2009 Connecticut Agricultural Experiment Station - Research Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

Advances have been made in basic and applied research in meeting the objectives set forth in all 4 planned programs: Global Food Security and Hunger (includes Integrated Pest Management (IPM) Systems), Food Safety, Human and Animal Health, and Soil and Water Quality. Cooperation with extension personnel at UConn, Cornell, and other land-grant universities have helped to transfer new scientific information to a broad base of stakeholders.

Research on plants and IPM systems has led to increased crop yields and profits for growers, less pesticide use, and reduced human risk of exposure to pesticides. New specialty crops have been introduced to the farm community. For example, different cultivars of Chinese cabbage were high yielding and could be grown in CT with little or no pesticides. Yields averaged 17.5 tons per acre. At a retail price of $0.99 per pound, there is a potential crop value of about $38,400 per acre. These results had impact because the crop is in high demand by Asian residents, and some growers are including Chinese cabbage in their farm operations. In another study, rapeseed is a desirable crop for biodiesel fuel production, and its use as a cover crop prevents soil erosion. When the plant parts are plowed into the soil and decomposing, glucosinolate chemicals are released. These chemicals, particularly sinigrin, control plant-parasitic nematodes. This practice has resulted in less use of nematicides as biofumigants, thereby reducing human health risks.

In the Food Safety Program, there was an important event that resulted in a national recall of a consumer food product and changed conditions. Scientists at the Experiment Station detected illegal residues of an insecticide (pirimiphos methyl) in imported cereals. Results were reported to the US Food and Drug Administration, and there was a national recall of 4,553 cases of cereal. These actions prevented human illnesses.

Progress has been made in the Human and Animal Health Research Program, and positive outcomes resulted in changes in behavior. Laboratory tests of 291,641 mosquitoes, collected throughout Connecticut, revealed widespread distribution of Eastern Equine Encephalitis viruses in the state. Press releases throughout the warmer months and the Governor's assistance on warning citizens to protect themselves from mosquito bites were important factors in preventing human cases. Based on surveys of state residents, the majority protected themselves by using repellents or not going outdoors when mosquitoes were biting. In other work, ticks were microscopically examined for the presence of vertebrate blood and tested for the DNA of the Lyme disease agent. Specimens had been removed from people, and if the ticks were found to be unengorged with blood, there was no need for preventive antibiotic treatment because unfed ticks do not transmit the disease organism. Similarly, if blood-engorged ticks were tested for the Lyme disease agent and found to be negative, no antibiotics were administered by the attending physicians.

In the Soil and Water Quality Program, there has been continued success in restoring water quality in lakes and ponds where invasive plants grow. Low concentrations of herbicides removed Variable water-milfoil, Eurasian water-milfoil, Minor naiad, and Curly leaf pondweed from 3 lakes and a pond. This improvement in lake conditions was significant, but there is added value for the results because the technique is now being used by municipal officials to correct similar weed infestations in other bodies of water.

Outreach programs have been active. There have been at least 48,466 direct and 204,256 indirect contacts with adults and youth in Connecticut. Staff members gave 1,062 talks and interviews, made 188 farm visits, performed more than 15,000 diagnostic tests, and answered more than 22,000 citizens' inquiries. Diagnostic testing is mainly limited to Connecticut residents and businesses because of costs. However, in special cases, specimens have been analyzed from Massachusetts, New Jersey, and New York. There are some Connecticut businesses that have branches in these states. Stakeholders have access to 119 new peer-reviewed articles or other publications. Assistance given to 80 reporters (representing newspapers, television, and radio) and public access to an upgraded Station website continue to be powerful methods of transferring new knowledge. There were 1,443,966 page views ("hits") and 473,334 visits during 2009; 222,956 files were downloaded. The average user time per visit was 14.53 minutes.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	27.6	0.0
Actual	0.0	0.0	38.7	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Expert Peer Review
- Other (Internal administrative and scientific review)

2. Brief Explanation

The review process described in the updated Plan of Work was followed during this reporting period. To further evaluate project outlines for formula funds, an external review component has been implemented during this reporting period. All scientific proposals submitted to USDA-NIFA or other federal agenices likewise received merit and at least 3 external peer-reviews to determine if the planned research had relevance to stakeholders' needs, met program goals, and had sufficient technical structure and resources to conduct the studies. In addition to critiques given by scientists in the discipline, Department Heads, the Vice-Director, and the Director were involved in the internal review process. The Director gave final approval of all research proposals and manuscripts. In addition to meeting residents' needs, the likelihood of success and originality of the studies received careful consideration. During 2009, there were 9 Hatch and McIntire Stennis project outlines reviewed and submitted to USDA/CSREES (NIFA) to address state and national needs and to accomplish planned research goals in the following programs: Global Food Security and Hunger (n = 8) and Food Safety (n = 1). The approved project outlines covered work on pesticide analyses of foods, honey bee health, photosynthesis, an insect pest of strawberries, plant disease risk, butternut canker, control of plant nematodes, and evaluating specialty crops. Additional expert peer-review was also received on the quality of research results when manuscripts were examined by journal editorial boards and reviewers and when grant proposals submitted for competitive funds were critiqued by scientific review panels.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public
- Other (Targeted invitations to legislators and their staff members)

Brief explanation.

Special efforts were made to have stakeholders participate in CAES research and public events. Conferences and workshops were held on organic farming (45 attendees), bed bugs (180 attendees), controlling nursery pests (110 attendees), and food safety (38 attendees). Information was disseminated to state residents living in widely separated towns and cities in the state. Press releases promoted 2 Open House events in the spring and summer (Plant Science Day). For the latter, a one-page promotional flyer was delivered to at least 92,000 households in an edition of the New Haven Register preceding Plant Science Day. Attendance at the April event (163 persons in the main auditorium) and at the August Plant Science Day at Lockwood Farm (838 adults, 210 youths) was excellent. Connecticut Network (CT-N), a public TV station, taped the main speaker's talk and 4 scientists' presentations at Plant Science Day for statewide telecasting. Extensive media assistance targeted the non-traditional stakeholder groups and individuals. Notices of these public events were mailed or e-mailed to 205 press contacts and 5,600 state residents on the Station's contact list to cover traditional stakeholder groups and individuals. Station displays of research, presented at 8 regional or state fairs, and invitations for high school students to tour Station laboratories, provided further opportunities to reach traditional and non-traditional stakeholders. For example, Farm/City Week is a statewide event, which provides children of urban families an

