2006 Annual Report of Accomplishments and Results

The Connecticut Agricultural Experiment Station

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TABLE OF CONTENTS

Executive Summary (Overview)

The primary mission of The Connecticut Agricultural Experiment Station ("Station") is research, and staff members work to meet the needs of all residents. The main laboratories are located in New Haven, while a 75-acre research farm and a small laboratory facility are located in Hamden and Windsor, CT, respectively. Since these facilities are located in urban and suburban settings, Station scientists are able to reach a broad base of stakeholders. The institution is not a university, and no federal funds are received for education or extension. However, federal formula and grant funds are received for research. Discoveries are promptly reported to the public in different venues, and efforts are made to include growers and other stakeholders in planning research projects. Outreach programs have been successful in meeting the needs of the under-served and under-represented. Moreover, extra efforts have been made to reach youth, an underserved group. Collaborations continue between the institution's scientists and extension specialists at the University of Connecticut and other land-grant universities and, thereby, continue to disseminate new findings to diverse groups of stakeholders. State appropriations continue to exceed amounts of federal Hatch funds. The latter, however, continue to play an important role in our ability to respond quickly to emerging problems, conduct relevant research, and to meet the needs of society.

As in the past six years, we are once again pleased to report progress that benefits stakeholders. In many instances, the results obtained over the duration of the original and updated Plans of Work can now be more easily assessed regarding their immediate and long-range impacts on these people. Outcomes have resulted in economic, health, or environmental benefits or behavioral changes in stakeholders. The research accomplishments reported herein align with some focus areas of the CSREES budget: improved pest control, invasive species issue, organic agriculture, the importance of small farms, sustainable agriculture and forestry, food safety, and water quality. The research activities and other efforts at The Connecticut Agricultural Experiment Station are strongly supported by stakeholders of different racial and ethnic backgrounds, who in some instances call problems to our attention. State residents have access to Station facilities and research information and are given opportunities to see laboratories and experimental plots, meet scientists, comment on research findings, and to request new research initiatives as the needs arise.

Research projects at The Connecticut Agricultural Experiment Station focus primarily on national priorities and federal (USDA) goals on improving the agricultural production system to be

highly competitive in the global economy (goal #1). Food safety, bioterrorism, and environmental issues remain important concerns of stakeholders. Accordingly, there are some activities associated with USDA national goals #2 and #4, respectively. Some research projects described herein also address goal #3 ("A healthy, well-nourished population") and goal # 5 ("Enhanced economic opportunity and quality of life for Americans"). Details on how all 5 national goals are being met are described in the updated *Planned Program* sections. As required, this Annual Report of Accomplishments and Results includes financial data for federal FY2006. The research results and impact statements are primarily linked to FY2006 activities, but collective results for this updated Plan of Work cycle are described to show short and long-term benefits to society.

Most of the research efforts are designed to promote the competitiveness of our agricultural system in an expanding global economy. Many research initiatives are directed at adding value to new and old agricultural products, increasing profitability, encouraging energy efficiency, reducing the use of pesticides, and improving soil and water quality, plant health, and agricultural production. Multistate and integrated activities increase efficiency and enable us to make progress on a wide range of problems during times when funding and other resources have declined. Stakeholders have requested assistance on studying soybean and rapeseed crops for biodiesel fuel production, a new initiative; identifying insects that attack crops, diagnosing plant diseases, treating diseased and infested plants with minimal amounts of pesticides or by cultural practices, and on growing vegetables organically. Integrated Pest Management (IPM) practices are being accepted by growers. It is important to develop new analytical methods and to refine older methods in our efforts to detect and quantitate pesticide residues and unwanted chemicals in soil, air, food, and drinking water. Finally, with increased amounts of imported goods, there is a need to survey our nurseries, orchards, vegetable crops, and forests for exotic, invasive insect and plant species and to take corrective action when problems arise.

Highlights of major accomplishments and impacts in Hatch/state-supported program **goal #1** are as follows:

1. The newest melons in the marketplace are seedless miniature "personal" watermelons weighing 3 to 7 pounds each. The cultivars "Extazy" and "S133" had the greatest yields (43 tons per acre). At a retail price of $4.99 per melon, the potential gross market value of one acre of production is about $62,000. The expected market value for 33 acres of potential production in Connecticut farmlands is $2,460,000.

2. Jilo is a solanaceous plant akin to eggplant. Popular in Brazilian populations, this vegetable is used in stews and sweet and sour mixes with pork and chicken. Field experiments revealed high yields of about 11 pounds per plant when plots were mulched. At a retail price of $4.99 per pound, the potential gross market value of produce per half acre is about $149,500.
3. Field tests revealed that pyrethoid insecticides effectively controlled the small Japanese cedar longhorned beetle on arborvitae. Following proper treatment, 885,370 pest-free arborvitae plants (valued at about $30,598,390) are being grown in Connecticut nurseries for future sales in local or out-of-state markets.
4. Fruit growers in Connecticut requested evaluations of plum cultivars in the hope that this minor specialty crop could be grown to diversify farming operations. Cultivar "Friar" yielded about 122 pounds per tree. At a retail price of $2.29 per pound, the potential market value for plums from one tree is about $279. For 15 acres of actual production, the potential gross market value is $606,825.
5. Public interest in heirloom tomatoes has increased. Field tests of different cultivars revealed a yield of 22 to 24 pounds per plant for four cultivars; 60 plants yielded about 1,380 pounds. At a retail price of $0.69 per pound, there is a potential gross crop value of $70,480 per acre. For 50 acres of actual production in Connecticut farmlands, the crop is valued at about $3,520,000.
6. White pine weevils attack white pine trees and cause damage in nurseries and landscapes. The insecticide bifenthrin effectively controlled this pest. On one large farm, $8,000 was saved in pesticide usage for a short-term benefit, compared to the use of Lorsban. The expected long-term impacts include continued profitability for growers, a cleaner environment, and the use of a less toxic insecticide, which will reduce human health risks.

Goal 1: Federal Hatch Funds ($431,667), State Funds ($2,780,172), Scientist Years (16.2)

Food quality and potential bioterrorism of our food and water are important public issues. Residents have requested that we conduct analyses for pesticide and other chemical residues in the food supply. At the request of The Connecticut Department of Consumer Protection, annual market basket surveys and analyses of food items were conducted.

Highlights of major accomplishments and impacts in program **goal #2**, which had support from Hatch and state funds, are as follows:

1. Surveys of farm crops were conducted in Connecticut to check produce for pesticides and other unwanted chemicals. A violation occurred in bell peppers. Concentrations of the pesticide chlorothalonil (0.06ppm) were above federal tolerance levels. These results had immediate impact because the entire crop was destroyed before it reached the market. The growers also willfully destroyed a crop of eggplant due to misapplication of the same pesticide. The short-term benefit is that contaminated food was not consumed by people. Long-term benefits include grower awareness of a food monitoring program and safe foods for human consumption.

Goal 2: Federal Hatch Funds ($119,972), State Funds ($215,275), Scientist Years (2.5)

Research objectives in program **goal #4** are designed to address a variety of environmental problems and issues that are of interest to stakeholders. Arthropod-transmitted pathogens that cause tularemia, Lyme disease, anaplasmosis, ehrlichiosis, babesiosis, or encephalitis affect humans and domesticated animals. Monitoring for changes in the natural occurrence of these infections, developing methods of tick control, and improving laboratory diagnosis meets the immediate critical needs of stakeholders. There continues to be grower interest in learning about heavy metal and pesticide contamination of soil and water, more efficient plant nutrient management in greenhouses, developing composting methods, and in implementing integrated pest management (IPM) practices. Deer populations continue to rise, and with damage to crops and motor vehicle accidents caused by these animals, research on reducing deer was continued.

Highlights of major accomplishments and impacts in program **goal #4**, which had support of Hatch and state funds, are as follows:

1. Municipal officials are relying on farmers to dispose of leaves in the form of compost. Onion plots amended with compost resulted in higher yields. At a retail price of $1.29 per pound, there is a potential increased crop value of $19,199 per acre associated with the use of compost. For 7 acres of actual onion production, there is a gross crop value of about $69,304. Expected impacts

include profitability for farmers in rural areas and less urban land space being devoted to composting.

2. Studies were conducted in greenhouses to improve the quality of tomatoes and to reduce labor costs. The use of shade cloth, applied over a greenhouse, reduced the number of fruit with cracked skin. With more marketable fruit produced, there was less need for workers to cull unmarketable fruit. On a per greenhouse basis, there were savings of about $60.00. There are about 70 greenhouses where tomatoes are being grown statewide. Therefore, there was a savings of about $4,200 in labor costs.
3. There were 217 isolations of the West Nile encephalitis virus following the analyses of 197,793 mosquitoes in Connecticut. There were an additional 3 isolations of Eastern Equine Encephalitis virus and two isolates of Trivittatus virus. The majority of infected mosquitoes were from densely populated urban and suburban areas of the southern part of the state. Public health officials were notified, residents were advised to minimize mosquito bites, and local health departments treated major mosquito-breeding areas. Although there were 9 human cases and one fatality, these measures to increase public awareness provided opportunities to educate the public about encephalitis during this reporting period.
4. Tularemia is caused by a bacterium, *Francisella tularensis*, and can occur in rabbits, human beings, and other mammals. Ticks can transmit the pathogen. Analyses of cat sera revealed that this disease occurs in Connecticut but at low prevalence. These results were reported to veterinarians. The expected long-term benefits are that cats can be used to monitor tularemia in nature; with antibiotic therapy, cats can be successfully treated.
5. Powdery mildew can cause damage to pumpkins, a crop grown on about 1,559 acres in Connecticut and worth about $2 million annually. Fungicides are currently used for control. Weekly foliar applications of 50% by volume aqueous solution of whole milk, skim milk, or powdered milk delayed the onset and severity of powdery mildew. This finding resulted in a savings of about $68 per acre in fungicide costs. The projected estimated savings for 1,559 acres would be about $106,000. Expected long-term benefits are increased profitability for growers, a cleaner environment, and less human exposure to pesticides.
6. Efforts were continued to teach nursery growers to adopt IPM practices and thereby, decrease amounts of pesticides used. Compared to pre-IPM status, there was a decrease of total active ingredient of insecticide/miticide used by 6.2 pounds on two small nurseries for a short-term

benefit of $104. It has been estimated that if similar IPM practices could be implemented on a large nursery of 100 acres, the cost savings would be about $2,080. Further cost savings for 8,730 acres of nursery production statewide would be about $180,000. Success at nursery operations is enabling the effort to be extended to other growers. This change in attitude among growers will help achieve long-term benefits of having a cleaner environment and reduced risks of pesticide exposure to the users.

Goal 4: Federal Hatch Funds ($200,350), State Funds ($2,764,708), Scientist years (17.1)

There are new accomplishments during this reporting period that benefited a broad and diverse group of stakeholders by helping to solve immediate problems. Meaningful results were reported to clientele and stakeholders in meetings, via the media, in written reports, on the station's website (http://www.caes.state.ct.us), or by other means described later. There was continued good balance in the scope of impact with a mixture of multistate and state-specific projects.

The USDA-approved multistate Hatch research projects (NE-009, NE-183, NE-187, NE-1017, NE-1019, NE-1020, NE-1025, S-1024, and W-1082) allowed for extensive scientific collaborations during times when individual experiment stations have had to reduce resources due to budget cuts and loss of staff positions. Enhanced interdependency among scientists has led to research progress. Other less formal multistate collaborations also exist and have yielded positive returns. The interaction with extension specialists, in particular, allowed for greater dissemination of new information to broader audiences and provided research scientists with different perspectives on stakeholder needs and concerns. The Hatch funds were efficiently utilized and are acknowledged in peer-reviewed publications. Hard copies of stakeholders' letters are also available on request as examples to show residents' satisfaction for the services and research results they received.

Introduction

This seventh Annual Report of Accomplishments and Results is submitted to comply with the Agricultural Research, Extension, and Education Reform Act (AREERA) of 1998 and is consistent with the approved updated Plan of Work. The Connecticut Agricultural Experiment Station (referred to as the "Station" in this report) is unaffiliated with a university and does not receive federal funds for extension or education. Federal Hatch and McIntire-Stennis funds are received for research,

however. Accordingly, the accomplishments and impacts reported herein are based on the Station's research program. As required by federal legislation, some research programs are linked to extension units at universities, and information on research findings was disseminated to extension personnel in accordance with objectives listed in the Station's approved updated Plan of Work. Improvements have been made in the multi-functional programs, including the integration of research and extension activities. Extension personnel at the University of Connecticut and other land-grant universities in northeastern United States heard oral presentations given by Station scientists and received written research findings that can be incorporated in educational programs directed at all five national USDA goals. Joint publications for scientists and other stakeholders have resulted. The main mission of CSREES to advance knowledge for agriculture, the environment, human health and well-being, and communities parallels that of the Station. The main goals are to enhance economic opportunities and quality of life among families and communities and to transfer technology to stakeholders. Scientists at the Station develop creative research projects to provide the support, which growers and other stakeholders need to succeed.

Close professional relationships currently exist between Station staff members and stakeholders. Stakeholders are defined as those who are interested in and benefit directly or indirectly from agricultural and forestry research and include scientists, legislators, business leaders, farmers, administrators, forestry officials, industry personnel, state and federal workers, and the general public. The Station receives direct assistance from stakeholders, who contact state and federal legislators to inform them of problems that need attention, research progress, and funding needs. Publishing scientific results in peer-reviewed journals is an important venue for reaching scientists in the nation, but other means of communication, such as giving oral presentations, disseminating written materials, and participation as officers in civic group organizations are other effective mechanisms for interacting with stakeholders. The multistate, multi-institutional, and multi-disciplinary approach to research at the Station (1) addresses critical issues of strategic importance identified by stakeholders, as described in the institution's approved Plan of Work; (2) addresses the needs and inputs of under-served and under-represented persons in the state; (3) meets the expected outcomes and impacts; and (4) results in improved program efficiency. As done in the first six annual reports, this accomplishment document provides new supportive information and documentation for the aforementioned statements. Advancements of multistate, multi-disciplinary, and integrated research projects, approved by the Northeast Regional Association and

USDA/CSREES for The Connecticut Agricultural Experiment Station's participation, will be further documented through annual northeast (SAES-422) reports. As stated in the updated Plan of Work, the research initiatives at the Station focus mainly on national priorities and federal (USDA) goals on improving the agricultural production system to be highly competitive in the global economy (goal #1), providing a safe and secure food and fiber system (goal #2), and on greater harmony between agriculture and the environment (goal #4). Results reported under these national goals, however, also apply in some instances to goal #3 (a healthy, well nourished population) and goal #5 (enhanced economic opportunity and quality of life for Americans). Details on which projects address one or more national goals are provided, as appropriate, in the updated *Planned Programs* sections of this report. A program review process (merit and peer review system) is being used to evaluate research projects for quality and relevance to national and state program goals and the needs of stakeholders.

Stakeholder Input Process

Station staff members have complied with Section 102 (c) of the Agricultural Research, Extension, and Education Reform Act of 1998, and report on (1) actions taken to seek stakeholder participation in research programs, (2) the process used by the Station staff to identify individuals and groups who are stakeholders, and (3) how the collected input was incorporated in the Hatch and McIntire-Stennis research programs during fiscal year (FY) 2006. Station staff members continually seek stakeholder input to identify problems so that critical issues in Connecticut can be addressed. Oral and written stakeholder comments received during this reporting period were seriously considered by Station personnel. It is our policy to respond to all public inquiries and to be of service to those in all racial and ethnic groups. Examples of how the collected stakeholder input was considered in the design, execution, and changing of research goals of various projects are given throughout this document. During this reporting period, we received input from the media, legislators and their staff members, and persons in organized groups (e.g., Connecticut Groundskeepers Association, Connecticut Forest and Parks Association, Connecticut Beekeepers Association, Connecticut Pomological Society, Connecticut Nursery and Landscape Association, Connecticut Tree Protective Association, Federated Garden Clubs of Connecticut, foresters, etc.) in an open and fair process that encouraged participation of diverse groups. Moreover, notices were sent to members of 17 protected organizations (i.e., minority groups) announcing the institution's job vacancies and describing research projects. There were several methods used to receive stakeholder

input on their needs, opportunities for people to see research plots and experimental results, and to encourage more meaningful engagements. Station scientists gave about 680 talks and interviews, including attendance at dozens of public meetings attended by stakeholders. University extension personnel received new information on research results. Station staff members served on advisory boards of about 120 stakeholder organizations. In addition, the Station held open houses and other public events and invited stakeholder comments on research projects during all of these listening sessions.

