2013 Connecticut Agricultural Experiment Station - Research Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

Executive Summary

Significant scientific advancement has been made at The Connecticut Agricultural Experiment Station (CAES) in meeting the research and outreach objectives set forth in 4 planned programs: Global Food Security - Plant and Integrated Pest Management (IPM) Systems; Food Safety; Human and Animal Health; and Soil and Water Quality. Cooperation with extension personnel at land grant universities such as the University of Connecticut, University of Massachusetts, and Cornell University, has facilitated the transfer new scientific information to a broad base of stakeholders. Collaborations exist with scientists in over three dozen states and nearly one dozen countries.

During the current reporting period, restrictions on hiring new employees on state funds remained in place because of budget deficits. We were, however, able to hire two Postdoctoral Research Scientists on federal grants, as well as one Technician. Moreover, we shifted some scientist year (SY) commitments from state-funded positions to Hatch projects. These steps increased SY times beyond those listed in the Plan of Work. Although most scientists and other staff members conduct research and outreach activities, we are unable, however, to accurately separate costs for these major initiatives.

Research on plants and IPM systems has continued. As an example, new incidences of boxwood blight, first reported in Connecticut in October 2011, continue to be diagnosed throughout the state. This new disease to North America is caused by the fungus *Calonectria pseudonaviculata* and has already resulted in significant financial losses in the state, which to date have exceeded $5 million. In addition to developing molecular methods for early detection, Station scientist have taken a leading role in refining Best Management Practices (BMPs) to provide guidance for nurseries, garden centers, landscapers, and property owners for dealing with this disease and offered suggestions to minimize the spread of the disease through commerce and planting of infected material. The New Crops Program continues to expand; according to the Connecticut Department of Agriculture, there were 125 farmers' markets in 2011, attended by over 400 farmers compared to 87 markets in 2007, a 52% increase. Station Scientists in the New Crops Program conduct research of direct benefit to this expanding market by investigating crop varieties with a high market value. Similarly, Station viticulture research programs continue to provide data on improved cultural practices and their effects on long-term vine health and fruit quality, as well as novel disease management strategies to accommodate Connecticut's warm, humid summers

In the Food Safety Program, CAES scientists continue to assist CT state agencies and the US Food and Drug Administration (FDA) in developing more efficient assay methods to detect toxic chemicals. Decisions on violations are based on tolerance levels established by the US Environmental Protection Agency or the US Food and Drug Administration. During this reporting period, Station Analytical Chemists worked directly with the FDA Forensic Chemistry Center (FCC) and the Center for Food Safety and Applied Nutrition (CFSAN) to validate new methods to detect arsenic species in juice and food. Separately, analysis provided by CAES led directly to a recall by USDA of certified organic nectarines that had over tolerance pesticide residues and a recall by FDA on imported eyeliner that was heavily contaminated with cadmium.

Progress has been made in the Human and Animal Health Research Program and positive outcomes have resulted in changes in behavior. Laboratory tests of a total of 189,379 mosquitoes (14,058 pools) representing 38 species were trapped and tested from over 90 sites. A record total of 235 isolations of West Nile virus were made from 7 mosquito species; other mosquito-borne viruses isolated included

Eastern Equine Encephalitis (EEE), Highlands J and Jamestown Canyon (JC). Based on surveillance of hundreds of state residents over several years, about 25-40% indicated that they protected themselves by using repellents or by going indoors when mosquitoes were biting. Additional studies have focused on overwintering biology of the principal vector of EEE virus and provided new insight on how warming winter temperatures associated with climate variability may impact the maintenance and amplification of this virus in the northeastern US. Research has begun on the mosquito *Aedes albopictus*, which is an aggressive human biter that has spread throughout the southeastern portion of the US and expanded further north into New Jersey, New York City and Long Island, New York. This mosquito species could also become established in Connecticut if climate change provides suitable conditions for future colonization; as such, work has begun to assess the ability of *A. albopictus* to serve as regional arbovirus vector.

In the Soil and Water Quality Program, research into novel means of aquatic weed control that minimizes herbicide usage and protects native vegetation continued. Investigations into non-chemical management options such as antagonistic biological organisms and winter water level adjustment have also been conducted.

Outreach remains a high priority. There have been direct and indirect contacts with adults in CT, respectively. Less frequent yet still significant direct contact and indirect contacts were noted for youth. Staff members gave 1,176 talks and interviews, made 238 farm visits to solve specific problems, and answered more than 20,118 citizens' inquiries, including 15,439 diagnostic tests. Stakeholders have access to 66 new published peer-reviewed scientific articles and 46 non-peer reviewed fact sheets, CAES Bulletins, newsletter articles, book chapters, and symposia proceedings. Assistance was given to 228 reporters, representing newspapers, television, and radio. The CAES website continues to be updated and serves as a powerful method of transferring new information to the public. There were many page views, including visits for publications and visits to the CAES Plant Pest Handbook. The average user time per visit was about 10 minutes. A series of Public Service Announcements and short videos are available on the website, including a Training Video on Bed Bugs and a video on the hazards of moving firewood as related to the spread of exotic insects.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	30.0	0.0
Actual	0.0	0.0	35.3	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 evaluate project outlines for Hatch grants, external reviews were acquired. All scientific proposals submitted to USDA-NIFA or other federal agencies likewise received merit and external peer-review 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 2013, there were 6 Hatch projects and 1 McIntire Stennis project outlines reviewed and submitted to USDA/NIFA to address state and national needs and to accomplish planned research goals in the following programs; Global Food Security: Plant and Integrated Pest Management Systems (n = 5), and Human Health (n = 2). 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.