opportunity to see farm research plots; 285 students (grades 3 to 7) saw Station displays. At the Norwalk-Wilton Tree Festival, 950 adults and 600 youths saw a Station exhibit. Survey forms were distributed at both open house events plus at selected exhibits in statewide agricultural trade shows to seek written public comment on research programs and to encourage stakeholder participation. Thousands of citizens saw Station exhibits on agricultural, forestry, and public health topics and had opportunities to bring insect, plant, and soil samples for diagnostic testing. To determine if state residents were pleased with talks given at a spring Open House event, forms were distributed at the end of the program to receive input. All 74 residents who responded were pleased with the program. The stakeholders lived in 40 towns or cities in Connecticut. Three meetings for bedding plant growers, organized by Station scientists and UConn extension specialists, were attended by 69 persons. All individuals rated the programs as useful, whereas 75% indicated that they would benefit economically based on what they learned. Station staff members served on advisory boards and committees of at least 132 agricultural and environmental civic groups. Invasive aquatic plant problems were identified at meetings of traditional and non-traditional groups and individuals. Moreover, staff members made 188 visits to farms and other properties where pest problems occurred. In many cases, growers participated in research to find solutions for controlling insect pests and plant diseases. Finally, 7 state representatives, 4 state senators, staff in the state Office of Policy and Management, state Office of Fiscal Analysis, State Attorney General's Office, and in one congressional office requested and received information following newspaper articles, other media coverage, or constituent requests.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Open Listening Sessions
- Needs Assessments
- Use Surveys
- Other (Public access to diagnostic laboratories)

Brief explanation.

Stakeholder input is a major factor in identifying projects for research. There are several mechanisms in place to identify individuals and groups of stakeholders and to collect input from them. Special e-mail messages and letters, written by state residents, are forwarded by Station staff members to Department Heads and the Director and are then summarized for the Record of the Year, an annual document of activities and accomplishments. All citizens received responses. A citizen concern requires a response and follow-up contacts by administrators if necessary. Active participation of Station staff members on 132 advisory boards of civic groups, representing different agricultural, forestry, environmental or public health interests, is an excellent way to identify users of Station research findings, receive stakeholder input, identify problems that need to be addressed, and to find solutions. A new research project on chemical testing of tire crumbs used in artificial turf athletic fields was requested by state residents. Current research on detecting pesticides in honey bees started as a result of requests from beekeepers and fruit growers who are concerned about rising honey bee mortality. Work on removing invasive plants from lakes was initiated when Station scientists attended lake association meetings. Field research on specialty crops was increased at the requests of Hispanic and Asian residents. Greenhouse growers requested research on ebb and flow irrigation systems. Station staff members, who were officers of civic groups, recognized the needs of the public and were able to respond. The two annual Open House events of the Station and frequent use of displays at public meetings, trade shows, and science fairs provided opportunities to meet stakeholders who are interested in science issues and to hear about the problems that need attention. Written survey responses obtained at special listening sessions held by CAES scientists during evenings for growers were especially useful in evaluating public input. About 1,062 talks and interviews were given to civic groups and the media. Discussion during question and answer periods following the talks was an effective process in collecting input and in performing needs assessments. Research priorities on food safety, solving crop pest problems, providing new niche crops, biofuels, and mosquitoes and ticks as transmitters of disease organisms were set as a result of public input. Phone inquiries from the public and stakeholder access to diagnostic services also revealed important problems that needed attention. For example, pest control operators have indicated that controlling bed bugs has become very difficult. Further, frequent attendance at agricultural groups' meetings was very helpful in collecting stakeholder input. Pest problems, difficulties in receiving permits for plant shipments and pesticide treatment, and interpreting federal and state plant regulations remain common concerns among meeting participants. Finally, the Science Citation Index was used to identify scientists in other institutions who were recognizing the Station's published works.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

Brief explanation.

Stakeholder input received during this reporting period was written and verbal. The written correspondence and completed surveys, which were well designed to ask specific questions, were very effective processes in collecting public input on research programs. Emphasis is being placed on obtaining more written input so that more in-depth evaluations of program effectiveness can be made and that objectives can be prioritized. Giving research reports, providing displays, and attending meetings of traditional stakeholder groups, such as the Connecticut (CT) Tree Protective Association, CT Nursery and Landscape Association, CT Pomological Society, CT Forest and Park Association, Federated Garden Clubs, CT Pest Control Association, CT Academy of Science and Engineering, Christmas Tree Growers, CT Greenhouse Grower Association, Northeast Organic Farmers Association, CT Beekeeper Association, Backyard Beekeeper Association, and the Experiment Station Associates, were effective in collecting direct stakeholder input. Three meetings for the CT Greenhouse Growers Association were co-organized by a Station scientist and personnel in the UConn extension system. When scientists met with the general public at two Open House events (advertised to all) and at organized shows where exhibits were displayed, verbal and written input was received from traditional and non-traditional stakeholders. Survey or evaluation forms which provided for more formal written comments were forwarded to Department Heads and the Director. All CAES staff members have been instructed to allow sufficient time following invited talks for attendees to ask questions. This process allowed traditional and non-traditional individuals to provide input. Inviting high school students and teachers to see CAES laboratories and hear brief presentations on research resulted in collecting written stakeholder input from teachers (mostly non-traditional individuals). The 15,436 diagnostic tests performed for traditional and non-traditional individuals also resulted in verbal or written stakeholder input. Finally, meeting with specific traditional and non-traditional individuals, such as state or federal legislative leaders or staff, was another effective method of collecting stakeholder input on research results and budgetary matters. A new, formal system of evaluating the effectiveness of Station research and outreach programs has been implemented by Connecticut's General Assembly. The Appropriations Committee is requiring all state agencies to report on performance measures and accomplishments as a part of their Research-Based Accountability (RBA) program. The Station's outreach activities and stakeholder input processes are components of the RBA evaluation requirement.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief explanation.