There were interactions with growers during this reporting period concerning plant pest problems and with the introduction of new specialty crops, such as personal-sized watermelons. A new research initiative on evaluating soybean and rapeseed crops for biodiesel fuel production was started during this reporting period. Legislative, industry, and grower interests stimulated the research effort.

Stakeholders requested the following publications: the identification of invasive aquatic plants, control of the hemlock woolly adelgid, caterpillars that attack conifers, tick control, forest regeneration handbook, and a manual to identify mosquitoes. All publications have been completed and distributed to nursery growers, landscapers, boaters, foresters, public health officials, and the general public. The mosquito manual and tick control handbook have had national interest. Thousands of copies have been sent to persons in several states. The publication on identifying invasive aquatic plants had immediate impact because it informed the public that some plants were invasive and could harm lakes and ponds. Cleaning boats of plant debris before entering bodies of water is an important step in preventing the spread of the invasive plants.

During FY 2006, oral presentations were given by Station scientists in Connecticut in conjunction with Hatch and McIntire Stennis programs. These talks were delivered in response to residents' requests and occurred in urban, suburban, and rural areas. Oral presentations provide opportunities for stakeholders to meet scientists and to comment on research findings. Frequent attendance at stakeholders' meetings enhanced professional relationships. People in the numerous groups, organizations, or agencies listed in the following pages heard scientific presentations on Hatch or McIntire-Stennis research findings, received assistance from Station scientists, provided comments on the research results, and gave input for research initiatives during question and answer sessions. These persons were, therefore, considered direct beneficiaries of agricultural research in

Connecticut and elsewhere. An asterisk marks stakeholder interactions in the McIntire-Stennis forest research programs.

Albertus Magnus College
Amity Senior HighSchool
*American Chestnut Foundation
American Phytopathological Society
American Rhododendron Society
American Society for Horticultural Science
Andover Senior Center
Asnuntuck Community College
Bartlett Arboretum
Bishops Orchards, Inc. (Guilford)
Branford Garden Club
Central Connecticut State University
Cheshire Garden Club
Cheshire Red Hat Club
Connecticut Academy of Science & Engineering
Connecticut Agricultural Information Council
Connecticut Beekeepers Association
*Connecticut Chapter of the American Chestnut Foundation
*Connecticut Chapter of the American Society of Foresters
*Connecticut Christmas Tree Growers' Association
Connecticut Department of Agriculture
Connecticut Department of Consumer Protection
*Connecticut Department of Environmental Protection
Connecticut Department of Health
Connecticut Entomological Society
Connecticut Farm Bureau
Connecticut Farm Wine Council
Connecticut Federation of Lakes

Connecticut Federated Garden Club

Connecticut Forest Council Research Committee

Connecticut Forest and Park Association

Connecticut Gladiolus Society

Connecticut Greenhouse Growers Association

Connecticut Groundskeepers Association

Connecticut Invasive Plant Working Group

Connecticut Master Gardeners

Connecticut NOFA (organic farmers)

*Connecticut Nursery & Landscape Association

Connecticut Pomological Society

Connecticut Rose Society

*Connecticut Tree Protective Association

*Connecticut Tree Warden School

*Connecticut Urban Forest Pest Council

Darien High School

Doolittle School in Cheshire

Durham Garden Club

Eastern Connecticut Land Owners' Association

Eastern Plant Board

Easton Garden Club

Ecological Landscaping Network

Entomological Society of America

Environmental Industry Council

Evergreen Garden Club of South Glastonbury

Experiment Station Associates

Fairfield County Municipal Deer Management Alliance

Fairfield Ludlowe High School

Federated Garden Clubs Garden Study School

Future Farmers of America

Green Bay Garden Club

Guilford Garden Club
Hadlyme Garden Club
Heritage Village Garden Club
Incarnation Church (Wethersfield)
Iowa State University
Invasive Non-Native Plant Working Group
Kent Land Trust
Killingworth Land Trust
Ludlowe High School (Fairfield)
Lyman Hall High School (Wallingford)
Lyman Orchards, Inc.
Mashantucket Pequot Tribe
Metacomet Elementary School
Metropolitan Business Academy
Mile Creek School in Old Lyme
Mitchell College (New London)
Natural Resources Council
Naugatuck Valley Audubon Society
*New England Christmas Tree Growers Assoc.
New England Grape Growers' Association
*New England Society of American Forester
New England Wildflower Society
New England Vegetable and Berry Growers
New Haven Public Schools
Newtown Health Department
Nichols Garden Club (Trumbull)
North Carolina State University
North Stonington Garden Club
*Northeast Forest Pest Council
Northeastern Mosquito Control Association
Northeast Organic Farming Association

Northeastern Weed Science Society
*Northern Nut Growers Assoc.
Oxford Garden Club
Potapaug Audubon Society
Quinnipiac Chapter of Sigma Xi
Quinnipiac University
Regional Water Authority and Metropolitan District
Sacred Heart University
Saint Francis School (New Haven)
Simsbury Garden Club
*Society of American Foresters
Southern Connecticut State University
Sound School (New Haven)
Spring Glen Garden Club
Stateline Pond Association
The Shoreline Gardeners' Club
Trinity College
University of Connecticut (includes Cooperative Extension)
University of Massachusetts
*US Forest Service (Durham, NH; Hamden, CT)
*USDA/APHIS/PPQ
West Haven Garden Club
Western Australia Grape Growers' Association
*Western Chestnut Growers Association
Westport Senior Center
*Yale University (includes forestry, public health, and Peabody Museum)
Yankee Society of American foresters

There are heavy demands for diagnostic services provided by the Station. Identification of insects and plant diseases and analyses of soil samples and ticks provide specific information on a variety of problems, but the effort is also useful in identifying emerging problems, such as the

introduction of exotic pests. The pathogen that causes Ramorum Blight (Sudden Oak Death) is a major concern. Diagnostic services, including the National Plant Diagnostic Network component, closely coincide with a USDA management goal: agricultural communications, and enhancing customer service/satisfaction information technologies. During state FY 2006, there were about 21,477 public inquires from stakeholders to all Station staff members. The problems varied. For example, scientists in the Department of Entomology identified 6,123 ticks. Of these, 5,897 (96%) were tested for the DNA of the Lyme disease bacterium. Information obtained by residents and health officials enhanced their knowledge of the geographic distribution of this disease. Plant pathologists answered 6,855 inquiries, while scientists at the Valley Laboratory in Windsor, Connecticut answered 8,517 inquiries from the public, including those from commercial growers and pest control operators. Questions about hemlock woolly adelgid, a serious forest-insect pest, and blue mold disease continued to be most frequent. Approximately 30% of the inquiries are from people who visit Station facilities. Scientists responded to special requests by visiting commercial and private properties on 468 different occasions to diagnose more complex problems and to give stakeholders immediate assistance in solving problems. One scientist made 52 visits to commercial and municipal operations. There were daily contacts between residents and scientists, an exchange of scientific information, and public input into research initiatives and diagnostic services.

Television, radio, and newspaper reporters frequently request information. In some instances, such as mosquito research and encephalitis virus outbreaks and the re-introduction of a plant pathogen called *Phytophthora ramorum* (a fungus-like agent that causes Sudden Oak Death or Ramorum blight) on nursery stock from Oregon, there was high national interest in research or survey findings. West Nile encephalitis viruses have spread quickly to western United States. An ambitious field research project on mosquitoes was continued in response to stakeholders' concerns in Connecticut. Administrators in towns and cities were kept informed of weekly mosquito surveillance test results. Information on the isolation of encephalitis viruses from mosquitoes collected in different towns had immediate impact on stakeholders' lives and resulted in their following precautionary measures, such as the application of repellents to clothing and avoiding mosquito bites during high risk periods. The notices of infected mosquitoes and information on precautionary measures provided opportunities for additional impact. During 2006, there was one human death from West Nile virus infection despite very high mosquito populations and extensive virus circulation and amplification in mosquitoes in southwestern and south central Connecticut.

Other findings on ticks, human pathogens, hemlock woolly adelgids, gypsy moths, the small Japanese cedar longhorned beetle, composting, pressure-treated wood, food safety issues, and a variety of plant diseases continue to be of high interest to reporters and other stakeholders nationally. The Director, Vice Director, and all Department Heads conduct research and report findings to the media and other stakeholders.

To invite stakeholder participation in Station events, public meetings and open houses, events are announced in newspapers, newsletters, and on radio stations. These actions enable people to meet scientists, see experimental plots, visit research laboratories, and to review and discuss research findings. Stakeholders met with scientists and discussed research "face to face" or attended public talks and were able to address specific issues and concerns. Special contacts were made by phone or correspondence with members of organizations that serve protected individuals, trade groups, commodity associations, and with other state agencies to reach under-served populations. Dozens of civic groups used Station conference rooms or the auditorium on multiple occasions. High school teachers and students toured laboratories and the research farms and became more knowledgeable about the scientific work being conducted. These experiences provided opportunities for stakeholders to meet and hear presentations by Station scientists.

During this reporting period, the Station held special public conferences and open houses. About 40 nursery growers and landscapers attended a meeting at the Valley Laboratory in Windsor, CT on September 19, 2006. They heard presentations on research and toured experimental plots. Attendees were shown research plots and educational gardens. In addition, attendees received new information from staff members on managing deer in landscapes, container weed management, the use of predatory beetles to control hemlock woolly adelgids, and on managing insects, mites, plant pests, and parasitic nematodes of plants. Stakeholders also received re-certification credit for private applicator and supervisory licenses. Discussions followed the talks. At an open house on April 20, 2006, scientists reported on pressure-treated wood and arsenic leaching, pesticide residues in food, and safeguarding the nation's food supply. Attendees also saw mobile laboratories of the CT Department of Environmental Protection and the CT National Guard Civil Support Team. Station scientists are collaborating with those in other agencies on homeland security programs. On August 2, 2006, an open house was held at the Station's farm in Hamden, Connecticut. About 625 persons (including children) attended this event on a very hot day (96^{o}F), and despite extreme weather conditions, showed interest in experimental plots, demonstrations, and exhibits. New scientific

information was presented on the control of invasive weeds in Connecticut lakes, lawn pests, organic farming, specialty crops, forestry research, new grape cultivars, mosquitoes and West Nile virus, biological and chemical control of hemlock woolly adelgids, landscaping tips, the use of certain plants (green manure) for controlling nematodes, wind dispersal of corn pollen, and other topics. There were over 60 exhibits and field plots. In addition to the planned major open house events, small groups were given opportunities to visit the Station and hear brief presentations in laboratories on selected topics of interest. Information gained by attending all of these events impacted stakeholders' lives by helping people to improve gardening practices, use less pesticides, and to avoid potential hazards in the environment.

The Experiment Station Associates (ESA), with a membership of about 750 stakeholders, continued to promote scientific activities of the Station and published a quarterly bulletin describing highlights of research accomplishments. Their bulletin was sent to their members, state legislators, and hundreds of other people interested in Station research results and events. In addition, a brochure on Station research activities was revised by the ESA for public distribution. These stakeholders requested the assistance of Station personnel in providing information for the brochures. Station scientists, including the Director, gave oral presentations and reports to ESA members at their annual meeting on March 16, 2006 and at bimonthly Board of Directors' meetings. Members in attendance at the annual meeting heard presentations by Station scientists on food safety. All of these activities provided opportunities for stakeholder input on critical issues in Connecticut agriculture, forestry, and public health problems. Interactions with stakeholders had impacts because more people became aware of Station research initiatives.

Station scientists worked closely with growers and foresters on research projects to solve specific problems. Special assistance was given to arborists, veterinarians, public health officials, groundskeepers, landscapers, members of the nursery industry, fruit growers, and vegetable growers. Sales in the Connecticut Green Industry (nurseries, Christmas trees, greenhouse operations, sod, and floriculture) exceeded $1.1 billion. The forest products industry is valued at $500 million. Many experiments were conducted in forests, nursery fields, greenhouses and other stakeholders' properties at the request of these people to reduce pesticide use and costs and to correct pest problems. Stakeholders were involved with the planning process, execution of scientific experiments, and evaluation of the results. An important problem re-occurred during this reporting period. More shipments of plants infected by *Phytophthora ramorum* were sent from Oregon to Connecticut. In

previous reporting periods, this pathogen was accidentally distributed from California and Oregon to Connecticut and several other states. Nursery growers and the general public received immediate assistance. Federal action quarantine orders and stop sale notices prohibited the movement of rhododendrons after cultures confirmed the identity of the pathogen in Connecticut. Station staff members closely monitored quarantined plants and the destruction of these materials. These efforts prevented the further spread of the pathogen and had impact because stricter regulations were placed on California and Oregon. A new molecular diagnostic laboratory for plant pathogens was created at the Station to detect emerging pathogens. Coupled with participation in the National Plant Diagnostic Network, test findings also had immediate impact by raising public awareness and by establishing extensive surveillance efforts. In other work, advances in the use of pathogenic nematodes has improved the control of black vine weevil grubs in nursery and strawberry fields and has resulted in lesser amounts of chemical pesticides being used. The resulting new management practice can now be applied in other pest-infested sites.

Forest stands are extensive in Connecticut. Approximately 60% of the state's land area is classified as woodlands. The Station's McIntire-Stennis program focuses on forest insect pests, such as hemlock woolly adelgids, orange-striped oakworm, gypsy moths, and the small Japanese cedar longhorned beetle. Emphasis was also placed on breeding timber and nut-producing chestnuts; the host/pathogen/parasite system of chestnut blight disease; and general management of forests. The latter includes work on reducing browsing damage caused by white-tailed deer, long-term studies of hardwood stands, cutting methods of hardwoods, and studies on unmanaged forests in Connecticut. Statewide surveys are being conducted for early detection of Asian longhorned beetles, emerald ash borers, pine shoot beetles, the fungus-like pathogen for Ramorum blight, and other exotic pests that could cause extensive economic losses and disruption of forest ecosystems. These studies are being conducted to help the wood products industry in Connecticut, which includes 350 firms that employ 3,600 loggers, millworkers, and other employees. At the requests of stakeholders, 95 talks and interviews were given by Station staff in association with the McIntire-Stennis forestry research program.

Adelges tsugae, hemlock woolly adelgid, is a destructive introduced pest of eastern hemlock and Carolina hemlock in at least 16 eastern states from Georgia to Maine. With continued decline or death of hemlock trees, stakeholders requested assistance on biological and chemical control. Pesticides can help manage *A. tsugae* on ornamental hemlocks but not in forests where thorough

treatment with pesticides at ground level is difficult. At a stakeholder's request, tests were conducted on soil applications and systemic control (i.e., tree injection methods) of the pest with imidacloprid. In replicated tests conducted during this reporting period, results re-affirmed that soil injections or drench applications near the trunk were most effective. Arborists are now using soil treatments along with foliar applications of horticultural oil to protect trees.