Stakeholders participated in CAES research programs and public events. Special conferences and workshops were held on pests of fruit trees and vegetables, bed bugs, hop and malt grain production, controlling Christmas tree pests, as well as a Future Farmers of America (FFA) Forestry Career Development event. Information was disseminated to state residents living in widely separated towns and cities in the state. Press releases promoted our annual summer Open House (Plant Science Day). A one-page promotional flyer was delivered to at least 90,000 households in an edition of the New Haven Register preceding Plant Science Day. This all day event, held at Lockwood Farm (Hamden, CT) each year on the first Wednesday of August, is open to the public. It would be great benefit for NIFA and NPL's to see the exhibits, hear the talks, and see stakeholder interactions. Attendance at the August Plant Science Day at Lockwood Farm (926 visitors, including 119 children) was excellent. Connecticut Network (CT-N), a public TV station, taped the main speaker's talk and scientists' presentations at Plant Science Day for statewide telecasting. Extensive media assistance targeted non-traditional stakeholder groups and individuals. Notices of this public event was mailed or e-mailed to 195 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 several 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, the Norwalk Tree Festival (now called the CT Tree Festival) provides stakeholders an opportunity to meet and engage with Experiment Station staff; approximately 1,100 people saw Station displays. Dozens of students have toured laboratories at the Station's main campus in New Haven or the facilities at Lockwood farm and have heard oral presentations of Station research and programs. Survey forms were distributed 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 event to receive input. Residents who responded were pleased with the program. Survey forms completed by 52 attendees of Plant Science Day indicated that residents came from at least 31 towns and cities of a total of 169 municipalities. A workshop to train and educate cooperative extension specialists on spotted wing drosophila was organized by Station scientists and was attended by 20 persons. Separate meetings on hops/malt production and tobacco research were held and attended by 25 and 113 people, respectively. All individuals rated the programs as both interesting and useful. The majority indicated that they would benefit economically based on what they learned. Station staff members served on advisory boards and committees of at least 158 agricultural and environmental civic groups. Invasive insects and aquatic plant problems were identified at meetings of traditional and non-traditional groups and individuals. Moreover, staff members made 238 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, 14 separate outreach or public events involved direct or indirect participation and interactions with federal, state, or local elected officials.

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.

Collecting input from stakeholders helps to realign and refocus research programs. There are several mechanisms in place to identify individuals and groups of stakeholders and to collect input from them. Evaluation forms, distributed to open house, meeting, and workshop attendees, were relied on heavily for stakeholder input. 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 addressed after review. The policy is that all citizens receive responses. A complaint requires a response and follow-up contacts by administrators. Active participation of Station staff members on 158 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 research project on the preserving genetic diversity of crop plants - heirloom varieties, wild varieties, etc., the process of plant domestication was requested. Additional projects on the consumption and safety of fresh water fish, cultivation of native weeds for human consumption and urban gardening were also

requested. Current research on detecting pesticides and pathogens 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 after Station scientists attended lake association meetings. Field research on specialty crops was increased at the requests of Hispanic and Asian residents. Members of the microbrewery industry in CT requested research on barley and hops; a research program has resulted that is now active and was supported by a well-attended conference at our Valley Laboratory. New cultivars of chestnut trees and grapes are being evaluated at growers' requests. 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 annual Open House event 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 for growers held by CAES scientists during evenings were especially useful in documenting public input. About 1,176 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. Major concerns are conveyed to the Director in writing or by email. Research priorities on food safety, solving crop pest problems, providing new niche crops, 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 continues to be very difficult. Further, frequent attendance at agricultural groups' meetings was very helpful in collecting stakeholder input. A public meeting for tobacco growers conveyed new pest information and new research on strategies to reduce pesticide use and minimize residual levels in harvested leaves, as well as providing pesticide applicator re-certification credits for 71 attendees. In addition, the Station website now has links to a Facebook Page and Twitter account; inquiries and comments received via this media are collected by the Information Officer and forwarded to appropriate staff for consideration and response. Finally, the Science Citation Index and Google Scholar was used to identify scientists in other institutions who were recognizing the Station's published works and using new knowledge.

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.

Written stakeholder input was received during this reporting period. The correspondence and completed surveys, which were well designed to ask specific questions, were effective processes in collecting public input on research and outreach programs. Emphasis is being placed on obtaining more written input so that additional 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 Timber Producers Association, 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, CT Urban Forest Council, Northeast Organic Farmers Association, CT Beekeeper Association, Backyard Beekeeper Association, and the Experiment Station Associates, were effective in collecting direct stakeholder input. 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 our annual Open House (advertised to all) and at organized events where exhibits were displayed, 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 additional input. Inviting high school students and teachers to see CAES laboratories to hear brief presentations on research resulted in collecting written stakeholder input from teachers. The 15,439 diagnostic tests performed for individuals also resulted in 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 requires all state agencies to report on performance measures and accomplishments as a part of their Results-Based Accountability (RBA) program. The Station's outreach activities and stakeholder input processes are key 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 the Director. All written comments received in e-mail messages, letters, survey forms, or via Facebook/Twitter were reviewed by Station staff members and considered by the appropriate Department Head in re-aligning research priorities or initiating new studies. At the requests of stakeholders, 10,857 inquiries were answered in the Department of Plant Pathology and Ecology or the Valley Laboratory. Fungal and bacterial infections of crops and other plants have economic impact and reporting information to the National Plant Diagnostic

Network (NPDN) has relevance to other states. However, many other inquiries answered in other departments, such as Entomology and Environmental Science, are not reported to the NPDN. Chrysanthemum white rust continues to be a problem for nursery growers, who requested guidance in disposing of federally regulated plant waste. Despite budget cuts, stakeholders want the high quality diagnostic and research services continued at the present level. Growers requested information on rapeseed cultivars for control of plant-parasitic nematodes. Members of the microbrewery industry, a new group of stakeholders, have requested research on hops and barley. Pest control operators notified CAES scientists that chemical control of bed bugs remains ineffective. Research on insecticide resistance is in progress. Health officials asked for research on Powassan virus in ticks. Beekeepers and fruit growers expressed concern about declining honey bee populations and requested that analyses be conducted for possible pesticide contamination. Hispanic and Asian stakeholders requested assistance on introducing new specialty crops. Accordingly, experiments were conducted on 55 cultivars of 6 specialty crops. At the request of stakeholders, training was given on IPM practices. In nurseries, insect infestations of Christmas trees and other economically important crops are having detrimental effects on plant vigor and quality. Field tests were continued in response to stakeholder requests. In other cases, stakeholders were concerned about the following: chemical contamination of foods, forest health, ticks, mosquitoes and viruses, possible health problems associated with invasive plants, mold in buildings, and insect pests of grass turf. Based on written stakeholder responses, research priorities were re-assessed to address current and relevant problems. All written comments received by the Director were discussed with appropriate Department Heads, and in some cases, specific objectives were included in the managers' annual performance goal programs.

