

**Annual Report of Accomplishments and Results
October 1, 1999 to September 30, 2000**

**NEW HAMPSHIRE AGRICULTURAL
EXPERIMENT STATION**

COLLEGE OF LIFE SCIENCES AND AGRICULTURE

**UNIVERSITY OF NEW HAMPSHIRE
DURHAM, NEW HAMPSHIRE**

NEW HAMPSHIRE AGRICULTURAL EXPERIMENT STATION
Annual Report of Accomplishments and Results
1999-2000

INTRODUCTION

The New Hampshire Agricultural Experiment Station resides within the College of Life Sciences and Agriculture at the University of New Hampshire. It has the responsibility for the Hatch, McIntire-Stennis, Animal Health, and Multi-State Research Programs. Within this reporting year, the Experiment Station has changed its administrative structure. The Experiment Station has a new Director that reports to the Dean of the College of Life Sciences and Agriculture; the previous position of Assoc. Director of the AES has been eliminated. The Dean reports to the Vice President (Provost) for Academic Affairs. This report of accomplishments does not include New Hampshire Cooperative Extension which is a separate unit in New Hampshire and reports directly to the Vice President for Research and Public Service. Although the two are separate reporting entities, there is effective coordination of appropriate programs. From conversations with the Administrator, Dr. Colien Hefferan, we understand that reporting by Key Themes is not required and thus we have elected not to use that format, but to report project impacts and results based on the structure of our POW. Under the direction of the new AES Director, the Experiment Station is currently creating a survey form for stakeholders to allow us to better assess the outcomes of our efforts under each of the goals of our programs.

A. Planned Programs

Goal 1: An Agricultural System that is Highly Competitive in the Global Economy

Issue

Provide both basic and applied research to support increased knowledge to improve production, marketing and processing of American agriculture.

Overview:

EXECUTIVE SUMMARY:

The New Hampshire AES has established as an outcome indicator to increase basic and applied projects related to New Hampshire agricultural needs. Toward that end, two new projects, added to the NH portfolio under this goal, were begun this reporting year:

1. Mild onion Vegetable Production in New England (source of fund: Hatch)
2. Nutrient management for production and maintenance of ornamental plants (source of funds: Hatch)

To assess outcomes, we use the increase in agricultural production in New Hampshire and growth in income to New Hampshire farm operations as indicators. In this reporting year,

we have seen an increase* in the number of NH farms (reversing a downward trend of ten years ago) with an increase to the State's Economy by the agricultural sector via the production of goods and services and net farm income (from 84.6 million dollars in 1998 to 92.4 million dollars in 1999*). Moreover, total farm assets have increased over the last year from 3,034.3 million dollars to 3,218.7 million dollars*, but unfortunately, total farm debt has also increased during this period from 94.3 million dollars to 103.7 million dollars*

(* Source: New England Agricultural Statistics, 2000)

We continue a philosophy that the mission of the Agricultural Experiment Station is greater than solely enhancing production agriculture and thus provide support to basic and applied sciences that help posture NH to 1) develop new agricultural products and jobs, 2) maintain and enhance farm-based and farm-related industry and income, 3) provide opportunities for non-traditional farming endeavors, and 4) create opportunities for farm and rural community development. Each of these areas contribute to developing and assuring an agricultural system that is highly competitive in the global market.

The NH Agricultural Experiment Station supports the following basic and applied projects within Goal 1 to create technology and research for the benefit of the state, region and nation. We believe these projects provided excellent results and value from the investment of AES funds and have positioned the NH AES well to successfully achieve the goals of its five year POW plan.

Report on Key Program Components of the NH POW

1. Genomic basis for resistance to avian diseases

a. Brief description of the activity

Crosses between different chicken genotypes indicate that tumor growth differed over time between different crosses. Results indicate that genetic influences can reduce the progressive effects of tumor development.

b. Short Impact/Accomplishment Statement

Poultry health will be improved by greater understanding of the genes that affect avian immunity. Improved health represents a substantial economic benefit to poultry breeders and producers.

c. Source of funding/total expenditures/full time equivalents

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$30,149

State- 179,050

Total - 209,199

iii. Full-time equivalents: Sci. 0.7; Tech. 1.0; Lab&Cler. 1.0; Total 2.7

d. Scope of impact: Multistate Research (AL, AR, CA, DE, GA, IA, MA, ARS, NH, NYC, NYG, NC, PA, MA-FRAM)

2. Improve supply of nutrients to dairy cows

a. Brief description of the activity

Considerable improvements in milk production and the efficiencies of conversion of feed nitrogen to milk protein can be realized by optimizing lysine and methionine nutrition. The only way to increase intestinal supplies of both amino acids without feeding more protein is to combine high-lysine protein supplements with a ruminally protected methionine product. This project has investigated compounds which ruminally protect methionine.

b. Short Impact/Accomplishment Statement

This study has shown that the isopropyl ester of methionine hydroxy analog (HMBi) is an effective alternative to other ruminally protected methionine products, and its use can lead to increased milk protein.

c. Source of funding/total expenditures/full time equivalents

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$56,561

Total - 212,451

iii. Full-time equivalents: Sci. 0.5; Pro. 1.4; Lab&Cler. 1.2; Total 3.1

d. Scope of impact: Multistate Integrated Research and Extension (AL, AZ, CA, FL, IL, IN, IA, KS, KY, MD, MI, MN, MO, NH, ND, OH, PA, SD, UT, WA, WI, USDA/DFRC, USDA/RN)

3. Predicting bovine fertility

a. Brief description of the activity

Fertilization failure and early embryonic loss have a major economic impact on the dairy industry. Three independent projects at NH work on this multistate effort to understand the relationship between sub-luteal function, and follicle development and fertility to enable design strategies to improve reproductive efficiency.

b. Short Impact/Accomplishment Statement

In lactating dairy cattle, estrous cycles during the postpartum period that consist of three waves of follicular growth preceding insemination appeared to be conducive to improved fertility. If the incidence of follicular wave pattern in cattle is determined genetically, this will impact future selection strategies used to identify genetically superior individuals and to enhance fertility.

c. Source of funding/total expenditures/full time equivalents (for 3 projects)

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$118,702

State- 71,320

Total - 190,022

iii. Full-time equivalents: Sci. 1.3; Tech. 1.1; Lab&Cler. 0.2; Total 2.6

d. Scope of impact: Multistate Research (CTS, MI, NE, NH, NJ, NYC, OH, PA)

4. Improving nutrition for dairy calves
 - a. Brief description of the activity

Lactoferrin was supplemented to preruminant dairy calves in milk replacer and examined for effect on earlier age at weaning, increased body weight, and preweaning average daily gain.
 - b. Short Impact/Accomplishment Statement

Lactoferrin supplementation appeared to improve performance of young calves through increased growth and profitability by earlier weaning. This will likely result in increased milk production.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$18,474
Total - 53,653
 - iii. Full-time equivalents: Sci. 0.1; Pro. 0.6; Total 0.7
 - d. Scope of impact: Multistate Research (AL, AZ, CA, FL, GA, IL, IN, IA, KS, LA, MI, MN, MO, NE, NH, NM, NY, OH, PA, SD, TN, TX, VA, WA, WI)

5. Characterizing avian tumor viruses
 - a. Brief description of the activity

Line UNH 193 trisomic chickens, having a specific MHC genotype, were used to examine major histocompatibility complex (MHC) gene dosage effects on the outcome of Rous sarcomas.
 - b. Short Impact/Accomplishment Statement

Determining important genes and increasing the knowledge of genes, including the MHC genes, that influence immune responses will improve poultry health. The poultry industry receives substantial economic benefit from improved health.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$30,149
State- 193,523
Total - 223,672
 - iii. Full-time equivalents: Sci. 0.7, Tech. 1.0, Cler&Lab. 1.0, Total 2.7
 - d. Scope of impact: State Specific

6. Molecular basis for retina functioning

This project has been reclassified as belonging in Goal 3 and will be reported on in that section.

7. Role of ethylene in signal transduction in plants
 - a. Brief description of the activity

Analysis of Arabidopsis two-component signaling elements by microarray was performed to determine if expression of ethylene receptors changed in response to ethylene or salt-stress, and if expression of ethylene receptor is regulated at the mRNA and protein levels.
 - b. Short Impact/Accomplishment Statement

Ethylene is a plant hormone involved in aspects of plant growth and development, including fruit ripening and organ abscission. This work leading to a better understanding of how ethylene signaling is regulated in the plant will allow for modification of these economically important traits.