Stakeholder input was considered by Station scientists, and in many cases, written comments were read by the Department Heads and Director. All written comments received in e-mail messages, letters, or survey forms are

reviewed by Station staff members and considered by the appropriate Department Head in re-establishing research priorities or initiating new studies. At the requests of stakeholders, 5,656 inquiries were answered in the Department of Plant Pathology and Ecology. Fungal and bacterial infections of crops and other plants have economic impact and reporting information to the National Plant Diagnostic Network has relevance to other states in the northeast and elsewhere. Chrysanthemum white rust was once again detected. Growers requested guidance in disposing of federally regulated plant waste. Despite severe budget cuts, stakeholders want the high quality diagnostic and research services continued at the present level. Growers are interested in rapeseed cultivars for control of plant-parasitic nematodes. Pest control operators notified CAES scientists that chemical control of bed bugs was ineffective. Insecticide studies continue to address the problem. Beekeepers and fruit growers expressed concern about declining honey bee populations (colony collapse disorder) and requested that analyses be conducted for possible pesticide contamination. Hispanics and Asians requested assistance in introducing new specialty crops. Accordingly, experiments were conducted on 10 specialty crops. At the request of stakeholders, training was given on integrated pest management practices. In nurseries, mite and insect infestations of arborvitae and other economically important crops are having detrimental effects on plant vigor and quality. Field tests were conducted in response to stakeholder requests. In other cases, stakeholders are concerned about the following: chemical contamination of foods, forest health, ticks, mosquitoes and viruses, possible health problems associated with toxic fumes being released from "tire crumbs" used in artificial turf, and insect pests of grass turf. Based on written stakeholder responses, research priorities were re-assessed to address these problems. All written comments received by the Director are discussed with appropriate Department Heads, and in some cases, specific objectives are included in the managers' annual performance goal programs.

Brief Explanation of what you learned from your Stakeholders

It is recognized that stakeholders have extensive knowledge and experience. Potential environmental, economic, or health impacts became apparent. Station scientists and administrators learned that bed bugs are resistant to pyrethroid insecticides. Members of lake associations revealed invasive plant infestations and provided feedback on effectiveness of control methods. Nursery growers enlightened Station scientists about new mite and insect damage of crops and about the increasing problem of insect resistance to certain pesticides. The general public expressed their concerns over food safety. We learned that people who participate in community garden programs do not have confidence in the quality of vegetables produced on former industrial land because of the presence of heavy metals in the soil. Increased surveillance for unwanted chemicals in foods was requested by the public and the Station responded accordingly. Conversations with growers and homeowners revealed late blight in tomatoes and potatoes. Physicians have alerted CAES scientists about the increase in numbers of ticks which transmit disease organisms that cause Lyme disease, granulocytic anaplasmosis, and human babesiosis. These people continue to describe the impact that these diseases have on their lives and the need to develop tick control programs for homeowner properties. We learned from foresters that the Asian longhorned beetle is spreading in Massachusetts. We learned from grape growers that fungal infections are a difficult problem to control. Fruit growers have informed CAES scientists that there are bacterial infections on peaches. Finally, CAES scientists learned that biochar might be an ideal soil amendment. Moreover, positive stakeholder input was received from growers and ethnic groups (Hispanic, Brazillian, and Asian) praising the Station's continued efforts to provide information on cultivars of specialty crops, such as jilo, calabaza, edamame, garlic, leeks, pak choi, daikon radish, and Chinese cabbage. We learned that crops evaluated by Station scientists are being sold in farmers' markets.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	861006	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	861006	0
Actual Matching	0	0	6172826	0
Actual All Other	0	0	2072614	0
Total Actual Expended	0	0	9106446	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from				
Carryover	0	0	0	0

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Global Food Security and Hunger
2	Food Safety
3	Human and Animal Health
4	Soil and Water Quality

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
202	Plant Genetic Resources			20%	
205	Plant Management Systems			25%	
211	Insects, Mites, and Other Arthropods Affecting Plants			15%	
216	Integrated Pest Management Systems			40%	
	Total			100%	

V(C). Planned Program (Inputs)

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	12.1	0.0
Actual	0.0	0.0	18.4	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	588865	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	3146900	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	239501	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Several expected outputs (i.e., activities, services, events, and new crops that reach people) are designed to assist a broad, diverse group of stakeholders by transferring scientific information to stakeholders and solving problems. All activities of this planned research program will ensure that people have equality of service and access to research findings. Direct contacts are tabulated from persons served or those in attendance at meetings, workshops, etc. Numbers of indirect contacts with youth are obtained from teachers, who receive CAES assistance and incorporate new findings in curricula. The following activities are planned: (1) CAES scientists will partner with stakeholders and participate in their organizations as members or officers, (2) CAES scientists will conduct workshops or meetings for stakeholders, (3) experiments will be performed on stakeholders'

properties as well as on CAES research farms, (4) diagnostic services will be provided to stakeholders, (5) training on IPM practices and other methodologies will be provided to stakeholders, (6) staff members will disseminate written information on research findings by presenting scientific displays at agricultural fairs and giving talks and interviews to civic groups, (7) staff members will work with the media and provide information on scientific discoveries, and (8) staff members will educate teachers and, thereby, indirectly reach youth. Public service is an important component for all output measures. For example, all state residents are allowed to request direct assistance on diagnosing insect or plant disease problems. About 38,000 stakeholders are expected to directly benefit from these activities annually. CAES scientists are members or officers in at least 132 stakeholder groups. This provides direct opportunities for stakeholder input on the research programs and facilitates reporting of research results. The non-traditional stakeholders are reached at agricultural fairs when they visit and inquire about CAES displays and via newspaper, radio, and TV reports. Based on media statistics for viewers or readers, one can estimate indirect contacts with adults and youth who hear or read about new scientific advances made at CAES and reported by the media. Two open house events are scheduled annually on CAES properties to allow the public to hear oral presentations on research results and to offer comments. Hundreds of talks and interviews are given to civic groups and the media to convey research results and to receive direct public input. Research experiments are important activities that lead to solutions to problems or information on new crops. Whenever possible, these experiments are conducted on farms or other private properties to encourage stakeholder engagement in the research. Results of these output activities lead to specific outcomes, such as reducing pesticide use, controlling insects or plant disease pathogens, the introduction of new specialty crops, and increased farm income. Scientific publications in peer-reviewed journals or articles written for the general public reach traditional and non-traditional groups of stakeholders.

