V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Plant Production

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources			6%	
102	Soil, Plant, Water, Nutrient Relationships			28%	
111	Conservation and Efficient Use of Water			3%	
201	Plant Genome, Genetics, and Genetic Mechanisms			6%	
202	Plant Genetic Resources			17%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			7%	
204	Plant Product Quality and Utility (Preharvest)			5%	
205	Plant Management Systems			8%	
206	Basic Plant Biology			5%	
211	Insects, Mites, and Other Arthropods Affecting Plants			3%	
212	Pathogens and Nematodes Affecting Plants			5%	
213	Weeds Affecting Plants			1%	
215	Biological Control of Pests Affecting Plants			1%	
216	Integrated Pest Management Systems			1%	
305	Animal Physiological Processes			1%	
501	New and Improved Food Processing Technologies			1%	
503	Quality Maintenance in Storing and Marketing Food Products			1%	
701	Nutrient Composition of Food			1%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	6.6	0.0
Actual	0.0	0.0	7.9	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	349814	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	605006	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	724840	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research new ways to increase the productivity of potato, blueberry, apple, small fruit and vegetable crops. Develop and test new potato, other vegetable, and horticultural plant varieties. Conduct research on basic plant biology and molecular biology issues. Research new soil management and cover crop techniques to increase yields and improve soil quality. Research basic soil chemistry issues. Publish peer-reviewed journal articles and other publications concerning research. Present findings at professional meetings, at field days for growers, and at other venues.

2. Brief description of the target audience

Plant geneticists, biologists, and molecular biologists, soil scientists, extension specialists, plant breeders, Maine's horticultural industry, Maine fruit and vegetable producers, greens managers.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	12	
Actual	0	6	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- # of research projects completed

Year	Target	Actual
2009	4	4

Output #2

Output Measure

- # of papers presented at professional meetings

Not reporting on this Output for this Annual Report

Output #3

Output Measure

- # of other types of publications

Year	Target	Actual
2009	9	20

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of improved analytical methods developed to study dissolved organic matter in soils
2	# of candidate stress-related genes or alleles that are functionally characterized
3	% of Maine apple growers who increase their knowledge about most suitable rootstocks for Maine conditions
4	# of gene-based marker systems used for targeted introgression in potato-variety-improvement program
5	% of Maine potato growers adopting new recommendations (i.e., fertility programs, tissue-testing tools, crop rotation recommendations)
6	% of Maine apple growers planting winter-hardy, early-bearing rootstocks
7	Increase in profitability for Maine apple industry from a quicker return on investment and reduction in catastrophic tree losses ($)
8	# of commercial-scale tests of new high-yielding, high-quality, and/or pest-resistant potato clones tested in Maine
9	# of Maine seed growers adopting new high-yielding, high-quality, and/or pest-resistant clones from the Maine Potato Breeding Program or other programs represented in our commercial trial program (as indicated by entry in seed certification)
10	Decrease in percentage of leaf tissue samples with nitrogen and phosphorus deficiences
11	Number of facilities propagating lowbush blueberry by tissue culture using information from this research
12	# of Maine lowbush blueberry growers learning about benefits of leaf sampling techniques to aid in fertility management decisions
13	Percentage of Maine lowbush blueberry growers surveyed who are changing their fertilization practices due to information provided by the fertility research program
14	# of high-quality and/or pest-resistant potato clones from the Maine Potato Breeding Program made available to other states for evaluation under diverse environmental conditions
15	# of new high-yielding, high-quality, and/or pest-resistant potato clones named and released by the Maine Potato Breeding Program
16	Percentage of Maine potato growers informed about promising new potato clones from the Maine Potato Breeding Program and other eastern programs
17	# of people improving their knowledge of the potential benefits of composting
18	Number of people surveyed using composts as a soil amendment to reduce organic waste volume and improve soil quality
19	# of Maine and New England vegetable growers learning about regionally adapted vegetable varieties
20	# of Maine vegetable growers learning about alternative crops and appropriate cultural management techniques for hoop house production