- c. Source of funding/total expenditures/full time equivalents (for 3 projects)
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$18,094
State- 32,568
Total - 50,662
 - iii. Full-time equivalents: Sci. 0.4; Pro. 0.5; Total 0.9
 - d. Scope of impact: State Specific
8. Genetic transposition in soil nematodes
- a. Brief description of the activity
Soil nematodes have the potential to be beneficial or harmful to agriculture. Transposon activity is a molecular method to both identify important genes and engineer for desired traits.
 - b. Short Impact/Accomplishment Statement
The mut-2 gene has been identified as an important gene for mutator activity. This project is cloning mut-2 by amplifying segments of genomic DNA from a mut-2 mutator strain and will identify fragments that supply met-2 mutator activity in transgenic lines.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$8,882
State- 38,442
Total - 47,324
 - iii. Full-time equivalents: Sci. 0.2; Pro. 0.1, Total 0.3
 - d. Scope of impact: State Specific
9. Genetics and breeding of Cucurbita
- a. Brief description of the activity
Two related projects are working toward the same endpoint. Although each project is developing pumpkins with hull-less seeds, one approaches the task by classical cross-breeding and the other by molecular cloning.
 - b. Short Impact/Accomplishment Statement
These programs have resulted in the development and release of several hull-less seed hybrids, and the commercial production of "Snackjack" hull-less pumpkin seeds as a new, nutritious snack food.
 - c. Source of funding/total expenditures/full time equivalents (for 2 projects)
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$19,570
State- 5,581
Total - 25,151
 - iii. Full-time equivalents: Sci. 0.2, Cler&Lab. 0.1; Total 0.3

- d. Scope of impact: 1) State Specific
2) Multi-State Research (CTH, CTS, DE, ME, MD, MA, NH, NJ, NYG, NYC, PA, RI, VT, WV, USDA/ARS)
10. Nitrogen release from land application of soil amendments
- a. Brief description of the activity
Field studies with biosolids were conducted to evaluate their use as nutrient resources and as a component of synthetic topsoil for reclamation use.
 - b. Short Impact/Accomplishment Statement
The use of biosolids for corn productions was shown to provide economic benefit and that use in synthetic topsoils permit the expanded use of lime-stabilized biosolids beyond application to farmland, with respect to pH restrictions.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$19,031
State- 107,270
Total - 126,301
 - iii. Full-time equivalents: Sci. 0.1, Pro. 0.8, Cler&Lab. 0.1; Total 1.0
 - d. Scope of impact: State Specific
11. Epidemiology and control of apple scab
- a. Brief description of the activity
Mixed-cultivar plantings comprised of cultivars differing in their susceptibility to scab were considered as a new management practice. The infection-causing efficiencies were determined for six popular cultivars in the US.
 - b. Short Impact/Accomplishment Statement
As this experiment will be repeated in the 2001 growing season, the impacts for this project will be reported next year.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$54,303
State- 49,117
Total - 103,420
 - iii. Full-time equivalents: Sci. 0.4, Pro. 0.5; Cler&Lab. 0.1, Total 1.0
 - d. Scope of impact: State Specific
12. Methods to increase growth seasons for plants
- a. Brief description of the activity
New growth conditions, including black vs. white plastic covering and trellised, raised beds, were examined to develop intensive, environmentally modified production systems to increase plant density and yield for the tomato growers.

- b. Short Impact/Accomplishment Statement
White mulch increased total yields by 39% over bare soil, and at close spacing, increased total plant biomass by 47%. Additionally, white mulch increased photosynthetically active radiation by approximately 14% over bare soil.
- c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$15,199
State- 58,048
Total - 73,247
 - iii. Full-time equivalents: Sci. 0.1, Pro. 0.6; Total 0.7
- d. Scope of impact: State Specific

13. Inhibition of photosynthesis by UV-radiation

- a. Brief description of the activity
Some effects of ultraviolet light are known to be damaging to plants. This effort is investigating how these wavelengths cause oxidative plant damage.
- b. Short Impact/Accomplishment Statement
In two species of *Dunaleilla*, oxidative stress from UV radiation produced ten-fold differences in increases of carotenoids. UVA radiation was shown to produce very different effects in oxidative stress compared to UVB radiation.
- c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$15,630
State- 26,620
Total - 42,251
 - iii. Full-time equivalents: Sci. 0.2, Pro. 0.3; Total 0.5
- d. Scope of impact: State Specific

14. Genetic control of strawberry

- a. Brief description of the activity
Molecular tools are being use to asses genes that confer fruit color in strawberries.
- b. Short Impact/Accomplishment Statement
Genes conferring yellow fruit color and white internal fruit color in otherwise red fruit have been mapped to the c locus and may be attributable to a mutant form of the F3H gene. Variations in the F3H promoter may be an important determinant of fruit color variations, and thus economic value, of strawberries
- c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$45,127
State- 29,618

Total - 70,608

iii. Full-time equivalents: Sci. 0.5, Pro. 0.4; Total 0.9

d. Scope of impact: State Specific

15. Genetic and molecular control of carrot embryogenesis

a. Brief description of the activity

S-adenosylmethionine decarboxylase (SAMDC) has been shown to be a key enzyme in polyamine biosynthesis. A cDNA clone of SAMDC has been isolated from carrot and subcloned into a yeast expression system. This cloning will allow for overexpression and antisense expression in plants and analysis of the metabolism of polyamines.

b. Short Impact/Accomplishment Statement

Since it is not currently known if the clone expresses a functional protein, the impact of this project will be reported next year.

c. Source of funding/total expenditures/full time equivalents

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$22,639

State- 34,887

Total - 57,527

iii. Full-time equivalents: Sci. 0.2, Pro. 0.7; Total 0.9

d. Scope of impact: State Specific

16. Evaluation of new apple cultivars

a. Brief description of the activity

Since apple growers in NH are struggling to survive a weak wholesale market, this project seeks to develop retail/wholesale markets for specialty apple cultivars not available through traditional market channels.

b. Short Impact/Accomplishment Statement

22 cultivars were established in 1999. Data on tree growth and development (including tree caliper, height and spread) as well as data on fruit production and quality is being collected for analysis. Impacts of this project will be reported next year.

c. Source of funding/total expenditures/full time equivalents

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$1,588

State- 26,203

Total - 27,790

iii. Full-time equivalents: Sci. 0.1, Pro. 0.1, Total 0.2

d. Scope of impact: Multistate Integrated Research and Extension

17. Reproductive performance of brown algae

This project has been terminated due to relocation of PI to another university.

18. Calcium control of plant enzyme activity

a. Brief description of the activity

Plants are able to detect and respond to changes in their environment by altering their metabolism. This project analyses the expression patterns of calcium-dependent protein kinase in transgenic Arabidopsis.

b. Short Impact/Accomplishment Statement

Results from this study indicate that cellular and subcellular locations of a group of enzymes implicated in a wide range of plant developmental process, the calcium-dependent protein kinases, are critical to the ability of plants to alter metabolic processes.

c. Source of funding/total expenditures/full time equivalents

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$15,072

State- 36,506

Total - 51,578

iii. Full-time equivalents: Sci. 0.4, Pro. 0.3; Total 0.7

d. Scope of impact: State Specific

19. Strawberry production in modified environments

a. Brief description of the activity

New growth conditions, including black plastic covering and raised beds in high tunnels, were examined to develop intensive, environmentally modified production systems to offer northern growers an expanded production and sales period.

b. Short Impact/Accomplishment Statement

Grower are adopting these systems to produce strawberries for the early market and as an alternative production system that is less pesticide intensive. These systems also reduce non-productive, vegetative growth in field grown strawberry production.

c. Source of funding/total expenditures/full time equivalents

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$21,897

State- 93,268

Total - 115,165

iii. Full-time equivalents: Sci. 0.4, Pro. 0.5;

Cler&Lab. 0.2, Total 1.1

d. Scope of impact: Integrated Research and Extension

20. Conservation of plant genetic resources

This report has been included under #9 of this goal.

21. Relationship of nitrogen fixation and oxygen deficit in plant roots

This project was terminated.

22. Lobster habitats and survival

a. Brief description of the activity

Predation on lobsters seriously impacts commercial fishermen. This study examined who were the main predators of lobster.

- b. Short Impact/Accomplishment Statement
 - Fish predation does not have a major impact on the abundance of lobsters.
 - The three main predators observed were lobsters, crabs and skate.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii.Total expenditures: Federal - \$43,562
State- 47,723
Total - 91,285
 - iii.Full-time equivalents: Sci. 0.6, Pro. 0.8; Total 1.4
 - d. Scope of impact: State Specific
23. Causes of soft shell clam decline
- a. Brief discription of the activity
 - Fish and shellfish disease diagnosis, treatment and prevention are among the most significant variables in aquaculture. Since are large portion of clams are susceptible to clam leukemia, leading to a decline in populations, molecular biology studies were undertaken to address this problem.
 - b. Short Impact/Accomplishment Statement
 - Convincing evidence has been gathered that demonstrates integral roles for p53 and p73 genes and their products in causing clam leukemia. These studies also have provided a mechanism to successfully treat this clam disease.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii.Total expenditures: Federal - \$29,101
State- 2671
Total - 31,773
 - iii.Full-time equivalents: Sci. 0.2, Total 0.2
 - d. Scope of impact: State Specific
24. Genetic improvement of tilapia for aquaculture
- a. Brief description of the activity
 - The ability to rapidly generate inbred lines of tilapia would provide a new approach to selective breeding of this species. Molecular biology techniques are being used to create hybrid crosses among such clonal lines.
 - b. Short Impact/Accomplishment Statement
 - Impacts will be reported next year.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii.Total expenditures: Federal - \$31,333
State- 9,601
Total - 40,934
 - iii.Full-time equivalents: Sci. 0.3, Pro. 0.5; Total 0.8