2. Brief description of the target audience

There are many targeted audiences, which include under-served and under-represented stakeholders. CAES does not receive extension funds but, nonetheless, serves a variety of farmers who grow vegetables, fruits, nursery stock, cattle, and flowers. CAES scientists work with the University of Connecticut extension specialists in planning growers' meetings. Progress has been made to submit new findings into the national extension service (www.extension.org) to reach stakeholders nationally. Five scientists at CAES are participating as members of communities of practice. The broad goals of the CAES research programs also include work on forestry and environmental problems. Accordingly, target audiences include landscapers, landscape architects, conservation officers, foresters, arborists, beekeepers, maple syrup producers, seed companies, and persons in the wood products industry. Efforts are also made to reach water company officials, horticulturalists, groundskeepers, pest control operators, pesticide manufacturers and retailers, environmental regulators, extension specialists, and municipal officials. Scientists and government officials are also important target audiences for new experimental results. This research program is mainly designed to reach the general public, which includes non-traditional stakeholder groups. Homeowners, who have interests in agriculture and forestry, have access to laboratories and scientific results as well as equality of service. Women, members of minority organizations, and children are examples of under-represented and under-served groups, important target audiences. Effort will be made to reach Brazilian, Hispanic, Asian American, African American, and Native American populations as well as elementary and high school students. New scientific information will be transferred to teachers to develop educational curricula, and, thereby, indirectly reach youth.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	26000	90000	6500	475
Actual	37354	82528	3663	24663

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

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	10	
Actual	0	27	27

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Total research papers

Year	Target	Actual
2009	55	90

Output #2

Output Measure

- # of site visits to conduct research and solve problems

Year	Target	Actual
2009	225	188

Output #3

Output Measure

- # of talks and interviews given to stakeholders

Year	Target	Actual
2009	550	755

Output #4

Output Measure

- # of responses to stakeholders' inquiries

Year	Target	Actual
2009	1800	16753

Output #5

Output Measure

- # of diagnostic tests performed

Year	Target	Actual

2009	1300	5989

Output #6

Output Measure

- # of new IPM intervention strategies judged to be effective

Year	Target	Actual
2009	5	5

Output #7

Output Measure

- # of vegetable and fruit cultivars evaluated

Year	Target	Actual
2009	25	106

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of homeowners gaining knowledge on insect pests and plant pathogens
2	# of homeowners learning practices to control plant and household pests
3	# of media reporters gaining knowledge on research results
4	# of students learning agricultural skills by attending talks, courses, or training sessions
5	# growers adopting IPM practices
6	# of cultivars introduced into farming operations

Outcome #1

1. Outcome Measures

of homeowners gaining knowledge on insect pests and plant pathogens

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	9000	16420

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Homeowners and farmers rely on Station diagnostic services to solve plant pest problems. Crops and houseplants can suffer from a variety of infections, nematode damage, and the adverse effects of insects and mites. People do not want their plants to decline or die prematurely, and they seek remedies from staff members who are knowledgeable. Scientists are likewise interested in the reasons why plants decline because the cause(s) might reflect an emerging pathogen that could negatively impact an important crop system or forests.

What has been done
Diagnoses of insect and plant disease problems were performed for 16,420 stakeholders. Results and suggestions for control were provided to these people along with written information on the pest. In about 45% of the inquiries, stakeholders visited the diagnostic laboratories to seek direct assistance from staff members.

Results
Diagnostic test results provided immediate new knowledge to stakeholders on what was causing the decline or premature death of plants. Pesticide treatments and fertilizer applications were remedies. During the past year, late blight affected tomatoes and potatoes in Connecticut. Heavy rainfall contributed to widespread crop infections. Use of fungicides in commercial fields saved crops valued at $4,000,000. Also, nursery stock was examined for Ramorum blight infestations. The immediate impact of diagnostic test results on plant diseases was to prevent the spread of pathogens and widespread economic losses. Expected long-term benefits include healthy plants for wholesale and retail sale, increased profits for businesses, and lower prevalence of infected plants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #2

1. Outcome Measures

of homeowners learning practices to control plant and household pests

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1500	9122

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Homeowners (including farmers) want to know how to control plant and household pests. Problems that occur on private and commercial properties can sometimes be solved by using biological controls, insecticidal soap, horticultural oil, or cultural practices, such as crop rotation. When these alternatives are not available, the least toxic chemicals are used. People want healthy plants, a clean and comfortable indoor or outdoor environment free of pests and chemical pesticides, and high-yielding, quality crops.

What has been done
Fact sheets and other publications were relied on heavily to teach residents how to control specific pests. These materials were revised as needed and posted on the CAES website (WWW.CT.GOV/CAES). At the Station's Plant Science Day (summer Open House), demonstrations on plant pest control were given. Also, in commercial operations, scientists visited stakeholders' properties and conducted experiments there. There were 188 farm visits to help solve specific pest problems. In most cases, stakeholders participated by contributing to the experimental design and allowed use of their own equipment and materials in pesticide treatment trials.

Results
The hemlock woolly adelgid is a major insect pest of eastern hemlock trees. Tree mortality in areas near streams causes soil erosion. Experiments were conducted with the insecticides imidacloprid and dinotefuran by soil injection or trunk spray methods. Use of dinotefuran was successful in controlling the targeted insect pest. Hemlock trees are now being treated by trunk spray methods in Connecticut. Officials in Greater Smoky National Park in Tennessee and North Carolina have adopted the use of dinotefuran to protect tens of thousands of hemlock trees. Foresters in the Delaware Water Gap National Park are using minimal dosages. The short-term impact is saving hemlock trees. The long-term benefits are ensuring diversity of tree species in forests, prevention of soil erosion, and protection of hemlock trees on private properties to sustain home values.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
216	Integrated Pest Management Systems

Outcome #3

1. Outcome Measures

of media reporters gaining knowledge on research results

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	10	46

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Growers and homeowners desire new knowledge on how to grow specialty crops with little or no pesticides. Farmers want to reduce pesticide costs and worker exposure to these chemicals, and desire to have marketable crops that are in public demand. Media reporters recognize the public's interest in having a cleaner environment and, likewise, seek new knowledge on managing crop systems so that this information can be transferred to a diverse group of stakeholders.

