

2015 University of Connecticut - Storrs Research and Extension and Connecticut Agricultural Experiment Station - Research Combined Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

The 2015 Report of Accomplishment submitted by the state of Connecticut represents the first joint effort between the Connecticut Agricultural Experiment Station (hereafter designated by CAES) and the University of Connecticut Storrs Agricultural Experiment Station and Cooperative Extension System (hereafter designated by UConn). The Report of Accomplishments consists of six program areas that represent critical needs for research and Extension programs identified by stakeholders from across the state. These program areas were revised by CAES and UConn and included in our first joint POW submitted in April 2013 in anticipation of transitioning to a 2015 joint Report of Accomplishment for the state of Connecticut. These six areas also align with UConn's new Academic Plan that highlights research, scholarship, instruction, and engagement. Program areas 1-4 are joint undertakings by CAES and UConn. These include: food safety, food security and food systems, human and animal health, and sustainable environments. The remaining two programs areas, 4-H/youth development, and community and economic development are conducted by UConn. CAES and UConn input their individual processes for the Merit Review and Stakeholder Input sections. The Expenditure Summary section is also input individually by CAES and UConn, while the FTE section on page 3 represents a combined total professional FTEs for the state of Connecticut. However, in the individual planned programs 1-6, the actual amount of FTEs/SY expended by program section, FTEs are reported individually, while the plan FTE number is a combined, prefilled number from the 2015 POW and should not be used for comparison.

UConn Overview:

Connecticut is a state of extraordinary disparity. Some of the wealthiest communities in the United States are located in Connecticut. Less than one hour away, are cities and communities with some of the highest unemployment rates in the nation. The state is home to a strong and vibrant agricultural sector but also faces challenges to providing safe, reliable, healthy food supplies to many urban residents.

Research and Extension programs at UConn's College of Agriculture, Health and Natural Resources (CAHNR) are committed to addressing these challenging disparities by investigating new areas relevant to agriculture, food, forestry, the environment, and human health. CAHNR is also the academic home for UConn Extension faculty and staff members who work to deliver science-based tools and technologies to help citizens, communities, and businesses prosper.

UConn Extension programs disseminated CAHNR's research results through more than 172 formal outreach programs. A key component to Extension programs is training volunteers who become trainers themselves, leveraging the federal-state financial partnership in UConn Extension. This reporting period we worked with over 3,060 active volunteers. There is no county government in Connecticut; the state is the only other source of support for local Extension programming and staffing. Our program efforts are far reaching, serving citizens through direct and indirect contacts via e-mail, webinars, websites that are managed or contributed to by UConn Extension, fact sheets, consultations, public workshops, and training sessions. Analysis completed on UConn Extension programs shows no fewer than 11 programs in each of the 169 towns in the state, with some towns having 22 or more Extension programs.

The Storrs Agricultural Experiment Station (SAES) manages the capacity research funding provided through the federal-state partnership and is responsible for facilitating CAHNR's research efforts. Our capacity research projects are integrated with the program areas and with our academic programs. Our

students are directly engaged with faculty in research as we train the next generation of scientists and leaders. Competitive funds are obtained from a variety of federal and non-federal sources through the independent initiative of CAHNR's faculty and staff. We encourage fundamental and applied research, as well as multidisciplinary collaborations to gain knowledge and implement results to advance national goals established by the United States Department of Agriculture National Institute of Food and Agriculture (USDA NIFA).

CAES Overview:

Significant progress was made on the objectives of the Connecticut Agricultural Experiment Station's (CAES) planned programs: Food Security and Food Systems; Food Safety; Human and Animal Health; and Sustainable Environments. Cooperation with extension personnel at land grant universities such as the University of Connecticut, University of Massachusetts, and Cornell University, has facilitated the transfer of scientific information to stakeholders. Professional collaborations exist with scientists in over three dozen states and a number of countries. During the current reporting period, one state-funded hiring of staff occurred (replaced a staff member that left). Several Postdoctoral Research Scientists were hired on federal grants, and these additional durational staff positively impacted our Programs. We also shifted some scientist year (SY) commitments from state-funded positions to Hatch projects, elevating the SY times beyond those listed in the Plan of Work. First, research on plants and IPM systems has continued. This includes work on pathogens such as boxwood blight, fire blight, and a number of bacteria. Investigations are targeting the basis of infection and strategies for management. The New Crops Program continues to expand; according to the regional statistics, there were 542 farmers' markets last year in CT, RI and MA that were attended by over 1000 farmers. Crop cultivar trials included melons, corn and squash. The Station viticulture program continues to provide important information on cultural practices and disease management to growers. Second, in the Food Safety Program, staff continue to assist other state agencies and the US FDA in developing efficient methods and more sensitive platforms to detect toxic chemicals and elements in food. With FDA funding, efforts to seek ISO 17025 Accreditation have expanded beyond pesticide surveillance in human food to include toxins in pet foods. Third, in our Human and Animal Health Research Program, 231,047 mosquitoes (12,678 pools) representing 39 species were tested from over 91 sites. A total of 68 isolations of West Nile virus were made from 7 mosquito species; other viruses isolated included Cache Valley, Eastern Equine Encephalitis, Jamestown Canyon, and Trivittatus. Research has continued on the population genetics of mosquito vectors, viruses/microsporidia that may infect important vectors, and other aspects of the mosquito that are relevant to infection and transmission. The tick testing program evaluated 1950 ticks for 3 pathogens, including the agent for Lyme Disease (31% tested positive). Additional research and outreach activities were focused on bed bugs and integrated management strategies for tick control. Fourth, our Sustainable Environments Program continues to focus on spread and control invasive plant species, as well as sudden vegetation die back in wetlands, on predicting and monitoring harmful algal blooms, and on the remediation of organic compounds in the environment. Last, outreach remains a high priority in all programs. Staff members gave over 800 talks and interviews, made 261 farm visits, answered approximately 19,660 citizens' inquiries, and conducted 23,760 diagnostic tests. Sixty six peer-reviewed scientific articles were published, along with 37 non-peer reviewed fact sheets, CAES Bulletins, newsletter articles, book chapters, and symposia proceedings. Assistance was given to 145 reporters; the CAES website continues to serve as a powerful and timely method of transferring information to the public, 120,121 visits and 406,441 page views during the current year. Many page views included visits for publications such as the CAES Plant Pest Handbook or for videos on topics such as bed bugs and the hazards of moving firewood due to the spread of exotic insects. Other prominent sections of the website include Press Releases, Publications, CAES in the news, and the CAES Seminar Series (open to the public).