- d. Scope of impact: Multistate Reseach (AL, CA, CTS,ME, NH, NJ, LA, VA, WA.) [Non-AES: DE, HI, LA, MA, MS, MO, NC. PA, RI, TX, WI, Scotland, England, Japan]
25. Increased efficiency of producing sea urchin roe
- a. Brief description of the activity
Green urchin in the Gulf of Maine have recently shown a consistent decline in population, demonstrating the need for hatcheries or sea-ranching. Manipulation of sea urchin rearing conditions is intended to produce quality urchins that can be managed by urchin farmers.
 - b. Short Impact/Accomplishment Statement
Manipulating the light cycle for adult urchins has demonstrated that the onset of gamete production can be delayed or initiated earlier. Delaying onset of the reproductive cycle can produce animals with large gonads, providing best quality roe for foreign markets. The most important bottleneck to commercial hatchery production is juvenile growth variation.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii.Total expenditures: Federal - \$11,448
State- 25,241
Total - 36,689
 - iii.Full-time equivalents: Sci. 0.2, Pro. 0.1; Total 0.3
 - d. Scope of impact: State Specific
26. Genetic mapping of aquaculture species
- a. Brief description of the activity
This project is developing genetic and physical linkage maps of tilapia to support the identification of genes controlling traits of commercial importance.
 - b. Short Impact/Accomplishment Statement
Impacts for this project will be reported next year, since isolation of BAC libraries containing microsatellite markers flanking QTL for sex determination and color have just begun.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii.Total expenditures: Federal - \$11,354
State- 1,945
Total - 13,299
 - iii.Full-time equivalents: Sci. 0.4, Pro. 0.5; Cler&Lab. 0.2, Total 1.1
 - d. Scope of impact: Multistate Reseach (AL, CA, CTS,ME, NH, NJ, LA, VA, WA.) [Non-AES: DE, HI, LA, MA, MS, MO, NC. PA, RI, TX, WI, Scotland, England, Japan]
4. Control of pigment production of summer flounder
- a. Brief description of the activity

Summer flounder change pigmentation as they develop. This project has identified techniques to monitor the change of pigmentation as a reporter system for early development processes.

b. Short Impact/Accomplishment Statement

Quantitative analysis of numbers and density of melanophores on each side of the body, before, during, and after metamorphosis demonstrates that the pigmentation of the future blind and ocular sides begins to diverge at the very beginning of metamorphic transformation.

c. Source of funding/total expenditures/full time equivalents

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$15,770

State- 31,862

Total - 47,632

iii. Full-time equivalents: Sci. 0.4, Total 0.4

d. Scope of impact: State Specific

5. Hormonal control of beetle reproduction and rearing characteristics

a. Brief description of the activity

This study looks at the role of juvenile hormone (JH) in burying beetles as a model system. The project investigates if mating occurs only during times of changes in JH levels.

b. Short Impact/Accomplishment Statement

The elucidation of hormonal control mechanisms may provide the best opportunity for control of beetle populations.

c. Source of funding/total expenditures/full time equivalents

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$7,241

State- 32,342

Total - 39,583

iii. Full-time equivalents: Sci. 0.4, Pro. 0.1, Total 0.5

d. Scope of impact: State Specific

29. Management of arthropod pests of livestock and poultry

a. Brief description of the activity

This study analyzed the geographic variation in the western horse fly throughout its known range, with keys to the immature and adult stages.

b. Short Impact/Accomplishment Statement

Work was completed on a revision of the *Hybomitra sonomensis* complex of western horse flies. The principle value of the work is to facilitate identification of species not previously well defined or that have been difficult to identify correctly.

c. Source of funding/total expenditures/full time equivalents

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$17,855

State- 7,732

Total - 25,586

- iii. Full-time equivalents: Sci. 0.3, Total 0.3
- d. Scope of impact: Multistate Research (CA, AL, AR, FL, GA, IA, IN, IL, KS, KY, LA, MN, MO, NE, NH, NC, ND, NY, OK, PA, TN, TX, WY, USDA-ARS, FLX, Canada)

Program Duration

The research projects that contribute to this goal are generally of three to five years duration. All projects are targeted for mid and long term problems.

In fiscal year 2000 the New Hampshire Agricultural Experiment Station has 10.3 full time equivalents of scientists time assigned to Goal 1. Their research was funded with federal funds from the Hatch, McIntire-Stennis, and Multi-State Research Programs. There were 7.2 full-time equivalents of technical and clerical staff attached to these projects. Professional help, in the form of graduate students doing research on these projects, amounted to 8.8 students. For this goal, as well as all subsequent goals, there are matching funds from the State of New Hampshire through a budget line within the University of New Hampshire's budget. It is not anticipated that any change in federal funding in the next five years would significantly alter the spectrum of key program components for Goal 1.

Goal 2: A Safe and Secure Food and Fiber System

Issue: Foods are in constant threat of contamination by microorganisms. The agricultural system has a responsibility to insure that the foods produced are safe to eat.

Overview:

EXECUTIVE SUMMARY:

The New Hampshire AES has established as output indicators for Goal 2, 1) to increase research results from projects dealing with microorganisms that are potential harmful contaminants of foods and 2) to increase understanding of the processes whereby harmful microbes carry out their infective and disease-causing processes. While the University of New Hampshire has a small number of excellent and talented faculty contributing to this goal, it is recognized that we need to increase efforts in this area. During the 2000 fiscal year, we have hired a new faculty member in the Microbiology Department. That individual will submit a new Hatch proposal during this fiscal year. In addition, the University of New Hampshire has submitted an NIH COBRE grant that contains funding to hire yet another microbiologist into a permanent, tenure-track position. It is our intention, by hiring new faculty into the area of microbiology, to strengthen the Agricultural Experiment Station support for Goal 2.

As outcome indicators, we evaluate 1) an absence or decrease of bacterial contamination of foods and 2) an increase in successful treatment of individuals who are exposed to pathogenic microorganisms. The second indicator, an increase in successful treatment has proven to be an

inappropriate indicator; since the University of New Hampshire does not have a medical program, this data is not consistently available, and we have therefore modified our second output indicator to evaluate the level of public awareness to the contribution of pathogenic microbes to animal and human illness. Data to assess the effectiveness of efforts in this area will be collected during this fiscal year.

We continue a philosophy that the mission of the Agricultural Experiment Station is consistent with Goal 2 and thus provide support to basic and applied sciences that help posture NH to 1) reduce bacterial illness, 2) determine the role of bacterial genes in diseases, 3) provide defense mechanisms against pathogenic bacteria, and 4) assess the impact of pathogenic bacteria on humans, animals and the environment. Each of these areas contribute to developing and assuring a safe and secure food and fiber system.

The NH Agricultural Experiment Station supports the following basic and applied projects within Goal 2 to create technology and research for the benefit of the state, region and nation. We believe these projects provided excellent results and value from the investment of AES funds and have positioned the NH AES well to successfully achieve the goals of its five year POW plan.

Key Program Components

1. Role of bacterial genes in diseases

a. Brief description of the activity

All microorganisms, including pathogens, face stressful conditions in their various environments. This project uses molecular and genetic techniques to create microbial mutations to provide information on how these microorganisms can be controlled, and possibly eliminated, with particular emphasis on pathogens.

b. Short Impact/Accomplishment Statement

Several stress proteins have been cloned or amplified by PCR. These sequences have been subcloned and the resulting organisms demonstrated to elicit toxin production. Conditions have been elucidated that control or regulate the expression of pathogenic toxins.

c. Source of funding/total expenditures/full time equivalents

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$15,213

State- 59,293

Total - 74,506

iii. Full-time equivalents: Sci. 0.4, Pro. 0.3; Total 0.7

c. Scope of impact: State Specific

2. Factors affecting Listeria virulence

This project has been terminated. The PI is currently on a 3 year leave of absence from UNH.

3. Host defenses against Salmonella
 - a. Brief description of the activity

Studies focused on two distinct models for assessing the role of proteins in host cell responses to *Salmonella typhimurium*. Flow cytometry was used to measure bacterial association to human intestinal cell lines.
 - b. Short Impact/Accomplishment Statement

These studies have contributed to understanding the molecular and cellular events involved in salmonella infections and will lead to developing intervention strategies for reducing illness associated with these bacteria.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$31,647
State- 22,687
Total - 54,334
 - iii. Full-time equivalents: Sci. 0.2, Pro. 0.3; Total 0.5
 - d. Scope of Impact: State Specific

4. Impact of microcystins on lakes
 - a. Brief description of the activity

This study focuses on the presence of cyanobacterial hepatotoxins, called microcystins, in the food web of twelve NH lakes. The project has developed new methods of sample preparation, and rapid sensitive ELISA assays for measurements of microcystins. HPLC analyses were used to identify specific toxin analogues.
 - b. Short Impact/Accomplishment Statement

A significant relationship between total phosphorus and microcystins in lakewater was observed, indicating that the microcystin concentrations are linked to eutrophication. The concentration of microcystins in lakewater, as well as bioaccumulated in the food web, indicate a potential risk for the lake ecosystem, as well as long-term use by animals and humans.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$65,065
State- 10,710
Total - 75,775
 - iii. Full-time equivalents: Sci. 0.2, Pro. 0.5; Total 0.7
 - d. Scope of Impact: State Specific

Program Duration

All projects under this goal are for a three to five year period. All projects are targeted for mid and long term problems.

In fiscal year 2000 the New Hampshire Agricultural Experiment Station had 0.9 full time equivalents of scientists time assigned to Goal 2. Their research was funded with federal funds from the Hatch, McIntire-Stennis, and Multi-State Research Programs. There were 0 full-time equivalents of technical staff attached to these projects. Professional help in the form

of graduate students doing research on these projects amounts to 1.1 students. For this goal, as well as all subsequent goals, there are matching funds from the State of New Hampshire through a budget line within the University of New Hampshire's budget. It is not anticipated that any change in federal funding in the next five years would significantly alter the spectrum of key program components for Goal 2.