What has been done
Reporters interviewed scientists, saw laboratories, and visited field research plots. There were at least 18 newspaper articles or other news releases on plants and IPM systems covering a wide range of topics, such as specialty crops, trees, gardening, and homeowner plantings. Station scientists gave 755 talks, some of which had reporters in attendance, and interviews. At the summer Plant Science Day event, public television (CTN) taped talks given by scientists on plant systems and telecasted the presentations to state residents via a cable network.

Results
Reporters learned about late blight, potential problems with the Asian longhorned beetle, effects of heavy rainfall on plant health, effects of neonicotinoid pesticides on honey bees, plant damage caused by deer, and the introduction of new specialty crops. All reporters accurately transferred new findings in written form to stakeholders. For example, a newspaper reporter learned that different calabaza squash is high yielding and could be grown in Connecticut with little or no pesticides. Yields averaged about 21,490 pounds /acre. At a retail price of about $0.99 per pound, there is a potential crop value of about $21,275 per acre. Seeds were distributed to commercial growers. These results had impact because calabaza is being purchased by Hispanic residents, and some growers are including this crop in their farm operations. The long-term benefits will include greater profits for growers, less pesticide use, farmland preservation, and a source of locally grown, nutritious food for consumers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants

216 Integrated Pest Management Systems

Outcome #4

1. Outcome Measures

# of students learning agricultural skills by attending talks, courses, or training sessions

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	500	571

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Educating youth, an under-served group, is a major outreach initiative. CAES scientists participated as judges in science fairs, showed exhibits and gave demonstrations at Farm/City Week and Plant Science Day events. Staff members organized tours of laboratories and experimental plots. Parents want their children to learn about science, including skills of growing crops. Science teachers request assistance in promoting interests in biology and chemistry and need material for curricula.

What has been done
Scientists contacted career specialists in two high schools in New Haven and invited students to see CAES facilities. Scientists also served as judges in science fairs, displayed exhibits at public events where youth of mixed racial and ethnic backgrounds attended, and gave 21 presentations to 996 elementary and high school students and 73 teachers. Hundreds of students toured chemistry laboratories and saw demonstrations on the use of analytical equipment. Ten students from the Sound School in New Haven were allowed to have their own garden plots at the Experiment Station's Lockwood Farm. They grew vegetables for their own use at the research farm and were taught good farming practices.

Results
Inner city minority students saw experimental field plots and learned how to grow vegetables and flowers, control plant pests by using mulching practices, and how to fertilize and rotate crops. Elementary and high school students learned about the biology and importance of honey bees. High school students learned about research on testing different cultivars and about chemical analyses used to ensure food safety. These efforts to change knowledge in students about agriculture had impact. The students who learned how to grow vegetables shared their knowledge with family members and neighbors, who were participating in urban community garden programs. In some cases, students learned about food banks and donated surplus produce. Based on verbal and written feedback from teachers, there was increased interest among students in science. New knowledge on gardening was incorporated in science programs in elementary schools and helped to reach other students (eg., indirect contacts with youth). The expected long-term benefits are a better educated youth population and increased interests in science.

4. Associated Knowledge Areas

KA Code	Knowledge Area

205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems

Outcome #5

1. Outcome Measures

growers adopting IPM practices

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	6	15

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
When pesticides are overused, they increase farm costs. They also can cause toxic effects on users, consumers and beneficial insects, and can pollute soil and surface and ground water. Farmers want to reduce amounts of pesticides used and exposure to chemicals. Other people want no pesticides in foods or in the environment. The adoption of IPM practices benefits farmers, consumers, golf course managers, landscapers, and the environment.

What has been done
At the request of golf course superintendents, field tests were conducted in a prior reporting period to develop more accurate monitoring systems for annual bluegrass weevil larvae in turf. Permethrin-based insecticides were ineffective because of pest resistance, but there was no way to precisely determine the degree of pest resistance. Moreover, it was unclear if parasitic nematodes were effective in control programs. The objectives were to develop a soil test kit which could be used to assess the degree of pesticide resistance at different sites and to continue efficacy trials.

Results
Studies revealed that the new test kits were useful, and in areas where pest resistance was strong, alternative biological control methods using insect pathogenic nematodes were effective in reducing weevil damage to turf. These test kits are now being used in 7 states. Short-term benefits include more efficient monitoring and weevil management programs. Long-term benefits include less toxic pesticide use, less human exposure to pesticides, and a cleaner environment. Research scientists and extension specialists at CAES, UConn, UMass, University of Rhode Island, and Cornell University worked together as a part of multistate project NE-1025.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems

Outcome #6

1. Outcome Measures

of cultivars introduced into farming operations

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	10	10

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Growers want cultivars of crops that are resistant to plant pests and are high yielding. Stakeholders desire locally grown fresh fruits and vegetables. Hispanic, Brazilian, Black, and Asian groups have requested that calabaza (squash), jilo, leeks, personal-sized watermelons, beach plums, edamame, garlic, Chinese cabbage, sweet potatoes, vegetable amaranth, pak choi, and diakon radish be evaluated for eventual commercial farming and distribution to local markets.

What has been done
At least 106 cultivars of fruits and vegetables are being evaluated in field or greenhouse settings. In addition to testing for plant resistance to insect pests and plant diseases and yield, crops are evaluated for potential market value and profits for growers.

Results
Ten cultivars of sweet potatoes, beach plums, Japanese plums, grapes, calabaza, jilo, personal-sized watermelons, and artichokes have been introduced to 22 farm operations in Connecticut, Massachusetts, and New Jersey. In Connecticut, grapes were processed into wine and fruits and vegetables were sold at 114 farmers' markets with an estimated cash value of about $35,000.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
205	Plant Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges
- Other (Media influences)

Brief Explanation

The resignation of an IPM specialist in a prior reporting period continues to adversely affect outcomes because the new knowledge could not be effectively transferred to more nursery managers. The vacant position has been filled and the new scientist is making contacts with growers. A rapport needs to be developed between the new scientist and the growers. The actual quantitative target outcome of 6 growers adopting IPM practices was met.

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

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)

Evaluation Results

Planned evaluation studies were conducted during this reporting period. "After only" evaluations verified that there were knowledge changes in reporters. "During program" evaluations showed that there were knowledge changes in 571 students, whereas "before and after" program on-site evaluations and observations indicated that there were positive outcomes in more effective control of turf pests in golf courses.

