Annual Report of Accomplishments and Results
October 1, 2000 to September 30, 2001

NEW HAMPSHIRE AGRICULTURAL EXPERIMENT STATION

COLLEGE OF LIFE SCIENCES AND AGRICULTURE

UNIVERSITY OF NEW HAMPSHIRE
DURHAM, NEW HAMPSHIRE

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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 changed its administrative structure. The Experiment Station continues to have a Director who reports to the Dean of the College of Life Sciences and Agriculture; but has restored the position of Assoc. Director of the AES that had been eliminated previously. 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. The AES administration is currently seeking the help of key individuals within the state to assist in establishing an AES Advisory Committee. Through this committee, we hope to improve stakeholder input and our delivery of research findings to end users.

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 agricultural products.

Overview:

The New Hampshire AES has established as an outcome indicator to increase the effectiveness of basic and applied projects related to New Hampshire agricultural needs. Additionally, 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, the number of NH farms remained stable (but greater than ten years ago) while the contribution to the State's Economy by the agricultural sector via the production of goods and services and net farm income decreased (from 94.9 to 93.4 million dollars and from 25.2 to 15.8 million dollars, respectively, in 1999 vs 2000 *). Total farm assets increased over the last year for which published results are available, from 938 million dollars to 955.2 million dollars in 1998 and 1999, respectively, but unfortunately, total farm debt also increased during this same period from 94.3 million dollars to 103.7 million dollars*

(*) Source: New England Agricultural Statistics, 2000 and 2001

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 contributes 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 I 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 Theme - Animal Production Efficiency

1. Improve supply of nutrients to dairy cows
   a. Brief description of the activity

Two projects are devoted to this issue. Considerable improvements in milk production and the efficiencies of conversion of feed nitrogen to milk protein can be realized by optimizing intestinal supplies of lysine and methionine. However, increasing intestinal supplies of lysine and methionine in ruminants requires dietary supplements of these amino acids designed to escape ruminal fermentation and yet be intestinally digestible. One project is focusing on screening available products to obtain accurate estimates of their bioavailability for lactating dairy cows. A second project is examining the ideal profile of essential amino acids in metabolizable protein for milk production.

b. Short Impact/Accomplishment Statement

Formulating diets to optimize the profile of absorbed amino acids is fundamental to maximizing the conversion of dietary protein to meat and milk protein and minimizing urinary and fecal loss

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

Source of funding:Hatch

Total expenditures: Federal - $83,072
State- 255,220
Total - 338,292

Full-time equivalents: Sci. 0.5; Tech 2.3; Lab&Cler. 1.6; Total 4.4

d. Scope of impact:

1) 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)

2) Multistate research (AL, AZ, CA, FL, IL, IN, IA, KS, MI, MN, MO, NE, NH, OH, PA, SD, WA, WI).

2. 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 contribute to a multistate effort to understand the

relationship between sub-luteal function, follicle development and fertility to enable design strategies to improve reproductive efficiency.

b. Short Impact/Accomplishment Statement
In lactating dairy cattle, postpartum estrous cycles with two vs three waves of follicular growth preceding insemination were observed at frequencies of 68 and 30 %, and resulted in pregnancy rates of 63 vs 81%, respectively. 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. Cows that became pregnant also had lower progesterone concentrations during the estrous cycle preceding insemination than cows that did not become pregnant. Greater understanding of the relationship between ovarian function and fertility may enable design of strategies to improve reproductive efficiency. To that end, matrix metalloproteinases and their endogenous inhibitors have been identified and their activities characterized throughout the lifespan of the corpus luteum.

c. Source of funding/total expenditures/full time equivalents (for 3 projects)
Source of funding: Hatch
Total expenditures: Federal - $98,294
State- 75,777
Total - 174,071
Full-time equivalents: Sci. 1.3; Prof 0.8; Lab&Cler. 0.2; Total 2.3

d. Scope of impact: Multistate Research (CTS, MA, ME, NH, NYC, OH, PA, WV)

3. Improving nutrition for dairy calves
a. Brief description of the activity
Initial investigations demonstrated that lactoferrin supplemented dairy calves consumed more grain, indicating earlier rumen development, and that they could be weaned at an earlier age. Current studies are aimed at determining the optimal level of lactoferrin supplementation for the preweaned calf.

b. Short Impact/Accomplishment Statement
Lactoferrin supplementation is expected to improve performance of young calves through increased growth. Profitability should increase due to earlier weaning and increased milk production.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $9,905
State- 28,669
Total - 38,574
Full-time equivalents: Sci. 0.1; Pro. 0.4; Total 0.5
d. Scope of impact: Multistate Research (AL, AZ, CA, FL, GA, IL, IN, IA, KS, LA, MI, MN, MO, NE, NH, NM, NYC, OH, PA, SD, TN, TX, VA, WA, WI)

4. Lobster habitats and survival

a. Brief description of the activity
Tracking instrumentation and methodology were developed to enable collection of information on the foraging area and home range of the American lobster. Tracking data have been compiled for several lobsters to date, with additional data still to be gathered.

b. Short Impact/Accomplishment Statement
By combining data on the foraging area and home range of the lobster with data concerning the area fished by a trap, it should be possible to estimate the density of lobsters per square meter of bottom more accurately than with other current methods. These data should greatly aid in the effective management of this valuable marine resource.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $43,408
State- 63,888
Total - 107,296
Full-time equivalents: Sci. 0.6, Pro. 0.8; Total 1.4

d. Scope of impact: State Specific

Key Theme - Animal Health

1. Genomic basis for resistance to avian diseases
a. Brief description of the activity
Crosses between different chicken genotypes indicate that tumor growth differs over time between different crosses. In one of the crosses, for which tumor growth was relatively high, the number of tumor sections testing positive for the presence of matrix metalloproteinase (MMP) 2 and 9 was greater. These results demonstrate genetic influences on tumor development, and the possible role of MMP's in mediating tumor invasion and progression.

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
Source of funding:Hatch
Total expenditures: Federal - $71,012
State- 202,302
Total - 273,314
Full-time equivalents: Sci. 0.7; Prof 1.1; Tech. 1.0; Lab&Cler. 1.0; Total 3.8
d. Scope of impact: Multistate Research (AL, AR, CA, CTS, DE, IA, NH, NYC, NC, PA, SC).

2. Characterizing avian tumor viruses

a. Brief description of the activity

Combinations of the regressive (B19) and progressive (B5) haplotypes were used to examine major histocom dose of the B19 haplotype when combined with the progressive B5 haplotype.

b. Short ImpactlAccomplishment 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

Source of funding:Hatch- animal health

Total expenditures: Federal - $4,361

Full-time equivalents: Total 0.0

d. Scope of impact: State Specific

3. Causes of soft shell clam decline

a. Brief description of the activity

Fish and shellfish disease diagnosis, treatment and prevention are among the most significant variables in aquaculture. Since a large portion of clams are susceptible to clam leukemia, leading to a decline in populations, molecular biology studies were undertaken to address this problem. Integral roles for p53 and p73 genes and their gene products have been demonstrated in clam leukemia, whereby lack of function of these proteins is related to their exclusion from the nucleus. It was hypothesized that if p53 and p73 proteins could be made to accumulate in the nucleus, then apoptosis should preferentially destroy leukemic cells allowing diseased clams to recover. Thus, the treatment of leukemic clams with etoposide was evaluated as a means to defeat the nuclear exclusion of these proteins. This treatment resulted in the apoptotic death of leukemic hemocytes.

b. Short Impact/Accomplishment Statement

Convincing evidence has been gathered that demonstrates integral roles for p53 and p73 genes and their products in clam leukemia. These studies also have provided a mechanism to successfully treat this clam disease, which can be applied for developing and maintaining leukemia-free seed stocks for the aquaculture industry.