In earlier work, a Station scientist found that *Sasajiscymnus* (*Pseudoscymnus) tsugae,* a Japanese ladybeetle, is an effective beetle predator of all adelgid life stages. Foresters and the general public requested that these predatory beetles be mass-reared and released to help control *A. tsugae* in Connecticut and elsewhere. Accordingly, the beetle has been continually released in widely separated sites infested with *A. tsugae*. As a part of an ongoing effort over 12 years, more than one million beetles have been released thus far in 25 forest and urban sites in Connecticut (including the Mashantucket Pequot Tribal property) and 13 other states. Beetles have been released in Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Tennessee, Vermont, Virginia, and West Virginia as a part of a cooperative multistate research project. Field research has demonstrated that the beetles are established at most sites and that the beetle is also attacking the balsam woolly adelgid, another important tree pest. These promising results provide immediate impact by showing that there is high potential for this beetle in biological control as an alternative to chemical control. Expected long-term benefits include healthy hemlock stands, protection of soil near streams and rivers, less pesticides being used, less adverse effects on non-target and beneficial organisms, and a cleaner environment. Current research includes the development of an artificial diet for the beetle, assessment of hemlock stand conditions, determining the patterns and timing of beetle release that will enhance the biological control effort, survival and dispersal of the beetles, and assessing the impacts of pesticides on the predatory beetle. Chemical applications are being modified to minimize adverse effects of pesticides on predatory beetles. Stakeholders now have a biological control option that will probably be effective in forests. The Station is also collaborating with the USDA Forest Service by improving colony health and mass-rearing methods for other related predatory ladybeetles (*Scymnus sinuanodulus*) imported from China. The *Scymnus* predatory beetles were released in Connecticut, Georgia, and Pennsylvania as a collaborative effort.

The success of rearing *S. tsugae* has led to commercialization efforts and short-term impacts. The predatory beetles can now be purchased by the public through "The Green Methods" catalogue

of the Green Spot via greenmethods.com in conjunction with ECOscientific Solutions in Scranton, Pennsylvania. Stakeholders have been buying the beetles for release on their properties. As more beetles are released, long-term impacts of reducing *S. tsugae* infestations are expected. The geographical range of the hemlock woolly adelgid is expanding northward in New England, where extensive stands of hemlock occur, and continues to be of great concern to federal, state, local government officials, and to arborists who are called upon to treat infested trees. There are numerous requests for information and guidance from stakeholders in different states on where the infestations occur. Scientists, arborists, foresters, owners and employees of nurseries, members of the Mashantucket Pequot Tribe in Connecticut, and other stakeholders benefited from the McIntire-Stennis program on the Station's research of hemlock woolly adelgids. In a multistate effort, Station scientists continue to collaborate with other scientists in the Virginia Department of Forestry on a related adelgid: balsam woolly adelgid. Knowledge gained from work on the hemlock woolly adelgid is aiding in these new studies. Stakeholder input was also received from questionnaires sent to arborists, from attendees of a Station scientist's talks at meetings, and from telephone conversations with state residents. Experiments were designed and revised based on stakeholders' inputs and needs.

A newly discovered fungus attacks elongate hemlock scale (*Firorinia externa*), a serious tree pest in Fairfield County, Connecticut and Orange and Putnam Counties, New York. An infection rate of 78.5% was recorded for one tree. The identity and potential of the fungus as a biological control agent are being investigated.

A Station scientist continued to contribute new information on adelgids and the predatory beetle for a website at Cornell University and has advised numerous arborists and extension agents in Connecticut and in New York State so that biological and chemical control results could be disseminated to a broader base of stakeholders in different states. Finally, stakeholders who are collaborating in field studies on control, represent businesses (i.e., tree care companies) and USDA Forest Service personnel. Evaluations of the efficacy of beetle releases are being conducted for cooperators. This is a good example of people in government and the business sector working together to solve a major problem.

A collaborative study with scientists at the University of Georgia, Western Connecticut State University, and a company is being conducted to determine if transgenic cottonwood trees can help remove mercury from soil at an old industrial site (a hat making factory) in Danbury, Connecticut.

The factory buildings were removed several years ago, but the soil remains heavily polluted. Two Station scientists were asked by stakeholders (i.e., Danbury city officials) to participate in the project because of progress made in other research problems on phytoremediation. The research is funded by the US EPA and the City of Danbury. The transgenic cottonwood trees are being provided by scientists at the University of Georgia, and USDA-APHIS is overseeing permits and other regulatory matters. The study site is located in a neighborhood section of Danbury, where residents are aware and approve of the research efforts to reclaim the land and eliminate a serious environmental problem.

In addition to the displays of research results at the Station's annual open houses for the public, other exhibits were presented at a Connecticut Tree Protective Association meeting, two Connecticut Nursery and Landscape Association meetings, Connecticut Flower and Garden Show, a Farm/City Week event, Connecticut Public TV Family Science Exposition, and the Eastern States Exposition (Big E) in West Springfield, MA. In addition, research results were presented to the U. S. Forest Service, USDA/APHIS, Eastern Plant Board meeting, and other regional forestry or regulatory meetings. Research findings were reported to 290 Christmas tree growers at their annual meeting. Comments received by thousands of attendees at meetings were useful in determining that new knowledge was indeed gained and in modifying experimental designs.

The American chestnut population in eastern United States suffered a severe epidemic caused by an imported fungal pathogen, *Cryphonectria parasitica,* during the early 1900's. This blight reduced the American chestnut to under-story shrubs, which decline, sprout from the base, decline and sprout again. There is continued strong public interest in reviving the American chestnut population, primarily for nut production. There is also demand for timber and a desire to improve the diversity of hardwood forests. Enhancement of biodiversity in forest ecosystems benefits the overall health of all plants and animals, reduces soil erosion problems, and protects water resources. Immediate impact of research results is evident. Preliminary studies revealed that the blight fungus could be controlled by using a virus, which reduces the ability of the fungus to kill trees. The aim of this long-term research project in Connecticut and other states in a USDA-approved, award-winning multistate McIntire-Stennis research project (NE-1015) is to breed timber chestnuts for resistance to diseases and to introduce them into orchards and forests where native trees are preserved. The main goal is to allow natural crossing to introgress the resistance genes into the native population. Our breeding program produced 1,252 seeds. Of these, 190 are being introduced to Vermont to assess

winter hardiness. An additional 40 seeds have been given to a middle school in Portchester, NY as an educational project. Remaining seeds are being planted by a nursery in Georgia for further study.

The first transgenic, hypovirulent *C. parasitica* release was made in 1994 as a single-season experiment in the Housatonic State Forest in Sharon, Connecticut on American chestnut sprouts under a closed canopy of hardwood trees. A scientist at the University of Maryland and his co-workers made the transgenic forms from strains of the fungus isolated in the plots where tests were planned. The 24 experimental trees were re-examined during this reporting period, and some of the other 241 numbered chestnut sprouts were examined as well. Hypovirulence is established in *C. parasitica* exposed trees and continues to do well. The trees are alive and fruiting.

The second transgenic release was made in 1997, also with native *C. parasitica* strains genetically engineered by the scientist from the University of Maryland to contain a nuclear DNA copy of the prototypic hypovirus genomic RNA. Water-containing spores of these transgenic strains were sprayed onto sprouting American chestnut stems in a clear cut area of the Meshomasic State Forest in Portland, Connecticut. Stems in the control plot were sprayed with water. Both control and treated plots were re-examined during this reporting period. Experimental findings are very encouraging. There is short-term impact of this work because in overall appearance, the chestnut sprouts in the treated plot are bigger and healthier than those in the control plot. Field releases were successful. Stakeholders are able to see the direct outcome of several years of work and look forward to long-term benefits of having American chestnut trees for nut production. Recent results indicate that a dwarf chestnut tree being developed could be a boon to commercial growers. The promising dwarf variety produces nuts with great flavor and good size. The nuts are excellent for cooking and peel easily. The small size of the tree is preferred by commercial growers. This multistate project has made a significant contribution toward improving timber and nut-bearing chestnut trees in eastern North America. Chestnut trees are now growing in forest plots, there is improved stand diversity, and there are potential economic opportunities for chestnut growers, who have vested interests in local and international markets.

A Station scientist heads the chestnut research activities in Connecticut. As in the past, she continued to interact with users of wood products (eg, lumber, fencing, poles, etc.), commercial nut growers, and persons interested in forest health. This Station scientist has been writing annual articles for the Connecticut Forest and Park Association to reach stakeholders, to broaden interest in the research efforts, and to update research findings. There have been ongoing discussions with the

National Wild Turkey Federation, the Mohegan Tribe in Connecticut, and the Connecticut Soil and Water Conservation Districts concerning new chestnut selections for plantings. In addition, stakeholders have direct contact with Station scientists via the internet (www.caes.state.ct.us); e-mail addresses are listed on at least six chestnut web pages. There have been numerous opportunities for stakeholders to continue to learn about chestnut research and to comment on all aspects of the work.

White-tailed deer cause severe damage to nursery plantings, homeowner shrubs, and tree regeneration in Connecticut forests. Deer also cause automobile accidents. Oak, an economically important tree for lumber production, has been affected along with eastern hemlock and maple trees. Deer remove saplings from the forest and are impacting forest composition. Foresters, nursery growers, and water authority officials have requested that research be conducted to find ways of protecting oak conifer seedlings in areas of high deer density. Experiments are being conducted in state forests, water company properties, and on lands owned by a power company (Northeast Utilities). Research cooperators in these organizations continue to assist Station efforts by providing materials and labor, selecting plots for research, and in designing experiments. There currently is an expanding stakeholder base, which includes Great Mountain Forest and Hull Forest Products, in the research cooperative. Research findings have been disseminated to these and other professionals regularly. A new research project has been started to find ways to keep deer away from major highways. In cooperation with the Connecticut Department of Transportation, Station scientists are exploring changes in vegetation structure near highways. The approach is to introduce plants that are not a desired food source for deer.

Improved forest management practices are needed to ensure that quality forest resources are available in the future. Past work conducted at the Station outlined the general framework of forest stand dynamics, but these studies did not provide a means of predicting future development of an individual stand of trees with its unique initial composition and disturbance history. During a previous reporting period, foresters asked a Station scientist to address this shortcoming and to examine the factors that affect the growth and survival of individual trees, particularly oak, which is an important export item. As in the past, research is supported by the State Division of Forestry in the Connecticut Department of Environmental Protection, which oversees the study sites. Work continues in additional plots with the cooperation of other stakeholders (White Memorial Foundation, Great Mountain Forest, and the Town of Manchester), who are participating in the research.

As several upland forest oak stands approach economic and biological maturity in southern New England, there is growing public concern over species composition following stand regeneration. A Station scientist conducted research on controlled burning of forested areas to help restore ecological functions, especially the oak regeneration process. State lands, Mashantucket Pequot tribal property, and private (Great Mountain Forest) properties were included in the study. The effects of prescribed burning on stand dynamics are being monitored. Under controlled conditions, oaks tend to survive better than other tree species, such as maple and birch. At the request of state foresters and utility company officials, long-term studies are being continued to investigate six distinct cutting methods and their effects on regeneration composition and residual stand growth. The research is designed to provide information on crucial hardwood management issues and will benefit forest managers from New England to West Virginia. Stakeholders from the State Division of Forestry in the Connecticut Department of Environmental Protection, the Regional Water Authority, the White Memorial Forest, and Nature Conservancy are collaborating with a Station scientist and have had input on experimental design and data collection methods. By participating in the research, these collaborators obtain current information. To seek further stakeholder input, a Station scientist presented his research findings at meetings of the following groups: New England Society of American Forester, Connecticut Tree Protective Association, Connecticut Forest and Park Association, The Nature Conservancy, and Association of Northeast Forest Watershed Managers.

Ticks are abundant in southern New England and transmit pathogens that cause Lyme disease, babesiosis, monocytic ehrlichiosis, granulocytic anaplasmosis, and Rocky Mountain spotted fever. Males and females of the blacklegged tick (*Ixodes scapularis*) prefer deer as hosts. As deer become more numerous, populations of this tick species also increase. Stakeholders requested Station assistance on the identification of ticks removed from themselves or family members. More than 6,000 ticks were submitted to health care professionals (eg., local health departments), who subsequently transferred the specimens to the Station. Blacklegged ticks were tested for the DNA of the Lyme disease organism, and results were reported to health care professionals, who then reported the findings to stakeholders. Knowledge of infected ticks has a direct impact on people, particularly when illness occurs, because physicians can more easily diagnose Lyme disease and prescribe antibiotics. Another immediate benefit of this research is that more stakeholders become familiar with the Station and its research mission. The establishment of new records for infected ticks in

towns also provides other immediate benefits by clarifying the geographical distribution of the Lyme disease agent. A Station scientist has worked closely with these health districts in at least eight towns on community-based Lyme disease prevention projects supported by funding from the Centers for Disease Control and Prevention. He is monitoring tick populations and infection rates in areas where control measures were implemented. Veterinarians requested Station assistance on performing antibody tests to determine if horses and cats were exposed to the Lyme disease and granulocytic anaplasmosis agents. Like the tick information, these results directly helped animal owners by diagnosing infections in their animals. Proper antibiotic treatment followed.

Stakeholder input also was obtained when scientists served as members of advisory boards and committees, adjunct professors at universities, or officers of organizations. During FY 2006, Station scientists interacted with stakeholders in the following organizations or state or national committees:

Albert Einstein College of Medicine (Visiting Assistant Professor)
American Phytopathological Society
American Society of Horticultural Science Technical Program Committee
American Society of Plant Biologists
Analytic Accreditation Board of American Industry Hygiene Association
Bloomfield High School Advisory Board for Agri-Science
British mycological Society
Canadian Phytopathological Society
Chestnut Growers of America
Clear Lake Improvement Assoc.
Community Gardens, Knox Parks Foundation (Hartford)
Concentrated Animal Feeding Operation Committee, EPA
Connecticut Academy of Science and Engineering
Connecticut Butterfly Association
Connecticut Christmas Tree Growers' Association
Connecticut Council on Soil and Water Conservation
Connecticut Endangered Species Committee
Connecticut Entomological Society
Connecticut Environmental Industry Council

Connecticut Forestland Council

Connecticut Forest and Park Association

Connecticut Gladiolus Society

Connecticut Greenhouse Growers Association

Connecticut Groundskeepers Association

Connecticut Invasive Plant Working Group

Connecticut Legislative Invasive Plant Council

Connecticut Legislative Wine Council

Connecticut Nursery & Landscape Association

Connecticut Pomological Society

Connecticut Tree Protective Association Board

Connecticut Urban Forestry Council

Cooperative Agricultural Pest Survey Committee

Cornell University (Adjunct Professor of Plant Pathology)

Florida Department of Agricultural and Consumer Services (Research Associate)

Eastern Plant Board

Goodwin Forestry Scholarship Committee

International Aerobiology Association

International Organization for Biological Control

International Society for Horticultural Science

Journals

- Agricultural & Forest Meteorology
- Biological & Cultural Tests for Control of Plant Diseases
- Compost Science & Utilization (Editorial Board)
- Environmental Engineering Science (Editorial Board)
- Environmental Pollution (Editorial Board)
- Environmental Toxicology & Chemistry
- Eukaryotic Microbiology
- International Journal of Phytoremediation (Managing Editor)
- Nematology
- Plant Nutrition

Weed Science
Leo F. Roettger Society (microbiology)
Mycology Society of America
National Christmas Tree Growers Association
National Plant Board
National Plant Disease and Pest Detection Network
National Risk Management Guidelines Working Group
Natural Resources Conservation Service (USDA)
New England Aquatic Plant Management Society
New England Pest Management Network
New England Vegetable & Berry Growers' Assoc.
New England Wildflower Society
North American Blue Mold Warning System
Northeast Greenhouse and Ornamentals IPM Commodity Work Group
Northeast Organic Farming Association of Connecticut
Northeast Soil Testing Committee
Northern Nut Growers' Association
Organic Land Care Committee
Pan-American Aerobiology Association
Sigma Xi (Quinnipiac University Chapter)
Sleeping Giant Park Association
Society of American Foresters
State of Connecticut Mosquito Management Program
University of Connecticut, Department of Pathobiology (Adjunct Professor)
USDA Coop. Agric. Pest Survey Committee (USDA)
Weed Science Society of America
Yale University (Adjunct Professors, Lecturers, Research Affiliates)

Program Review Process (Merit and Peer Review)

There have been no significant changes in the review processes since the updated Plan of Work was approved. In accordance with the approved Plan, scientific proposals of the Station were

subjected to merit and peer review following federal register guidelines and the National Science Foundation model (http://www.eng.nsf.gov/pet/review-2.htm). Merit review for proposals followed criteria proposed by the National Science Foundation (NSF-99-172). The Station's processes of merit and peer review are evaluated annually by the Director for effectiveness and compliance with federal requirements. Project outlines for Hatch, McIntire-Stennis, multistate research funds, or grants were reviewed by qualified scientists within (including at least two Chief Scientists and the Director or Vice Director) or outside the Station. This process of review ensures that the planned research is relevant to established priorities, which are consistent with stakeholders' changing needs, efficiently meets state and national USDA program criteria and goals, and has a reasonable likelihood of success. No federal funds were released for research on any project until CSREES approvals of project outlines and grant proposals were given. Reviews are kept on file in Chief Scientists' offices. Scientific peer review is required to determine the suitability and validity of the methods used (i.e., critically evaluate technical quality), originality of the study, and value of the work to the scientific community and public.