Key Items of Evaluation

The Science Citation Index verified recognition of published articles on plant systems written by 23 scientists. There were 484 citations for this planned program during this reporting period. Nineteen accurately published news articles showed that substantial knowledge changes had occurred in reporters. Likewise, verbal feedback from teachers verified knowledge changes in youth. On-site observations and evaluations verified success in improved IPM monitoring and control methods.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Food Safety

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources			100%	
	Total			100%	

V(C). Planned Program (Inputs)

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	1.5	0.0
Actual	0.0	0.0	3.1	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	52733	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	513496	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	565543	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The expected outputs (i.e., activities, services, and events that reach people) are designed to assist a broad, diverse group of stakeholders by mainly disseminating scientific information to the public through the media, publications, and exhibits. People will have equality of service and ease of access to scientific results. The state-generated outputs include numbers of food samples tested, scientific publications, and talks and interviews. The following activities are planned: (1) staff members will disseminate new information on analytical test results to visitors at open house events and in scientific displays at agricultural fairs, (2) oral presentations will be given to civic groups, and (3) laboratories will be opened to allow adults and youth to meet staff members and see analytical equipment. Direct interactions with a broad base of stakeholders provide a mechanism for public input on the research program. Non-traditional stakeholders are reached at agricultural fairs when they visit Station displays. Two open house events are scheduled annually on Station properties to allow the public to hear oral presentations on research results and to offer comments. Results of these activities will lead to specific outcomes, such as removing tainted or adulterated food items from the

markets and greater public awareness of research on food safety.

2. Brief description of the target audience

A diverse group of targeted audiences includes: state and federal public health officials and regulators, state and federal legislators and their staff members, food producers and importers, managers of supermarkets, educators, extension specialists, researchers in the food sciences, and the general public. Women, members of minority organizations, and children are examples of under-represented and under-served groups who are expected to receive benefits.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	1000	4000	1400	1000
Actual	525	555	1104	240

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

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	1	
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Total research papers

Year	Target	Actual
2009	3	3

Output #2

Output Measure

- # of talks and interviews

Year	Target	Actual
2009	20	18

Output #3

Output Measure

- # of tests performed

Year	Target	Actual
2009	700	1174

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of stakeholders gaining knowledge of food safety
2	# state regulatory agencies applying decisions on testing results

Outcome #1

1. Outcome Measures

of stakeholders gaining knowledge of food safety

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1500	1349

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
With increased commerce from foreign countries and more emphasis on large-scale food processing domestically, there have been instances when foods, beverages, and other products contained unwanted chemicals, such as pesticide residues. National recalls of various food products have increased public awareness about food safety. Consumers, food producers and importers, and public health officials are concerned about food safety and security.

What has been done
As part of a statewide monitoring program, state officials in the Departments of Agriculture and Consumer Protection submitted samples to the CAES for chemical analyses.

Results
Analyses conducted at the CAES revealed illegal residues of the insecticide pirimiphos methyl in imported cereals. Results were reported to the Connecticut Department of Consumer Protection and the US Food and Drug Administration. There were 4,553 cases of cereal products recalled nationally. These results had impact because stakeholders learned that a food security monitoring system was detecting contaminated products. The prompt recall of contaminated products prevented human illness.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources

Outcome #2

1. Outcome Measures

state regulatory agencies applying decisions on testing results

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	4	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Domestic products sometimes can be contaminated with unwanted chemicals. When these events occur, prompt regulatory action is required. Consumers, food producers and importers, and public health officials are concerned about food safety and security.

What has been done
As a part of a statewide monitoring program, state officials in the Departments of Agriculture and Consumer Protection submitted samples to the CAES for chemical analyses. Analyses of food products, an important component of market basket surveys, were routinely conducted.

Results
A sample of black currant juice was found to contain residues of the insecticide carbaryl (0.006 ppm). Products were recalled at the state level. The grower indicated to state officials that carbaryl had not been applied to the crop used to produce the juice. Several samples were subsequently submitted for testing. The source of the problem was identified as the black currant concentrate from one barrel (0.266 ppm). The contaminated juice was destroyed and there were no further problems with the end products. The prompt recall of contaminated products prevented illness in humans, and the beverage producer sustained minor economic losses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Appropriations changes
- Competing Programmatic Challenges

Brief Explanation

One scientist retired on August 1, 2008, and with the current hiring freeze in place and continued budget cuts, this vacancy was not filled. In addition, the Chief Scientist took advantage of an early retirement program offered by the state. Work continues in the Department of Analytical Chemistry, and planned program objectives were met. A new scientist from another department in CAES was promoted to Chief Scientist in Analytical Chemistry.

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

1. Evaluation Studies Planned

- During (during program)

Evaluation Results

Information on research and service results was obtained "during the program" evaluations at public meetings (1 Open House), civic groups' meetings, and at Station exhibits. Positive feedback was received from stakeholders. There was sufficient interest among media reporters, and at least 1 article was written for the New Haven Register. Observations made during interviews with stakeholders revealed positive stakeholder sentiment about program effectiveness and value.

Key Items of Evaluation

The key items of evaluation and data collection were as follows: media reporters' responses upon learning about research and service findings and verbal responses received from stakeholders at public meetings. The Citation Index indicated that articles written by 3 scientists were recognized and cited by scientists in this field (total citations = 37 during this reporting period).

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Human and Animal Health

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
722	Zoonotic Diseases and Parasites Affecting Humans			85%	
723	Hazards to Human Health and Safety			15%	
	Total			100%	

V(C). Planned Program (Inputs)

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	9.5	0.0
Actual	0.0	0.0	11.3	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	99934	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	1365992	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	983704	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The expected outputs are designed to benefit federal, state, and local public health officials, physicians, veterinarians, and the general public. State-generated outputs mainly include scientific publications, talks and interviews, identifying and testing ticks for the Lyme disease agent, and numbers of state residents served directly by answering inquiries. For activities, staff members will (1) disseminate information on research findings by giving talks and media interviews, (2) analyze ticks and mosquitoes, (3) answer public inquiries, and (4) inform public health officials on control methods. All activities strongly emphasize public service and include traditional and non-traditional stakeholders. Two open houses are planned annually on Station properties to allow the public to hear oral presentations on research findings and to offer comments. Results of these activities will lead to specific outcomes, such as more efficient or environmentally sound methods of tick and mosquito control and prevention of human illnesses.