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

Source of funding:Hatch

Total expenditures: Federal - $22,032
State- 9,228
Total - 31,260

Full-time equivalents: Sci. 0.2; Prof 0.1; Total 0.3

d. Scope of impact: State Specific

4. Management of arthropod pests of livestock and poultry

a. Brief description of the activity

Species complexes of economically important North American horse flies (Tabanidae) were studied in the southeastern and western United States. These included the Hybromitra sonomensis group, the Tabanus lineola and Tabanus nigrovittatus complexes, the Tabanus mularis complex and the Tabanus sulcifrons complex. Approximately 6000 specimens of the Hybromitra sonomensis group and 4000 Tabanus sulcifrons specimens were examined, to document critical distinguishing features and/or the range of variation in color and seasonal distribution throughout the eastern United States.

b. Short Impact/Accomplishment Statement

The work during the life of this project has provided the basis for accurately identifying members of some taxonomically difficult species groups within the Tabanidae. It also has pin-pointed those species groups that have remained resistant to accurate identification by anatomical features alone and which will require study by other methods (cuticular hydrocarbons, differences in proteins and other molecular or genetic techniques). Approximately 1000-3000 identification services per year have been performed for state and federal agencies throughout the United States and Canada.

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

Source of funding:Hatch
Total expenditures: Federal - $20,457
State- 6,858
Total - 27,315
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, NE, NH, NM, NC, NYC, OK, PA, TN, TX, WY, USDA-ARS, Canada)

Key Theme - Niche Market

1. Food system performance

a. Brief description of the activity

A proposal to evaluate consumer behavior and attitudes related to consumers purchasing directly from producers and attitudes towards preservation of open space has been developed.

b. Short Impact/Accomplishment Statement

This research will help agricultural producers develop strategies that will improve the direct marketing efforts to consumers, and strategies that governmental agencies and non-profit organizations can use to develop public support for efforts to preserve agricultural lands and open space.

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

Source of funding: Hatch
Total expenditures: Federal - $38,376
State- 21,503
Total - 59,879

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

d. Scope of impact: Multistate Research (NJ, MD, MT, NV, AZ, ND, CA, VA, MN, OH, IL, MI, RI, MA, IN, CTS, WI, GA, KS, LO, IA, FL, NYC, TX, NH, WA)

Key Theme - Plant Production Efficiency

1. pH and plant nutrition relationships

a. Brief description of the activity

This project has tested several options for liming soilless media when pH is excessively low, and for acidifying media or providing micronutrient supplements when pH is excessively high. The results have shown 40 ppm iron of iron-EDDHA or 80 ppm iron from iron DTPA to be appropriate corrective iron drench applications for floricultural crops at high media pH.

b. Short Impact/Accomplishment Statement

The resulting recommendations and knowledge on corrective strategies will allow greenhouse growers to avoid crop losses.

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

Source of funding:Hatch

Total expenditures: Federal - $33,714
State- 13,918
Total - 47,632

Full-time equivalents: Sci. 0.4; Prof 0.2; Tech 0.1; Cler&Lab 0.1; Total 0.8

d. Scope of impact: State specific

2. Control of plant growth systems

a. Brief description of the activity

High-pressure sodium lighting (HPS) was evaluated for effects on development of seedling nursery plugs. HPS during the plug stage hastened the flowering of petunia by 10 days and impatients by 0-7 days, depending on the cultivar.

b. Short Impact/Accomplishment Statement

Lighting of greenhouse plugs is relatively expensive technology, and lack of information limits its adoption. Current research coupled with economic analyses will help growers make informed management decisions and maximize return on investment in HPS.

c. Source of funding/total expenditures/full time equivalent Source of funding: Hatch

Total expenditures: Federal - $11,329
Total - 11,329

Full-time equivalents: Prof 0.2; Total 0.2

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

3. Genetics and breeding of Cucurbita

a. Brief description of the activity (2 projects)

Three hybrids with a compact or bush growth habit were produced from bush x bush line crosses, and fruit yield parameters of bush lines and respective hybrids compared.

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. Fifteen curcurbit varieties have been released over the past ten years as a result of this project and are being marketed commercially, with wholesale seed sales of about one million dollars.

c. Source of funding/total expenditures/full time equivalents (for 2 projects)

Source of funding:Hatch
Total expenditures: Federal - $77,438
State- 143,230
Total - 220,668
Full-time equivalents: Sci. 0.6, Prof 1.3; Cler&Lab. 0. 1; Total 2.0

d. Scope of impact:

1) State Specific
2) Multistate research (WV, MA, PA, DE, CTS, NYG, NH, RI, ME)

4. 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 tomato growers.

b. Short Impact/Accomplishment Statement

White interrow reflective mulch increased tomato yields by 28 to 39% over bare soil. Cumulative yield increases were first evident at the sixth harvest, and became more pronounced as the season progressed. Use of interrow white reflective mulch under field conditions is a new even nontrellised vegetable crops.

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

Source of funding: Hatch
Total expenditures: Federal - $13,848
State- 45,064
Total - 58,912
Full-time equivalents: Sci. 0.1; Total 0. 1

d. Scope of impact: State Specific

5. 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
Currently 5 New Hampshire farms and at least 25 other New England farms are employing this system based on this research. The 5 NH farms using this system are producing berries with an estimated annual crop value of $250,000. Ten other NH farms are testing this system. In addition, this system is of significant interest to the organic industry as it offers growers a management system that is potentially pesticide independent. Potential use of this system in NE should reach 300 acres of production with annual sales exceeding $5 million.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $33,793
State- 105,243
Total - 139,036
Full-time equivalents: Sci. 0.4, Tech 0.5, Cler&Lab. 0. 1, Total 1.0

d. Scope of impact: Integrated Research and Extension

6. Genetic control of strawberry
a. Brief description of the activity
Molecular tools are being use to assess genes of economic importance in strawberries. 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. A wide range of allelic variation has been noted for both the F3H and alcohol dehydrogenase genes. Additional studies are examining whether the same gene is responsible for the yellow color in two different varieties, and advanced segregants from a diploid mapping cross have been selected for a novel fruit color trait that may provide the basis for development of a new Alpine type diploid cultivar.

b. Short Impact/Accomplishment Statement
The results of these investigations are expected to 1) facilitate the use of molecular tools for the development of strawberry cultivars with desirable fruit color and other characteristics,

and 2) identify useful wild Fragaria germplasm as a source of genes for strawberry improvement.

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

Source of funding:Hatch

Total expenditures: Federal - $59,243
State- 35,135
Total - 94,378

Full-time equivalents: Sci. 0.5, Tech 0.5, Cler&Lab. 0.1, Total 1.1

d. Scope of impact: State specific

7. 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. Trees from the second planting (1999) produced their first crop in the autumn of 2001. Data have been collected on yield and fruit size, harvest date and starch-iodine and soluble solids indicators, tree height, spread and trunk cross sectional area, bloom date and bloom density.

b. Short Impact/Accomplishment Statement

The conversion of an industry largely dependent on McIntosh produced for the wholesale, fresh market to direct retail sales requires a major shift in the cultivar mix. Consumer demand is for crisp, high quality apples. This project has already identified one key new retail cultivar, Honeycrisp, which has become the most heavily planted cultivar over the past three years. It has also sparked intense consumer interest in locally produced apples. New cultivar choices for the consumer should facilitate the development of a vital, retail oriented apple industry.