Goal 3: A Healthy, Well-Nourished Population

Issue: The reasons people eat particular foods are complex and the foods that are included in a diet have short-term and long-term health consequences. Knowledge of food-consumption patterns and the results of those choices are needed.

Overview:

EXECUTIVE SUMMERY:

The New Hampshire AES has established as output indicators for Goal 3, 1) increased research results from projects dealing with why particular foods that make up a diet are chosen and 2) increased research results detailing the short and long term consequences of food consumption patterns on health issues.

We will evaluate as outcome indicators if our efforts within this goal are contributing to 1) healthier food choices resulting in a better balanced diet for consumers and 2) fewer incidences of disease or disorders directly related to improper diet choices.

During the last reporting year, the College of Life Sciences and the Agricultural Experiment Station made the commitment and did the planning to transfer into our college the Medical Laboratory Sciences program (from the College of Health and Human Services). The transfer of faculty and one "new faculty hire" will occur during this year. All faculty from the Medical Laboratory Sciences program will be given the opportunity, upon joining our College, to submit AES Hatch project proposals. This addition to our College should strengthen our ability to address the aims of Goal 3.

We continue a philosophy that the mission of the Agricultural Experiment Station is consistent with Goal 3 and thus provide support to basic and applied sciences that help posture NH to 1) understand and control the metabolism and oxidation in adipose tissue, 2) assess the nutritional risk in the elderly, 3) understand relationships of diseases and gender or age, and 4) assess the functional properties of food protein. Each of these areas contributes to developing and assuring a healthy and well-nourished population.

The NH Agricultural Experiment Station supports the following basic and applied projects within Goal 3 to create technology and research for the benefit of the state, region and nation. We believe these projects provided excellent results and value from the investment of AES funds and have positioned the NH AES well to successfully achieve the goals of its five year POW plan.

Key Program Components

1. Hormonal control of fat oxidation in adipose tissue
 - a. Brief description of the activity

This project is investigating the role of sex hormones on energy and lipid metabolism of male and female swine. Animals were pretreated with DHEA sulphate, placebo or were castrated and given hormones via subcutaneous implantation.
 - b. Short Impact/Accomplishment Statement

Studies have demonstrated that the regulation of energy metabolism and substrate utilization involves a balance between androgen and estrogen hormones. The outcome of these experiments may help explain the development of obesity that is associated with aging in humans as well as metabolic imbalances associated with hypogonadism in men and polycystic ovarian syndrome in women.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$15,489
State- 158,313
Total - 173,803
 - iii. Full-time equivalents: Sci. 0.5, Pro. 0.5, Tech. 1.0; Cler/Lab 0.1,
Total 2.1
 - d. Scope of Impact: State Specific

1. Control of adipose tissue metabolism
 - a. Brief description of the activity

Adipose tissue blood flow can influence local metabolism of this tissue, and thereby impact both the rate at which nutrients are deposited and the rate at which metabolites are removed. Adipose blood flow was measured in over-the-shoulder subcutaneous fat in 16 swine using the 133-xenon washout technique.
 - b. Short Impact/Accomplishment Statement

Adipose tissue blood flow varies significantly among swine and exercise-training significantly increases epinephrine-stimulated adipose blood flow in this species.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - i. Total expenditures: Federal - \$17,322
State- 47,547
Total - 64,869
 - ii. Full-time equivalents: Sci. 0.5; Total 0.5
 - d. Scope of Impact: State Specific

3. Assessing the nutritional risk of the elderly
 - a. Brief description of the activity

Macular pigment density was examined as a marker for antioxidant status. 110 subjects aged 45-70 completed a study in which fruit and vegetable use was compared with markers of antioxidant status.

- b. Short Impact/Accomplishment Statement
Vegetable-derived antioxidants originating from dietary carotenoids appear to decrease risk of aging-related eye disease. Dietary modification may help alleviate the cost of eye disease and improve quality of life.
- c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$18,406
Total - 62,796
 - iii. Full-time equivalents: Sci. 0.3, Pro. 0.6; Total 0.9
- d. Scope of Impact: Multistate Research (CTS, DC, ME, MD, MA, NH, NYC, PA, RI, USDA/ARS)

1. Gender relationship to atherogenesis

- a. Brief description of the activity
The expression of matrix metalloproteinases and tissue inhibitors of these proteinases were characterized in the coronary arteries of male and female Yucatan miniature swine.
- b. Short Impact/Accomplishment Statement
Intact females do not appear to have as much protection from atherosclerosis due to estrogens as has been thought. The enzymes that are now shown to be important in the development of lesions may be targets for therapeutic intervention.
- c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$23,903
State- 73,864
Total - 97,767
 - iii. Full-time equivalents: Sci. 0.5, Pro. 0.5; Total 1.0
- d. Scope of Impact: State Specific

New projects in this goal

2. Molecular basis of retinal function

- a. Brief description of the activity
Many blinding diseases and visual disabilities in animal and humans result from disorders of the photoreceptor cells (rods and cones) or the retina. This project characterizes isozyme-specific antibodies to cone and rod phosphodiesterase subunits for retinal photoreceptors.
- b. Short Impact/Accomplishment Statement
These studies of the visual pathway in cone photoreceptors are providing information on how defects in cone function lead to cone cell degeneration, loss of visual function and/or blindness in animals and humans.

- c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$15,206
Total - 57,893
 - iii. Full-time equivalents: Sci. 0.4, Pro. 0.3; Total 0.7
 - d. Scope of Impact: State Specific
3. Atherogenesis at the cellular level
- a. Brief description of the activity
Cells from different strains of pigeon, one susceptible and one resistant to atherosclerosis, are used in culture to study the uptake of cholesterol from the medium versus synthesis of cholesterol by the cells.
 - b. Short Impact/Accomplishment Statement
Cholesterol incorporated from the culture medium is metabolized differently than cholesterol synthesized de novo by the cells. Excessive amounts of protein-carbohydrate complex produced by blood vessel cells causes changes in cholesterol metabolism which are characteristic of early atherosclerosis.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$8,472
Total - 63,524
 - iii. Full-time equivalents: Sci. 0.3, Total 0.3
 - d. Scope of Impact: State Specific

Program Duration

The research projects that contribute to this goal are generally of three to five years duration. All projects are targeted for mid and long term problems.

In fiscal year 2000 the New Hampshire Agricultural Experiment Station has 2.5 full time equivalents of scientists time assigned to Goal 3. Their research was funded with federal funds from the Hatch, McIntire-Stennis, and Multi-State Research Programs. There were 1.1 full-time equivalents of technical and clerical staff attached to these projects. Professional help in the form of graduate students doing research on these projects amounts to 1.9 students. For this goal, as well as all subsequent goals, there are matching funds from the State of New Hampshire through a budget line within the University of New Hampshire's budget. It is not anticipated that any change in federal funding in the next five years would significantly alter the spectrum of key program components for Goal 3.

Goal 4: An Agricultural system which Protects Natural Resources and the Environment

Issue: Agriculture is a human activity and as such goes on within a larger environment. Agriculture and forestry activity can have major impacts on soil and water and land ecology and its environment because of their direct links to soil, water, air, and biological resources.

Overview:

EXECUTIVE SUMMERY:

The New Hampshire AES has established as output indicators for Goal 4, research activity that deals with the problems associated with agricultural and forestry practices as related to the environment.

We will evaluate the outcome indicator of whether our efforts within this goal are contributing to an agricultural and forestry industry that causes minimal changes and produces very minor alterations to the environment yet is productive.

We continue a philosophy that the mission of the Agricultural Experiment Station is consistent with Goal 4 and thus provide support to basic and applied sciences that help posture NH to maintain a sustainable environment and forest industry.

The NH Agricultural Experiment Station supports the following basic and applied projects within Goal 4 to create technology and research for the benefit of the state, region and nation. We believe these projects provided excellent results and value from the investment of AES funds and have positioned the NH AES well to successfully achieve the goals of its five year POW plan. Each of the following projects contributes to maintaining a sustainable environment.