2. Brief description of the target audience

Research on human and animal health benefits a broad range of stakeholders. Research findings are directly transferred to scientists via peer-reviewed journals and conferences. The general public is reached and participates in events by means of agricultural fairs, open houses, TV, radio, and newspaper articles. Media reporters frequently request information for stories. Oral presentations will be given to public health officials in meetings and, as requested, to civic groups. Also, state residents are allowed to submit ticks through local health departments for identification and analysis for the Lyme disease agent. Results are reported to public health officials when they inform the residents. General information on tick-related research is also provided. Fact sheets and other information posted on the CAES website are made available to everyone. Although these communication venues allow for extensive contacts with the public, special efforts are made to reach underserved and under-represented groups. Information on ticks and mosquitoes is printed in Spanish. A fact sheet on beg bugs is printed in Spanish and Chinese. Displays at agricultural fairs and open houses are designed to interest children as well as adults. Public participation in agricultural fairs is particularly effective in reaching non-traditional stakeholder groups.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	3000	3000	1000	2700
Actual	2526	67742	1259	10830

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

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	8	
Actual	0	12	12

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Total research papers

Year	Target	Actual
2009	15	14

Output #2

Output Measure

- # of talks and interviews

Year	Target	Actual
2009	140	176

Output #3

Output Measure

- # of responses to stakeholders' inquiries

Year	Target	Actual
2009	2500	1607

Output #4

Output Measure

- # of ticks identified or tested

Year	Target	Actual
2009	4500	3404

Output #5

Output Measure

- # mosquitoes identified and/or tested

Year	Target	Actual
2009	155000	291641

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of residents gaining knowledge of ticks, mosquitoes, and mold
2	# of media reporters gaining knowledge of ticks, mosquitoes, and mold

Outcome #1

1. Outcome Measures

of residents gaining knowledge of ticks, mosquitoes, and mold

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	8500	5011

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Stakeholders are concerned about bacterial pathogens transmitted by ticks, such as the spirochetes that cause Lyme disease and the agent that causes human granulocytic anaplasmosis. Both diseases have worldwide distribution in temperate areas and affect several thousand state residents. The general public, health care providers, physicians, and veterinarians are interested in accurate diagnosis of illnesses.

What has been done
During prior reporting periods, antibody tests were developed to help diagnose infections in people and domesticated animals. Tests were subsequently developed for deer and mice to facilitate field studies of these zoonotic diseases.

Results
Following publications in peer-reviewed journals, there was interest in the scientific community to use published methods to perform diagnostic assays. To honor requests, positive and negative reference sera were sent to 4 out-of-state laboratories along with specific information on how to conduct the antibody tests. These activities had immediate impact because assays developed at CAES are now being used at the University of Minnesota, Abaxis (Union City, California), The National Veterinary Institute (Oslo, Norway), and the Royal Veterinary College (London, England). The use of these assays should improve confirmation of Lyme disease and granulocytic anaplasmosis infections in humans, dogs, deer, and mice, thereby preventing illnesses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
722	Zoonotic Diseases and Parasites Affecting Humans
723	Hazards to Human Health and Safety

Outcome #2

1. Outcome Measures

of media reporters gaining knowledge of ticks, mosquitoes, and mold

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	30	33

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Reporters frequently seek information on mosquitoes, ticks, and associated diseases and are interested in new knowledge gained from research on the spread of disease organisms in nature and the status of tick and mosquito population densities. Lyme disease is prevalent in Connecticut. West Nile virus, an exotic pathogen, is now firmly established in North America. Moreover, the Eastern Equine Encephalitis (EEE) virus has re-emerged after several years of low prevalence and can cause human and horse deaths. This disease has a 30% human fatality rate. The detrimental effects of vector-borne pathogens on humans and horses illustrate the importance of monitoring for emerging pathogens and changes in the status of endemic disease organisms.

What has been done
There were at least 33 reporters who sought information on mosquitoes, encephalitis viruses, ticks, tick control, or tick-transmitted disease organisms. By interviewing scientists conducting field and laboratory investigations, the reporters gained new knowledge of mosquitoes and ticks and transferred this information to the general public. Tens of thousands of stakeholders were kept informed of recent research findings and the significance of new scientific advances.

Results
There were more than 65 news stories on mosquito and tick population numbers, prevalence of viral or bacterial infections in these arthropods, and methods of control. Articles written by 26 (79%) of 33) reporters accurately transferred results to stakeholders. These actions had impact because upon learning about the presence of the EEE virus in 23 towns, state officials responded by increasing public service announcements encouraging state residents to prevent mosquito bites. There were no human cases of EEE. Also, more than 3,000 state residents learned about the Station's diagnostic services available to test ticks for the Lyme disease agent and submitted 3,404 ticks for identification and analyses. Stakeholders learned whether or not ticks were infected and received a letter reporting results and a fact sheet describing how these arthropods transmit the Lyme disease organism. During the past year, 1,870 ticks were not engorged with blood, and since no transmission of pathogens occurs until blood engorgement, there was no need for unnecessary antibiotic treatment. The immediate benefits are a well-informed public, reduced costs for analyzing ticks, and less antibiotics being used in treatment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
722	Zoonotic Diseases and Parasites Affecting Humans

723 Hazards to Human Health and Safety

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

Because of budget cuts, the number of available vehicles for field visits was reduced. This factor made it difficult to collect specimens. There were no changes in public policy, competing priorities, amounts of grant funding, or competing programmatic challenges.

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

1. Evaluation Studies Planned

- After Only (post program)
- Before-After (before and after program)
- During (during program)

Evaluation Results

"During program" and "after only" evaluations were conducted to assess program effectiveness. The treatment of mosquito larval habitats, following news releases of West Nile and EEE virus infections in mosquitoes, successfully reduced mosquito populations at selected, key sites. Surveys of stakeholders revealed positive responses to news releases to warn the public about infected mosquitoes.