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

Source of funding:Hatch

Total expenditures: Federal - $1,525
State- 12,820
Total - 14,345

Full-time equivalents: Sci. 0.1; Total 0.1

d. Scope of impact: Multistate Integrated Research and Extension (UT, OR, WA, NYG, NJ, PA, GA, OH, VT, MA, IN, WV, MI, CTH, NYC, NH, ME, AR, WI, NYG)

8. Conservation of plant genetic resources

This report has been included under #3 of this goal.

9. Role of ethylene in signal transduction in plants

a. Brief description of the activity

Microarray analysis of Arabidopsis was used to compare gene expression between the ethylene-insensitive mutant etr 1-1 and the constitutive ethylene response mutant ctr 1-2, using both light- and dark-grown seedlings. Genes were identified that were differentially expressed under only one or both conditions.

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 equivalent

Source of funding: Hatch
Total expenditures: Federal - $8,555
State- 42,309
Total - 50,864
Full-time equivalents: Sci. 0.4; Pro. 0.1; Total 0.5

d. Scope of impact: State Specific

10. Nutrient management for ornamental plants

a. Brief description of the activity

Nitrogen fertilization frequency and time of application are being investigated for effects on three deciduous woody species: Fraxinus pennsylvanica, Syringa vulgaris and Viburnum trilobum.

b. Short Impact/Accomplishment Statement

Development of fertilizer recommendations for trees and shrubs in produdion nurseries, and later in landscape situations, will result from these trials. Nutrient use efficiency is economically and environmentally important.

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

Source of funding: Hatch
Total expenditures:
Federal - $6,953
State- 4,158
Total - 11,111
Full-time equivalents: Sci. 0.3; Tech 0.5; Cler&lab 0.1; Total 0.9

d. Scope of impact: State specific

11. Nitrate reduction and oxygen deficit in plant roots.

This project was terminated early in the fiscal year due to a reassignment of the PI's responsibilities.

Source of funding/total expenditures/full time equivalents

Source of funding: Hatch
Total expenditures:
State- $8,246
Total - 8,246
Full-time equivalents: Total 0.0

12. Mild onion vegetable production
This project was terminated due to the relocation of the PI to another institution.

Source of funding/total expenditures/full time equivalents
Source of funding: Hatch
Total expenditures:
Federal- $517
Total - 517
Full-time equivalents: Total 0.0

Key Theme - Plant Health

1. Inhibition of photosynthesis by UV-radiation
a. Brief description of the activity
Two projects are assessing this issue. Some effects of ultraviolet light are known to be damaging to plants. These efforts are investigating 1) the relationship between UV-A and UV-B on photosynthesis, antioxidant responses and blue-light filtration by beta-carotene and 2) the possible role of UV-B radiation as an important component of environmentally based plant signaling.

b. Short Impact/Accomplishment Statement
Although only 10% of sunlight consists of ultraviolet radiation, it has disproportionately large effects on plants. Many of these effects are stressful, yet we do not understand how plant defenses are mobilized to limit oxidative stress. This project is examining some of these responses.

c. Source of funding/total expenditures/full time equivalents
Source of funding: Hatch
Total expenditures: Federal - $8,985
State- 67,322
Total - 76,307
Full-time equivalents: Sci. 0.4, Pro. 0.3; Total 0.7

d. Scope of impact: State Specific

2. 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
This study will lead to a better understanding of the role of polyamines in somatic embryo development as well as stress response in plants.

c. Source of funding/total expenditures/full time equivalents
Source of funding: Hatch
Total expenditures: Federal - $17,213
State- 40,391
Total - 57,604
Full-time equivalents: Sci. 0.2, Pro. 0.4; Total 0.6

d. Scope of impact: State Specific

3. Epidemiology and control of apple scab
a. Brief description of the activity
This project has been investigating the use of mixed-cultivar plantings comprised of cultivars differing in their susceptibility to scab as a new management practice.

b. Short Impact/Accomplishment Statement
This project has been terminated due to early retirement of the PI.

c. Source of funding/total expenditures/full time equivalents
Source of funding: Hatch
Total expenditures: Federal - $69,420
State- 44,607
Total - 114,027
Full-time equivalents: Total 0.0

d. Scope of impact: State Specific

Key Theme - Plant Genomics

1. Molecular biology of seed coat development in pumpkin
a. Brief description of the activity
This research is aimed at identifying genes that are differentially expressed in the wild type and hull-less seeds of pumpkin during their development.

b. Short Impact/Accomplishment Statement
Cloning of genes expressed specifically in the seed coat will lead to controlling the development of seed coat in different varieties of cucurbits to produce hull-less seeds.

c. Source of funding/total expenditures/full time equivalents
Source of funding: Hatch
Total expenditures: Federal - $12,569

Total - 12,569
Full-time equivalents: Sci 0.1, Total 0.1.

d. Scope of impact: State specific

2. 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 processes, 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

Source of funding:Hatch
Total expenditures: Federal - $15,149
State- 49,934
Total - 65,083
Full-time equivalents: Sci. 0.4, Pro. 0.5; Total 0.9

d. Scope of impact: State Specific

Key Theme - Aquaculture

1. Genetic improvement of tilapia for aquaculture

a. Brief description of the activity

Two experiments are devoted to this objective. Experiments have been conducted on various approaches for controlling the reproduction of females to maximize the yield of high-quality eggs for gynogenesis. The tilapia BAC library has also been screened to identify clones containing the microsatellites flanking QTL for sex and color.

b. Short Impact/Accomplishment Statement

Continued development of the genetic and physical maps for tilapia will allow the rapid identification of genes controlling economically important traits. In addition, the ability to generate completely inbred lines would provide a new approach to selective breeding. Hybrid crosses are expected to show strong heterosis and excellent uniformity, and might provide a mechanism for breed protection.

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

Source of funding:Hatch
Total expenditures: Federal - $52,679
State- 17,574
Total - 70,253

Full-time equivalents: Sci. 0.5, Pro. 0.5; Total 1.0

d. Scope of impact:
1. State specific
2. Multistate Reseach (AL, CA, CTS, NH, LA, VA)

2. Increased efficiency of producing sea urchin roe
a. Brief description of the activity
A demonstration hatchery system for green sea urchins has been established to promote aquaculture of sea urchins for both stock enhancement and sea ranching on leased sites. Four year classes (1998 - 2001) are being maintained in culture, while wild recruitment studies continue on sites in the Gulf of Maine.

b. Short Impact/Accomplishment Statement
Green urchin in the Gulf of Maine have recently shown a consistent decline in population, demonstrating the need for hatcheries or sea-ranching.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $4,991
State- 36,771
Total - 41,762
Full-time equivalents: Sci. 0.2, Pro. 0.3; Total 0.5

d. Scope of impact: State Specific

3. 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. It ha

b. Short Impact/Accomplishment Statement
A detailed understanding and description of pigmentation development in summer flounder is useful for tracking the appearance of pigmentation in production runs, and is essential for designing and interpreting experiments to analyze the basis of normal and abnormal pigmentation development. Such experiments should lead to more effective strategies for minimizing pigment defects that reduce market value and also render juveniles unsuitable for stock enhancement releases.

c. Source of funding/total expenditures/full time equivalents
Source of funding: Hatch
Total expenditures: Federal - $9,488
State- 39,912
Total - 49,400
Full-time equivalents: Sci. 0.4; Prof 0.3; Total 0.7

d. Scope of impact: State Specific

4. Photosynthesis-light relationships in the seaweed Porphyra

a. Brief description of the activity

This project seeks to identify the best candidate species for integrated aquaculture in which Porphyra will be used to remove excess nutrients from the wastewater of finfish tanks. Four native species have been identified and their response to stress conditions is being evaluated.

b. Short Impact/Accomplishment Statement

The evaluation of photosynthesis-light relationships in native species of Porphyra has contributed to the selection of the best candidate for polyculture. The species characterization work has instigated a significant taxonomic revision of the genus Porphyra in the Northwestern Atlantic.

c. Source of funding/total expenditures/full time

Source of funding:Hatch

Total expenditures: Federal - $19,867
State- 13,125
Total - 32,992

Full-time equivalents: Sci. 0.8; Prof 0.6; Tech 0.1; Cler&lab 0.1; Total 1.6

d. Scope of impact: State specific

Key Theme - Other

1. 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

Cloning and further characterization of mut genes will elucidate the function of each gene and the role of each in transposon control, RNAi and other processes in the C. elegans germ line. The work has direct implications for agriculturally important nematodes.