Station scientists are encouraged to publish their results in peer-reviewed journals that have national and international audiences and to write reports for the general public. Critical scientific reviews are important in ensuring quality science and accountability. Book chapters, symposia proceedings, Station bulletins, and state and regional publications are also acceptable means of communication to stakeholders. In addition to written reports, scientists presented their findings to their peers and stakeholders at international, national, and local meetings and conferences. Citizens who do not have scientific backgrounds are not excluded in this reporting process. They receive non-technical summaries included in Station publications for public use. Written or oral comments received were important in ensuring accountability, evaluating the usefulness of scientific accomplishments, and in the re-alignment of research initiatives to address changing needs and priorities.

Updated Planned Programs

Program Goal #1: **An agricultural system that is highly competitive in the global economy.**

Research. Goal 1: Through research and education, empower the agricultural system with knowledge that will improve competitiveness in domestic production, processing, and marketing.

Performance. Goal 2. To increase market shares for targeted agricultural products of Connecticut.

Output Indicators. 1. As stated in the updated Plan of Work, the numbers of publications, talks, and interviews by scientists are tabulated annually and reported herein to document communication to stakeholders. There were 52 publications and 302 talks and interviews recorded for state FY 2006 in association with this program goal. There were 70 officerships and memberships held by Station scientists in stakeholders' organizations and national or state committees during this reporting period. Excerpts of letters from stakeholders regarding services rendered, media reports, and narratives of scientific accomplishments are on file. This information is available to those who are interested in the Station's research activities and results.

Output Indicators. 2. As described below, research was conducted to produce value-added agricultural products. Progress made on growing quality fruits and vegetables, reducing farm costs, and on improved quality of nursery plants are examples of accomplishments. In this and other sections of the report, concise annual accomplishment summaries are presented under the respective outcome indicators listed and represent progress made consistent with the updated Plan of Work. Accomplishment and impact headings are marked in bold type in each section. Impact statements are provided when the research has progressed to an appropriate stage of evaluation. Short- and long-term impacts are discussed to show positive behavioral changes by the intended users or economic, social, health, or environmental benefits for stakeholders. Whenever possible, efforts were made to present results summaries and impact statements in non-technical terms for clarity. In many cases, expected outcomes were accomplished in the past five years or during this reporting period, while in some other instances, more time is needed to complete research objectives and to meet expected goals in the near future.

Outcome Indicators. There are several expected outcomes and impacts, which include positive changes in behavior of stakeholders and economic benefits, associated with the performance goals listed in the updated Plan of Work. It is expected that:

(1) Results of field studies on biological and cultural control of insect pests of vegetables will result in reduced pesticide use, lower costs of control, and reduced human exposure to pesticides.

Those outcomes also apply to USDA goal #3 (healthy, well nourished population and goal #4 (greater harmony between agriculture and the environment). **Themes: Agricultural competitiveness, Agricultural profitability, Diversified/alternative agriculture, Innovative farming techniques, Niche market, Organic agriculture; Small farm viability; Sustainable agriculture**

Results and an impact statement for this objective were reported last year. Other studies are in progress, and findings are incomplete at this time.

(2) The dispersal of corn pollen will be determined, and models will be developed to aid in the establishment of effective strategies for gene flow management. Federal and state regulatory officials will be able to set buffer zones between genetically modified corn plantings and non-genetically modified plants. Results will provide a basis for new federal and state permit requirements.

Themes: Plant Regulatory Changes; Improved Pollination of Corn; Agricultural competitiveness

Description: As a part of a multi-year, integrated project, field experiments were replicated in Connecticut and New York State (Cornell University) as a part of integrated activities to determine the dispersal of corn pollen. There is growing concern among stakeholders that there will be unwanted gene flow from genetically modified corn to conventional corn. It was important to replicate experiments in different years because of variations in weather and growing conditions.

Accomplishment/Impact: Results confirmed earlier findings that in small plots (less than one acre), corn pollen normally does not move more than 0.5 miles from the source. Dispersal from large plots (more than 10 acres), however, can extend to almost one mile. It was concluded that a one mile buffer zone seems to be adequate in preventing the crossing of genetically modified corn with conventional corn. This outcome has had impact because this information is being considered by states and the USDA (APHIS) in establishing regulatory zones for planting genetically modified corn near non-genetically modified corn.

(3) More efficient IPM practices will lead to the reduction of pesticide use and more efficient pest control efforts in nurseries to facilitate international and interstate shipments. These outcomes

also apply to USDA goals #4 and #5 (enhanced economic opportunity and quality of life for Americans. **Themes: Integrated Pest Management, Agricultural Profitability, Human Health**

Description: The small Japanese cedar longhorned beetle (*Callidiellum rufipenne*), an exotic insect pest from Asia, attacks arborvitae, red cedar, Atlantic white cedar and other species of ornamental and wild plants in the family Cupressaceae. This pest is established in at least 58 towns in southern Connecticut and has an economic impact on the nursery industry. Replicated tests were conducted in different nurseries to check on efficacy results obtained in a previous reporting period.

Accomplishment/Impact: Findings confirmed that minimal applications of permethrin-based insecticides during the spring were effective in controlling the insect. These findings had immediate economic impact during this reporting period because 885,370 healthy arborvitae plants (valued at about $30,598,390) are being grown in two large nurseries for future sale in local markets or in other states. There are other long-term benefits because permethrin-based insecticides degrade rapidly in the environment and are far less toxic to the users, compared to organophosphate insecticides. The expected long-term impacts are continued profitability for nursery growers, less pesticide residues in nurseries, less risk of contaminating ground and surface water sources (eg., streams, lakes, and ponds), and less human exposure to pesticides, thereby reducing health risks.

Sources of funds: Hatch, McIntire Stennis, state

Scope of impact: national

Sources of funds: Hatch and state.

Scope of impact: state-specific.

(4) Commercial greenhouse production facilities will operate more efficiently to reduce environmental contamination by fertilizers or to decrease labor costs. **Themes: Agricultural competitiveness; Agricultural profitability; Small farm viability**

This objective was completed last year. Positive results and an impact statement were submitted in the 2005 Annual Report.

(5) Monitoring efforts in orchards, nurseries, and vegetable crop production areas will detect emerging insect and plant diseases that may affect plants. **Agricultural profitability; Integrated pest management.**

Description: Stakeholders are concerned about new diseases emerging in agricultural settings. In response, orchards, nurseries, and vegetable crop production areas were surveyed for insect and plant pathogen problems.

Accomplishment/Impact: *Phytophthora ramorum* is a highly infectious fungus-like organism that causes Ramorum Blight (also known as Sudden Oak Death). The disease is established in California, Oregon, and Washington State and can affect at least 30 plant species, including nursery crops and prime hardwood trees, such as oak. The pathogen can be easily spread by movement of nursery stock to several states. During this reporting period, potentially diseased rhododendrons were observed at a commercial site in Connecticut. DNA analyses of tissues, conducted at The Connecticut Agricultural Experiment Station and the USDA/APHIS laboratory in Beltsville, Maryland, confirmed *P. ramorum* infections. Pesticides were not used. Instead, quarantines were imposed and hundreds of plants were incinerated to prevent further spread of the pathogen. These measures had immediate impact because the prompt destruction of diseased plants prevented the sale of these items to the public. Ensuing investigations of shipping documents traced infections to fields in Oregon, where further steps were taken to prevent movement of diseased plants. These actions helped protect the $400 million nursery and $500 million wood-products industries in Connecticut and were instrumental in drafting new federal regulations on inspection procedures for large plant-growing operations in western United States. Moreover, there was no human exposure to pesticides, thereby reducing health risks.

Sources of funds: Hatch and state

Scope of impact: national

(6) Field-testing of new fruit and vegetable cultivars will identify high-yielding, marketable crops that are genetically resistant to plant disease. This outcome also applies to USDA goal #3.
Themes: Adding value to agricultural products; Agricultural competitiveness; Agricultural profitability; Innovative farming techniques; Plant health, Precision agriculture; Integrated pest management; Small farm viability

The research project on apples has been completed. Results and impact statements were submitted in previous Annual Reports. This USDA-approved multi-state project had scientific participation from 19 states and made numerous contributions in identifying and introducing new

apple cultivars over a span of several years. Some of these cultivars are being grown in Connecticut orchards.

Description: The newest melons in the marketplace are seedless miniature "personal-sized" watermelons weighing 3 to 7 pounds each. These fruits offer the following advantages: they occupy less refrigerator space, have a thinner rind, and have high concentrations of lycopene and beta-carotene (antioxidants). Consumer demand has increased, and growers want to supply these melons. Six cultivars were evaluated for yield and quality.

Accomplishment/Impact: The cultivars "Extazy" and "S133" had the greatest yields (43 tons/acre). At a retail price of $4.99 per melon (weighing about 5 pounds each) the potential gross market value of one acre of production on mulched plots is about $62,000. The expected market value for 33 acres of potential production on Connecticut farmlands would be about $2,460,000. Farmers in Connecticut are enthusiastic about growing these melons, and crop production thus far has been satisfactory. Expected long-term benefits include increased economic opportunities for farmers who are seeking new, alternative crops to grow; the availability of locally grown produce for consumers, providing a nutritious food; and preservation of farmlands.

Source of Funds: Hatch and state

Scope of impact: State specific

Description: Jilo is a solanaceous plant akin to eggplant. Its main use is in vegetable stews and sweet and sour mixes with pork and chicken. This tropical vegetable is an important food item in Nigeria but also has been very popular in Brazil. There are about 4,500 Brazilians living in the Waterbury and Danbury areas of Connecticut. Consumers and growers asked Station scientists to grow cultivars of jilo and determine yields and quality.

Accomplishment/Impact: Field experiments conducted over a 3-year period revealed that high yields of jilo (cultivar "Comprido Verde Claro") can be obtained in Connecticut. Optimal yields of 11 pounds per plant were recorded when the plants were mulched with black plastic to warm the soil. At a retail price of $4.99 per pound, the potential gross market value of produce per half acre is about $149,500. On a per-acre basis, 545 plants can be grown with an expected gross crop value of about $299,000. One farmer successfully grows jilo on 0.5 acres of land and sells all of the produce at his farm stand. With current public demand for jilo in Connecticut, Boston, and New York City markets and increased grower interest, significant economic benefits are expected for farmers in rural areas. Other benefits include the availability of locally grown produce for Brazilians and other residents and preservation of farmlands.

Source of funds: Hatch and state

Scope of impact: state-specific

Description: Many fruit growers are interested in adding minor specialty crops to diversify farming operations. Growing plums along with apples, pears, and peaches has further economic benefits for farmers, particularly in view of increased public interest in locally grown fruits. Twelve cultivars/rootstock combinations of Japanese plum and 4 cultivars of pawpaws were evaluated.

Accomplishment/Impact: "Shiro" and "Friar" yielded about 129 pounds and 122 pounds per tree, respectively. At a retail price of $2.29 per pound, the potential gross market value for fruits from one tree is about $279. For 15 acres of actual production, with 145 trees per acre, the gross potential market value is $606,825. Long-term benefits include added income for growers, fresh produce for consumers, and preservation of farmlands.

Source of funds: Hatch and state

Scope of impact: state-specific

Description: Recent developments in the fast-food industry to provide low carbohydrate foods to diet-conscious, consumers has prompted a replacement of mashed potatoes with mashed cauliflower. The increased demand has attracted attention among growers in Connecticut, but with multiple cultivars available, it is not clear which varieties have the highest yield and quality or what the best planting dates are. Nineteen cultivars were evaluated to determine yield rates and the best times to plant for optimal maturing.

Accomplishment/Impact: Fall yield of "Freedom" was greatest at 14 tons/acre (9,680 plants). An earlier planting date in mid-July for this and other late-maturing cultivars was most desirable. At $2.49 per head, there is a gross potential crop value of $24,103 per acre. For 10 acres of actual production, the potential crop value is about $241,103. Since most cultivars of cauliflower grow well in Connecticut, the expected long-term benefits include meeting market demands for cauliflower, providing a nutritious vegetable for consumers, and preservation of farmlands.

Source of funds: Hatch and state

Scope of impact: state-specific

(7) Field-testing of new specialty crops, such as tropical pumpkin (Calabaza), jilo, maxixi, and radicchio, will provide growers added income and supply consumers with produce of high interest to ethnic groups. These outcomes also apply to USDA goals #3 and #5. **Themes: Agricultural competitiveness, Agricultural profitability, Small farm viability**

Description: Public interest in and sales of heirloom tomatoes have increased in the past decade. Consumers are willing to forego appearance for that good old-fashioned taste. Knowledge of high-yielding cultivars benefits stakeholders, especially those who serve urban consumers or purchase these fruits at local farmers' markets in the Northeast. Ten cultivars were evaluated for yield, quality, and profitability at two research farms.

Accomplishment/Impact: Average yields ranged between 22 and 24 pounds per plant for "Anna Russian", "Pineapple", "Giant Ponderosa", and "Kellogg's Breakfast". Sixty plants yielded about 1,380 pounds of tomatoes. The success in growing heirloom tomatoes had immediate economic impact for growers. At a retail price of $0.69 per pound, there is a potential gross crop value of $70,400 per acre. For 50 acres of actual commercial production, the expected gross crop value will be about $3,520,000. Farmers plan to grow more heirloom tomatoes. Expected long-term benefits include increased economic opportunities for growers, the availability of locally grown produce for consumers, and preservation of open space.

Source of funds: Hatch and state.

Scope of impact: state-specific

(8) Laboratory tests on the molecular genetics and biochemistry of plants will characterize nucleobase/ascorbate transporters and other processes so that new plants can be ultimately developed to use fertilizers more efficiently. **Theme: Plant Genomics, Plant Health, Plant Production Efficiency.**

Results and impact statements were reported last year. Scientists at the University of California (Davis) are conducting experiments in collaboration with biochemists at The Connecticut Agricultural Experiment Station to develop crops that are resistant to insects and plant pathogens.

Description: Quality of white pine trees grown in nurseries and landscapes declines when white pine weevils attack the trees. These insects cause damage to the upper, leading branches of trees, and the unsightly appearance of trees with dead branches affects marketability. Weakened trees are also more susceptible to diseases. Christmas trees are grown on about 6,000 acres by 495 growers in Connecticut. White pines are grown on about 300 acres in Connecticut and comprise about 20% of the $9 million annual gross revenue of harvested trees. Moreover, white pine trees are in great demand for local landscaping. The nursery industry requested assistance from Station

scientists to meet immediate critical needs on solving a specific pest problem. Various insecticides were tested to find acceptable cost-effective control measures. Field tests were repeated in consecutive years to assess reproducibility of results.