Key Program Components

1. Endocrine control of reproduction in lamprey eel
 - a. Brief description of the activity
In the Great Lakes and other area lakes, lampreys are considered a major deterrent to fish populations because of the lamprey's parasitic phase in the lake in which it feeds. This effort is investigating the actions of analogs to a brain hormone called gonadotropin-releasing hormone that will eventually be used for sterilizing lampreys.
 - b. Short Impact/Accomplishment Statement
This study has provided further immunocytochemical data and compelling physiological evidence that indicates both lamprey GnRH-I and III act through the hypothalamic-pituitary-gonadal axis to modulate reproductive processes in the lamprey. Putative antagonists/agonists have been identified that offer the opportunity to enhance reproduction or be used for sterilization in lampreys.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$26,013
Total - 33, 438
 - iii. Full-time equivalents: Sci. 0.2, Pro. 0.1, Total 0.3
 - d. Scope of Impact: State Specific
2. Genetic diversity of northeastern conifer species

- c. Brief description of the activity
 - The geographic distribution of red, black and white spruce has changed greatly since the last glacial maximum. Mitochondrial introns were amplified using universal primers and PCR reactions to determine whether hybridization is a major factor in the evolution of conifers.
 - b. Short Impact/Accomplishment Statement
 - Evidence has been generated for natural introgression of white and black spruce, species generally believed not to hybridize at high rates in natural habitats.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: McIntire-Stennis
 - ii. Total expenditures: Federal - \$48,180
Total - 54,038
 - iii. Full-time equivalents: Sci. 0.4, Pro. 0.3, Total 0.7
 - d. Scope of Impact: State Specific
4. Developing genetic systems for Frankia
- a. Brief description of the activity
 - New protocols were developed to aid in efforts to exploit the potential of this microbial system to provide renewable resources for fuel and restore previously disrupted environments.
 - b. Short Impact/Accomplishment Statement
 - This study has led to the development of essential genetic tools for this neglected bacterial system. Results suggest that Frankia has potential bioremediation and phytoremediation applications especially on heavy-metal contaminated land.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$25,056
Total - 36,280
 - iii. Full-time equivalents: Sci. 0.3, Pro. 0.3, Total 0.6
 - d. Scope of Impact: State Specific
5. Distribution of algae in the Great Bay estuary
- a. Brief description of the activity
 - Eelgrass is being used to develop a plant-based Nutrient Pollution Indicator (NPI).
 - b. Short Impact/Accomplishment Statement
 - Eelgrass has been established as a robust early indicator of estuarine and coastal nutrient pollution in New England. At relatively low cost and using preexisting technology, the NPI gives managers and scientists information on the nutrient status of coastal waters before obvious eutrophication occurs.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$8,000
Total - 8,000

- iii. Full-time equivalents: Sci. 0.2, Total 0.2
 - d. Scope of Impact: State Specific
- 5. National atmospheric deposition program
 - a. Brief description of the activity
 - Dogbane and broad leaf aster were studied as ozone-damage indicator species.
 - b. Short Impact/Accomplishment Statement
 - The response of plants to ozone under natural conditions appear to give a more realistic picture of levels of injury incurred by plants during any particular growing season than do active or passive samplers.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$7,142
Total - 7,142
 - iii. Full-time equivalents: Sci. 0.1, Total 0.1
 - d. Scope of Impact: Multistate Research (IL, NH)
- 6. White-tail deer and wild turkey energetics
 - a. Brief description of the activity
 - Metabolizable energy intake (MEI) was measured in deer and correlated with monthly basal metabolism to determine if deer exhibited an internal metabolic rhythm associated with rapid fat deposition.
 - b. Short Impact/Accomplishment Statement
 - An endogenous metabolic rhythm was identified in white tailed deer. This helps clarify the interrelationships of autumn forage and habitat, metabolism and fat deposition. This process likely enhances the survival of deer in winter and their subsequent reproduction and recruitment.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: McIntire-Stennis
 - ii. Total expenditures: Federal - \$21,259
Total - 103,098
 - iii. Full-time equivalents: Sci. 0.7, Pro. 0.1, Total 0.8
 - d. Scope of Impact: State Specific
- 7. Models of gypsy moth infestations
 - a. Brief description of the activity
 - Egg masses for gypsy moth were distributed at 10 test sites in New Hampshire to determine conditions that enhance and repress egg hatch.
 - b. Short Impact/Accomplishment Statement
 - Validation of the lapse rate and aspect adjustment elements of the gypsy moth egg hatch model allows more accurate prediction of initial egg hatch over large areas and aids in planning control procedures.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: McIntire-Stennis
 - ii. Total expenditures: Federal - \$19,830
Total - 44,311

- iii. Full-time equivalents: Sci. 0.2, Total 0.2
 - d. Scope of Impact: State Specific

- 8. Herbivore foraging and forest diversity
 - a. Brief description of the activity

Natural and man-made egg-containing nests were examined to study the landscape features that affect viability of wildlife populations.
 - b. Short Impact/Accomplishment Statement

Results allow an understanding of landscape features that protect wildlife and should facilitate recovery strategies for long-term survival of endangered species.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: McIntire-Stennis
 - ii. Total expenditures: Federal - \$18,986
State- 65,835
Total - 84,821
 - iii. Full-time equivalents: Sci. 0.5, Pro. 0.5, Total 1.0
 - d. Scope of Impact: State Specific

- 8. Organic matter supply effects on forest soils
 - a. Brief description of the activity

The effects of organic matter supply on the solution chemistry of a deciduous forest soil were determined by sampling soil solution from zerotension and tension lysimeters in a series of forest plots.
 - b. Short Impact/Accomplishment Statement

Fundamental information was determined about how forest ecosystems regulate the production and delivery of dissolved organic carbon and nitrogen to surface waters. Dissolved carbon and nitrogen are important in aquatic nutrient cycles and as contaminants in drinking water supplies.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: McIntire-Stennis
 - ii. Total expenditures: Federal - \$23,525
State- 68,756
Total - 92,281
 - iii. Full-time equivalents: Sci. 0.5, Pro. 0.5, Total 1.0
 - d. Scope of Impact: State Specific

- 9. Nutrient dynamics and forest succession (2 projects)
 - a. Brief description of the activity

Sewage sludge is being composted with gravel and short fiber paper in gravel-mining pits to restore these disturbed sites. Moreover, sludge is being treated with lime as a cost-effective treatment method to minimize the risks associated with the application of Class B sludge to land.
 - b. Short Impact/Accomplishment Statement

These projects provide our first data on the nature of microbial community changes during in situ composting of manufactured topsoil. Evaluation of the lime stabilization technique demonstrates it is sufficient to inactivate

Hepatitis A virus, Rotavirus and Poliovirus. Such data are critical to making informed decisions regarding this controversial practice.

- c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$24,296
State- 12,844
Total - 37,140
 - iii. Full-time equivalents: Sci. 0.6, Total 0.6
- d. Scope of Impact: State Specific

11. NH forest ecological reserves

- b. Brief description of the activity
This project is developing a policy and management audit of selected potential ecological reserve sites to create contextual maps of each site and establish socio-political-institutional dimensions for its ecological profile.
- b. Short Impact/Accomplishment Statement
This effort is assisting public agencies and private landowners, conservation organizations, land trusts, and others in assessing which lands have potential for designation as ecological reserves.
- c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: McIntire-Stennis
 - ii. Total expenditures: Federal - \$26,974
Total - 34,799
 - iii. Full-time equivalents: Sci. 0.4, Pro. 0.1, Total 0.5
- d. Scope of Impact: State Specific

12. Soil quality and forest stress related to radium availability

This project has been terminated.

13. Genetic control of stress response of trees

- a. Brief description of the activity
Polyamine metabolism has been shown to be involved in plant growth, development and stress response. Catabolism of putrescine in transformed and non-transgenic poplar was studied to evaluate the various roles of polyamines in plant cells.
- b. Short Impact/Accomplishment Statement
New insights have been provided into the regulation of polyamine metabolism in plants and its relationship with the metabolism of aminoacids.
- c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: McIntire-Stennis
 - ii. Total expenditures: Federal - \$19,180
Total - 60,421
 - iii. Full-time equivalents: Sci. 0.1, Total 0.1
- d. Scope of Impact: State Specific

14. Horticultural plant growth in soil-less media

- a. Brief description of the activity
Studies of how the pH of a soil-less growing medium and the micronutrient concentration in a water-soluble fertilizer affect plant growth were incorporated into a computer program to assist greenhouse growers
 - b. Short Impact/Accomplishment Statement
A computer program, FloraSoil, has been developed for tracking soil test values in a greenhouse, which will aid and improve grower fertilizer decision-making.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$33,659
Total - 36,950
 - iii. Full-time equivalents: Sci. 0.2, Pro. 0.2, Total 0.4
 - d. Scope of Impact: State Specific
15. Engineering greenhouses for horticultural plant growth
- a. Brief description of the activity
The effect of supplemental lighting on cutting production was evaluated to determine how lighting design affected cutting quality.
 - b. Short Impact/Accomplishment Statement
Collaborations have been initiated with Clemson University and Rutgers University in lighting-related projects for improved greenhouse lighting designs.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$8,514
Total - 8,514
 - iii. Full-time equivalents: Sci. 0.1, Total 0.1
 - d. Scope of Impact: Multistate Integrated Research and Extension
1. Role of fungi in forest floor nutrient availability
- a. Brief description of the activity
Sterile wood baits of red maple and white pine were incubated in sterile jars with soils collected from soil pits. These were subsequently tested for activities of brown and white rot fungi.
 - b. Short Impact/Accomplishment Statement
Analysis shows that if the fungi in the wood are connected to the mineral soil, from which they obtain certain elements, ultimately replenishing the organic soil, the forest management practices may need to be modified.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: McIntire-Stennis
 - ii. Total expenditures: Federal - \$6,244
Total - 8,619
 - iii. Full-time equivalents: Sci. 0.2, Pro. 0.2, Total 0.4
 - d. Scope of Impact: State Specific

2. Forest management and plant biodiversity

Six projects that fall under this topic are each scheduled to terminate or be renewed at the end of the current year. The impacts and progress of these projects will be reported in the next year.
3. Detection of cyanobacteria in water supplies
 - a. Brief description of the activity

Brine shrimp larvae were exposed to pure microcystin-LR under various incubation temperatures and lengths of exposure time.
 - b. Short Impact/Accomplishment Statement

A bioassay using brine shrimp larvae to detect the cyanobacterial toxin, microcystin, has been developed. This assay is an inexpensive, reliable, and rapid alternative to more costly, equipment-dependent methods.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$21,918
Total - 25,501
 - iii. Full-time equivalents: Sci. 0.3, Pro. 0.4, Total 0.7
 - d. Scope of Impact: State Specific
19. Predicting range expansion in the Gulf of Maine for introduced species
 - a. Brief description of the activity

Detailed field studies have been conducted at several sites in the Gulf of Maine and compared with historical data to determine the growth and range of an invasive water plant species.
 - b. Short Impact/Accomplishment Statement

The study documents that the plant's rapid growth, high reproductive potential and broad physiological plasticity have allowed it to expand rapidly throughout much of the Gulf of Maine. This has implications as an indicator for human impacts, temperature alterations, and pollution effects.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$8,640
State- 35,696
Total - 44,336
 - iii. Full-time equivalents: Sci. 0.2, Pro. 0.1; Total 0.3
 - d. Scope of impact: State Specific
20. Small mammal populations and forests
 - a. Brief description of the activity

Trapping was performed on two white cedar swamp sites for several years. Animals collected were evaluated for population density and genetic variability.
 - b. Short Impact/Accomplishment Statement

Populations of several species were not seen to decrease over time. Genetic material has been collected and genetic variability among populations is being determined.