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

Source of funding:Hatch

Total expenditures: Federal - $25,215
State- 53,627
Total - 78,842

Full-time equivalents: Sci. 0.4; Pro. 0.9, Total 1.3

d. Scope of impact: State Specific

2. Character and control of yeast regulatory genes

a. Brief description of the activity.
This study is investigating the functional and physical interactions of yeast regulatory genes.

b. Short Impact/Accomplishment Statement
Several genes have been identified that appear to be involved in gene expression and mRNA degradation. Close connections have been demonstrated between two regulatory complexes that appear to control several aspects of gene expression. Since these protein complexes are found in all eucaryotes, these studies may have broad implications in understanding gene regulation in medically and agriculturally important organisms.

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

Source of funding:	Hatch
Total expenditures:	Federal - $15,903
	State- 42,719
	Total - 58,622
Full-time equivalents:	Sci. 0.4; Pro. 0.5, Total 0.9

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 2001 the New Hampshire Agricultural Experiment Station had 10.7 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 8.4 full-time equivalents of technical and clerical staff attached to these projects. Professioal help, in the form of graduate students doing research on these projects, amounted to 9.8 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 ensure that the foods produced are safe to eat.

Overview:

The New Hampshire AES has established output indicators for Goal 2 as follows: 1) increase research results from projects dealing with microorganisms that are potential harmful contaminants of foods and 2) increase understanding of the processes whereby harmful microbes carry out their infective and disease-causing processes. During the 2001 fiscal year, a newly-hired faculty member in The Microbiology Department submitted a new Hatch proposal that is currently under review. The research by this new faculty member will strengthen Agricultural Experiment Station support for Goal 2.

As outcome indicators, we evaluate 1) an absence or decease of bacterial contamination of foods and 2) the level of public awareness of the contribution of pathogenic microbes to animal and human illness. 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. We also support programs to enhance public awareness of food safety issues. In FY 2001, the AES supported a Controversial Issues Symposium on the topic of genetically modified organisms, that attracted between 350 to 400 participantts. The NH Agricultural Experiment Station also supported 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 Theme - Food Safe

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

Source of funding:	Hatch
Total expenditures:	Federal - $15,481
	State- 67,735
	Total - 83,216
Full-time equivalents:	Sci. 0.4, Pro. 0.3; Total 0.7

d. Scope of impact: State Specific

2. Host defenses against Salmonella

a. Brief description of the activity

This study is investigating the role of major outer membrane proteins in host cell recognition and response to Salmonella, and factors associated with the ability of neutrophils to kill various strains of this organism.

b. Short Impact/Accomplishment Statement

Salmonellosis continues to be a major foodborne disease in the United States and worldwide. By understanding the early events in infection and host response, we can develop intervention approaches for preventing clinical disease. This project has demonstrated an important role for t

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

Source of funding:Hatch
Total expenditures: Federal - $26,076
State- 30,344
Total - 56,420
Full-time equivalents: Sci. 0.2; Pro. 0.5; Total 0.7

d. Scope of Impact: State specific

3. 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 webs of NH lakes.

b. Short Impact/Accomplishment Statement

Potent liver toxins, called microcystins, were measured in whole lakewater and phytoplankton, and also their accumulation in zooplankton, bivalves, crayfish, fish and benthic sediments in cyanobacteria such as microcystins represent a potential health threat for recreational and water supply users.

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

Source of funding: Hatch
Total expenditures: Federal - $40,637
State- 3,986
Total - 44,623
Full-time equivalents: Sci. 0.2, Pro. 0.2; Total 0.4

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 2001 the New Hampshire Agricultural Experiment Station had 0.8 full time equivalents of scientists time assigned to Goal 2. Their research was funded with federal funds from the Hatch Program. 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 1.0 student. 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:

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 fiscal year 2001, the Medical Laboratory Sciences Program (from the College of Health and Human Services) was transferred to the College of Life Sciences and Agriculture. The transfer of one faculty member occurred and the search for another "new faculty hire" was initiated. All faculty members from the Medical Laboratory Sciences Program will be given the opportunity to submit AES Hatch project proposals, and one such proposal has been submitted and is currently under review. The addition of these faculty members to the 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 Theme - Human Health

1. Hormonal control of fat oxidation in adipose tissue

a. Brief description of the activity

This project investigated the role of sex hormones on energy and lipid metabolism of female swine.

b. Short ImpactlAccomplishment Statement

This study has demonstrated that imbalances in steroid hormones can produce a decrease in lipid disappearance and an increase in fat storage in prepubertal swine. These findings help explain the role that sex hormone imbalances may have in the etiology of obesity and

metabolic changes, and may provide a link between the association of sex hormone imbalances and development of chronic health conditions in women.

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

Source of funding:Hatch

Total expenditures: Federal - $18,238
State- 140,963
Total - 159,201

Full-time equivalents: Sci. 0.5, Pro. 0.1; Tech 1.8, Cler&lab 0.1,Total 2.5

d. Scope of Impact: State Specific

2. Control of adipose tissue metabolism

a. Brief description of the activity

This study examined whether acute exercise increased adipose tissue blood flow (ATBF) and if the ATBF response to acute exercise differed between exercise-conditioned and sedentary swine.

b. Short Impact/Accomplishment Statement

Blood flow controls the rate at which nutrients enter and metabolic products leave adipose tissue. These studies have shown that ATBF increases in response to a 20-minute bout of exercise, and that the response is similar in exercise-conditioned and sedentary swine.

Since swine and humans share physiological similarities, these results have implications for the role of exercise in human health.