Accomplishment/Impact: Results confirmed earlier work that the insecticide bifenthrin (Talstar) was very effective in controlling white pine weevils. In attempts to solve another immediate insect infestation, this product was also successful in controlling pales weevils on Christmas trees. These findings had short-term impacts because Christmas tree growers have replaced chlorpyrifos (Lorsban), an organophosphate insecticide that is very hazardous to the users, with a much safer alternative. It is estimated that a well-timed, low concentration of bifenthrin has saved about $8,000 in damage to trees on one large farm. Sales of quality Christmas trees are ensured, thereby enhancing local agricultural markets and expanding economic opportunities for owners of nurseries in rural areas. There are additional benefits because tree companies are now using bifenthrin to control white pine weevils on homeowners' properties. Moreover, the US EPA has changed the label requirements to restrict the use of chlorpyrifos, which can no longer be purchased in garden centers. Selection of bifenthrin not only reduces costs but offers expected long-term benefits of having cleaner environments in and near nurseries, many of which border residential areas, and having less negative impacts on wildlife species. There is also less human exposure to insecticides, continued profitability for growers, and fewer potential problems with contaminated streams and ground waters.

Sources of funds: Hatch and state.

Scope of impact: multistate integrated research (CT, MA, NY, RI) and extension.

Accomplishments also apply to goals #4 (**Theme: Pesticide application**) and #5

Allocated Resources. Fiscal and human (expressed as Scientist Years) resources are listed for federal FY 2006.

	Fiscal Resources				Human Resources	
	Federal*		State		Scientist Years	
Years	Target	Actual	Target	Actual	Target	Actual
2005	$360,000	$390,000	$1,724,422	$2,374,116	12.1	15.8
2006	$360,000	$431,667	$1,724,422	$2,780,172	12.1	16.2

*Federal Hatch funds only.

Program Goal # 2: A safe and secure food and fiber system.

Research Goal: To ensure an adequate food and fiber supply and food safety through improved science based on detection, surveillance, prevention, and education.

Performance Goals (1). To annually increase the research and knowledge base available to CSREES partners and cooperators on food safety and food-borne risks and illnesses. (*2)* To increase consumer access to selected agricultural products of Connecticut, which provide greater assurances for safety.

Output Indicators. (1). Numbers of publications, talks, and interviews given by scientists were tabulated annually and are reported here to document interactions with stakeholders. During state FY 2006, there were four publications recorded in association with this program goal and 20 talks and interviews.

Output Indicators (2). The Department of Analytical Chemistry is responsible for testing agricultural products and drinking water for pesticide residues. During FY 2006, produce was analyzed at the request of the Connecticut Department of Consumer Protection. Findings were reported to the appropriate state and federal agencies as well as to the public.

Outcome Indicators. There are two major expected outcomes and impacts associated with the performance goal(s) listed in the updated Plan of Work. It is expected that results of laboratory investigations with state-of-the-art equipment will lead to the development of new procedures to detect pesticides in plants, soil, and air. This outcome also applies to USDA goal #4.

(1) There will be greater consumer access to safe foods grown in Connecticut or produced elsewhere. This outcome also applies to USDA goal #3. **Themes: Food handling; Food safety**

Description: Surveys of harvested crops are conducted annually by the Connecticut Department of Consumer Protection to check produce for unwanted chemicals resulting from unlawful pesticide use. Bell peppers grown in Connecticut were included in routine analyses.

Accomplishment/Impact: Scientists in the Department of Analytical Chemistry at The Connecticut Agricultural Experiment Station analyzed bell pepper samples for pesticide residues and found a violation. Concentrations of chlorothalonil (0.06ppm) were above federal tolerance levels. These results had immediate impact because the entire crop was destroyed. The same grower willfully destroyed a crop of eggplant due to the misapplication of chlorothalonil. Contaminated produce never reached the consumer. There are long-term benefits, too. Growers learn that sampling and analyses of produce will check farm activities and ensure safe foods for consumers. Most produce samples tested are not in violation, and based on releases of laboratory results to the public, residents of the state are re-assured that, in general, produce samples are safe to eat.

Sources of funds: Hatch and state.

Scope of impact: state-specific.

Description: There are at least 150 community gardens in Connecticut, mainly located in urban neighborhoods. Some gardens are located in abandoned industrial or housing sites. Stakeholders have questions about possible heavy metals being present in the soil and have requested Station assistance in analyzing soil samples. In a pilot study, 90 soil samples, taken from 10 community gardens, were tested.

Accomplishment/Impact: Laboratory results indicated that 30% of the soil samples contained elevated concentrations of lead, while 8% had relatively high concentrations of arsenic. There were short-term impacts because upon learning about the heavy metal contamination problem, garden activities ceased so that consumers would not eat potentially contaminated foods. New initiatives include an expansion of the testing program to cover more areas of the state, the application of remedial steps to correct polluted soil, and the testing of produce for heavy metals. The long-term benefit is that there will be less human exposure to heavy metals, which will reduce health risks.

Sources of funds: Hatch and state

Scope of impact: state specific

Allocated Resources. Fiscal and human (expressed as Scientist Years) resources are listed for federal FY 2006.

	Fiscal Resources				Human Resources	
	Federal*		State		Scientist Years	
Years	Target	Actual	Target	Actual	Target	Actual
2005	$121,400	$139,216	$244,510	$263,432	2.6	2.4
2006	$121,400	$119,972	$244,510	$215,275	2.6	2.5

*Federal Hatch funds only.

Program Goal # 4: Greater harmony between agriculture and the environment.

Research Goal: Enhance the quality of the environment through better understanding of and building on agriculture's and forestry's complex links with soil, water, air, and biotic resources.

Performance Goal 2. To increase technology options available to agricultural producers to enhance profitability without damaging the environment.

Output Indicators. (1). Numbers of publications, talks, and interviews given by scientists were tabulated annually to document communications to stakeholders. During state FY 2006, there were 59 publications and 358 talks and interviews recorded in association with this program goal. The number of officerships and memberships in stakeholder organizations and national or state committees was 50 during this reporting period. Letters from stakeholders regarding Station research findings and assistance, comments from the media, and narratives of scientific accomplishments are on file.

(2) Production practices options for reducing over-reliance on chemicals. See outcome indicators below for specific results.

(3) Methods of plant waste management that protect the environment. See outcome indicators below for specific results.

(4) Methods for removing chemicals from soil and water. See outcome indicators below for specific results.

(5) Methods for detecting and removing invasive plants from lakes and ponds.

Outcome Indicators. There are several expected outcomes and impacts associated with the above mentioned performance goals listed in the updated Plan of Work. It is expected that:

(1) Laboratory and field experiments will reveal more efficient, cost-effective methods of applying nutrients to greenhouse-grown tomatoes and other crops. This outcome also applies to USDA goals #3 and #5. **Theme: Nutrient management**

Description: There is continued strong consumer demand for tomatoes grown in greenhouses during the colder months. Cultivars of greenhouse tomato are available to the 50 growers interested in marketing this crop, but labor costs can significantly decrease profits for growers because unmarketable fruit must be culled from harvested items. Earlier studies revealed that using shade cloth in greenhouses resulted in the production of high quality tomatoes. Experiments were continued to determine if shading would increase the fraction of marketable fruit without sacrificing fruit size and if labor costs could be reduced.

Accomplishment/Impact: Results showed that shade cloth applied over a greenhouse soon after the start of fruit production reduced the number of fruit with cracked skin, while having little effect on fruit size. However, shade did not increase marketable yield. The fraction of fruit that was marketable was least without shade and greatest under 50% shade. The short-term benefit in using shading methods is that there would be less labor used to pick non-marketable fruit. It is estimated that labor costs could be reduced by at least 10%. On a per greenhouse basis, savings in labor costs would be about $60.00. There are about 70 greenhouses where tomatoes are being grown in the state. Therefore, the savings statewide is $4,200.

Sources of funds: Hatch and state.

Scope of impact: state-specific.

Results also apply to goal #1 **(Theme: Agricultural competitiveness; Agricultural profitability; Diversified/alternative agriculture; Plant production efficiency; and Small farm viability)** and goal #3 **(Theme: Human health)**.

(2) Laboratory tests will improve methods of detecting and degrading pesticides and other agricultural compounds that have contaminated soil and water. **Themes: Agricultural waste management; Hazardous materials; Soil quality; Water quality**

This objective has been completed. Accomplishments/Impacts were described in previous annual reports.

(3) Results of field experiments will lead to more efficient production and use of compost in agroecosystems, including stakeholders' gardens. **Theme: Recycling; Yard waste/composting**

Description: Municipalities are relying on farmers to use leaves as compost rather than burning the plant materials. Farmers have been plowing the leaves into the soil (sheet composting) but do not know whether or not such measures result in increased crop yields. Accordingly, experiments were conducted in onion plots with cultivars "Corona" and "Daytona" to determine if yields are greater when compost is used.

Accomplishment/Impact: Plots amended with compost and compost mulch with the same amounts of fertilizer resulted in the highest yields for cultivars "Corona" (8.3 oz/onion) and "Daytona" (14.8 oz/onion) compared to control plots (5.4 oz/onion and 10.7 oz/onion, respectively). At a retail price of $1.29 per pound, there was a total increased potential crop value of $19,199 per acre for cultivar "Daytona". The use of compost in 7 acres of actual production results in a gross crop value of about $69,304. In addition to economic impact, there are expected long-term benefits of recycling leaves and other plant remains because valuable space will not have to be devoted to composting in municipal properties and there will be cleaner air because leaves will not be burned.

Sources of funds: Hatch and state.

Scope of impact: state-specific.

Accomplishments also apply to goal #1 (**Themes: Home lawn and gardening; Plant production efficiency**).

(4) Laboratory analyses will identify which mosquito species are important in the transmission of West Nile Encephalitis (WNE), Eastern Equine Encephalitis (EEE), and California group encephalitis viruses in forested areas so that there will be minimal use of pesticides for control resulting from a more precise time interval defined for application of pesticides. There will be rapid notification of virus isolation results to the public so that precautions on reducing mosquito bites can be taken. **Themes: Biological control; Integrated pest management; Pesticide application; Other (Wildlife science)**

Description: Mosquito-transmitted encephalitis viruses are of public health concern nationally. The West Nile encephalitis virus moved quickly to western United States following its initial discovery in Connecticut and New York in 1999. Infections of EEE virus have higher fatality rates of about 30%. To meet the immediate needs of stakeholders to warn if mosquitoes are infected, a statewide mosquito surveillance program was continued to include 91 trapping sites.

Accomplishment/Impact: Based on analyses of 197,793 mosquitoes, including 12,661 pools of specimens grouped by species, West Nile and EEE viruses are well established in the state. There were 217 isolates of West Nile virus, 3 isolates of EEE virus, and 2 isolates of Trivittatus virus. Of these, West Nile virus is more widely distributed, particularly in the densely populated urban and suburban areas of southwestern and central Connecticut. There were nine human cases, including one fatality during this reporting period. Following public notification of virus results, knowledge of widespread occurrence of infected mosquitoes had immediate impact on people. They used

repellents and took other measures to minimize mosquito bites. The elderly were informed about elevated fatality rates of West Nile virus infections for their age group. Local health departments treated catch basins and other sites containing stagnant water with larvicides to reduce mosquito populations. Since 1999, there have been 50 human cases of WNE reported in Connecticut with 2 fatalities. Considering the widespread occurrence of WNE and EEE viruses in birds and mosquitoes, the annual surveillance and research activities offer long-term benefits because patterns of virus prevalence and changes in infection rates in mosquitoes will be clarified. If viral activity decreases to low levels, then pesticide applications can be reduced accordingly to meet the immediate needs, thereby reducing costs for municipalities (estimated to be about $20,000 per municipality) and human exposure to pesticides. Reduced pesticide use will also decrease risk of environmental contamination (i.e., ground and surface waters) and lessen the adverse effects on non-target organisms. Finally, having a mosquito surveillance/virus isolation program will facilitate the detection of certain pathogens in the event of bioterrorist activities.

Sources of funds: Hatch and state.

Scope of impact: state-specific.

These accomplishments also apply to national goals #1 **(Themes: Animal health; Risk management)** and to goals #3 and #5 by providing information on emerging human and veterinary diseases so that there would be a healthy population and enhanced quality of life for citizens living in rural and suburban areas (**Themes: Human health; Children, youth, and families at risk**).

(5) New antibody tests will be developed for the laboratory diagnosis of Lyme disease, granulocytic anaplasmosis (formerly known as ehrlichiosis), and tularemia in human beings, domesticated animals, and wildlife species (i.e., deer and mice) to determine specific localities where

there is risk of infection and a need to control ticks. **Themes: Integrated pest management; Pesticide application and management; Other** (**Emerging infections; Wildlife science)**

Description: Tularemia, also known as rabbit fever, is caused by a highly pathogenic bacterium that can be acquired by direct contact or a tick bite. The disease naturally occurs in several states but is more prevalent in southern United States. The infectious agent, *Francisella tularensis*, is classified as a select agent and has public health significance because of its potential use as a biological weapon. There is very little known about the natural occurrence of this disease organism in the Northeast. Accordingly, studies were conducted to determine if cats carry antibodies to this pathogen. Cats were selected because they are free roaming and have exposure to ticks and rodents.

Accomplishment/Impact: Analyses of 91 cat sera by microagglutination (MA) and indirect fluorescent antibody (IFA) staining methods verified current or past *F. tularensis* infections in cats living in Connecticut and New York State. Eleven and 22 positive cat sera were identified by MA and IFA methods, respectively. There was good agreement (73% concordance) in results of both tests. These results had immediate impact because public health officials now know that this pathogen is present in Connecticut and New York State, albeit at low prevalence. The expected long-term benefits are that cats can be used to monitor tularemia infections in nature and, thereby, indicate an increase in prevalence of the disease and that with reduced exposure to ticks, there will be a healthy human population.

Sources of funds: Centers for Disease Control and Prevention, Fort Collins, CO, Hatch, and state.

Scope of impact: multistate (CT, CO, NY) and integrated research and extension.

These accomplishments also apply to national goals #1 **(Theme: Animal health)**, #3, and #5 by providing information on important tick-associated diseases so that there would be a healthy population and enhanced quality of life for citizens living in rural and suburban areas (**Themes: Human health; Children, youth, and families at risk; Promoting business programs)**.

(6) Field experiments will reveal prevalence of infected ticks near human dwellings and effective methods of controlling ticks that transmit pathogens to mammalian hosts. **Themes: Biological control; Integrated pest management; Other (Wildlife science)**

Description: The blacklegged tick, *Ixodes scapularis*, transmits different bacteria that cause Lyme disease and granulocytic anaplasmosis and a protozoan organism that causes human babesiosis. Ticks have become more abundant in or near forested areas where white-tailed deer have increased. Homeowners have requested assistance in finding ways of reducing ticks without the use of chemicals and the risk of tick-associated diseases near their homes. Laboratory experiments were conducted to evaluate a fungus (*Metarhizium anisopliae*, strain 52) to determine efficacy as a biological control. .

Accomplishment/Impact: Results showed that when the fungus is applied as an oil-based emulsifiable concentrate, the treatment effectively killed *I. scapularis* ticks at a 100% mortality rate within a week following 3 minutes of tick exposure to the fungus. A fungus-enriched product is being developed commercially for use in tick-infested areas near human dwellings. With an effective biological control method for tick control, there will be less human exposure to chemical pesticides, a cleaner environment, and fewer cases of tick-borne infections.

Sources of funds: Centers for Disease Control and Prevention, Hatch, and state.

Scope of impact: national multistate: CO (CDC), CT. Research work also applies to national goals #1 **(Theme: Risk management)** and #3 and #5 by providing important information on tick-associated diseases so that there would be a healthy population and enhanced quality of life for stakeholders living in rural and suburban areas (**Themes: Human health; Children, youth, and Families at risk**).

Sources of funds: Hatch and state.

Scope of impact: multistate (CT, MD, NJ, PA).

Themes: Human health; **Children, youth, and families at risk; Forest resource management**. This project also applies to goal #1 (**Theme: Ornamental/Green Agriculture**).