- c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: McIntire-Stennis
 - ii. Total expenditures: Federal - \$ 4,246
Total - 26, 844
 - iii. Full-time equivalents: Sci. 0.1, Total 0.1
- d. Scope of Impact: State Specific

Program Duration

The research projects which contribute to this goal are generally of three to five years duration. All projects are targeted for mid and long term problems.

In fiscal year 2000 the New Hampshire Agricultural Experiment Station has 5.4 full time equivalents of scientists time assigned to Goal 4. Their research was funded with federal funds from the Hatch, McIntire-Stennis, and Multi-State Research Programs. There were 0 full-time equivalents of technical staff attached to these projects. Professional help in the form of graduate students doing research on these projects amounts to 2.7 students. For this goal, as well as all subsequent goals, there are matching funds from the State of New Hampshire through a budget line within the University of New Hampshire's budget. It is not anticipated that any change in federal funding in the next five years would significantly alter the spectrum of key program components for Goal 4.

Goal 5: Enhanced Economic Opportunity and Quality of Life for Americans

Issue:

Research is necessary to help people improve their economic status in order to improve their perceived quality of life.

Overview:

EXECUTIVE SUMMERY:

The New Hampshire AES has established as an output indicator for Goal 5, increased applied and basic research to define the issues that improve quality of life, at what expense, and to improve the chances that rural communities can provide these opportunities.

We will evaluate the outcome indicators of 1) more rural communities capable of providing employment opportunities to their residents, and 2) rural communities better able to adjust and adapt to structural changes in agriculture and forestry so that they remain viable and exciting places in which families may reside.

We continue a philosophy that the mission of the Agricultural Experiment Station is consistent with Goal 5 and thus provide support to basic and applied sciences that help posture to maintain enhanced economic opportunity and quality of life for Americans.

The NH Agricultural Experiment Station supports the following basic and applied projects within Goal 5 to create technology and research for the benefit of the state, region and nation. We believe these projects provided excellent results and value from the investment of AES funds and have positioned the NH AES well to successfully achieve the goals of its five year POW plan. Each of the following projects contributes to maintaining economic opportunity and quality of life.

Key Program Components

1. Private industry and the log export market for the northeast
 - a. Brief description of the activity
The conduct and structure of the log export markets in rural New England are examined by means of key informant interviews, analysis of the US and Canadian government forest products trade statistics and surveys of market participants.
 - b. Short Impact/Accomplishment Statement
This project determines the magnitude of the region's log export market and factors influencing market participation. It also estimates the economic impact of an export tax on log market participants.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: McIntire-Stennis
 - ii. Total expenditures: Federal - \$5,017
Total - 65,850
 - iii. Full-time equivalents: Sci. 0.4, Pro. 0.3, Total 0.7
 - d. Scope of Impact: State Specific

1. GIS satellite mapping and accuracy issues
 - a. Brief description of the activity
The accuracy of remotely-sensed maps was assessed by comparing samples of the map data with actual ground conditions. For maps that are used every day for making decisions about land management and use, it is key that the maps used in these decisions are as accurate as possible.
 - b. Short Impact/Accomplishment Statement
The research conducted in this project has extended our knowledge and ability to assess the accuracy of land cover maps generated from remotely sensed data. The use a single pixel for validation is strongly discouraged because of the registration issues. A minimum 3x3 pixel cluster is recommended as the appropriate sample unit.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: McIntire-Stennis
 - ii. Total expenditures: Federal - \$6,713
Total - 76,644
 - iii. Full-time equivalents: Sci. 0.5, Pro. 0.5, Total 1.0
 - d. Scope of Impact: State Specific

2. Rural economic development alternatives in the northeast
 - a. Brief description of the activity

Three mail questionnaires were developed and administered to three distinct populations: 1) a stratified random sample of 800 members of specific recreation organizations, 2) a sample of 1000 persons knowledgeable about the potential impacts of open ocean aquaculture and 3) a random sample of NH marine recreation fishermen.

b. Short Impact/Accomplishment Statement

This project has contributed to the inventory of knowledge regarding measurement and non-response error. This knowledge has educated numerous policy makers, local leaders and resource managers on the potential threats to accuracy of surveys.

c. Source of funding/total expenditures/full time equivalents

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$10,308

Total - 20,773

iii. Full-time equivalents: Pro. 0.5, Total 0.5

d. Scope of Impact: Multistate Research

4. Public policies and food system performance (2 projects)

a. Brief description of the activity

Employment and earnings changes by industrial sectors were delineated and compared for New Hampshire and New York.

b. Short Impact/Accomplishment Statement

The sector-by-sector return and risk coefficients (which may vary widely) are of interest to state and local agencies engaged in economic development programs. As the State of New Hampshire debates adding a possible sales or income tax to fund education, these delineated results of job and earnings growth should be useful.

c. Source of funding/total expenditures/full time equivalents

i. Source of funding: Hatch

ii. Total expenditures: Federal - \$17,537

Total - 136,020

iii. Full-time equivalents: Sci. 0.8, Pro. 0.5, Total 1.3

d. Scope of Impact: Multistate Integrated Research and Extension

5. Benefits and costs in natural resource planning

a. Brief description of the activity

The responses of 101 respondents to a survey of New Hampshire food processors were analyzed. These findings describe the nature of the food processing industry in New Hampshire and give an indication of the contribution of the industry to the state's economy.

b. Short Impact/Accomplishment Statement

This project collected and analyzed information on the nature and characteristics of the New Hampshire food processing industry, and the characteristics of firms that enjoyed higher sales. Firms can use the information to improve their operations so that they can compete better in their markets.

c. Source of funding/total expenditures/full time equivalents

- i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$27,734
Total - 38,114
 - iii. Full-time equivalents: Sci. 0.4, Pro. 0.1, Total 0.5
 - d. Scope of Impact: Multistate Research
- 6. Economic considerations for municipal solid waste disposal (2 projects)
 - a. Brief description of the activity

Analysis was done for 1) trends in industry concentration in order to draft recommendations for reducing out of state imports of solid waste and 2) mechanisms to predict the sensitivity of residents to the land application of biosolids.
 - b. Short Impact/Accomplishment Statement

Information was generated to allow recommendation with respect to surcharges on in-state and out-of-state waste. Results further allowed the prediction of resident attitudes toward biosolids.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$47,234
Total - 104,550
 - iii. Full-time equivalents: Sci. 0.9, Total 0.9
 - d. Scope of Impact: State Specific and Multistate Research
- 7. Welfare reform and the well-being of rural low-income families
 - a. Brief description of the activity

This effort tracked over time the individual and family circumstances, functioning and well-being of rural low-income families with children in the context of welfare reform.
 - b. Short Impact/Accomplishment Statement

Data indicate that the rural poor in New Hampshire have problems finding child care, finding employment that pays a living wage and maintaining their access to transportation.
 - c. Source of funding/total expenditures/full time equivalents
 - i. Source of funding: Hatch
 - ii. Total expenditures: Federal - \$8,042
Total - 8,042
 - iii. Full-time equivalents: Total 0
 - d. Scope of Impact: Multistate Intergrated Research and Extension

Program Duration

The research projects that contribute to this goal are generally of three to five years duration. All projects are targeted for mid and long term problems.

In fiscal year 2000 the New Hampshire Agricultural Experiment Station has 3.5 full time equivalents of scientists time assigned to Goal 5. Their research was funded with federal funds from the Hatch, McIntire-Stennis, and Multi-State Research Programs. There were

0 full-time equivalents of technical staff attached to these projects. Professional help in the form of graduate students doing research on these projects amounts to 1.4 students. For this goal, as well as all subsequent goals, there are matching funds from the State of New Hampshire through a budget line within the University of New Hampshire's budget. It is not anticipated that any change in federal funding in the next five years would significantly alter the spectrum of key program components for Goal 5.

B. Stakeholders Input

A. Actions taken to seek stakeholder input:

The University of New Hampshire continues to solicit input from the following list provided with our POW (updated for this report).