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

Source of funding:Hatch

Total expenditures: Federal - $16,690
State- 57,860
Total - 74,550

Full-time equivalents: Sci. 0.5; Total 0.5

d. Scope of Impact: State Specific

3. 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 photorectors.

b. Short Impact/Accomplishment Statement

Cone photoreceptors in the retina of the eye are responsible for daytime vision as well as for color discrimination. Thus, any defect in the normal functioning of the cones is very serious and can result in blindness. Relatively little is known about cone receptors because they are less abundant and harder to purify compared to rod photoreceptors. The advances we have made in purifying and characterizing cone phosphodiesterase, the central enzyme in the cone

visual pathway, may help design therapeutic agents that can target the cone enzyme selectively.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $25,835
State- 54,951
Total - 80,786
Full-time equivalents: Sci. 0.4; Prof 0.5; Total 0.9

d. Scope of Impact: State Specific

4. Regulation of zinc transport
a. Brief description of the activity
This project is investigating the hypothesis that blood vessel endothelial cells comprise a permeable barrier with the potential of regulating inter-organ distribution of Zn.

b. Short Impact/Accomplishment Statement
This study has demonstrated that the walls of the blood vessels in the brain adapt their transport and metabolism of zinc in order to protect the brain from receiving sub-optimal quantities of zinc during periods of zinc malnutrition. While there is evidence that zinc malnutrition contributes to mental illness and brain disorders, their severity would likely be much greater without this protective mechanism. This study is attempting to identify the cellular components of this process.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $28,964
State- 42,681
Total - 71,645
Full-time equivalents: Sci. 0.6; Total 0.6

d. Scope of Impact: State specific

Key theme - Human Nutrition

1. Assessing the nutritional risk of the elderly
a. Brief description of the activity
To establish the determinants of macular pigment optical density (MPOD), retinal loci, dietary intake, anthropornetric status, serum carotenoid concentration and lipid status were assessed in 98 male and female human subjects aged 45 to 73 years.

b. Short Impact/Accomplishment Statement.
Factors that influence the bioavailability of dietary carotenoids for deposition in the retina as macular pigment may influence vision with aging. The results of this investigation show a relationship between body mass index and circulating triglycerides and the density of the

macular pigment. Fruit and vegetable intake in the higher versus lowest consumption groups was associated with more retinal pigment. Thus, health behaviors and their outcome may have a significant impact on vision health.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $13,686
State- 110,728
Total - 124,414

Full-time equivalents: Sci. 0.3; Prof 0.6; Tech 1.0; Total 1.9

d. Scope of Impact: Multistate Research (CTS, DC, ME, MD, MA, NH, NYC, RI)

2. Gender relationship to atherogenesis
a. Brief description of the activity
The expression of matrix metalloproteinases and tissue inhibitors of these proteinases was characterized in the coronary arteries of male and female Yucatan miniature swine on low and high fat diets.

b. Short Impact/Accomplishment Statement
Females on high fat diets developed more atherogenic plasma lipid profiles and greater arterial lesions than their male counterparts, and these differences were associated with the expression of matrix metalloproteinases and their naturally occurring inhibitors, the tissue inhibitors of matrix metalloproteinases. This research may help us understand the mechanisms by which atherosclerotic lesions form and the differences for risk of this disease between men and women.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $28,195
State- 98,537
Total - 126,732
Full-time equivalents: Sci. 0.5; Tech 0.5; Total 1.0

d. Scope of Impact: State Specific

3. Atherogenesis at the cellular level
a. Brief description of the activity
By using two different strains of pigeon, one susceptible and one resistant to atherosclerosis, this study is attempting to isolate the gene responsible for susceptibility or resistance to spontaneous atherosclerosis in pigeons.

b. Short Impact/Accomplishment Statement
Identification of the gene responsible for atherosclerosis in a simple model will allow subsequent evaluation of the effect of environmental or lifestyle risk factors (i.e., diet, stress,

lack of physical activity, etc.) on expression of the gene. This should help explain the development of atherosclerosis in more complex systems such as humans.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $15,334
State- 71,866
Total - 87,200
Full-time equivalents: Sci. 0.3; Prof 0.2; Total 0.5

d. Scope of Impact: State Specific

Theme - Food Quality

1. Gelation of Beta-Lactoglobulin A and B
a. Brief description of the activity
This study is investigating the mechanisms involved in beta-lactoglobulin (B-Lg) gel formation and stabilization.

b. Short Impact/Accomplishment Statement
Gel formation is an important functional property of B-Lg, and because of its nutritional value, B-Lg is included in many food products. Information regarding the mechanism of heat-induced gelation of B-Lg could be applied to the refinement of processed food characteristics.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $13,291
State- 60,514
Total - 73,805
Full-time equivalents: Sci. 0.4; Prof 0. 1; Total 0.5

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 2001 the New Hampshire Agricultural Experiment Station had 3.5 full time equivalents of scientist's time assigned to Goal 3. Their research was funded with federal funds from the Hatch and Multi-State Research Programs. There were 3.4 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 1.5 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 year's 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:

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 Theme - Air Quality

1. 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 use of native plants as bioindicators of ozone injury provided a low cost alternative to air pollution monitoring that is useful at remote sites. In addition, since plants integrate environmental factors, assessment of injury to native plants in situ provides a realistic measure of injury not

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

Source of funding: Hatch

Total expenditures: Federal - $3,124
State- 4,679
Total-7,803

Full-time equivalents: Total 0.0

d. Scope of Impact: Multistate Research (CA, GA, IA, IL, IN, MI, MN, NE, NH, OH, PA, UT, VA, VT, WI)

2. Tardigrade diversity as a bioindicator of sulfur dioxide pollution

a. Brief description of the activity

This study is evaluating the use of lichen health as a measure of sulfur dioxide pollution at study sites in Vermont, New Hampshire and Maine.

b. Short Impact/Accomplishment Statement

Electrolyte leakage and chlorophyll content measurements can provide good indicators for overall lichen health. Lichen collected in areas of higher sulfur dioxide concentrations will show an increase in cell membrane permeability and in chlorophyll content.

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

Source of funding:Hatch
Total expenditures: Federal - $23,870
State- 4,295
Total - 28,165
Full-time equivalents: Sci 0.3; Total 0.3

d. Scope of Impact: State specific

Key Theme - Biodiversity

1. Genetic diversity of northeastern conifer species

a. Brief description of the activity

The geographic distribution of red, black and white spruce has changed greatly since the last glacial maximum. Genetic approaches are being used to determine whether hydridization is a major factor in the evolution of conifers.

b. Short Impact/Accomplishment Statement

A strong correlation has been detected between chloroplast haplotype and longitude for black spruce, which is consistent with gene flow from the pollen parent on a west to east gradient. Also, a red spruce mitochondrial haplotype was detected among black spruce from the western Great lakes. This is well outside the range of red spruce, and suggests that the two species introgressed at some time during the migration from the Pleistocene refugia. Such information about the current population structure of important forest species will help us understand how trees migrated in response to previous cycles of climate change. This in turn will help us better understand how spruce will respond to ongoing changes in global climate.

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

Source of funding: McIntire-Stennis
Total expenditures: Federal - $26,126
State- 8,433
Total - 34,559

Full-time equivalents: Sci. 0.4; Total 0.4

d. Scope of Impact: State Specific

2. Forest management and plant biodiversity

a. Brief description of the activity

Intensive vegetation sampling is being used to examine vegetation dynamics in the College Woods natural Area of Durham, N.H.

b. Short Impact/Accomplishment Statement

Study of pitch pine barrens vegetation will allow more effective management of this rare and transitional community type. Projecting vegetation change in the College Woods Natural Area suggests management techniques to maintain tree diversity. Buckthorn is shown to have an impact on native forest ecosystems justifying certain control measures.

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

Source of funding:McIntire-Stennis
Total expenditures: Federal - $67,433
State- 71,308
Total - 138,741
Full-time equivalents: Sci. 1.0; Prof 0.4; Total 1.4

d. Scope of Impact: State specific

3. Floristic diversity in old growth forests

a. Brief description of the activity

A comprehensive botanical inventory of hardwood old-growth forests is being compiled to provide a baseline for long-term monitoring of important biological reserves and to serve as a basis for comparison between managed and unmanaged forests.

b. Short Impact/Accomplishment Statement

This project is critical to determining the level of biodiversity in New Hampshire's old growth forests to serve as a comparison between managed and unmanaged forests.

