possible to move genetic polymorphisms that affect production between breeds.

MAS00878 Several possible reasons exist for the low reproductive success & importantly among them are the environmental and metabolic stresses that these animals must bear to achieve high milk production yields. We will assess possible detrimental effects on oocyte maturation and developmental competence of the female gamete. We expect to find abnormalities & since we will evaluate the molecules involved in such effects, appropriate preventive measures can be taken.

MAS00880 Our results are fundamental to understanding factors that affect O3 uptake and plant injury. This has direct bearing on air quality standards for plants and people. We are also identifying new bioindicators for O3 that will increase public awareness of the O3 problem.

MAS00895 Fruits which are of high quality at the time of harvest are often reduced to poorer or even unacceptable quality by the time they reach the consumer. This project seeks to find ways to extend storage life of fruit and to contribute to providing consumers with attractive, nutritious, and flavorful food.

MAS00663 Issues of chronic diseases that often accompany the aging process are associated with poor nutrition. Valid and reliable methods to assess the nutritional status and dietary intake in older adults are needed in order to screen and evaluate the population's health status. This project examines the methodologies used to elicit dietary intake information among older adults, targeting the growing population of elderly blacks, with particular emphasis on fruit and vegetable antioxidant intake

MAS00881 many components in foods can have positive effects on health yet little is know about how they work. This project will investigate how non-essential nutrients from foods improve health.

MAS00496 Acid rain and atmospheric pollution continues to be a regional and national problem. The site's data contributes to the accurate assessment of precipitation chemistry and the effectiveness of the nation's air pollution laws and regulations.

MAS00841 To evaluate the utilization of sewage biosolids in soil management in the Northeast by assessing the sustainability of soil quality, water quality and food safety (for people and other animals) where sewage biosolids are applied to agricultural land. To develop appropriate outreach materials and educational events for the Northeast that links the current research to actual field management of sewage biosolids products in the Northeast.

MAS00877 Recreational fees are being increased but little is known about the impact on low income users. Forest ecosystem management programs are being proposed but little is known about how landowners will respond.

MAS00880 Our results are fundamental to understanding factors that affect O3 uptake and plant injury. This has direct bearing on air quality standards for plants and people. We are also identifying new bioindicators for O3 that will increase public awareness of the O3 problem.

MAS00896 Cryphonectria parasitica has been identified as the causal agent of chestnut blight which has been responsible for the widespread loss on the American Chestnut. The goal of this study is to reestablish the American Chestnut for agricultural production, and to elucidate the fungal community on American Chestnut bark, in hopes of identifying a possible biocontrol agent(s) to the pathogen Cryphonectria parasitica.

MAS00886 The smooth functioning of the family is important to the well-being and viability of rural communities. This project will add to the understanding of rural low-income families over time using the primary longitudinal data set collected by the NC-223 multi-disciplinary research team.