POTENTIAL STAKEHOLDERS
Opinion Invited

Stephen H. Taylor, Commissioner
New Hampshire Department of Agriculture,
Markets, & Food

Clifford W. McGinnis, D.V.M.
New Hampshire Department of Agriculture,
Markets, & Food
Division of Animal Industry

Richard Uncles, Supervisor
New Hampshire Department of Agriculture,
Markets, & Food
Bureau of Markets

Dr. Siegfried Thewke
New Hampshire Department of Agriculture,
Markets, & Food
Division of Plant Industry

John Hodsdon, President
N.H. Association of Conservation Districts

Mr. Rick Demark
North Country Resource Conservation &
Development Project

Mr. Rick DeMark
Southern N.H. Resource Conservation &
Development Project

Ms. Joanna Pellerin, Coordinator
State Conservation Committee

Mr. Keith Farrell, Credit Manager
Farm Service Agency

Roberta A. Harold, Acting Director
Rural Economic & Community
Development

Dr. William Lord
N.H. Blueberry Growers Association

Mr. Erick Leadbeater, President
N.H. Horticulture Society

Mr. Chris Robarge, Secretary
N.H. Plant Growers Association

N. H. Fruit Growers Association

Mr. Robert Harrington, President
N.H. Small Fruit Growers Association

Mr. Phil Ferdinando, President
N.H. Vegetable Growers Association

Mr. Alden Marshall, President
N.H. Beekeepers Association

Ms. Wendy Benedict, President
N.H. Specialty Food Association

Ms. Pam Dwyer, Executive Secretary
NH/VT Christmas Tree Association

Mr. Glen Bohanan
Granite State Dairymen's Association

Ms. Jane W. Cappannelli
N.E. Dairy & Food Council

Ms. Jan Brown
N.H. Lama Association

Mr. Norman Duchano, President
N.H. Poultry Fanciers Association

Ms. Lisa Derby Oden, President
N.H. Horse Council

Mr. Berrie Donovan, Program Director
N.H. Farm Museum

New England Agricultural Statistics Service
22 Bridge Street

USDA Natural Resources Conservation
Service
Federal Building

Ms. Lisa Oden, Educational Director
Ag in the Classroom

Granite State Dairy Promotion

N.H. Farm Bureau Federation
295 Sheep Davis Road

Mr. Chuck Bagley, Executive Director
N.H. Rural Development Council

Mr. Eric Kingsley, Executive Director
N.H. Timberland Owners Association

Ms. Jane Diffley, President
Society for the Protection of N.H. Forests

N. H. Aquaculture Association

Mr. Ron Panneton
N.H. Beekeepers Association

Mr. Nigel Manley, Chairman
N.H. Christmas Tree Promotion Board

Ms. Pam Dwyer, Executive Secretary
NH/VT Christmas Tree Association

Mr. Garth Witty
N.H. Dairy Goat Association

Mr. Clark Lindley, President

N.H. Game Farmers Association
Ms. Lisa Derby Oden, President
N. H. Horse Council

N. H. Maple Producers Association

Ms. Linda Lucas, Director
N. H. Pork Producers Association

Mr. William Merrill, President
N. H. Poultry Growers Association

Ms. Ronda Geisler, President
N. H. Sheep & Wool Growers Association

Northeast Organic Farming Association

Ms. Lulu Pickering
N.H. Biotechnology Council

In addition, the NH-AES initiated new efforts to reach and interact with a different cross-section of stakeholders.

1. Two publications targeted largely to stakeholders have been produced and each sent to an audience of approximately 10,000 per issue. These publications include two issues (twice yearly) of "INSIGHTS", which address events, people and contributions from

- the College of Life Sciences and Agriculture and the NH-AES. Comments and opinions back to the NH-AES and the College are encouraged. A separate issue of “Research Highlights” exhibits the contributions and impacts of research sponsored by the NH-AES and the College of Life Sciences and Agriculture. Comments and opinions back to the NH-AES are encouraged.
2. An annual “Controversial Issues Symposium” has been created (sponsored by the NH-AES and the College of Life Sciences and Agriculture) to allow direct interactions with the public on important issues facing the state and region. This year the topic was “plant biotechnology and GMOs, a public forum”. Over 250 persons attended and a panel discussion provided excellent stakeholder input.
 3. A Research Advisory Committee was created to assist the Agricultural Experiment Station Director in the review of AES proposals and to recommend research areas of State and regional importance to which the AES should pay particular attention.
 4. The Director of the NH-AES has participated with the State of NH Agricultural Advisory Committee to inform them on NH-AES activities and to request input.
 5. The Director of the NH-AES served on the NH Current Use Board and attended community fact-finding meetings as well as serving on the State Conservation Committee to get stakeholder input.
 6. The NH-AES has been a participant several State Fairs and at the NH Farm and Forest Exposition. These interactions allow direct stakeholder input.
 7. The Director of the NH-AES was a presenter at meetings of the NH-Berry Growers, the NH Vegetable Growers, the Farm Bureau, and the NH Horticulture Association.
 8. Representatives of the NH-AES have visited NH farms, orchards, greenhouses and extension twilight meetings to speak directly with constituents.

B. Statement of the process used to identify stakeholders and collect input. The Agricultural Experiment Station Director and the AES Research Advisory Committee review and update the list of contact stakeholders yearly. New names to add to our stakeholder contact list are requested from the State of NH Agriculture Commission Advisory Committee. In addition to inviting input from these persons, the NH-AES sends INSIGHT and Research Highlights publications to citizens of the state and region requesting input on research areas, concerns and needs. The NH-AES and the College of Agriculture attend state and regional fairs and expositions with a prepared display to meet stakeholders, distribute information and obtain input. The NH-AES Director presented talks at various grower group meetings, as well as the Grange and Farm Bureau, to meet stakeholders and obtain input. The AES Director and others working with the NH-AES visited state and regional farms, orchards, greenhouses, and extension meetings to assess needs and collect input. The AES Director frequently travels to different counties with Extension Specialists to obtain input on integrated needs.

C. Statement of how collected information was considered. Information from a variety of stakeholder sources was incorporated into AES policy and practice this year. Concerns over AES-funded projects that did not serve the needs of the state and region led to a change in the criteria for evaluating AES program proposals. A statement is now required, explaining how the project will impact state and/or regional needs. Concerns over limited support for horticulture, the fastest growing areas of NH economy, and concerns for water quality have led to targeted funding from the AES for

projects in horticulture and water quality. Concerns over non-balanced information with which to make informed decisions on plant biotechnology and genetically engineered foods led to the AES-sponsored Public Forum on Plant Biotechnology and GMOs. In addition to our expanded efforts to identify and engage stakeholders, the NH-AES has begun efforts to have a survey instrument developed to assess the needs of a larger population of stakeholders. The AES is sponsoring (with preparation through the Department of Resource Economics at UNH) the creation of a survey instrument and the survey of New Hampshire citizens to obtain input on the needs and results of AES projects as defined by the five national goals.

C. Program Review Process

The New Hampshire Agricultural Experiment Station has had a peer review process for projects for over fifteen years. The proposal-process applies to all Goals and is as follows. Each August a letter is sent to all faculty in the College of Life Sciences and Agriculture and to Deans of other Colleges that there will be a competition for Hatch and McIntire-Stennis funds. Faculty must submit a one page description of the project they are interested in performing. They meet with the Associate Director to discuss the project and a decision is made as to whether this can be supported with either of these two funds, i.e., does it fit within the guidelines for them. If so, the faculty member develops a full proposal using the CSREES/USDA format. Faculty must also suggest five or six potential external (non-UNH) peer reviewers. From this list the Associate Director obtains at least two anonymous reviews. The reviews are given to the faculty member and they have the opportunity to revise the proposal or rebut the reviewer's comments if they wish. The next step in the review process is an evaluation of priority for funding projects. This is done by an internal committee of four or five faculty members who are experienced in research. All proposals are reviewed, taking into account the external reviewer's evaluations and the faculty member's response. From this they make a recommendation for priority for submission to USDA for approval. The AES Director uses this recommendation and his own evaluation to make the final decision as to which projects will be funded with Experiment Station funds. Usually about 80% of the proposals submitted are forwarded to CSREES/USDA for their approval for funding. We will continue this process in New Hampshire, however, we have modified it to utilize the results of stakeholders input. When the call for proposals is sent out each year, it now includes (beginning with last year) guidelines of the criteria used for internal proposal evaluation. These criteria include, along with research quality and potential, 1) how the proposal addresses state, regional and stakeholder issues, 2) the quality of the prior year progress report, and 3) outcomes (including publications and grant submissions) from the work performed.

D. Evaluation of the Success of Multi and Joint Activities

1. Did the planned programs address the critical issues of strategic importance.

Below is listed the topic areas in which the NH-AES is involved with multistate and joint activities that are planned programs listed in our POW. Each area and project address a critical area of strategic importance as described by its placement within the list of the five national goals above.

- Genomic basis for resistance to avian diseases

- Improved supply of nutrients to dairy cows
- Predicting bovine fertility
- Improving nutrition for dairy calves
- Genetics and breeding of Cucurbita
- Evaluation of new apple cultivars
- Strawberry production in modified environments
- Genetic improvement of tilapia for aquaculture
- Assessing the nutritional risk of the elderly
- National atmospheric deposition program
- Engineering greenhouses for horticultural plant growth
- Rural economic development alternatives in the northeast
- Public policies and food system performance
- Benefits and costs in natural resource planning
- Economic considerations for municipal solid waste disposal
- Welfare reform and the well-being of rural low-income families

Many of these projects originated as the result of stakeholder input and continue to address stakeholder needs.