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

Source of funding: McIntire-Stennis
Total expenditures: Federal - $8,381
State- 49,748
Total - 58,129
Full-time equivalents: Sci. 0.1, Prof 0.2, Total 0.4

d. Scope of Impact: State specific

4. 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 invasive water plant species.

b. Short Impact/Accomplishment Statement

This study documents the rapid growth, high reproductive potential and broad physiological plasticity of one introduced species that 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

Source of funding:Hatch
Total expenditures: Federal - $11,847
State- 47,431
Total - 59,278
Full-time equivalents: Sci. 0.2; Prof 0.2; Total 0.4

d. Scope of impact: State Specific

5. Biodiversity of aquatic plants

a. Brief description of the activity

The diversity of tropical aquatic and wetland plants was evaluated and summarized in a bilingual field guide, and field studies have begun to compare biodiversity in created and natural wetlands in New Hampshire.

b. Short Impact/Accomplishment Statement

This project has demonstrated that the diversity of plants in the aquatic and wetland ecosystems of the tropics are less rich than those in New England, thereby highlighting the importance of conserving such ecosystems in the northeast.

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

Source of funding: Hatch
Total expenditures: Federal - $2, 219
State- 2,248
Total - 4,467
Full-time equivalents: Sci 0.1, Total 0.1

d. Scope of Impact: State specific

6. University of New Hampshire Herbarium

a. Brief description of the activity

The herbarium is maintained and curated as a critical resource for biodiversity, systematic and ecological plant studies. Recent growth included plant collections representing biodiversity in tropical and wetland habitats from Costa Rica and regional field collections from old-growth forests in New Hampshire.

b. Short Impact/Accomplishment Statement

The UNH Herbarium serves the state as an important resource documenting the flora of the region and is especially important as a repository of rare and endangered flora of New Hampshire and New England. Numerous identifications of plant materials are also provided for the public through this facility.

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

Source of funding:Hatch
Total expenditures: Federal - 0
State- 0
Total - 0
Full-time equivalents: Total 0.0

d. Scope of Impact: State specific

7. Soil microbial biodiversity response to land application of biosolids

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, and the effect of the amended wastes on microbial diversity are being evaluated

b. Short Impact/Accomplishment Statement

There have been no comparable studies of soil microbial community diversity change in response to application of biosolids. In addition to its general ecological value, such information, if available, would have considerable utility in monitoring the composting process, assessing op

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

Source of funding:Hatch
Total expenditures: Federal - $15,449
State- 8,264
Total - 23,713
Full-time equivalents: Prof. 0.4, Total 0.4

d. Scope of Impact: State Specific

Key Theme - Biological Control

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

A highly specific GnRH-III antibody was produced that successfully was used to test various GnRH analogs and can be further used in biological studies. A new method of sterilization

would be very useful in the field of sea lamprey control in the Great lakes as well as in certain fish maintained for aquaculture.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $29,322
State- 12,540
Total - 41,862
Full-time equivalents: Sci. 0.2; Pro. 0.3; Total 0.5

d. Scope of Impact: State Specific

2. 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
The gypsy moth egg hatch model, adjusted for slope aspect and elevation, should provide a valuable management tool for planning hatch sensitive control operations over a wide area.

c. Source of funding/total expenditures/full time equivalents
Source of funding:McIntire-Stennis
Total expenditures: Federal - $21,118
State- 5,457
Total - 26,575
Full-time equivalents: Prof 0.2; Total 0.2

d. Scope of Impact: State Specific

3. Hormonal control of beetle reproduction and rearing characteristics
a. Brief description of the activity
The goal of this research is to understand the role of juvenile hormone (JH) in the regulation of reproduction and reproductive behavior of burying beetles. JH hemolymph titers are beingevaluated in relation to breeding bouts and in relation to parental care of offspring.

b. Short Impact/Accomplishment Statement
JH appears to be important in regulating behavior especially during the later part of a
breeding bout. It does not appear to play a gonadotropic role in burying beetles. Burying beetles may serve as
beetles) are pests, and understanding the male and female endocrine pattern may aid in their control.

c. Source of funding/total expenditures/full time equivalents
Source of funding: Hatch
Total expenditures: Federal - $3,676
State- 54,809

Total - 58,485
Full-time equivalents: Sci 0.3; Prof 0.4; Total 0.7

d. Scope of Impact: State specific

Key Theme - Forest Resource Management

1. 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
Source of funding:McIntire-Stennis
Total expenditures: Federal - $18,007
State- 88,765
Total - 106,772
Full-time equivalents: Sci. 0.5, Pro. 0.5, Total 1.0

d. Scope of Impact: State Specific

2. 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
Decay fungi are suspected of transporting certain elements from the mineral soil into decaying wood, thereby replenishing the organic soil as the wood decays. It is also thought that this process occurs only when the decaying wood is at least several inches in diameter. If so, forest managen

c. Source of funding/total expenditures/full time equivalents
Source 'of funding: McIntire-Stennis
Total expenditures: Federal - $9,957
State- 7,451
Total - 17,408
Full-time equivalents: Sci. 0.1; Pro. 0.3; Total 0.4

d. Scope of Impact: State Specific

3. Measuring stocking and structure in N. H. forests

a. Brief description of the activity

Permanent plot measurements and hemispherical photography measurements were taken and are being used

b. Short Impact/Accomplishment Statement

Present results suggest a tentative interactive relationship between density indices and site index as predictors of leaf area and volume growth; however, that relationship contradicts the conventional assumptions underlying the utility of density indices and stocking diagrams. Hemispherical photography was unable to provide statistically significant or practically acceptable prediction. These results underscore the importance of new technologies for predicting growth an

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

Source of funding: McIntire-Stennis
Total expenditures: Federal - $28,278
State- 12,418
Total - 40,696
Full-time equivalents: Sci. 0.4, Pro. 0.2, Total 0.6

d. Scope of Impact: State specific

4. Remotely sensed forest vegetation mapping

a. Brief description of the activity

High spatial resolution imagery is being evaluated as a means for increasing the accuracy of forest vegetation maps for areas such as New England and the Great Lakes states where forests contain complexity and mixtures of tree species.

b. Short Impact/Accomplishment Statement

The use of higher resolution imagery and improved computer processing techniques offer the potential for producing better forest vegetation maps.

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

Source of funding:McIntire-Stennis
Total expenditures: Federal - $10,340
State- 75,944
Total - 86,284
Full-time equivalents: Sci. 0.5, Pro. 0.1, Total 0.6

d. Scope of Impact: State specific

5. 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. The effect of nitrogen availability on the up- or down-regulation of polyamine biosynthesis is being investigated.

b. Short Impact/Accomplishment Statement
New insights have been provided into the regulation of polyamine metabolism in plants and its relationship with the availability of nitrogen and its effects on metabolism of amino acids.

c. Source of funding/total expenditures/full time equivalents
Source of funding:McIntire-Stennis
Total expenditures: Federal - $24,360
State- 44,412
Total - 68,772
Full-time equivalents: Sci. 0.2; Prof 0.6; Total 0.8

d. Scope of Impact: State Specific

6. Potential for forest ecological reserves (2 projects)
Both of these projects have been terminated upon the relocation of one PI to another institution.