(7) Laboratory analyses will determine concentrations of pesticides and other toxic chemical residues in air, water, food, or soil samples submitted by state regulatory agencies. Methods of control will be investigated. **Themes: Air quality; Soil quality, Hazardous materials; Pesticide application**

Description: Although banned for residential use, chromate copper arsenate (CCA)-treated wood remains present in or near homes and playgrounds. Compounds, such as arsenic, leach from the wood, enter the soil, and could be taken up by certain plants. Arsenic is a class "A" carcinogen, and stakeholders are concerned about its presence in the environment, particularly in garden soil in raised beds bordered by pressure-treated wood. Accordingly, experiments were continued to determine if coating the wood would slow or prevent leaching and subsequent uptake of arsenic by plants.

Accomplishment/Impact: Opaque, film-forming finishes applied to CCA-treated wood form an effective barrier to arsenic leaching and subsequent plant uptake. Reduction in plant arsenic

ranged from 50 to 84% in plants grown next to the opaque finished wood. These results had immediate impact because new guidelines could be followed by greenhouse operators and homeowners to avoid contamination of arsenic. With the added step of growing plants 6 cm or more away from the wood, the reductions in the uptake of arsenic by plants greatly decrease exposure of humans and other animals to this dangerous chemical, thereby reducing health risks. There will also be a long-term benefit of reducing the build-up of arsenic in the environment.

Sources of funds: Hatch and state.

Scope of impact: state-specific. These accomplishments also apply to goal #1 **(Theme: Risk management).**

(8) Laboratory and field studies will identify species of entomopathic microsporidia that may be used to control mosquito larvae in wetland habitats and thereby reduce chemical control. **Themes: Biological control; Integrated pest management**

This objective has been completed. No significant new progress has been made following the results and impact statements reported in the previous annual accomplishment reports.

(9) Field and laboratory experiments will be conducted to find environmentally safe methods of detecting and removing invasive aquatic weeds from lakes and ponds. **Themes: Improving Water Quality, Pest Management**

Description: Invasive aquatic plants eliminate native aquatic plants and reduce water quality. Water milfoil, Cabomba, and Eurasian water milfoil are invasive species, which have greatly impacted Connecticut lakes by lowering water quality and limiting recreational uses. Members of lakes' associations have requested assistance on finding ways to remove invasive plants from bodies

of waters. Spot treatments of low concentrations of herbicides (fluoridone and 2, 4-D) were applied in localized infested areas.

Accomplishment/Impact: Late summer applications of herbicides effectively removed invasive aquatic plants (Cabomba and Eurasian water milfoil) from Lake Quonnipaug (Guilford), Bashan Lake (East Haddam), and Grannis Lake (East Haven). These findings had immediate environmental impacts because residents regained full recreational uses of the lakes. Control methods will be applied to other lakes to remove invasive aquatic plants. Expected long-term benefits are stabilization of property values near the lakes, reduced eutrofication of lakes, and improved water quality over broader regions of the state.

Sources of funds: Hatch and state

Scope of impact: state-specific

(10) IPM methods will be developed for nurseries to reduce amounts of pesticides used and will result in more efficient uses of agricultural chemicals by producers. **Themes: Integrated pest management; Pesticide application**

Description: Efforts were continued to reduce amounts of pesticides used in commercial nurseries and to promote adoption of IPM practices. Two small nurseries on a total of about 5 acres of land received intensive on-site assistance during 2005. Detailed pesticide records were available to calculate changes in pesticide use (pre-and post-IPM adoption) attributed to increased grower acceptance of IPM strategies.

Accomplishment/Impact: Compared to pre-IPM status before 2005, there was a decrease of total active ingredient of insecticide/miticide usage by 6.2 pounds on both farms. This translated into a short-term benefit of a $104 decrease in cost for insecticidal product on these farms. It is estimated

that if a similar IPM program could be implemented for a larger nursery of 100 acres, the cost savings would be about $2,080. Projected cost savings for 8,730 acres of nursery production statewide range between $180,000 and $185,000. Owners were asked if the IPM program was useful. Each person supported the effort and would recommend that other growers consider adopting similar practices. Aside from economic benefits, acceptance of the IPM effort is an important short-term goal and a departure from previous practices of excessive and unnecessary pesticide applications. Expected long-term benefits include the production of quality plants with less adverse effects on beneficial insects that help control pest species in nurseries; less pesticide contamination of ground water, streams, and rivers; and less human and animal exposure to pesticides, thereby reducing health risks. Nursery growers are more convinced that IPM practices are cost effective and useful. This change in attitude among growers will help achieve other expected long-term benefits of more widespread acceptance of IPM methods among other growers and having an overall cleaner environment.

Sources of funds: Hatch and state.

Scope of impact: state-specific, integrated research and extension.

These accomplishments also apply to national goal #1 **(Themes: Agricultural competitiveness; Agricultural profitability; Ornamental/Green agriculture; Precision agriculture; Small farm viability).**

Description: Powdery mildew can have a detrimental effect on the quality of pumpkins, a crop grown on about 1,559 acres in Connecticut and worth about $2 million annually. Connecticut is ranked #20 in pumpkin production in the nation. Fungicides are currently used to manage fungus infections and to preserve a marketable crop. There is continued interest among growers for scientists to develop biological controls and to find ways of reducing pesticide use and costs. Previous research revealed that the use of milk-based foliar sprays reduced crop damage caused by

powdery mildew infections on pumpkins and muskmelon. Experiments were continued to evaluate the new method of controlling powdery mildew.

Accomplishment/Impact: Weekly foliar applications of a 50% by volume aqueous solution of either whole, skim, or powdered milk delayed the onset and severity of powdery mildew on pumpkins. Treatments were 50% to 70% as effective in reducing foliar damage and post-harvest fruit rot as chemical (fungicide) control. Milk-sprayed plots were 40% to 50% as effective in increasing marketable yields, compared to treatments of chemical fungicides. This research development represents a savings of about $68 per acre in fungicide costs. If this new method of control could be adopted statewide for 1,559 acres, the estimated savings would be about $106,000. Expected long-term benefits include less human exposure to pesticides, thereby reducing health risks, and a cleaner environment.

Sources of funds: Hatch and state.

Scope of Impact: state-specific

Description: Experiments were continued to evaluate insecticidal control of pales weevil, an important pest of Christmas trees. This insect weakens trees and causes significant economic losses. In Connecticut, about 495 growers harvest about 440,000 trees annually, representing about 6% of the total 7.7 million trees grown in the state. Annual sales of about $4,000,000 are attained. Stakeholders requested assistance on finding an insecticide that could be used minimally in an IPM effort to effectively manage the insect pest.

Accomplishment/Impact: Field experiments revealed that treatments with the insecticide bifenthrin in early April suppressed pales weevil populations by 99.3%, compared to treatments done in later periods and untreated check plots. With effective treatment in the spring, there was no need for subsequent applications of insecticides, and pest management could be attained at $18.50 per acre

instead of $73.00 per acre with Lorsban, a more toxic chemical. Application of this new treatment procedure on 4,800 acres of production sites would save growers about $262,000 statewide. There will also be long-term benefits of less human exposure to pesticides, reduced health risks, less adverse effects on beneficial insects, and a cleaner environment.

Sources of funds: Hatch and state.

Scope of Impact: Multistate integrated research and extension (CT, MA, NY, RI).

Sources of funds: Hatch and state.

Scope of Impact: Multistate (CT, MA) and integrated research and extension. These results also apply to national goal #1 **(Themes: Agricultural profitability; Plant health; Ornamental/green agriculture; Plant production efficiency; Small farm viability).**

Allocated Resources. Fiscal and human (expressed as Scientist Years) resources are listed for federal FY 2006.

	Fiscal Resources				Human Resources	
	Federal*		State		Scientist Years	
Years	Target	Actual	Target	Actual	Target	Actual
2005	$286,227	$229,625	$1,945,864	$2,396,085	18.6	19.9
2006	$286,227	$200,350	$1,945,864	$2,764,708	18.6	17.1

*Federal Hatch funds only.

Multi-Institutional, Multi-Disciplinary, and Multistate Research

The Station's Hatch projects, CRIS/CSREES accession numbers, and state and federal Hatch funds are listed in separate tables to document multi-institutional, multi-disciplinary, and multistate research (Tables 1-3). Table 4 shows a distribution of funds for this part of the research effort and the ≥25% required amounts for formula funds. Table 5 shows integrated activities with extension systems in land-grant universities, while Table 6 lists separate planned integrated projects showing

actual allocated resources (SY) and costs for FY2006. Table 7 reports actual distributions of Hatch and state matching funds for federal FY 2006. The CRIS code for The Connecticut Agricultural Experiment Station is CONH.

Table 1. Multi-Institutional (FY 2006)

Hatch Project	CRIS Access.#	Collaborating institutions and businesses
CONH 135[c]	0187947	None
137[c]	0198865	CT Dept. of Consumer Protection, US EPA, US FDA
138	0199518	US EPA, CT Dept. of Consumer Protection
139[b]	0204361	CT Dept. of Environmental Protection
243[c]	0198426	Yale University
244	0200136	Yale University, Purdue University
245	0204616	Yale University
246[b]	0206764	University of Connecticut (Storrs)
344[d]	0078445	Centers for Disease Control (Fort Collins, Co), New York State Health Department, Yale Univ., Univ. of Connecticut (Storrs), University of Iowa, University of Texas (Houston), L^2 Diagnostics, LLC (New Haven)
371[d]	0179183	Univ. of Connecticut (Storrs), Cornell Univ.
377[c,d]	0191684	Cornell Univ., Univ. of CT (Storrs), Rutgers Univ.
378[c,d]	0195135	University of Connecticut (Storrs), Univ. of Massachusetts, Cornell University, North Carolina State, Rutgers University, Penn. State
380[a,d]	0198512	Cornell University, Univ. of Massachusetts
383[a,d]	0205882	Univ. of Connecticut, Cornell Univ., Penn. State, Univ. of Mass., Rutgers Univ., Univ. of Rhode island
560[a,c,d]	0190494	Cornell Univ., Rutgers Univ., Penn. St. Univ., Univ. of Maryland, Virginia Polytechnic Inst., West Virginia Univ.
561[c,d]	0191645	CT. Dept. of Agriculture, Cornell University, Univ. of Oklahoma
563[d]	0193029	CT. Vegetable Producers, CT. Greenhouse Growers Assoc., Univ. of Connecticut,

565[a,d]	0198286	Cornell Univ., Michigan State Univ., Rutgers Univ., CT. Vegetable Producers, CT Greenhouse Growers Assoc., Univ. of Arizona, Univ. of Kentucky, Univ. of Nebraska, Penn. State, Univ. of Texas
566	0201194	Cornell Univ., Penn. State. Univ., Univ. of Maryland
567[d]	0201745	Cornell Univ.
568[ad]	0202597	Cornell Univ.
569[a,d]	0205754	Cornell Univ., Rutgers Univ., Penn. State
570[b]	0206270	University of Connecticut (Storrs)
630[d]	0195468	Cornell Univ., Univ. of CT (Storrs), Michigan State Univ., Penn. State
633[d]	0199708	Cornell Univ.
772[c]	0192464	Cornell Univ., Univ. of CT (Storrs), Univ. of Virginia
773[a,d]	0205786	Several states cooperating on S-301, USDA/ARS Center for Med. Agric. & Vet. Entomology
774[a,d]	0206141	Several states cooperating on W-082
775	0206215	University of Connecticut (Storrs)
776	0207366	University of Massachusetts
805[d]	0198560	Univ. of CT (Storrs)
806[b]	0201979	New York State

[a]USDA approved multistate research project.

[b]New Hatch project approved during reporting period.

[c]Hatch project expired during reporting period.

[d]Includes integrated activities (research/extension).

Table 2. Multi-Disciplinary (FY 2006).

Hatch Project	Scientific Disciplines
CONH 135	analytical chemistry, food production systems
137	analytical chemistry, toxicology
138	analytical chemistry, toxicology
139	analytical chemistry, toxicology
243	insect pathology, molecular biology
244	plant biochemistry, molecular genetics

245	plant biochemistry, molecular genetics
246	plant biochemistry, molecular genetics
344	acarology, microbiology, immunology, molecular biology, epidemiology, human and veterinary medicine, wildlife diseases
371	acarology, entomology, IPM
377	entomology, ecology
378	entomology, IPM
380[a]	entomology, horticulture, IPM
383[a]	entomology, IPM
560[a]	animal behavior/ecology, deer management
561	horticulture, composting, plant physiology
562[a]	horticulture, plant physiology
563	horticulture, plant physiology
565[a]	horticulture, plant physiology
566	animal behavior/ecology, deer management
567	horticulture, plant genetics
569	horticulture, plant physiology
568[a]	horticulture, plant genetics
570	horticulture, plant genetics
630	mycology, plant pathology, horticulture, IPM
633	meterology, plant pathology, biophysics
772	environmental toxicology, soil chemistry
773[a]	protozoology, invertebrate pathology, entomology
774[a]	soil and water chemistry, environmental toxicology
775	botany, water chemistry, molecular biology
776	botany, soil and water chemistry
805	analytical chemistry, horticulture, weed management
806	mycology, environmental toxicology

[a]USDA approved multistate research project.

Table 3. Multistate Collaborations (FY 2006).

Hatch Project	CSREES Multi-state Project Number	Participating states
CONH 135		
137		
138		
139		
243		
244		IN
245		
246		
344		CT*, CO, GA, IA, NY, SC, TX
371		CT*, NY
377		CT*, NJ, NY
378		CT*, MA, MN, NC, NH, NJ, NY, PA, RI
380	NE-009[a]	CT*, DE, ME, MD, MA, NH, NJ, NY, PA, RI, VT, WV
383	NE-1025	CT, NJ, NY, MA, MD, PA, RI
560	NE-1005[a]	MD, NJ, NY, PA, VA, WV
561		NY, OK
563		
565	NE-1017[a]	AZ, CT*, KY, MI, NE, NH, NJ, NY, OH, PA,
566		MD, NY, PA
567		MA, NY
568	NE-1020[a]	CA, CO, CT*, ID, IA, KY, MD, MA, MN, NE, NV, NY, OH, OR, PA, SD, TX, UT, VA, WA
569		AZ, CT*, KY, MI, NE, NH, NJ, NY, OH, PA
628		
630		CT*, FL, MA, NY, PA
633		NY

634	NE-1019[a]	CT*, FL, GA, MA, MI, NY, PA, RI, SC, WV
636		
772		NY, VA
773	S1024[a]	AL, AR, CA, FL, GA, ID, IL, KY, LA, ME, MN, MS, NJ, NY, NC, SC, TN
774	W1082[a]	AR, AZ, CA, CT*, FL, HI, IA, IN, KS, MN, MT, NV, NY, WA
775		
776		
805		CT*, MA
806		NY

[a]USDA approved multistate research project.

CT* = University of Connecticut (unaffiliated with The Connecticut Agricultural Experiment Station).

Table 4. Distribution of Hatch and state matching funds at The Connecticut Agricultural Experiment Station (C.A.E.S.). Federal FY 2005 and 2006 data for Multi-Institutional, Multi-Disciplinary, and Multistate Projects.

			SY units	
	Connecticut		Multi-	Total
Fed. Hatch Funds	State Funds	Total	Categories	Hatch Program
FY 05 $541,401	$3,278,125	$3,819,526	27.9	38.1
FY 06 $629,692	$3,264,855	$3,894,547	23.2	35.8

Total funds available for entire Hatch program (FY 2006) at C.A.E.S.	$751,989
% Hatch funds dedicated to multi-institutional, multi-disciplinary, and Multistate research	83.7%

Table 5. Integrated research activities for all research projects between The Connecticut Agricultural Experiment Station (C.A.E.S.) and extension programs in land-grant universities during federal FY 2005 and 2006.