Brief Explanation of what you learned from your Stakeholders

Stakeholders have extensive knowledge and experience that has consistently shown to be of benefit to research programs. Potential environmental, economic, or public health impacts are apparent in a number of examples. Damage to fruits and vegetables, caused by spotted wing drosophila (Drosophia suzukii), was reported to our entomologists. We were informed that golden bamboo might be another invasive plant. Station scientists and administrators learned that bed bugs are resistant to pyrethroid insecticides and that infestations in buildings are worsening. Members of lake associations revealed invasive plant infestations and provided feedback on effectiveness of control methods, such as the use of herbicides, biological control agents and lakewater draw-down programs. Nursery growers alerted Station scientists about insect damage of Christmas trees and about the increasing problem of insect resistance to certain pesticides. The general public expressed their concerns over product and food safety, particularly with regard to pesticide residues and metals such as arsenic. We learned that people do not have confidence in the quality of imported foods. Increased surveillance for unwanted chemicals in foods was requested by the public and the Station responded accordingly with both state and federally supported surveillance programs. Physicians have alerted CAES scientists about the increase in numbers of ticks which transmit the disease organisms that cause Lyme disease, granulocytic anaplasmosis, and human babesiosis. These people described the impact that these diseases had on their lives and the need to develop tick control programs for homeowner properties. We were informed by local health officials that our new methods of controlling mosquitoes in catch basins are working. We learned from foresters that the Asian longhorned beetle and emerald ash borer are spreading in Massachusetts and New York State, respectively. The latter insect has been found in 15 CT towns in four counties, one discovery being from following-up a report from a stakeholder. 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 for enhancing crop growth and for retaining/absorbing certain soil pollutants. 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, pak choi, daikon

radish, vegetable amaranth, and Chinese cabbage. We learned that crops evaluated by Station scientists were grown commercially and 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	898349	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	898349	0
Actual Matching	0	0	4393952	0
Actual All Other	0	0	1221539	0
Total Actual Expended	0	0	6513840	0

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

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger - Plant and Integrated Pest Management Systems

☑ Reporting on this Program

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 FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	13.0	0.0
Actual Paid Professional	0.0	0.0	18.2	0.0
Actual Volunteer	0.0	0.0	0.0	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	561458	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	2802269	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	746503	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The main research objectives for this program are to develop methods of pest control that require less chemicals and to develop and evaluate plant cultivars that are resistant to insect and plant pathogens and provide high yield. Important advances were made on these objectives during the reporting period. Several expected outputs (i.e., activities, services, events, and new crops that reach people) were designed to assist a broad, diverse group of stakeholders by providing products and information that will be used by growers and the general public to solve problems. We anticipate that some of these advancements will eventually benefit food production internationally. All activities of this planned research program will ensure that people have equality of service and access to research findings. Direct contacts were tabulated from persons served or those in attendance at meetings, workshops, etc. Numbers of indirect contacts with youth were obtained from teachers receiving CAES assistance and informative new findings in science curricula. The following activities were planned: (1) CAES scientists partnered with stakeholders and participated in their organizations as members or officers, (2) CAES scientists conducted workshops or special meetings for stakeholders, (3) experiments were performed on growers' properties as well as on CAES research farms, (4) 55 cultivars, representing 6 different crops, are currently under evaluation, and new cultivars of vegetables (e.g., broccoli) and fruits (e.g., peppers) will be tested, (5) Methods of controlling powdery mildew and crown gall continue to be developed, including dinofuran (Safari) testing as a trunk spray for insect pests of trees, (6) diagnostic services were provided to stakeholders, (7) training on IPM practices and other methodologies was provided to stakeholders, (8) staff members disseminated written information on research findings by presenting scientific displays at agricultural fairs and giving talks and interviews to civic groups, (9) staff members worked with the media and provide information on scientific discoveries, and (10) staff members educated teachers and thereby, indirectly reach youth. Public service is an important component for all output measures. For example, all state residents were allowed to request direct assistance on diagnosing insect or plant disease problems. About 20,118 stakeholders directly received assistance from these activities in this reporting period. CAES scientists are members or officers in at least 158 stakeholder or professional groups. This provides direct opportunities for stakeholder input on the research programs and facilitates reporting of research results. The non-traditional stakeholders were reached at agricultural fairs when they visited or inquired about CAES displays or through 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. One open house was held on CAES property to allow the public to hear oral presentations on research results and to offer comments. About 700 talks and interviews were given to civic groups and the media to convey research results and to receive direct public input. Research experiments solved problems or provided information on new crops. Whenever possible, these experiments were conducted on farms or other private properties to encourage stakeholder engagement in the research. Results of these output activities led to specific outcomes, such as reducing pesticide use, controlling insects or plant disease pathogens, development of resistant cultivars, the introduction of new specialty crops, and increased farm income. Scientific publications in peer-reviewed journals or articles written for the general public reached traditional and non-traditional groups of stakeholders.

2. Brief description of the target audience

Diverse target audiences include under-served and under-represented stakeholders. CAES does not receive extension funds but, nonetheless, serves a variety of farmers and other stakeholders that grow vegetables, fruits, nursery stock, cattle/livestock, and flowers. CAES scientists worked with the University of Connecticut extension specialists in planning growers' meetings. Progress was made in reporting new findings to the national extension service (www.extension.org) to reach stakeholders nationally. Several 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 were also made to reach government and 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 with 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 that are important target audiences. Efforts 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.

3. How was eXtension used?

Although The Connecticut Agricultural Experiment Station does not receive extension funding and is not an official institution with eXtension, several CAES staff members in this program are registered with eXtension with the consumer horticulture, youth, pesticide environmental stewardship, bee health, grape, eOrganic, and urban IPM communities of practice. New findings, fact sheets, links to Station material, and answers to questions have occasionally been provided to the national eXtension service (www.extension.org).