Source of funding/total expenditures/full time equivalents
Source of funding:McIntire-Stennis
Total expenditures: Federal - $7,220
State- 18,592
Total - 25,818
Full-time equivalents: Total 0.0

Key Theme - Water Quality

1. Eelgrass nutrient pollution indicator
a. Brief description of the activity
The goal of this project is to develop a new plant-based indicator for the early detection of coastal nutrient pollution problems.

b. Short Impact/Accomplishment Statement
This project will establish eelgrass plant parameters as a robust early indicator of estuarine and coastal nutrient pollution in New England, called the Nutrient Pollution Indicator (NPI). At relatively low cost and using preexisting technology, the NPI will give managers and scientists information on the nutrient status of coastal waters before obvious eutrophication occurs.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $10,466
Total - 68,772
Full-time equivalents: Total 0.0

d. Scope of Impact: State specific

2. Insect-based water quality statements

a. Brief description of the activity

Generic richness, species richness and the abundance of individuals are being evaluated in relation to surface water quality, especially as influenced by urban runoff and acid waste contamination. These data are being used to develop a species identification manual with tolerance values for use in developing water quality statements.

b. Short Impact/Accomplishment Statement

The key to species will allow individuals studying water quality as sites in New Hampshire to indicate the biotic index based on the aquatic insect species found at the site. This will allow rapid and more precise assessment of water quality when using aquatic insects to make statements on water quality.

c. Source of funding: Hatch
Total expenditures: Federal - $28,085
State- 109,290
Total - 137,375
Full-time equivalents: Sci. 0.9; Total 0.9

d. Scope of Impact: State specific

3. Rotavirus and hepatitis A persistence in Class B limed sludge (2 projects)

a. Brief description of the activity

A bench scale model of lime stabilization, as would occur in a treatment plant, has been designed and is being used to evaluate the effects of a lime stabilizing treatment on the survivability of human pathogens. A second study is assessing the survival and long-termoutcomes of pathog

b. Short Impact/Accomplishment Statement

Using lime to reduce or eliminate pathogen content is a cost-effective treatment method that is currently being used in almost all Class B biosolids production plants in New Hampshire. Evaluation of the lime stabilization technique to demonstrate that it is sufficient to inactivate Hepatitis A, Rotavirus and Poliovirus is necessary to begin to ease the uncertainties and minimize the risks associated with the land application of Class B sludge to land.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $589
State- 5,784
Total - 6,373
Full-time equivalents: Prof 0.2; Total 0.2

d. Scope of Impact:
1) State specific
2) Multistate research (MA, NJ, PA, NYC, NH)

4. Application of sewage biosolids to agricultural soils

a. Brief description of the activity

The impacts of multiple applications of biosolids on groundwater quality are being studied by sampling water quality in wells installed in upslope and downslope of the treatment area.

b. Short Impact/Accomplishment

This is a new project, for which results will be reported next year.

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

New project, to be reported next year.

d. Scope of Impact: Multistate research (MA, NJ, PA, NYC, NH)

Key Theme - Wetlands Restoration and Protection

1. Iron speciation in spodosols and wetland soils

a. Brief description of the activity

A method for speciating iron in solutions from seasonally-saturated forest soils has been developed, and is being used to study the movement of iron released from soils and into groundwater in the spring.

b. Short Impact/Accomplishment Statement

The results thus far suggest that iron, in tandem with organic compounds from the upper soil horizons, is mobile in receding water tables; other metals may parallel iron and be released from soils into groundwater in the spring. The method developed in this study may be applied to study other metals in solution. Also, it appears that soil color may be influenced by both dissolved organic compounds as well as oxygen depletion, and wetland delineation should be performed with both processes in mind.

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

Source of funding:Hatch

Total expenditures: Federal - $23,571
State- 41,985
Total - 65,556

Full-time equivalents: Sci. 0.4; Prof 0.9; Total 1.3

d. Scope of Impact: State specific

Key Theme - Wildlife Science and Management

1. White-tail deer energetics

a. Brief description of the activity

Metabolizable energy intake (MEI) was measured in deer and correlated with monthly basal metabolism (BMR), to determine if increased MEI was a factor in the autumnal increase in BMR and associated rapid fat deposition.

b. Short Impact/Accomplishment Statement

The lack of a relationship between MEI and BMR of ad libitum and maintenance deer indicated that increased autumnal BMR is not a function of increased MEI.

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

Source of funding:McIntire-Stennis
Total expenditures: Federal - $22,531
State- 115,380
Total - 137,911
Full-time equivalents: Sci. 0.7; Prof 0.4; Total 1. 1

d. Scope of Impact: State Specific

2. Small animal populations and forests (3 projects)

a. Brief description of the activity

One study is examining the demographic responses of snakes and turtles to habitat fragmentation in New England. A second is examining the diversity and abundance of small mammal communities in a large urban preserve, while the third is investigating the functional role of two-lined salamanders and brook trout as predators in forest stream food webs.

b. Short Impact/Accomplishment Statement

The first of these projects has demonstrated that populations of reptiles are sensitive to land use changes. The specific results should enhance the ability of natural resource agencies to improve the long-term survival of populations of reptiles currently threatened with regional or global extinction. The second investigation documented the presence and density of eight species of small mammals in the largest tract of undeveloped forest in the City of Manchester, N.H. This investigation demonstrated that a diverse and abundant small mammal community can exist in a large urban preserve. Due to an injury to one of the project participants, work on the third project has been delayed; results will be reported next year.

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

Source of funding:McIntire-Stennis
Total expenditures: Federal - $42,492
State- 93,729
Total - 136,221
Full-time equivalents: Sci. 0.9; Prof 0.7; Total 1.6

d. Scope of Impact: State specific

Key Theme - Other

1. 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 lead 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

Source of funding:Hatch

Total expenditures: Federal - $20,722
State- 18,472
Total - 39,194

Full-time equivalents: Sci. 0.3, Pro. 0.3, Total 0.6

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 2001 the New Hampshire Agricultural Experiment Station had 7.5 full time equivalents of scientist's 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 amounted to 5.5 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:

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 Theme - Community Development

1. Improvement of rural and agricultural sample survey methods

a. Brief description of the activity

Four mail questionnaires and two alternative data collection strategies were conducted to survey public attitudes on a number of community issues and also to investigate the effects of personalization on response rates and non-response bias.

b. Short Impact/Accomplishment Statement

This project provided the opportunity to integrate experiments, each of which addressed substantive research issues. The integration of experiments into applied research projects improves the credibility of the data collected and provided technical assistance that minimizes response and measurement error.

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

Source of funding:Hatch
Total expenditures: Federal - $11,241
State- 11,961
Total - 23,202
Full-time equivalents: Sci 0.3; Pro. 0.5; Total 0.8

d. Scope of Impact: Multistate Research (AZ, CA, IA, ID, MT, NH, NY, OR, PA, WA)

2. Rural economic development alternatives in the northeast (2 projects)

a. Brief description of the activity

One project is focused on the growing shortage of affordable rental and owner-occupied housing in Eastern MA, Southern N.H. and Maine, which has become a major concern of area business leaders and advocates for housing for the low-income population. This research investigates alternatives for providing additional affordable workforce housing and involves the development of several budget case scenarios for housing development. The second project is assessing the economic impact of a once dominant pulp and paper industry in chiefly rural, Coos County, New Hampshire.

b. Short Impact/Accomplishment Statement

In addressing the affordable housing issue, local municipal planning boards, real estate developers, and housing providers will benefit from information on the expected economic and financial consequences of alternative land use and affordable housing strategies. Similarly, from the economic impact analyses of employment in the pulp and paper industry, state and local agencies concerned about possible plant closings could make use of the findings when

considering alternative policies, including subsidization on the current existing plant or attracting alternative industries.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $10,525
State- 148,029
Total - 158,554
Full-time equivalents: Sci 0.8; Prof 0.4; Total 1.2

d. Scope of Impact: Multistate research (VA, SC, AZ, WI, UT, PA, NYC, KY, NV, DE, WA, NH, IA, OH, GA, RI, ND, IN, MN, NC, CO, OR)