				SY units	
	Connecticut				Total
	Fed. Hatch Funds	State Funds	Total	Integrated only	Hatch Program
FY 05	$363,823	$2,537,212	$2,901,035	21.5	38.1
FY 06	$391,557	$2,441,887	$2,833,444	18.5	35.8

Total funds allocated to entire Hatch program at C.A.E.S. in FY 2006	$751,989
% dedicated to all multi-categories and integrated activities with CT and other states	52.1%

The Connecticut Agricultural Experiment Station dedicated Hatch funds to integrated activities with extension systems in land-grant universities in different states. In Connecticut, $359,842 was dedicated to integrated activities in FY 2006 with extension at the University of Connecticut, an institution not affiliated with The Connecticut Agricultural Experiment Station.

Table 6. Distributions of projected and actual Hatch and state matching funds and SY units at The Connecticut Agricultural Experiment Station for all Multi-Institutional, Multi-Disciplinary, Multistate, and Integrated Activities for federal FY 2005 and 2006.

	Federal Hatch*	State funds*	Scientist Years
Projected	$260,360	$845,500	10.0
Actual (FY2005)	$363,823	$2,537,212	21.5
Actual (FY2006)	$391,557	$2,441,887	18.5

*Funds distributed to all “multi” categories with integrated activities.

Table 7. Distributions of projected and actual fiscal and human resources (SY units) dedicated to the entire Hatch and associated state research activities for federal FY2005 and FY2006.

	Total Federal Hatch	Total State Match	Total SY
Projected	$767,627	$4,068,700	36.8
Actual (FY2005)	$759,224	$5,033,633	38.1
Actual (FY2006)	$751,989	$5,760,155	35.8

Progress Reports: Planned Integrated Activities

Attachments to Form CSREES-REPT. (Revised 09/04)

(Hatch Act Funds)

Federal FY 2006

Activities descriptions: As presented in the updated Plan of Work, 13 Hatch projects were listed as planned, integrated activities (Hatch Act Funds). In a previous section of this Annual Report of Accomplishments and Results (including the Tables), descriptions and impact statements were given regarding progress made on the planned integrated and other projects. Form CSREES-REPT (09/04) reporting expenditures for FY 2006 follows these brief research summary statements for these specific activities. Please note: financial figures for items # 2, 5, & 7 and items # 6, 9, & 12 have been consolidated in Form CSREES-REPT under the planned activities titles "managing insects/fungi" and "IPM", respectively.

1. Tick-borne infections: As a part of a homeland security initiative, studies were conducted to determine if *Franciscella tularensis,* the causative agent of tularemia was present in Connecticut and southeastern New York State. This disease organism could potentially be used as a bioterrorist weapon. Cats were chosen to determine prevalence of antibodies to the bacterial agent so that general baseline estimates of pathogen occurrence could be determined. Analyses of 91 cat sera revealed the presence of antibodies in 11 and 22 samples tested by microagglutination and indirect fluorescent antibody staining methods, respectively. It was concluded that the disease organism naturally occurs in the state, albeit at relatively low prevalence. Public health officials and veterinarians were informed.

2. Managing insects on vegetable crops: There are collaborations with two organic farmers in Connecticut, who are breeding their own vegetable lines to diversify Brassica populations to avoid flea beetle damage and to be able to grow crops for longer periods during the growing season. Other breeding experiments are continuing to inter-cross potatoes as a first step toward developing cultivars with resistance to potato leafhoppers. These efforts are being made to satisfy consumers and growers who want to reduce the use of pesticides and, thereby, cut business costs, decrease health risks for pesticide users, and to have a cleaner environment.

3. Plant genetic resources (NE-9): Experiments continued on crossing mizuna, talsoi, and scarlet turnip in cooperation with the "Restoring Our Seed" project. New specialty crops are requested by growers and are of interest to consumers. This research effort is in the early stages of development. New agricultural crops offer growers in rural areas alternatives for an expanding market, which includes a diversity of ethnic groups. Keeping farmers on the farm also preserves open space.

4. Greenhouse production (NE-1017): The use of shade cloth over greenhouses soon after the start of tomato production reduced the number of fruit with cracked skin. This technique reduces labor costs because there is less unmarketable fruit to cull from production. Fifty growers have about 70 greenhouses in use for tomato production. The overall savings in labor costs is about $4,200. Increased profitability aids growers.

5. Managing insects in apple orchards: Biological control is an important component of integrated pest management (IPM) in northeastern apple orchards. An encyrtid wasp, released previously, is well established in experimental orchards and is controlling the exotic spotted tentiform leafminer. The wasp has spread to commercial orchards and is surviving conditions where there is limited use of insecticides. These promising results indicate that the wasp can be used effectively as a part of IPM

programs. Expected long-term benefits include a cleaner environment, quality fruits for market, and less human exposure to pesticides, thereby reducing health risks.

6. Integrated pest management (IPM) for Connecticut nurseries: Two small nurseries (total = 5 acres) received assistance on implementing IPM practices to reduce amounts of pesticides used. There was a decrease of total active ingredients of insecticide/miticide usage of 6.2 pounds for both farms, compared to data for prior years with no IPM program. If this short-term benefit of $104 in cost savings were to be applied for 8,730 acres of nursery production, there would be an expected long-term benefit of about $180,000 in reduced pesticide costs. Other long-term benefits will include a cleaner environment, less pesticide exposure to humans and beneficial insects, and more effective biological control of pest species.

7. Management of insects in soil and other pests (includes NE-187 and NE-1025): Pales weevil is an important pest of Christmas trees. Damage to trees can result in significant economic losses. Growers requested assistance on control. Treatment with bifenthrin in early April suppressed Pales weevil populations by 99.3%, compared to treatments made in later periods and untreated checks. Successful pest management required a single treatment that could be accomplished for about $18.50 per acre instead of $73.00 per acre with Lorsban, a more toxic chemical. Application of this new method of chemical control over 4,800 acres of Christmas tree production would save growers about $262,000, reduce human exposure to pesticides, and would lessen contamination of surface waters.

8. Evaluation of new apple cultivars (NE-183): This multistate project has terminated and no further research is planned. Results and impact statements were reported earlier. “Suncrisp”, a cultivar evaluated in previous years, is being grown in Connecticut.

9. Suppression of plant diseases: Powdery mildew can have detrimental effects on the quality of pumpkins grown on about 1,559 acres in Connecticut and worth $2 million annually. Fungicides are

used to control plant disease. Foliar applications of milk-based materials were 50% to 70% as effective in reducing damage as chemical fungicides, but were less expensive. There were savings of about $68.00 per acre. If the new method was applied statewide, there would be a savings of about $106,000. Expected long-term impacts include cleaner farm environments, increased participation of growers' acceptance of alternative control methods, and reduced human exposure to pesticides.

10. Wildlife Management (NE-1005): White-tailed deer cause automobile accidents and crop damage. Being the chief host of *Ixodes scapularis* ticks, deer are a major factor in the rise of tick populations and prevalence of Lyme disease, granulocytic anaplasmosis, monocytic ehrlichiosis, and human babesiosis. The principal research scientist on this project resigned to take another job elsewhere. Under the guidance of another scientist, research on deer management has been re-directed. Work has started on finding ways to decrease deer presence near highways. In collaboration with civil engineers in the Connecticut Department of Transportation, it has been suggested that oak trees be removed from highway sites where automobile accident rates are high. Acorns are a favorite food source of deer and attract these animals. In addition, sterilization procedures evaluated in previous years will be applied to reduce numbers of deer at selected sites. Finally, ten repellents are being tested to reduce crop damage. Expected long-term benefits include reduced numbers of automobile accidents and less crop damage. Effective deer management will also benefit forests by reducing browse damage to saplings.

11. Dispersal of corn pollen: Experiments are nearly completed on determining the range of corn pollen dispersal. Results of replicated trials in different sites indicate that about one mile is the maximum extent of pollen dispersal. This means that genetically modified corn must be planted at least one mile from non-genetically modified corn. This information will be used in recommendations made on establishing buffer zones for federal and state regulatory purposes.

12. Integrated pest management of plant parasitic nematodes (NE-1019): *Pratylenchus penetrans* (lesion nematode) causes root damage of strawberries, which can lead to fungal infections, whereas *Meloidogyne hapla* (northern root-knot nematode) causes damage to other crops, such as tomato. Endospores of *Pasteuria* species, a biological control agent of nematodes, were discovered in the cuticles of 60% of *M. hapla* juveniles. This is the first record for *Pasteuria* in the Northeast. These results show promise for the development of biological control and future use in IPM programs. The findings are particularly important because the conventional chemical control of nematodes with methyl bromide is now very restricted. Development of biological controls and IPM practices will reduce pesticide use and human exposure to pesticides.

13. Herbicides/weed control: Weeds growing in nursery fields and containers compete for plant nutrients and reduce product quality. Preliminary results on the efficacy of a granular herbicide (BroadStar), registered in 2003, show good control of grassy and broadleaf weeds in containers. Aside from being an effective treatment, another short-term benefit is that this herbicide can be used in lower dosages ($\geq$ 50%) than other herbicides. The expected long-term impact will be improved plant quality and enhanced marketability for growers, less human exposure to pesticides, and less pesticide entering the environment.

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Actual Expenditures of Federal Funding for Multistate Extension and Integrated Activities
(Attach Brief Summaries)
Fiscal Year:____2006____

Select One: □ **Interim** □**X Final**
Institution: The CT. Agric. Exper. Station
State: Connecticut

	Integrated Activities (Hatch)		**Multistate Extension Activities (Smith-Lever)**		**Integrated Activities (Smith-Lever)**	
Established Target %	25	**%**	N/A	**%**	N/A	**%**
This FY Allocation (from 1088)	751,989		No funds		No Funds	
This FY Target Amount	187,997		N/A		N/A	
Title of Planned Program Activity						
Tick-borne infections	13,201					
Greenhouse production	15,518					
Managing insects/fungi	133,624					
Plant genetics resources	775					
IPM	113,843					
Apple cultivars	0					
Wildlife management	0					
Dispersal of corn pollen	1,069					
Weed control	30,750					
Total	308,780					
Carryover	0					

Certification: I certify to the best of my knowledge and belief that this report is correct

and complete and that all outlays represented here accurately reflect allowable expenditures of Federal funds only in satisfying AREERA requirements.

L. Magnarelli_____ 3/23/07_____

Director **Date**

Assistance to the Under-Served and Under-Represented/Equal Employment Opportunity

The Connecticut Agricultural Experiment Station has a Policy Statement on nondiscrimination and an approved Affirmative Action Plan in accordance with Connecticut regulations (46a-68-31 through 46a-68-74). During this reporting period, the Policy Statement was given to women, minority, and other employees and their unions and was posted in several locations visited by the public on Station property, including both experimental farms. The Station's policy on affirmative action and equal employment applies to all aspects of research activities and the employment process, such as applications, job qualifications, job specifications, recruitment, hiring, promotion, personnel policies (including those against sexual harassment), job structuring, orientation, training, counseling, grievance procedures, evaluation, layoffs, and termination. Pursuant to Connecticut regulations (46a-68j-21 through 43), special efforts have been made to increase purchases of items or services received from businesses owned by women and minorities. Highlights of activities for FY 2006 are described below as they relate to specific goals and procedures outlined in the Station's approved updated Plan of Work to assist the under-served and under-represented. The stated goals for these initiatives are consistent with USDA management goals on multi-cultural diversity issues.

Goals & Procedures: Program Delivery

Efforts have continued to reach under-served and under-represented groups during this reporting period. A notice was sent to members of 17 organizations serving protected groups to invite minorities to apply for positions and participate in existing research activities. Career specialists in New Haven high schools were contacted to

recruit minority students for research mentorship programs. The main goals are to cultivate the interest of these persons in agriculture, increase diversity among beneficiaries of Station research, seek further citizen input on research activities, and to disseminate research findings to stakeholders.

A mentorship program, started earlier, was continued during this reporting period. To attract minority students to agricultural research and to train these persons for future work, a joint effort between The Connecticut Agricultural Experiment Station and the Sound School in New Haven was renewed. One Hispanic male was recruited to assist in analytical chemistry and entomology laboratories. Seven other students (3 Black females, 2 Black males, 1 Hispanic male, and 1 Hispanic female) were under the supervision of a high school teacher and were permitted to assist Station scientists with field studies at Lockwood Farm. These students learned about field research on crops grown at the research farm and were allowed to have their own garden plots to grow vegetables for their own use. This project had immediate impact. It encouraged minority student participation in Station research, promoted workforce diversity at the Station, provided specialized training for the interns, and stimulated interest in plant sciences. Some of these students have entered college and are pursuing science majors.

New initiatives were started during this reporting period to assist youth, an under-served group. Station scientists participated in science education programs sponsored by the Yale Peabody Museum of Natural History and the Olin-Bayer group. There also was participation in the Connecticut Public Television Family Science Expo. These efforts resulted in direct contacts with hundreds of students, parents, and teachers. In addition, Station scientists served as judges in science fairs in New Haven. All of these efforts aid in the recruitment of minorities for Summer Worker positions.

The Hispanic population in Connecticut continues to increase. Many Hispanics are working in nursery, tree care, and landscape companies. With limited English proficiency in this employment group, there is a need to communicate in Spanish so that these workers can effectively perform their duties. In previous years, a scientist at the Experiment Station (White male) taught classes on arboriculture in Spanish to help Hispanics broaden their educational backgrounds and obtain arborist licenses. Most persons, who attended those classes, are now licensed arborists. This effort has brought

Hispanics closer to the Station and has provided opportunities for these stakeholders to learn about research projects and the latest results. Fact sheets on mosquitoes and ticks have been written in Spanish and continue to be distributed to this group of stakeholders.

Goal 1: Annual public events will be scheduled to meet the needs and interests of all stakeholders, including those of under-represented groups, such as children, as a means of increasing their participation and inviting stakeholder input.

Procedures: Public events will be scheduled annually during the spring, summer, and fall. Notification of Station events will be published in the Experiment Station Associates Bulletin, which is also distributed to state legislators and the Associates' 750 members, and announced through the media (newspapers and radio stations). Efforts will be made to invite minority students. Public tours of Station facilities will be organized.

Report: Open House events occurred as planned during this reporting period. An Open House and Plant Science Day were held in the spring (April 20, 2006) and summer (August 2, 2006), respectively, in the main auditorium and at Lockwood Farm. Notifications of these events were made as described above.

At the spring event, about 70 persons attended and heard three talks on pressure-treated wood in gardens, safeguarding the nation's food supply, and pesticide residues in food. About 625 persons attended the August Plant Science Day at the Station's main research farm (Lockwood Farm) in Hamden, Connecticut. Efforts to increase the number of children (an under-served group) were particularly successful. Minorities attended both events and had opportunities to meet scientists and to see laboratories or experimental plots. A bus provided transportation within the farm to allow physically challenged and elderly persons better access to research plots. Restrooms have been remodeled to meet ADA requirements. Wheelchair accessible paths exist in the popular bird/butterfly demonstration garden plot to allow better access for all persons. To reach other minorities, the Station hosted and participated in Farm/City Week; about 800 students, 22 teachers, and 89 parents saw the research farm and displays. Station scientists participated in the Connecticut Flower and Garden Show in Hartford, the Eastern States Exposition in Massachusetts, and other annual fairs. These efforts had immediate impact. Hundreds of students, including Blacks and Hispanics from area high schools, attended these events, saw Station exhibits, and became interested in and more

knowledgeable about science. Persons of diverse racial and ethnic backgrounds had opportunities to become familiar with the Station's research projects, to learn of its findings, and to meet scientists, administrators, and other staff members.

Goal 2: The Station will work closely with inner city garden communities and encourage good agricultural practices.

Procedures: Station personnel will aid inner city residents by assisting on solving insect and plant disease problems. Groups of stakeholders will be invited to see experimental plots on Station-owned farms.