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	18168	28462	1622	7718

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	22	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Total research papers

Year	Actual
2013	76

Output #2

Output Measure

- # of site visits to conduct research and solve problems

Year	Actual
2013	344

Output #3

Output Measure

- # of talks and interviews given to stakeholders

Year	Actual
2013	344

Output #4

Output Measure

- # of responses to stakeholders' inquiries

Year	Actual
2013	14968

Output #5

Output Measure

- # of diagnostic tests performed

Year	Actual
2013	2288

Output #6

Output Measure

- # of new IPM intervention strategies judged to be effective
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of homeowners and growers gaining knowledge on insect pests and plant pathogens
2	# of homeowners and growers 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 and growers 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	Actual
2013	10793

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
American foulbrood (AFB) is a highly infectious disease of honey bees (Apis mellifera) caused by the endospore-forming bacterium Paenibacillus larvae, and is a regulated reportable disease in many countries. Not only is AFB devastating to colony health, but this disease has the capability to cause complete loss of an infected colony and render equipment unusable. A three year AFB survey in Connecticut has shown that 46.4% of the apiaries examined contain P. larvae spores. Most U.S. states mandate that bee hives with clinical symptoms of AFB be destroyed. Replacement cost to a beekeeper is approximately $300 for a single deep hive box plus bees. Connecticut has, on a yearly average, approximately 2800 registered bee hives.

What has been done
The main activity for the program consists of site visits to CT apiaries to meet with beekeepers and collected samples for analysis of AFB and Nosema infestations.

Results
Results are disseminated through bulletins and talks given to industry groups, citizens and other interested organizations. In addition, a database of registered beekeepers in Connecticut has been established for the years 2007-2011. New apiary registrations for 2012 are being added to the database. Staff scientists also maintain active membership in professional and amateur beekeeping societies and conduct work in collaboration with Ted Jones (president CT Beekeepers Association) at the Massaro Community Farm apiary in Woodbridge CT.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

# of homeowners and growers 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	Actual
2013	1916

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Materials at the nanoscale or nanoparticles (NP) possess unique chemical and physical properties not observed in their equivalent bulk materials. The literature clearly demonstrates enhanced availability and transport of NP in plants, but information is scarce. There is no information on how NP micronutrients might uniquely affect root pathogens. The mechanisms of NP absorption in plant leaves and roots could significantly impact crop yield and plant disease management. More importantly the effect of NP on soil borne disease has not been studied.

What has been done
Six greenhouse trials and one field study were conducted with tomatoes and eggplants to determine the effect of applying NP of Al, Cu, Fe, Mn, Ni, or Zn to plant leaves and roots and to determine whether these compounds are actively translocated within the plant. Roots and leaves were assayed for these elements by ICP mass spectrometry.

Results
We found that Cu and Mn NP were the most effective element in conferring resistance to soil-borne pathogens. Aluminum, Fe, Ni, and Zn were not as effective and often were damaging to the plant. The NP was always superior to the bulked oxide in increasing plant size and eggplant yield and there was significantly more downward translocation to the root when the NP form was used when compared to the bulked form. These findings, thus far, suggest NP may be useful in disease management.

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	Actual
2013	153

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Stakeholders requested new knowledge on how to grow specialty crops with little or no pesticides. Farmers wanted to reduce pesticide costs and worker exposure to these chemicals and desired to have marketable crops that are in public demand. Media reporters recognized the public's interest in having a cleaner environment and, likewise, sought new knowledge on managing crop and soil 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 24 newspaper articles or other news stories on plants and IPM systems covering a wide range of topics, such as specialty crops, honey bee pollination, insect pests, trees, gardening, and homeowner plantings. Station scientists gave over 1000 talks and interviews, with at least 200 having participation of the press. At the summer Plant Science Day event, public television (CTN) recorded talks given by scientists on plant systems and pests and telecasted the presentations to state residents via a cable network.

Results
Reporters learned about the detection of the emerald ash borer in CT, effects of changing climate on plant health, effects of neonicotinoid pesticides on honey bees, role of nanoparticles in agriculture, plant damage caused by deer, and the introduction of new specialty crops. For example, one 30 minute radio interview conducted on Texas Public Radio's "Science Studio" focused on nanotechnology in agriculture and reached an audience measuring in the tens of thousands.

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	Actual
2013	591

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Students are tomorrows scientists and educating youth, an under-served group, is a major outreach initiative. By interacting with students, CAES scientists promote greater interest in science, and provide opportunities for students to learn more about biology and chemistry.

What has been done
A CAES scientist mentored seven high school students for research projects, which gave them hands-on opportunities to assist with laboratory and greenhouse studies, data collection, and data entry. The projects the students have worked on have been salt marsh dieback, earthworms and biochar, biochar and plant disease, and salt tolerance among salt marsh fungi.

Results
Research projects geared to the individual interests of each student were designed and developed, with the option of using the project for state-wide science fair competitions. Students received hands-on experience setting up experiments, collecting and analyzing data, and presenting their findings. Over half of the students involved in this program presented their projects and one student was awarded first place in a CT science fair for high school students. Teachers reported that students developed an increased interest in science. The long-term benefits are nurturing students with greater understanding and interest in science and possible careers 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	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In October 2011, boxwood blight, a new fungal disease for North America was identified in Connecticut and North Carolina. This disease is now found in 12 U. S. states and three provinces in Canada. Boxwood blight is a devastating disease that can cause plant death, often hastened by secondary invaders. Boxwood is not only an important landscape plant in Connecticut and the U.S., it is also a significant part of the wholesale and retail nursery industry in Connecticut. The current annual wholesale market value for boxwood nursery production is estimated at $103 million (USDA-NASS, Census of Horticulture, 2010). Losses attributed to boxwood blight in CT alone have been estimated at $5.5 million since 2011.

What has been done
Plant pathologists at the Experiment Station drafted best management practices (BMPs) for boxwood blight in response to the initial U.S. outbreaks, but these were largely based on research performed in Europe. Although significant gaps in science-based information on many features of disease development and mitigation were evident, particularly under U. S. conditions, this prompted an unprecedented level of collaboration among federal, state, and university researchers with industry support. As a founding participant of this research consortium, CAES researchers have taken the lead in developing molecular detection assays, identifying effective products for sanitizing tools and equipment, and identifying effective fungicides.