3. Transborder forestry relations
a. Brief description of the activity
A mail survey of 163 sawmills in Quebec, Canada was used to determine the mill dependency on logs imported from Northern New England, and to assess the relationship of forest dependence on unemployment, female unemployment, and low educational attainment of the population.

b. Short Impact/Accomplishment Statement
Results indicate that criteria and indicators of sustainable forestry related to preferences to local employment and processing should be modified to account for bioregions that transcend international boundaries. Results also suggest that analysts of community dependency of forest resources will find the forestry reliance index to have a better representation of dependency on the forestry sector that Shannon Weaver Index or Location Quotient.

c. Source of funding/total expenditures/full time equivalents
Source of funding:McIntire-Stennis
Total expenditures: Federal - $13,715
State- 77,567
Total - 91,282
Full-time equivalents: Sci. 0.4, Pro. 0.5, Total 0.9

d. Scope of Impact: State Specific

4. Economic considerations in municipal solid waste disposal
a. Brief description of the activity
This research is focusing on the effect of unit-based pricing, in which waste management fees are unbundled from property taxes, on waste production and recycling.

b. Short Impact/Accomplishment Statement
Previous studies have shown that unit pricing can decrease waste production and increase recycling, but long-term impacts have not been evaluated. Additional information on the overall impact of unit pricing will be valuable in the policy making process at the state and local levels.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $24,298
State- 43,014
Total - 67,312
Full-time equivalents: Sci. 0.5, Total 0.5

d. Scope of Impact: State specific

5. Benefits and costs of resource policies
a. Brief description of the activity
A biosolids survey was sent to 500 property owners in one N.H. community, in which biosolids are being applied to agricultural land, to assess the public's awareness of the costs and benefits of this practice.

b. Short Impact/Accomplishment Statement
These results suggest that resident awareness was very low regarding the land application of biosolids in their town. Media and town officials may need to be more aggressive in obtaining citizen input.

c. Source of funding/total expenditures/full time equivalents
Source of funding:Hatch
Total expenditures: Federal - $40,460
State- 25,656
Total - 66,116
Full-time equivalents: Sci. 0.4, Total 0.4

d. Scope of Impact: Multistate research (CA-B, CA-D, CO, CT, IA, MA, MI, MN, MT, NH, NM, NV, OH, OR, TN, UT, WA, NV, WY)

6. 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
Source of funding:Hatch
Total expenditures: Federal $2,999
State- 1,453
Total 4,452
Full-time equivalents: Total 0.0

d. Scope of Impact: Multistate Integrated Research and Extension (IN, MI, MN, MO, OH, CA, CO, ID, KY, LA, MA, NH, OR, UT, WY)

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 2001 the New Hampshire Agricultural Experiment Station had 2.4 full time equivalents of scientist's 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 amounted to 1.4 students. For this goal, there were 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. Stakeholder 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

The response from stakeholders has not been sufficient. Therefore, the AES has begun to solicit assistance from key individuals from within N.H. who will contribute to the establishment an AES Advisory Committee. The first meeting with these individuals will occur later this month. The Advisory Committee will be constituted with representatives appropriate for the five goals of the NH AES. In addition, work is underway to develop databases in preparation for conducting a series of major stakeholder surveys. Other efforts to reach and interact with a cross-section of stakeholders include the following:

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. A semi-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. The topic in fiscal year 2001 was genetically modified foods. Between 350-400 persons attended and a panel discussion provided excellent stakeholder input.

3. We continue to use a Research Advisory Committee to assist the Agricultural Experiment Station administra

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 attended meetings with 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.

9. The NH AES (Director and Associate Director) participated in hosting the NESA (Northeast Student Affiliate) competition for animal science undergraduates.

10. The Associate Director addressed the annual state Grange meeting and attended the annual N.H. Farm Bureau meeting.

B. Statement of the process used to identify stakeholders and collect input.

The Agricultural Experiment Station Administrators 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 Administrators presented talks at various grower group meetings, as well as the Grange and Farm Bureau, to meet stakeholders and obtain input. The AES Administrators 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 Administrators frequently travel 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 has been incorporated into AES policy. Concerns over AES-funded projects that might better 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 Genetically Modified Foods. 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. Additionally, the AES has begun efforts to establish an Advisory Committee that will assist the AES in identifying important current and emerging needs, and to advise the AES on matters such as preferred mechanisms for achieving the timely delivery of research findings to end users.

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 AES Director to discuss the project and a decision is made as to whether this can be supported with either of these two funds, 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 performed 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 Administrators use this recommendation and their 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 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 multi-state and joint activities that are planned programs listed in our POW. Each area and project addresses 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
- 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.

2. 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 underrepresented and under-served populations, most of the 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.

3. 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. Some 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

- Ruminally protected amino acids can lead to increase milk protein and more efficient utilization of dietary protein, thereby reducing levels of nitrogen excretion in dairy manure.

- 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 snake food for consumers.

- Growers 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.

- Work is under way in to enable 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.

- Information was generated to assess the effect of unit pricing on waste production and recycling within communities.

- 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.

- Hatch related research of two NH AES investigators resulted in receipt of a large IFAFS grant to study factors affecting carotenoid levels in plants and the effect of carotenoids on vision

- The Hatch related research of one NH AES scientist provided the basis for new and substantially revised NRC guidelines on the protein and amino acid requirements of dairy cattle

4. 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. Multistate 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 reopened 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

From the table of integrated projects below, one may see that the NH AES spent $345,399 of a combined Federal allocation for Hatch and Multistate of $1,380,169. 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. 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

Name	Project Number	Project description	FY 2001	
MacHardy William	H-197	Epidemiology and control of apple scab	Federal $	69,420
Schwab Charles	H-366	Metabolic Relationships in supply of Nutrients for lactating cows	Federal $	41,224
	H-368	Management systems for improved decision making and profitablity of dairy herds	Federal $	41,848
Loy J. Brent	H-387	Conservation and utilization of plant genetic resources	Federal $	5,429

	H-074	Genetics and breeding of cucurbits	Federal $	72,009
Lord William	H-383	Intensive Production of strawberries	Federal $	33,793
	H-375	Multidisciplinary evaluation of new apple cultivars	Federal $	1,525
Erickson Peter	H-395	Management systems for improved decision making and profitability of dairy herds	Federal $	9,905
Kopsell David	H-411	Mild onion vegetable production in New England	Federal $	517
Fisher Paul	H-394	A decision-support system for control of pH in soilless container media	Federal $	33,714
	H-396	Decision support for design and control of plant growth systems	Federal $	11,329
Knight Suzann	H-402	Rural low-income families: tracking their well-being and functioning in the context of welfare reform	Federal $	2,999
Neal Cathy	H-413	Nutrient management for production and maintenance of ornamental plants	Federal $	6,953
Assessments			$	14,734
TOTAL			$	345,399

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 folliage (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 ruminally protected amino acids can be used to enhance protein utilization and 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 Brent H-387 /H-074 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 are 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

Kopsell David H-411 Mild onion vegetable production in New England

This project was terminated due to relocation of the PI.

Fisher Paul H-394 A decision support system for control of pH in soilless container

Investigations on options for liming soilless media when pH is excessively low or high have resulted in recommendations and strategies to allow greenhouse growers to avoid crop losses.

Fisher Paul H-396 Decision support for design and control of plant growth systems

Investigations are providing information that will allow improved greenhouse lighting designs.

Knight Suzann 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.

Neal Cathy H-413 Nutrient management for production and maintenance of ornamental shrubs

Development of fertilizer recommendations for trees and shrubs in production nurseries, and later in landscape situations, will result from these trials. Nutrient use and efficiency are economically and environmentally important.