Key Items of Evaluation

Data were collected mainly by on-site verbal input or written evaluations conducted following talks to civic groups. A survey was conducted to assess changes in behavior regarding prevention of mosquito and tick bites, and there were face-to-face interactions with reporters and other stakeholders. During this reporting period, there was a total of 286 citations for scientific articles written by 8 scientists.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Soil and Water Quality

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation			100%	
	Total			100%	

V(C). Planned Program (Inputs)

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

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	4.5	0.0
Actual	0.0	0.0	5.9	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	119474	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	1146438	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	283866	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The expected outputs are scientific publications, newsletters, and fact sheets; talks and interviews; and numbers of state residents served directly by analyzing soil samples or identifying invasive aquatic or terrestrial weeds. These activities, services, or events are designed to disseminate new information to stakeholders and to seek their input on the research program and findings. Participation by members of lake associations in group discussions and workshops are particularly important because these stakeholders must agree on how to remove aquatic weeds from lakes. Options are limited to herbicide treatment and mechanical methods, which can vary in effectiveness depending on the extent of invasive weed infestations. Diagnostic services are available to determine the extent of pollution problems and to determine the success of field experiments. Information will also be made available to all stakeholders on the CAES website, in newsletters and fact sheets, and in displays at the open houses or at agricultural fairs. It is also expected that there will be interest from reporters to write articles on the research, thereby enhancing awareness of pollution problems. Results of these output activities will lead to specific outcomes, such as removing pesticides from soil and water, clearing lakes and ponds of invasive aquatic plants, and preventing pollution.

2. Brief description of the target audience

A broad base of stakeholders, including under-represented and under-served persons, is targeted. It is expected that the following stakeholder groups will directly benefit from the research: farmers, lake associations, boaters, homeowners, water company officials, environmentalists, extension specialists, corporate and municipal officials, and pesticide producers. Special efforts will be made to contact and include members of minority organizations, women, and children to provide information and to participate in open house events.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	7000	9000	185	500
Actual	915	15240	1119	2458

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

Year: 2009
Plan: 0
Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	2	
Actual	0	5	5

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Total research papers

Year	Target	Actual
2009	5	15

Output #2

Output Measure

- # of talks and interviews given to stakeholders

Year	Target	Actual

2009	90	113

Output #3

Output Measure

- # of diagnostic tests performed

Year	Target	Actual
2009	2700	11699

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of homeowners gaining knowledge on pesticide pollution and invasive aquatic plants
2	# of homeowners gaining knowledge on soil and water quality
3	# of lakes and ponds surveyed and/or cleared of invasive aquatic plants

Outcome #1

1. Outcome Measures

of homeowners gaining knowledge on pesticide pollution and invasive aquatic plants

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	80	2087

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Members of lake associations see extensive growths of aquatic weeds and are concerned about the loss of water quality. Homeowners also are concerned about the over use of herbicides for weed control in lakes and possible contamination of ground water.

What has been done
At the request of stakeholders, lakes were surveyed for invasive aquatic plants. In general, it was most effective to remove invasive plants by applying dilute concentrations of herbicides to infested areas. Twenty town meetings were held to transfer survey information to stakeholders and to answer questions. Other state residents requested information by e-mail or phone.

Results
Herbicide treatments cleared Eurasian water-milfoil, variable-leaf milfoil, and curly-leaf pondweed from small lakes. The immediate impacts were improved water quality and transfer of information to 2,087 homeowners. Long-term impacts are a cleaner environment for fish and other wildlife, preservation of drinking water supplies, and recreational use of lakes and ponds.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #2

1. Outcome Measures

of homeowners gaining knowledge on soil and water quality

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1500	2169

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fertilizers are used extensively by homeowners, landscapers, golf course managers, and farmers. In many cases, these chemicals are applied without knowledge of soil quality. This practice can lead to polluted surface and ground water, thereby encouraging rapid growth of algae and other invasive aquatic plants. People who own or rent lake-front properties have expressed concern over reduced water quality and the inability to navigate boats in areas where aquatic weed populations are dense.

What has been done
At the request of stakeholders, 11,699 soil tests were performed to determine nitrogen and phosphorous concentrations, acidity, and amounts of organic matter present. Specific results were provided on soil quality, and written suggestions were made concerning the addition of fertilizers and lime to improve soil quality, or a statement was provided that no fertilizers were needed.

Results
Of the 11,699 soil samples tested, 585 (5%) were considered adequate for plant growth and did not require fertilizer applications. These stakeholders, mainly homeowners who submitted soil samples collected from their lawns and gardens, learned that they did not need to purchase fertilizers and, collectively saved about $11,700. Another short-term benefit is less fertilizer leaching into surface and ground water. The long-term benefit is a cleaner environment.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #3

1. Outcome Measures

# of lakes and ponds surveyed and/or cleared of invasive aquatic plants

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	4	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Invasive aquatic plants reduce public access to water, restrict boat navigation, decrease water quality by increasing sedimentation and eutrofication rates, and alter wildlife habitats. People who own or rent lake-front properties have requested assistance on the control of aquatic weeds, such as Eurasian water-milfoil and variable water-milfoil.

What has been done

Experiments were conducted with the herbicides 2,4D, diquat, and fluridone, to develop methods to control variable water-milfoil and Eurasian water-milfoil infestations from three lakes and a pond. Spring and late summer treatments were applied to infested areas. Global positions system-based (GPS) bathymetric vegetation maps were created and digitized along with text-based narratives. In addition, GPS-derived transects were established within each treated lake or pond. These transects serve as a diagnostic assessment tool to track changes in aquatic species abundance and distribution over time.

Results

Late summer applications of herbicides were as effective as traditional spring treatments, and control of aquatic plants was achieved without the spring treatment. There were immediate impacts because the use of herbicides in a 20-acre lake costs about $2,000, compared to hydroraking ($15,000). Costs for draining water and dredging can exceed $250,000. Water quality has been restored in the treated bodies of water. Long-term benefits are high water quality and preservation of wildlife habitats.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Other (Unexpected changes in workforce)

Brief Explanation

There were no external factors that affected outcomes.

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

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)

Evaluation Results

"Before and after" and "during" evaluations were conducted to document increased knowledge of aquatic plants, whereas "during" evaluations were most helpful in assessing advanced knowledge of stakeholders on soil and water quality issues. More than 120 stakeholders participated in the aquatic weed abatement programs and in town meetings. They followed progress as treatments cleared the weeds from targeted areas.

Key Items of Evaluation

Written information on survey forms following workshops (on-site) and verbal feedback from interviews with volunteers and other stakeholders (unstructured) were important information collection methods for program assessments. During this reporting period, there were 278 citations for scientific articles written by four scientists.