Results

A sensitive and specific molecular detection assay has been developed to improve early, pre-symptom diagnosis, and work is underway to apply this assay to understand sources of the pathogen in potting media, soil, and water. Research has also successfully identified effective products (e.g., bleach, Lysol, Oxidate, ZeroTol, and X3) for sanitizing tools and equipment needed to refine current BMPs and minimize new infections and carry-over from infected plants, thereby reducing economic loss. Effective systemic and protectant fungicides (e.g., propiconazole, myclobutanil, thiophanate-methyl, fludioxonil, pyraclostrobin, kresoxim-methyl, and chlorothalonil) have also been identified from laboratory, greenhouse, and container nursery studies. New information was communicated to green industry professionals through presentations and posters at meetings, through fact sheets, and was incorporated into revised versions of BMPs. Prompt action by Station researchers, in concert with decisive regulatory actions, continue to minimize the economic impact of boxwood blight on the Connecticut nursery industry. Growers and landscape professionals incorporated this new information and updated BMPs into their practices. Although significant losses were realized after the initial outbreak, CAES actions helped to maintain boxwood as a viable and important component of the Connecticut landscape and nursery industry.

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	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Today, about 11,000 acres on 733 farms in Connecticut are devoted to vegetable production with a cash value of $30.2 million. Vegetable growers responding to a state survey requested that field trials be conducted on specialty pumpkins.

What has been done
Field tests revealed that the cultivar Apprentice yielded almost 15,000 more pumpkins per acre than the cultivar Minitreat.

Results
At a retail price of $2.00 per fruit, a grower can potentially gross nearly $30,000 more per acre with Apprentice than growing another popular cultivar Minitreat. Twenty-five vegetable growers are including this crop in their farming operations. The long-term benefits of growing specialty pumpkins include an additional product and revenue for growers who attend farmers markers or have their own roadside stands.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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 (Staff changes, media influences)

Brief Explanation

As reported previously, the loss scientific staff in this program has adversely affected outcomes. However, recent improvement in the state funding situation has allowed the hiring of 3 scientists, although the search process has just begun and will not likely be complete until late 2014. It is likely that significant portions of the research programs of these new staff will fall under this program and increased progress and outcomes are anticipated in the future.

V(I). Planned Program (Evaluation Studies)

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 591 students, whereas "before and after" program on-site evaluations and observations indicated that there were positive outcomes in more effective control of various plant pests. Moreover, after requested field trials on specialty pumpkins, 25 growers included the selected cultivar in subsequent farming operations.

Key Items of Evaluation

The Science Citation Index and Google Scholar verified recognition of published articles on plant systems written by more than a dozen scientists. There were 1215 citations for this entire planned program during 2013. Several published news articles showed that substantial knowledge changes had occurred in reporters. Likewise, feedback from nearly 50 teachers verified knowledge changes in youth. On-site observations, site visits, and evaluations verified success in improved pest control methods, as well as IPM monitoring.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Food Safety

☑ Reporting on this Program

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 FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual Paid Professional	0.0	0.0	3.4	0.0
Actual Volunteer	0.0	0.0	0.0	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	39243	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	195527	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	83088	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The main research activities are to develop more efficient and sensitive analytical methods to detect toxic chemicals and heavy metals in food and other consumer products, to determine if consumer products contain allowable amounts of these constituents, and to determine the role of pesticides in causing honey bee mortality. A pilot collaboration program was established in a previous reporting period with the CT Department of Public Health to test foods for unwanted chemicals and pathogenic bacteria. Decisions on whether or not foods are "safe" depends on tolerance levels established for chemicals by the US Environmental Protection Agency (EPA) or the Food and Drug Administration (FDA). Good progress was made on all objectives. The 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, ease of access to scientific results, and the ability to see laboratories and field plots. The state-generated outputs include numbers of food and consumer product samples tested, scientific publications, and talks and interviews. The following activities were planned: (1) new analytical chemistry procedures were developed, (2) staff members disseminated new information on analytical test results to visitors at open house events and in scientific displays at agricultural fairs, (3) oral presentations were given to civic groups, and (4) laboratories were 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. An annual open house event on Station property allows 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 target 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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1575	133	20	66

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	8	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Total research papers

Year	Actual
2013	12

Output #2

Output Measure

- # of talks and interviews

Year	Actual
2013	81

Output #3

Output Measure

- # of tests performed

Year	Actual
2013	2047

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 and federal regulatory agencies making decisions on test results

Outcome #1

1. Outcome Measures

# of stakeholders gaining knowledge of food safety

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1595

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There have been several instances when foods were contaminated with toxic chemicals or heavy metals. Food producers, retail operators, and consumers want foods that contain safe levels of these constituents. Federal and state regulators request analyses of foods and enforce laws by recalling contaminated products from commerce. These programs include fresh and manufactured foods, as well as animal feeds, including raw products such as alfalfa and processed products such as canned wet and bagged dry feeds.

What has been done
As part of routine surveillance of the food supply in the CT, Department of Consumer Protection Inspectors submitted samples of fruits and vegetables, including certified organic products, for analysis by the Department of Analytical Chemistry at The Connecticut Agricultural Experiment Station (CAES). The food samples were extracted and analyzed for over 1000 pesticides, poisons, and toxins. The US EPA sets tolerance levels for specific pesticides on specific food commodities. The USDA National Organic Program has regulatory jurisdiction over organic food products. The Organic Foods Production Act of 1990 indicates that a food product may only be sold as certified organic if it contains less than 5% of the allowable tolerance of a pesticide as set by the US EPA.

Results
Organic yellow nectarines were found to contain residues of the pesticide Thiophanate Methyl at unacceptable levels. This residue fails the criteria for organic labelling and as a result, the USDA National Organic Program, Compliance and Enforcement Division, conducted an investigation of the growers fields. A determination of spray drift was found to be the root cause of the contamination and the NOP mandated an increase in buffer zones in between organic and non-organic crops. This change in actions will prevent exposure to excessive chemicals in food. Stakeholders gained knowledge of the test findings and the actions taken to correct the problem.

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 and federal regulatory agencies making decisions on test results

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food and other consumer products are tested for unwanted chemicals and heavy metals to determine if they are in compliance with labels or safe to use by consumers. People are concerned about potentially contaminated products. State and federal regulatory officials are mandated to enforce consumer protection laws. Historical precedence exists for concerns over certain imported consumer goods having excessive levels of heavy metals. Past products of concern where the Department of Analytical Chemistry at The Connecticut Agricultural Experiment Station (CAES) reported findings of dangerous heavy metals include childrens toy jewelry and toys.

What has been done
In response to a consumer complaint, Department of Consumer Protection inspectors submitted a sample of Hashmi Surma Special Eyeliner to the Department of Analytical Chemistry at The Connecticut Agricultural Experiment Station (CAES) due to such concerns. The sample was digested in concentrated acid and analyzed by inductively coupled plasma with mass spectrometry to screen for heavy metal content.