21	# of Maine vegetable growers learning about fall beds and the hybrid mulching system
22	# of Maine vegetable growers practicing crop rotation in hoop houses by growing alternative crops
23	# of Maine vegetable growers using fall made beds or hybrid mulching
24	Percentage of Maine vegetable growers that have improved management of their hoop houses
25	New, productive and pest-resistant potato varieties to enhance farm sustainability in the eastern U.S.
26	New techniques for woody plant breeding
27	Reducing potassium fertilizer use in potatoes
28	Changes in cover crop management by organic growers
29	Fertility advice for commercial greenhouse growers

Outcome #1

1. Outcome Measures

# of improved analytical methods developed to study dissolved organic matter in soils

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources

Outcome #2

1. Outcome Measures

of candidate stress-related genes or alleles that are functionally characterized

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

% of Maine apple growers who increase their knowledge about most suitable rootstocks for Maine conditions

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	60	60

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

# of gene-based marker systems used for targeted introgression in potato-variety-improvement program

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done
The researchers found that modulated gene expression plays a crucial role in differential ability of Solanum species to cold acclimate. Downregulation of energy related genes indicates that Sc is able to adjust its metabolic activities under sub-optimal condition better than St.

Results
The researchers found that modulated gene expression plays a crucial role in differential ability of Solanum species to cold acclimate. Downregulation of energy related genes indicates that Sc is able to adjust its metabolic activities under sub-optimal condition better than St.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

% of Maine potato growers adopting new recommendations (i.e., fertility programs, tissue-testing tools, crop rotation recommendations)

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

% of Maine apple growers planting winter-hardy, early-bearing rootstocks

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	25	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #7

1. Outcome Measures

Increase in profitability for Maine apple industry from a quicker return on investment and reduction in catastrophic tree losses ($)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

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

Outcome #8

1. Outcome Measures

# of commercial-scale tests of new high-yielding, high-quality, and/or pest-resistant potato clones tested in Maine

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	10	13

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

MAFES researchers coordinated 16 commercial-scale variety trials on Maine farms during 2009. These trials represented 13 new potato varieties (3 chippers, 5 russets, 2 reds, 1 speciality, 1 fresh market white, and 1 fresh market yellow fleshed) and 201 acres of production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
211	Insects, Mites, and Other Arthropods Affecting Plants
701	Nutrient Composition of Food

Outcome #9

1. Outcome Measures

# of Maine seed growers adopting new high-yielding, high-quality, and/or pest-resistant clones from the Maine Potato Breeding Program or other programs represented in our commercial trial program (as indicated by entry in seed certification)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	3	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done
Over the past two years, 11 clones (7 russets, 1 long white, 3 round whites) have been submitted to Maine's tissue culture laboratory in preparation for commercial seed production.

Results
AF2291-10, an early blight-resistant clone with good chipping quality, began commercial-scale evaluation and seed increase during 2008. It is a candidate for naming and release during 2010. AF2574-1, a fresh market clone with good yields and late blight resistance, did well in its initial commercial test. AF3001-6 and AF3362-1 are being commercially evaluated as dual-purpose clones for french fry processing and fresh market. AF3317-15, a russet with good late blight and pink rot resistance, generated favorable results in a 2009 industry trial. Seed of AF0338-17, a round-white that is widely adapted to eastern growing conditions, is being widely distributed to other eastern states so that it can attract interest among commercial seed growers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
211	Insects, Mites, and Other Arthropods Affecting Plants
701	Nutrient Composition of Food

Outcome #10

1. Outcome Measures

Decrease in percentage of leaf tissue samples with nitrogen and phosphorus deficiences

Not Reporting on this Outcome Measure

Outcome #11

1. Outcome Measures

Number of facilities propagating lowbush blueberry by tissue culture using information from this research

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
206	Basic Plant Biology

Outcome #12

1. Outcome Measures

# of Maine lowbush blueberry growers learning about benefits of leaf sampling techniques to aid in fertility management decisions

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	100	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

206	Basic Plant Biology

Outcome #13

1. Outcome Measures

Percentage of Maine lowbush blueberry growers surveyed who are changing their fertilization practices due to information provided by the fertility research program

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	10	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
{No Data Entered}