1. Did the planned programs address the needs of under-served and under-represented populations.

While not all of the multistate and joint projects are designed to serve the under-represented and under-served populations, 10 of the last 11 projects in the multistate list above, directly serve under-represented and under-served populations. These include the poor, the homeless, small communities with less than adequate resources and representation, families in rural areas, the elderly, the undernourished, those seeking self-sufficiency, and farmers seeking new crops or replacement crops for species with failing sales, among others.

2. Did the planned programs describe the expected outcomes and impacts.

Individual projects are at different stages of maturity and have exhibited different levels of impact. Each multistate and joint project, in our opinion, has been a good investment of federal and state funds, resulting in continuing progress and benefits to the people of the state and region. Examples of the outcomes and impacts derived from these projects may be seen below.

- Poultry health will be improved by greater understanding of the genes that affect avian immunity. Improved health represents a substantial economic benefit to poultry breeders and producers
- The isopropyl ester of methionine hydroxy analog (HMBi) is an effective alternative to other ruminally protected methionine products, and its use can lead to increase milk protein.
- In lactating dairy cattle, estrous cycles during the postpartum period that consist of three waves of follicular growth preceding insemination appeared to

be conducive to improved fertility. If the incidence of follicular wave pattern in cattle is determined genetically, this will impact future selection strategies used to identify genetically superior individuals and to enhance fertility.

- Lactoferrin supplementation appeared to improve performance of young calves through increased growth and profitability by earlier weaning. This will likely result in increased milk production.
- Commercial production of “Snackjack” hull-less pumpkin seeds as a new, nutritious snack food offers a new crop opportunity for farmers, a new sales opportunity for retailers and a new choice of healthy snack food to consumers.
- Grower are adopting new systems to produce strawberries for the early market and as an alternative production system that is less pesticide intensive. These systems also reduce non-productive, vegetative growth in field grown strawberry production.
- Vegetable-derived antioxidants originating from dietary carotenoids appear to decrease risk of aging-related eye disease. Dietary modification may help alleviate the cost of eye disease and improve quality of life.
- The response of plants to ozone under natural conditions appear to give a more realistic picture of levels of injury incurred by plants during any particular growing season than do active or passive samplers.
- Work has been initiated with Clemson University and Rutgers University in lighting-related projects for improved greenhouse lighting designs.
- An inventory of knowledge regarding measurement and non-response error in surveys has been collected. This knowledge has educated numerous policy makers, local leaders and resource managers on the potential threats to accuracy of surveys.
- The sector-by-sector return and risk coefficients (which may vary widely) are of interest to state and local agencies engaged in economic development programs. As the State of New Hampshire debates adding a possible sales or income tax to fund education, these delineated results of job and earnings growth should be useful.
- Information on the nature and characteristics of the New Hampshire food processing industry was collected and analyzed, and the characteristics of firms that enjoyed higher sales. Firms can use the information to improve their operations so that they can compete better in their markets.
- Information was generated to allow recommendations to be provided to lawmakers and residents with respect to surcharges on in-state and out-of-state waste. Results further allowed the prediction of resident attitudes toward biosolids.
- Data indicate that the rural poor in New Hampshire have problems finding child care, finding employment that pays a living wage and maintaining their access to transportation.

1. Did the planned programs result in improved effectiveness and/or efficiency.

Multistate research has allowed NH to leverage the results it gets for the funds it expends. We have experienced a decrease in duplication of efforts between states, and

an increase in communication and coordination. Multisate research expenditures appear currently to be the best use of money (based on project return for dollars invested) of any of the projects in the NH-AES portfolio of AES-sponsored research. Further efficiency has been realized with efforts to improve our integrated research. Because the NH-AES and NH-Extension do not report to the University along the same reporting lines, communication between the AES and Extension had become poor. Efforts to improve integrated research has re-opened the lines of communication and provided the opportunity of effective integrated efforts.

E. Multistate Extension Activities

This section is not applicable to the NH-AES

F. Integrated Research and extension Activities

The NH-AES was unable to calculate a 1997-rate, and thus assigned a year 2000 target of 20% for integrated activities. From the table of integrated projects below, one may see that the NH-AES spent \$338,390 of a combined Federal allocation for Hatch and Multistate of \$1,352,583. This represents a 25% integrated portfolio, in excess of the 20% agreed to for FY 2000.

CSREES-REPT (2/00) has been filled in to accompany this report and will be faxed to USDA to be attached to this report. Pertinent information from the form is included in the table below. A brief description of the progress to date on each planned activity follows the table.

Integrated Projects			03/01/2000		
Name	Project Number	Project description		FY 2000	
MacHardy	William	H-197	Epidemiology and control of apple scab	Federal \$	54,030
Schwab	Charles	H-366	Metabolic Relationships in supply of Nutrients for lactating cows	Federal \$	56,561
		H-368	Management systems for improved decision making and profitability of dairy herds	Federal \$	53,541
Loy	J. Brent	H-387	Conservation and utilization of plant genetic resources	Federal \$	4,071
		H-074	Genetics and breeding of cucurbits	Federal \$	53,649
Lord	William	H-383	Intensive Production of strawberries	Federal \$	21,897
		H-375	Multidisciplinary evaluation of new apple cultivars	Federal \$	1,588

Erickson	Peter	H-395	Management systems for improved decision making and profitability of dairy herds	Federal \$	18,474
Kopsell	David	H-411	Mild onion vegetable production in New England	Federal \$	4,221
Fischer	Paul	H-394	A decision-support system for control of pH in soilless container media	Federal \$	33,659
		H-396	Decision support for design and control of plant growth systems	Federal \$	8,514
Knight	Susan	H-402	Rural low-income families: tracking their well-being and functioning in the context of welfare reform	Federal \$	11,769
Assessments			NASULGC		16,416 338,390

Integrated Project Descriptions-

MacHardy William H-197 Epidemiology and control of apple scab

Leaves represent a habitat for vectors of apple scab to “winter over” and re-infect orchards the next year. This project has determined that removing the foliage (vacuum removal) prevents the spread of apple scab.

Schwab Charles H-366 Metabolic Relationships in supply of Nutrients for lactating cows

This study has shown that the isopropyl ester of methionine hydroxy analog (HMBi) is an effective alternative to other ruminally protected methionine products, and its use can lead to increase milk protein.

Schwab Charles H-368 Management Systems for profitability of dairy herds

This study has better defined protein requirements and feeding strategies for increasing efficiencies of gain, feed conversion to weight and lowered feed costs from birth to first lactation.

Loy J. Brent H-387 Conservation and utilization of plant genetic resources

These programs have resulted in the development and release of several hull-less seed hybrids, and the commercial production of “Snackjack” hull-less pumpkin seeds as a new, nutritious snack food.

Lord William H-383 Intensive Production of strawberries

Grower are adopting these systems to produce strawberries for the early market and as an alternative production system that is less pesticide intensive. These systems also reduce non-productive, vegetative growth in field grown strawberry production.

- | | | | |
|----------|---------|-------|---|
| Lord | William | H-375 | Multidisciplinary evaluation of new apple cultivars |
| | | | Twenty-two cultivars were established in 1999. Data on tree growth and development (including tree caliper, height and spread) as well as data on fruit production and quality is being collected for analysis. |
| Erickson | Peter | H-395 | Management systems for improved decision making and profitability of dairy herds |
| | | | Lactoferrin supplementation appeared to improve performance of young calves through increased growth and profitability by earlier weaning. This will likely result in increased milk production. |
| Kopsell | David | H-411 | Mild onion vegetable production in New England |
| | | | This new project began in 2000 and will not have reportable progress until next year. |
| Fischer | Paul | H-394 | A decision-support system for control of pH in soilless container |
| | | | A computer program, FloraSoil, has been developed for tracking soil test values in a greenhouse, which will aid and improve grower fertilizer decision-making. |
| Fischer | Paul | H-396 | Decision support for design and control of plant growth systems |
| | | | Collaborations have been initiated with Clemson University and Rutgers University in lighting-related projects for improved greenhouse lighting designs. |
| Knight | Susan | H-402 | Rural low-income families: tracking their well-being and functioning in the context of welfare reform |
| | | | Data indicate that the rural poor in New Hampshire have problems finding child care, finding employment that pays a living wage and maintaining their access to transportation. |

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)

Institution University of New Hampshire
 State New Hampshire

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

Actual Expenditures

Title of Planned Program/Activity	FY 2000FY 2001FY 2002FY 2003FY 2004				
William MacHardy H-19 _____	54,303	54,303	54,303	54,303	54,303
Charles Schwab H-366, H-368 _____	110,102	89,302	110,102	110,102	110,102
J. Brent Low H-387, H074 _____	57,720	57,720	57,720	57,720	57,720
William Lord H-383, H375 _____	23,485	23,485	23,485	23,485	23,485
Peter Erickson H395 _____	18,474	18,474	18,474	18,474	18,474
David Kopsell H-411 _____	4,221	18,474	18,474	18,474	18,474
Paul Fisher H-394, H-396 _____	42, 173	42, 173	42, 173	42, 173	42, 173
Susan Knight H-402 _____	8042	8042	8042	8042	8042
Catherine Neal H-413 _____	0	9,000	9,000	9,000	9,000
Assessments _____	16,416	16,416	16,416	16,416	16,416
Total	334,936	323,136	343,663	343,663	343,663

William R. Trumble
 Director

04/09/2001
 Date

Form CSREES-REPT (2/00)