Results
The eyeliner was found to contain nearly 17% lead by weight (167,390 parts per million lead). Results were reported to the Department of Consumer Protection and to the US FDA. As a consequence of the findings, the US FDA facilitated a product recall and issued a public notice indicating that this product could cause health problems to consumers, particularly infants.

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

- Economy
- Appropriations changes
- Competing Programmatic Challenges
- Other (Staff changes)

Brief Explanation

One scientist retired on August 1, 2008, and up until 2013, the vacancy could not be filled due to a hiring freeze. We are happy to report that the vacancy was indeed filled effective July 12, 2013. In addition, a Postdoctoral Research Scientist was also hired on a federal grant (US FDA) to assist in this work. These are critical positions because the discipline requires the testing of toxic heavy metals (e.g., lead, arsenic, cadmium, and mercury) in range of products by a number of advanced methods. Other scientists, who were working entirely on state projects with state funds, have been reassigned to either part or full-time status on Hatch-funded programs. Work continues in the Department of Analytical Chemistry and planned program objectives were met. Grant-funded positions are now a critical component for food safety programs.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Information on research and service results was obtained "during the program" written evaluations and oral comments received at public meetings (1 Open House), civic groups' meetings, and at Station exhibits. Positive feedback as received from stakeholders. 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: stakeholders' written responses concerning food analyses; constructive written feedback from grant peer-reviewers for a competitive USDA grant; and responses and corrective actions by the State of Connecticut, USDA, and US FDA to remove suspect products from commerce. The Citation Index and Google Scholar indicated that articles written in previous years by several scientists were recognized and cited by other scientists in this field (total citations exceeded 600 during the reporting period).

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Human and Animal Health

☑ Reporting on this Program

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 FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	10.0	0.0
Actual Paid Professional	0.0	0.0	7.3	0.0
Actual Volunteer	0.0	0.0	0.0	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	177867	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	882656	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	198019	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The main research objectives are to determine the primary mosquito vectors of encephalitis viruses, the sources of blood meals found in engorged mosquitoes, if biological control agents can effectively control mosquitoes and ticks, and to determine which vertebrate hosts serve as reservoirs for arthropod-transmitted pathogens. Significant advancements were made on all objectives. The expected outputs will benefit federal, state, and local public health officials, physicians, veterinarians, and the general public. The primary state-generated outputs include scientific publications, talks and interviews, identifying and testing ticks for the Lyme disease agent, and numbers of state residents directly served by answering inquiries. Specifically, staff members (1) conducted research on tick and mosquito control and disseminated information on research findings by giving talks and media interviews, (2) analyzed ticks and mosquitoes for disease agents, (3) answered public inquiries, and (4) informed public health officials on the success of control methods. All activities strongly emphasize public service and include traditional and non-traditional stakeholders. One open house events was held on Station property to allow the public to hear oral presentations on research findings and to offer comments directly to appropriate staff. Results of these activities have and/or 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 is of direct benefit to a broad range of stakeholders. Research findings were directly transferred to fellow scientists via peer-reviewed journal articles and professional conferences. The general public was reached and participated in events by means of agricultural fairs, open houses, TV, radio, and newspaper articles. Media reporters frequently requested information for stories. Oral presentations were given to public health officials in meetings and, as requested, to civic groups. Also, state residents were allowed to submit ticks through local health departments for identification and when the tick was engorged, analysis for the Lyme disease agent. Results were reported to public health officials who then informed the residents. General information on tick-related research was also provided to the public. Fact sheets and other information were posted on the CAES website and made available to everyone. Although these communication venues allowed for extensive contacts with the public, special efforts were made to reach underserved and under-represented groups. Information on ticks and mosquitoes was printed in Spanish. A fact sheet on bed bugs was printed in Spanish, Chinese, and French. Displays at agricultural fairs and open houses were designed to interest children as well as adults. There has been ongoing cooperation with the Yale Peabody Museum to provide new information on mosquitoes and ticks to develop science curricula for middle and high school students. The Yale program, funded by a $1.3 million Science Education Partnership Award and supported by the National Institutes of Health, is expected to impact 18,000 students and hundreds of teachers by 2016. Public participation in agricultural fairs continued and was particularly effective in reaching non-traditional stakeholder groups.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3078	4381	50	2519

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	16	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Total research papers

Year	Actual
2013	27

Output #2

Output Measure

- # of talks and interviews

Year	Actual
2013	170

Output #3

Output Measure

- # of responses to stakeholders' inquiries

Year	Actual

2013	3906

Output #4

Output Measure

- # of ticks identified or tested

Year	Actual
2013	2363

Output #5

Output Measure

- # mosquitoes identified and/or tested

Year	Actual
2013	192172

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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

Outcome #1

1. Outcome Measures

# of residents gaining knowledge of ticks, mosquitoes, bed bugs, and mold

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3128

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Prevalence of Lyme disease, human granulocytic anaplasmosis (HGA), and human babesiosis cases continue to increase in the United States. There were 30,831 confirmed and probable cases of Lyme disease reported to the Centers for Disease Control and Prevention in 2012. In 2013, the CDC officially acknowledged that the true number of Lyme disease cases was probably around 300,000 human cases per year. Without antibiotic treatment, persons can suffer from dermatologic, joint, cardiac, or neurological disorders. The mean cost per Lyme disease patient is about $1,965 (in year 2000 dollars). Pathogens for HGA and babesiosis attack white and red blood cells, respectively. The application of pesticides remains one of the primary methods for tick control in the residential landscape, and there is growing interest in biological, natural, and cultural methods in an integrated approach to reduce the risk of tick bite and disease.

What has been done
Field research was initiated in 2013 on an integrated tick management project to determine if an IPM approach could reduce the abundance of the tick Ixodes scapularis and the entomological risk of tick-borne disease (TBD). This tick is the main vector for the Lyme disease, HGA, and human babesiosis agents. The strategies include spraying the entomopathogenic fungus Metarhizium anisopliae, rodent targeted bait boxes, and deer reduction.

Results
A reduction in tick abundance of 58% was obtained the first year in 2012 in this study from sites with the combined fungus and bait box treatment. Reduced abundance or activity of nymphal ticks is of paramount importance in reducing risk of human infections during May and June in CT. These studies will have impact as guidelines to an effective IPM approach to tick management are needed for residents and communities to respond to the increasing risk for TBD.