What has been done
{No Data Entered}

Results
{No Data Entered}

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
206	Basic Plant Biology

Outcome #14

1. Outcome Measures

# of high-quality and/or pest-resistant potato clones from the Maine Potato Breeding Program made available to other states for evaluation under diverse environmental conditions

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual

2009	10	17

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
211	Insects, Mites, and Other Arthropods Affecting Plants
701	Nutrient Composition of Food

Outcome #15

1. Outcome Measures

# of new high-yielding, high-quality, and/or pest-resistant potato clones named and released by the Maine Potato Breeding Program

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
211	Insects, Mites, and Other Arthropods Affecting Plants
701	Nutrient Composition of Food

Outcome #16

1. Outcome Measures

Percentage of Maine potato growers informed about promising new potato clones from the Maine Potato Breeding Program and other eastern programs

Not Reporting on this Outcome Measure

Outcome #17

1. Outcome Measures

of people improving their knowledge of the potential benefits of composting

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	10	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
215	Biological Control of Pests Affecting Plants

Outcome #18

1. Outcome Measures

Number of people surveyed using composts as a soil amendment to reduce organic waste volume and improve soil quality

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
215	Biological Control of Pests Affecting Plants

Outcome #19

1. Outcome Measures

# of Maine and New England vegetable growers learning about regionally adapted vegetable varieties

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	250	250

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #20

1. Outcome Measures

of Maine vegetable growers learning about alternative crops and appropriate cultural management techniques for hoop house production

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	125	125

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #21

1. Outcome Measures

of Maine vegetable growers learning about fall beds and the hybrid mulching system

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	100	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #22

1. Outcome Measures

# of Maine vegetable growers practicing crop rotation in hoop houses by growing alternative crops

Not Reporting on this Outcome Measure

Outcome #23

1. Outcome Measures

# of Maine vegetable growers using fall made beds or hybrid mulching

Not Reporting on this Outcome Measure

Outcome #24

1. Outcome Measures

Percentage of Maine vegetable growers that have improved management of their hoop houses

Not Reporting on this Outcome Measure

Outcome #25

1. Outcome Measures

New, productive and pest-resistant potato varieties to enhance farm sustainability in the eastern U.S.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Potato growers in the East need new potato varieties that are highly productive and less susceptible to stress, diseases, and insects than current varieties. This regional potato breeding effort and trial network produces new potato varieties and evaluates their potential to serve fresh, processing, and specialty potato markets in the East.

What has been done
The MAFES breeding program focuses on russets and long whites for processing. Greenhouse crosses resulted in 118,000 true potato seeds representing 123 families. Seedling tubers from prior ME crosses and from germplasm exchanges with other breeding programs were planted in the field with 965 selected for continued evaluation in 2010. In advanced selection trials, 17 clones were retained in 2009 and continue to show potential for commercial development.

Results
These new varieties are expected to improve grower profitability by improving yields, market quality, and/or decreasing costs associated with pests. Given the scale and value of eastern potato production the impact of a successful new potato can mean many millions of dollars to the industry over a period of years. For example, potatoes can cost more than $2000 per acre to produce and devastating diseases such as pink rot and/or late blight can totally destroy the crop. Resistant varieties greatly decrease the risk of such losses and, in the case of late blight resistance, can reduce production costs by reducing the number of chemical sprays applied to protect the crop from the pest. Over the years, the eastern regional project has resulted in the release of many commercially important potato varieties (e.g., Atlantic, Andover, Harley Blackwell, Kanona, Keuka Gold, MaineStay, Marcy, Monticello, Pike, and Sunrise). Peter Wilcox, a purple-skinned yellow-fleshed specialty variety from the USDA-ARS program, and Lehigh, a yellow-fleshed dual-purpose variety from NY, are the more recent releases from the eastern programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
701	Nutrient Composition of Food

Outcome #26

1. Outcome Measures

New techniques for woody plant breeding

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Traditional woody plant breeding takes a long time. MAFES researchers are using molecular markers and rapid reproduction techniquest to better guide their woody plant breeding and to rapidly regenerate new plants.