Report: During this reporting period, the Station farm manager at Lockwood Farm in Hamden, Connecticut and his assistants provided mulch for community gardens in the greater New Haven area and Hamden. Seeds for vegetables were once again donated by Station scientists. This enabled the poor, who live in different neighborhoods, to have gardens as a source of fresh vegetables. Station scientists provided expertise on diagnosing and solving insect and plant pathogen problems. In addition, Station scientists tested potential garden plots for heavy metal contamination. Polluted sites were not used for gardening. These efforts had many short-term benefits. Stakeholders learned about agriculture, became familiar with Station staff and research, had access to research findings, and produced fresh produce for their families. Minorities and other residents of New Haven were encouraged to attend Station events and to tour the experimental farm plots. Another Station scientist continued his work with the Knox Foundation in Hartford to help select sites for inner city gardens. Soil samples were tested to determine needs for fertilizers and if heavy metals were present.

Goal 3: The Station will donate produce to charitable organizations in food-sharing programs to meet the needs of the poor.

Procedures: Station personnel will make and maintain contacts with charities and coordinate the harvest and distribution of produce to organizations in food-sharing programs.

Report: About 8 tons of fruits and vegetables grown at the Station's farms in Hamden and Windsor, Connecticut were donated to charities, including food-sharing programs in the New Haven and Hartford metropolitan areas. Improved nutrition was a

short-term benefit. These efforts address USDA national goal #3 (“A healthy well-nourished population”).

Report: Public Notifications: The Station has a continuing policy of commitment to affirmative action and equal employment. In addition to a Policy Statement, there was re-notification to all bidders, contractors, subcontractors and suppliers of materials that the Station will not knowingly provide services and programs from or do business with anyone who discriminates against protected persons. A list of objectives for affirmative action was given during this reporting period to each Station employee. One of the objectives ensures equal access and nondiscrimination in all terms and conditions of all research activities and information gained by studies. Employees and their unions were invited to review and comment on the Station’s state-approved Affirmative Action Plan. All job notices included statements that the Station is an Affirmative Action/Equal Employment Opportunity Employer and were posted on the Station’s Home Page (http://www.caes.state.ct.us), published in newspapers, sent to colleges and universities, submitted to scientific societies, and mailed to members of organizations representing protected persons in Connecticut. Public notification efforts had immediate impact because minority applicants were hired and there was improved workforce diversity. Policies regarding discrimination and equal opportunity were clearly stated or expressed in official Station documents or as a part of various public activities, including contract compliance. Station policies on equal employment and against discrimination were reviewed during this reporting period by the Director of the Station and are consistent with those of the United States Department of Agriculture outlined in memos on Departmental Regulations dated February 25, 1998 and March 16, 1998 from the Office of Civil Rights and the Office of the Secretary, respectively.

Goal 1: Job candidates will be notified of program availability and requirement of nondiscrimination on the basis of race, color, national origin, sex, disability, and other categories covered by state and federal laws.

Report: All procedures described in the updated Plan of Work and in the last six Annual Accomplishment Reports were followed during this reporting period.

Diversity Training, Minority Training, and Employment

The Station is committed to further development of innovative programs to increase applicant flow from minorities and to train women and members of protected and non-protected groups. Civil rights training for newly hired staff members is required to improve employee relations. Pursuant to Connecticut regulations (Public Acts 99-180, 00-72, and 01-53), newly hired permanent or temporary Station employees received a minimum of 3 hours of diversity training and education. An institutional policy on sexual harassment was written and distributed to all Station staff members, who were also required to attend training sessions. This educational program exceeded state legal requirements. The objectives are to increase workforce diversity, provide employment opportunities for promising students interested in science, and to promote harmony among staff members and the public. Station staff members, including the Director and Chief of Services, have been in contact with career specialists in area high schools and with other community leaders to reach minorities in urban settings. A teacher at the Sound School in New Haven continued to cooperate with Station administrators by recruiting seven minority high school students during the summer of 2006 to assist on field research projects. These students learned about agricultural research at the Station and participated in Plant Science Day held in August at the Station's Lockwood Farm.

During summers, there are extensive field studies and needs for technical assistance. State and federal dollars were made available to support research initiatives and to hire college students as Summer Workers. These students worked closely with scientists as apprentices in the field and laboratory and learned about agricultural research. This mentorship program has been successful. During FY 2006, three Black males, one Black female, and two Hispanic males were hired along with 22 white males and 17 White females to learn new skills. Efforts have been made to locate qualified minority students.

To assist the under-served and under-represented in more advanced research, one Other female and one White female are employed as Postdoctoral Research Scientists. The skills these people received from colleagues improved their qualifications for future permanent employment and upward mobility. Funds from federal grants, including those

from USDA, enabled these persons to work in FY 2006 under the direct mentorship of established scientists.

Specialty Crops Initiative

Stakeholders of different ethnic groups continue to receive the Station's assistance on growing specialized crops, such as "personal-sized" watermelons, arugula, radicchio, okra, jilo, leeks, artichokes, sweet potatoes, Calabaza (squash), and Chinese cabbage. All of these crops are very popular at farmers' markets. Jilo is in demand by Brazilians and is sold quickly in Connecticut, Boston, and New York City markets. A Station scientist field-tested these crops to determine quality and yield. These efforts had immediate impact. There is increased interest among vegetable growers to raise ethnic crops, which represent an emerging "niche market", and produce is available in local markets. This activity has enhanced contacts with minorities. In response to stakeholder requests, another Station scientist is conducting research on organic farming practices. These efforts address USDA national goals #1 and #3.

Assistance to Mohegan and Pequot Tribes

Members of the Mohegan and Pequot tribes in Connecticut continue to rely on the Station for information and direct assistance on composting, greenhouse operations, forest/wetlands management, and control of hemlock woolly adelgids. Members of the Pequot tribe have established greenhouses for tomato production. Station scientists have cooperated with tribal officials in finding ways to grow tomatoes, improve efficiency of composting paper products, to better manage forests and wetlands in concert with commercial development of land, and to biologically and chemically control adelgids. The long-term impacts of these outreach efforts are: there will be locally grown produce that can be used in restaurants on tribal properties, efficient re-cycling of paper product waste materials, and preservation of forests and wetlands. This initiative addresses USDA national goals #1, #3, and #4.

Contract Compliance Program

In accordance with Connecticut regulations (Sec. 32-9(n) and Sec. 46a-68-35), the Station is required to report annually to the State Commission on Human Rights and Opportunities regarding the agency's efforts in awarding a fair proportion of its contracts for service or materials to small contractors, including businesses owned by minorities and women. Although a large portion of the Station's budget for services and materials must be awarded to businesses that have state contracts through the Department of Administrative Services, a small portion of the budget is available for outside bidders. This program yielded immediate short-term benefits. During state FY 2006, $233,014 was awarded to small business and minority business enterprises. This amount greatly exceeded the state-approved goal ($199,539). There were 29 Minority Business Enterprise set-aside purchases and contracts worth $121,910, which also greatly exceeded the state-approved goal of $39,908. Contracts were awarded to businesses owned by Blacks, Asians, Hispanics, and women.

Evaluation of the Success of Multistate, Multi-Institutional, Multi-Disciplinary Programs and Joint Research/Extension Activities

As presented in Tables 1 and 2 of this annual accomplishment report, several Hatch projects continue to be linked to outside collaborating institutions or businesses and include a multi-disciplinary approach to research. Scientific collaborations are normally formed between or among scientists and are not mandated by administrators. The Director and Vice Director strongly encourage collaborative multistate work, however. These joint efforts have become more successful in achieving research objectives. Some statutory requirements authorize cooperation among state agencies. Many scientists at The Connecticut Agricultural Experiment Station are trained or have gained experience in different scientific disciplines and actively seek expertise from other investigators within or outside the institution when needed.

Multistate collaborations are likewise extensive (Table 3). Of the 34 Hatch projects listed, 22 (65%) have multistate affiliations. Scientists at The Connecticut

Agricultural Experiment Station continue to interact with colleagues in at least 41 other states. The 8 USDA-approved multistate projects (NE-009, NE-1005, NE-1017, NE-1019, NE-1020, NE-1025, (S-1024), and W-1082) include an extensive blend of scientific expertise for research and extension.

There are 13 Hatch projects identified as "planned" research/extension integrated activities. In most cases, the extension component is in the University of Connecticut.

There are four key questions that need to be addressed: (1) did the planned program address the critical issues of strategic importance as described in the institution's updated Plan of Work; (2) did the planned program address the needs and inputs of the under-served and under-represented populations in the state; (3) did the planned program meet and describe the expected outcomes and impacts; and (4) did the planned program result in improved program effectiveness and efficiency? Accomplishments have been described in this report regarding all of these key questions. A special effort was made to describe immediate short-and expected long-term impacts on how results led to positive changes in the behavior of stakeholders and (or) economic, environmental, product quality, improved human /animal health, or social benefits. We affirm that our program is meeting stakeholders' needs as described in the updated Plan of Work and in this Annual Accomplishment Report. The critical issues stated in each of the program goal sections of the updated Plan of Work are based mainly on stakeholder input. Contact with stakeholders is a continual and evolving process, and research initiatives are modified based on public needs. Solutions have been found for some problems, such as finding ways to reduce pesticides and increase profitability, but new demands for research arise, such as the need to grow crops (soybeans and rapeseed) for biodiesel fuel,

enhancing homeland security, ensuring food safety, and controlling insect pests. Expanding the clientele of stakeholders, including minorities, and increasing their involvement in research projects remains a high priority. Farmers work along with scientists on solving problems. In return, growers provide valuable space for field experiments and information on the history of pest problems. These stakeholders benefit by having continual discussions with scientists, by receiving early results, and seeing progress being made in their fields and greenhouses. We recognize the need to obtain financial data, whenever possible, to more clearly show profitability and impact of our research efforts. In this report, we have provided specific information on economic impacts (i.e., dollars saved, increased profitability measures, adoption of more efficient farming practices, etc.) for projects where sufficient progress has been made. In other scientific advancements, it is difficult to show a dollar value for a new discovery, but progress is still being made. Brief descriptions of short- and long-term impacts are included throughout this document to demonstrate the relevance of the scientific findings and to ensure accountability for federal and state funds received.

Although setbacks occur in research and there are uncertainties in funding, the objectives are being accomplished. The critical issues of producing new and value-added agricultural products and commodities; protecting crops and forests from insect pests and plant diseases; testing new crops for ethnic groups; improving small farm production; promoting sustainable agriculture, improving crop quality and yields; ensuring food safety and security; protecting soil and water from pesticide and other chemical contamination; reducing the use of pesticides and fertilizers in agricultural systems; finding ways to utilize farm and homeowner plant wastes (i.e., composting); and the

issues of emerging human and veterinary pathogens transmitted by ticks and mosquitoes have been addressed. Many of these activities receive help from scientists in other states.

We have demonstrated how efforts are being made to identify and meet the needs of the under-served and under-represented. Because our main laboratories are located in New Haven, this has helped us meet and interact with minority groups in an urban setting. Contacts have been made with career specialists in New Haven high schools. Other initiatives being carried out at our Valley Laboratory in Windsor also have assisted the Station in addressing the needs of the under-served and under-represented in the Hartford area and in farming areas where Hispanic and other minority populations are increasing. Recent census data indicate a dramatic rise in the Hispanic population in Connecticut. A Station scientist, who speaks Spanish, taught courses for Hispanics on arborist-related topics in Connecticut during previous reporting periods but still gives guidance to these people. Also, by growing specialty crops, we are attempting to reach minorities. Opportunities are given for the under-served and under-represented to attend Station Open House events. Working with minority groups on the inner-city garden projects is particularly effective in describing the scope of our agricultural research. Fruits and vegetables from state and Hatch-supported research projects were donated to charitable organizations and food-sharing programs to help improve nutrition. Minorities received training when hired to assist on USDA grants and Hatch-supported research projects. Knowledge gained from research on composting techniques and forest management benefited members of the Mohegan and Pequot tribes in Connecticut. In general, the multi-faceted research activities and outreach efforts are successful in

addressing the needs of a broader base of under-served and under-represented persons. Continual program expansion is planned, however, to assist more individuals.

The multistate projects continue to increase overall program effectiveness and efficiency by allowing for successful collaborations, reducing unnecessary duplication of research experiments, and by better utilizing dwindling resources of participating institutions within and outside Connecticut. Scientific collaborations have accelerated progress and helped to attract extramural funding. The following are examples of improved efficiency resulting from recent research: providing specialized crops, such as jilo and calabaza, for growers; finding ways to remove invasive aquatic plants from lakes and ponds; implementation of IPM guidelines to monitor pest problems and reduce costs of controlling plant pathogens and insects; and finding ways to control ticks on homeowner properties. The availability of research data from USDA-approved multistate projects, particularly in the Northeast, has resulted in more efficient experimental design and better utilization of equipment and facilities located in cooperating institutions during times when state operating budgets have been reduced. Moreover, the impact statements for multistate projects, approved by the northeastern experiment station directors, have greatly facilitated the communication of research findings to a broad national audience. Information is available to all on the northeast regional association's (NERA) home page. The development of the National Information Management and Support System has greatly facilitated reporting and public access.

Integrated activities (research/extension) remain an important component. Good progress continues to be made on reducing the potential for environmental contamination by pesticides and other organic chemicals in agricultural systems. For example,

collaborations of scientists participating in (NE-1019) to manage plant nematodes have resulted in the effective use a biological agent (*Pasteuria penetrans*) to help control nematodes that attack the roots of vegetable and small fruit plants. Research on rapeseed to control plant nematodes has had benefits in the new crops/biodiesel initiative. The experience gained by growing this cover crop was helpful in determining seed yield and oil production. Efforts are now being made to include the IPM component for nematode control along with seed production for biodiesel fuel. Moreover, nursery and vegetable growers are now using less toxic pesticides and IPM practices have been implemented on some farms to reduce costs of operations. Modest reductions in the uses of pesticides in agricultural production areas have been achieved, and more growers have become enthusiastic about implementing IPM practices. The inclusion of research/extension specialists in other USDA-approved multistate projects in our research efforts, (i.e., NE-009, and NE-1005, NE-1017, NE-1019, NE-1020, NE-1025, NE-1024, and W-1082), has benefited Station research by promoting collaborations, increasing efficiency, meeting stakeholder needs, providing a more concentrated and coordinated regional effort, and by allowing scientists to learn new skills. All integrated activities identified in this Annual Accomplishment Report continue to have functional extension components where research results are reported to stakeholders in extension publications or at meetings.

Numerous publications have been distributed to stakeholders and are available on the Station's website. A publication on identifying invasive aquatic plants is very popular among boaters and members of lake associations. The mosquito identification manual and tick handbook continue to be in great demand by public health officials, mainly in eastern United States. Foresters are interested in management practices. Pesticide guides

toward IPM have been updated annually for arborists, the nursery industry, groundskeepers, and Christmas tree growers. These technology transfer publications also have been made available to the general public and media. A homepage exists for NE-1019 “Biologically Based IPM Systems for Management of Plant-Parasitic Nematodes” at the Station website: (http://www.caes.state.ct.us/coopregionalresearchproject/multistatenematode.htm). Growers in all regions of the United States have access to scientists, research information, and science-related activities. The feedback from growers and other stakeholders continues to be positive. Finally, there is continued public concern over safety and security of foods. Joint efforts between the Station, seven other selected states, and US FDA continue to develop counter-terrorism programs as a part of the Food Emergency Response Network.

In conclusion, the Station’s multi-initiatives with joint research/extension activities have been making progress in solving specific stakeholders’ problems on farms and in homes and businesses. Stakeholders’ requests and needs are diverse and complex. The frequent visits that scientists make to solve problems on farms improve efficiency of operations and develop stronger relationships with stakeholders. Although applied research activities dominate, there remains a strong core component for basic research. Impacts resulting from applied research are realized much earlier than those resulting from basic research.

Certification

This seventh Annual Report of Accomplishments and Results was written by Dr. Louis A. Magnarelli, Director, with input from Station scientists. This document is submitted as a part of specified reporting requirements, as mandated by the Agricultural

Research, Extension, and Education Reform Act of 1998 and as allowed under the USDA's guidelines for preparing accomplishment reports.

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