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, bed bugs, and mold

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	65

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Reporters frequently sought information on mosquitoes, ticks, human pathogens, and associated diseases and were interested in new information gained from research on the spread of disease organisms in nature and the status of tick and mosquito population densities. West Nile and Eastern Equine Encephalitis (EEE) viruses constitute ongoing threats to human health by causing severe illness or death. Since its introduction into the United States in 1999, West Nile virus has sickened nearly 30,000 people resulting in over 1,500 deaths. During this reporting period, there were six human cases of West Nile virus in CT, but no deaths were reported. Public health officials have requested studies on the ecology of mosquitoes and viruses and biological control of mosquitoes.

What has been done
There were at least 34 reporters who sought information on mosquitoes and encephalitis viruses and 18 on ticks and Lyme disease. More than 2 million mosquitoes were tested for viruses over 14 years. By interviewing scientists, who were conducting field and laboratory investigations, the reporters gained new knowledge of mosquitoes and the three main viruses (West Nile, Eastern Encephalitis, and Jamestown Canyon) that cause human illnesses. Viruses cultured from mosquitoes were identified by RNA analyses. Results were conveyed to the general public via press releases. Tens of thousands of stakeholders were kept informed of recent research findings and the significance of new scientific advances as they relate to the geographic areas they live in.

Results

There were several dozen news stories on mosquitoes and viruses. Reporters and stakeholders learned that Culex pipiens is the main carrier of the West Nile virus and that this species is a complex of closely related subspecies of mosquitoes. Information on the overwintering ecology of a key mosquito species was published in the Journal of the American Mosquito Control Association. Stakeholders also learned about the key vector-host interactions in the occurrence of Eastern Equine Encephalitis though a publication in Vector Borne and Zoonotic Disease. These results had impact because mosquito control programs targeted the most important mosquito species and state residents took precautions to avoid mosquito bites. The long-term benefit is healthy human and domestic animal populations. Citations of published papers totaled in excess of 600 for the mosquito/encephalitis virus program.

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
- Other (Staff changes)

Brief Explanation

Grant funds were available to hire a Postdoctoral Research Scientist and there were shifts in scientists' work times from state projects to Hatch projects. Because of occasional delays in re-hiring temporary workers on grant funds, it is sometimes difficult to collect mosquitoes from field sites. The traps used require technical expertise and the use of dry ice (carbon dioxide attracts mosquitoes). The public would not be able to assist on mosquito collections. There were no changes in public policy, competing priorities, or competing programmatic challenges. A hiring freeze on state supported positions existed in 2013 but current plans are to hire an additional scientist for this program in 2014.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

"During program" and "after only" evaluations were conducted to assess program effectiveness. The treatment of catch basins in areas where West Nile virus is prevalent was successful in reducing Culex pipiens. Surveys of stakeholders revealed positive responses to news releases to warn the public about infected mosquitoes, at least 46 of 52 persons surveyed indicated that they closely followed advice to reduce exposure to mosquitoes.

Key Items of Evaluation

Data were collected mainly by on-site 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 were over 1000 citations for scientific articles written by staff scientists on ticks and mosquitoes for the entire planned program.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Soil and Water Quality

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management			30%	
133	Pollution Prevention and Mitigation			70%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	4.5	0.0
Actual Paid Professional	0.0	0.0	6.4	0.0
Actual Volunteer	0.0	0.0	0.0	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	119781	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	513500	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	193929	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The main research objectives are to develop chemical, biological and mechanical methods of controlling invasive plants, to use molecular methods to identify invasive plants, and to develop procedures

to monitor herbicides in water. Additional objectives focus on the detection and potential remediation of heavy metals and persistent organic pollutants in soil. Good progress was been made on these objectives. The outputs were new scientific findings; scientific publications, newsletters, and fact sheets; talks and interviews; and the number of state residents served directly by analyzing soil samples, identifying invasive aquatic or terrestrial weeds, or controlling these pest plants. These activities, services, or events are designed to provide new information that can be used by the general public 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 for herbicide treatment and mechanical methods, which can vary in effectiveness depending on the extent of invasive weed infestations and possibly by the co-presence of threatened or protected non-target species. Diagnostic services are available to determine the extent of pollution problems and to determine the success of field experiments. Water quality standards for acceptable herbicide concentrations are those established by the CT Department of Energy and Environmental Protection and the US Environmental Protection Agency. Information was made available to all stakeholders on the CAES website and other social media, in newsletters and fact sheets, and in displays at the open house events 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 invasive plant infestations. Results of these output activities did or will lead to specific outcomes, such as removing pesticides from soil and water, clearing lakes and ponds of invasive aquatic plants, and preventing loss of water quality.

2. Brief description of the target audience

A broad base of stakeholders, including under-represented and under-served persons, was targeted. The following stakeholder groups did or 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 continue to be made to contact and include members of minority organizations, women, and children to provide information and to participate in open house events.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	250	1828	85	314

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	14	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Total research papers

Year	Actual
2013	29

Output #2

Output Measure

- # of talks and interviews given to stakeholders

Year	Actual
2013	46

Output #3

Output Measure

- # of diagnostic tests performed

Year	Actual
2013	10312

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 about watershed protection and 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	Actual
2013	335

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Extensive growths of invasive aquatic weeds, such as Eurasian watermilfoil (Myriophyllum spicatum) and curly leaf pondweed (Potamogeton crispus) can significantly reduce water quality and alter native aquatic habitats. Stakeholders requested assistance with determining the species of aquatic vegetation and integrated weed control.

What has been done
Staff mapped native and invasive aquatic vegetation in 16 new and 14 previously surveyed water bodies. The effects of six years of winter drawdown on invasive plants were quantified in the States largest lake. The effects of grass carp (fish that eat aquatic plants) in Grannis Lake was evaluated. Fall herbicide applications in Bashan Lake to control variable watermilfoil were continued.