What has been done
A group of 48 inkberry accessions and two other Ilex species (Ilex crenata Thunb. and I. mutchagara Makino) were studied using AFLP markers. A total of 229 markers between 50 and 500 base pairs (bps) were produced from eight AFLP primer combinations. Among them, 87% of markers produced were polymorphic.

Results
Based on our Ilex glabra AFLP results, the genetic relationships within six cultivated groups were similar, and the opportunity to breed new plants within each group was much less than between the groups. These genetic markers could also be applied for the identification for existing or new cultivars. From their cold-hardiness research on Ilex glabra, the scientists recommend that Maine growers, select 'Shamrock' for production because it was the most cold-hardy cultivar. 'Compacta', 'Densa', 'Chamzin', 'Pretty Girl' should also be considered.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
205	Plant Management Systems
206	Basic Plant Biology

Outcome #27

1. Outcome Measures

Reducing potassium fertilizer use in potatoes

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Potato producers in the Northeast require management practices that will provide a high-quality product for new and expanding markets, while also optimizing yields under the region's variable soil and climatic conditions. Additionally, fertilizer and pesticide input costs have increased by approximately twofold over the past two years due to volatile energy markets. As a result, potato growers are increasingly focusing on ways to decrease their input costs and improve the sustainability of their farming operations.

What has been done
MAFES researchers conducted potassium fertilization experiments in potato plots and have used their results to revise potash fertilizer recommendations for potatoes during 2009.

Results
Their revised recommendations allow growers to choose between the previous build-and-maintain approach and a new sufficiency-level approach. On most soils, growers choosing the new approach will reduce their potash fertilizer application rates. Fertilizer savings are typically in the range of 60 kg of potash per ha. Our research indicates that yield and quality can be maintained with less fertilizer; however, growers will need to consider varietal characteristics and marketing criteria as they decide between the systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
503	Quality Maintenance in Storing and Marketing Food Products

Outcome #28

1. Outcome Measures

Changes in cover crop management by organic growers

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Cover crops are commonly used for soil improvement, and nitrogen additions, but there is little information guiding farmers about the effects of timing or species choice in fulfilling their goals.

What has been done
A MAFES project has been examining a wide range of cover crop management and species choices to recommend the best combinations to accomplish various farming systems goals.

Results
The most significant outcome from this project was the unexpected data showing the enormously important contribution of perennial legume roots to both nitrogen and soil quality changes in the cropping system that relied on red clover. After several years of red clover roots, the following crop yields (broccoli) were actually significantly better when only roots and no aboveground biomass was incorporated into the soil. This has led to changes in management among organic growers who now feel more confident about removing red clover for hay before turning the stand in to plant a summer crop. Previous wisdom dictated that the entire plant needed to be turned in to get significant benefits. This adds an additional feed crop or sold commodity for those farms that follow this practice.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

Outcome #29

1. Outcome Measures

Fertility advice for commercial greenhouse growers

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	{No Data Entered}	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In survey conducted at UMaine, organic and conventional growers indicated that fertility is a major concern for them in organic container production. Compost would be a renewable material that could serve as a substrate component and provide some fertility. However, composts in New England vary greatly from one supplier to the next, and some appear to be unsuitable as container media.

What has been done
MAFES researchers incorporated several New England composts into substrates for container-grown basil and marigolds.

Results
The research determined that growth of plants in three of the tested commercially available composts was comparable to that in a conventional substrate with a starter fertilizer. No nutrient deficiencies were visible until 3 weeks after transplant. However, growth was minimal in plants grown in the other three composts. Physical and chemical analyses of the composts did not indicate any consistent reason for superior or inferior performance. In fact, sodium levels should have been toxic in some of the composts in which plants grew well. This indicates that composts are variable from one supplier to the next, and that growers should do on-site trials before incorporating composts into substrates.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (new pest/disease species)

Brief Explanation

Certain investigators have retired or left the university. Some projects were terminated earlier than originally anticipated. University has had several years of budget cuts, affecting ability to hire new or replacement faculty.

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

1. Evaluation Studies Planned

- After Only (post program)
- During (during program)
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}