Results
After eight years of surveillance, 60 percent of Connecticut lakes and ponds have been shown to contain invasive plants. These plants cover approximately 10 percent of the combined area of all Connecticut lakes and the problem is increasing. The coverage of Eurasian watermilfoil shows a negative relationship to drawdown depth and duration in Candlewood Lake. After no decrease in curly leaf pondweed in Grannis Lake in 2008 and 2009, grass carp were found to reduce the plants abundance in each year thereafter. We have largely restored Bashan Lake to preinfestation conditions after years of selective fall herbicide applications. Long-term benefits will be a clean water supply and a body of water which can safely be used for recreation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #2

1. Outcome Measures

# of homeowners gaining knowledge about watershed protection and soil and water quality

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1986

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Biochar has shown much promise as a soil amendment in enhancing water-holding capacity, nutrient retention, toxin absorption, and promotion of root health. Moreover, the combination of applying earthworms and biochar together may lead to active consumption by the earthworms as a means to deliver biochar into lower soil columns where the living roots reside. The role earthworms play in the cycling of biochar in the soil column is poorly understood.

What has been done
Numerous laboratory and greenhouse studies were conducted to understand the active consumption of biochar by earthworms. In addition, long term asparagus field plots were established in Hamden, Griswold, and Windsor and monitored to study the combination of earthworm with biochar for their effect on Fusarium crown rot, an important disease of asparagus.

Results
Results revealed that biochar alone did not increase yield compared to controls, but did increase mycorrhizal colonization three fold and reduced disease ratings. The earthworm treatment alone produced 37% more yield than controls, increased mycorrhizal colonization by 50%, and also suppressed disease. However, the combination of earthworms and biochar produced 26% more yield compared to controls, increased mycorrhizal colonization from 7.7% to 26.6% (3.5 fold increase) and had the lowest disease ratings. The most preferred biochar that was actively consumed by earthworms was an aged biochar harvested from charcoal mounds, whereas the least consumed biochar was a fast pyrolysis biochar called CQuest. These results show promise for the ability of biochar and earthworms to promote root health, with possible long-term benefits of reduced use of fertilizers and pesticides.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
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 Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	23

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Salt marshes are considered the most productive ecosystems on the planet, which provide multiple benefits. They protect coastal communities from storm surges and wave erosion, absorb tons of excess nitrogen and phosphorus from rivers, detoxify pollutants, and provide habitat and shelter for many hundreds of species. Along intertidal creeks in salt marshes of the Atlantic and Gulf States, there have been large, barren areas where the dominant plant, Spartina alterniflora, has disappeared. The cause of this condition, called Sudden Vegetation Dieback (SVD), remains unclear. Loss of Connecticut salt marshes would be devastating to delicate ecological cycles, which would be disturbed and potentially lead to cascade disturbances in many other ecosystems.

What has been done
Scientists at The Connecticut Agricultural Experiment Station identified a new endophytic-pathogenic fungus, Fusarium palustre, that was found in higher incidence in SVD sites. Although the fungus is not able to incite plant death by itself, it can interact with other stressor(s) such as drought and flooding, to cause mortality. The herbivorous purple marsh crab, Sesarma reticulatum, was also found in SVD sites. Given that the cause of SVD remains unknown, scientists hypothesized that Spartina plants stressed by drought and disease might be more attractive to feeding by the purple marsh crabs, which in turn, prevents recovery in these sites. Scientists also conducted greenhouse and in situ studies designed to understand the role these species and other stressors (e.g., drought flooding) play in SVD.

Results

Research findings provided a better understanding of the tripartite interaction between plant, fungus, crab, and environment. Infection by the fungus alters the plant to make it more attractive to herbivory by the crab that may in turn lead to a tipping point that results in wide spread dieback and limited regeneration. This information is being used to develop scenarios that may lead to management practices aimed that reducing SVD in Connecticut marshes.

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
- Competing Public priorities
- Other (Staff changes)

Brief Explanation

Although there were no external factors that immediately affected outcomes during this reporting period, the current economy, changes in state or federal appropriations, and resulting staff changes remain the primary external factors that could affect outcomes.

V(I). Planned Program (Evaluation Studies)

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. Stakeholders from several lake associations/towns 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 evaluation forms following workshops, held in different towns, was an important information collection method for program assessments. During this reporting period, there were 1040 citations for scientific articles written by several scientists for the planned program. These citations indicate that knowledge was gained by scientists and used in their studies.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Climate Change

☐ Reporting on this Program

Reason for not reporting

Not a program we report on at CT AES

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.0	0.0
Actual Paid Professional	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	1890 Matching	1862 Matching	1890 Matching
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	1890 All Other	1862 All Other	1890 All Other
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

V(D). Planned Program (Activity)

1. Brief description of the Activity

{No Data Entered}

2. Brief description of the target audience

{No Data Entered}

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

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

Patent Applications Submitted

Year: 2013

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	{No Data Entered}	{No Data Entered}	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

Outcome #1

1. **Outcome Measures**

{No Data Entered}

V(H). Planned Program (External Factors)

External factors which affected outcomes

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Sustainable Energy

☐ Reporting on this Program

Reason for not reporting

Not a program we report on at CT AES

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Actual Paid Professional	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	1890 Matching	1862 Matching	1890 Matching
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	1890 All Other	1862 All Other	1890 All Other
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

V(D). Planned Program (Activity)

1. Brief description of the Activity

{No Data Entered}

2. Brief description of the target audience

{No Data Entered}

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

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

Patent Applications Submitted

Year: 2013

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	{No Data Entered}	{No Data Entered}	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

Outcome #1

1. **Outcome Measures**

{No Data Entered}

V(H). Planned Program (External Factors)

External factors which affected outcomes

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Childhood Obesity

☐ Reporting on this Program

Reason for not reporting

Not a program we report on at CT AES

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Actual Paid Professional	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
Actual Volunteer	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 Matching	1890 Matching	1862 Matching	1890 Matching
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}
1862 All Other	1890 All Other	1862 All Other	1890 All Other
{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}	{NO DATA ENTERED}

V(D). Planned Program (Activity)

1. Brief description of the Activity

{No Data Entered}

2. Brief description of the target audience

{No Data Entered}

3. How was eXtension used?

{No Data Entered}

V(E). Planned Program (Outputs)

1. Standard output measures

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

Patent Applications Submitted

Year: 2013

Actual: {No Data Entered}

Patents listed

{No Data Entered}

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	{No Data Entered}	{No Data Entered}	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- {No Data Entered}

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

Outcome #1

1. **Outcome Measures**

{No Data Entered}

V(H). Planned Program (External Factors)

External factors which affected outcomes

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}