Total Actual Amount of professional FTEs/SYs for this State

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	63.0	{No Data Entered}	80.0	{No Data Entered}
Actual	62.6	0.0	98.0	0.0

II. Merit Review Process

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

- Internal University Panel
- External University Panel
- External Non-University Panel
- Combined External and Internal University Panel
- Combined External and Internal University External Non-University Panel
- Expert Peer Review

2. Brief Explanation

CAES: The review process described in our Plan of Work was followed. Hatch grants are subject to external and internal review. All proposals submitted to USDA or other federal agencies are reviewed to ensure that the planned research had relevance to stakeholders' needs and program goals. In addition to evaluation by scientists in the discipline, Department Heads, the Vice-Director and the Director are involved in the internal review process. The Director gives final approval for all proposals and manuscripts. In addition to meeting residents' needs, the likelihood of success and originality of the work receive consideration. During the current period, there were 7 Hatch projects (1 multi-state) reviewed and submitted to USDA/NIFA under Food Security and Food Systems (4), Human Health (1), and Sustainable Environments (2). Additional expert peer-review was also received when manuscripts were submitted to journals and when proposals were submitted for competitive funding.

UConn: The College Advisory Group of stakeholders provided overall direction for research, education and Extension programs. Peer review for Hatch projects ensures that quality research projects, consistent with identified priorities, are approved. Reviews involve the objective opinion of other scientists, and/or administrators within the University of Connecticut, external scientists and users of research results, when appropriate. Peer review ensures that every project receives a rigorous and systematic evaluation for appropriateness and quality. The process was conducted within the framework of predetermined criteria whose objective was to assess whether each Storrs Agricultural Experiment Station (SAES) research project (1) is guided by state, regional, and national priorities, (2) is of high scientific merit and quality, (3) incorporates a state-of-the-art scientific approach (4) is likely to successfully meet the goals of the project, and (5) whether it is completed and prepared according to the SAES guidelines. The peer review process provided principal investigators with additional counsel on research direction and implementation. Department Heads participated in the peer review process by suggesting qualified reviewers. The Director of the SAES/the Associate Dean distributed projects to qualified reviewers and approved edited projects once they were critically reviewed.

III. Stakeholder Input

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

- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public

Brief explanation.

CAES: Stakeholders participated in CAES research programs and public events. Conferences and workshops included: Christmas Tree Twilight meeting, a tobacco research meeting, two meetings on bedding plants, and a CT Future Farmers of America Forestry Career Development Day. Station staff participated in the New Haven Public School Science Fair. Information was disseminated to residents across the state. Press releases promoted our annual summer Plant Science Day; a promotional flyer was delivered to at least 90,000 households via the New Haven Register. Attendance at Plant Science Day (1,062 visitors, including 100+ children) was excellent. Connecticut Network, a public TV station, taped the main presentations for statewide telecasting. Notices of these public events were mailed or e-mailed to over 190 press contacts and over 5000 state residents and was posted on our website. Station displays of research, presented at several regional or state fairs, and invitations for students to tour laboratories, provided further opportunities to reach stakeholders. To encourage stakeholder participation, surveys were distributed at exhibits in statewide agricultural trade shows and at our Plant Science Day. Thousands of citizens saw Station exhibits and had opportunities to bring insect, plant, and soil samples for diagnostic testing. Staff served on 180 agricultural and environmental civic or professional groups and made 261 visits to farms and other properties where pest problems occurred. Sixteen outreach events involved federal, state, or local elected officials.

UConn: During 2014, CAHNR created an Extension Centennial Committee to consider the future of Extension programs in Connecticut at the time of the Centennial celebration of Extension in the United States. This group identified critical needs for programs. However, they also identified the need to expand efforts to market UConn Extension - and Extension programs - to ensure that programs reach the widest possible audience.

More broadly, the college-wide stakeholder input process continued to include considerations for both research and extension. Regular consultation with the College Advisory Board, farmers, producers, public and private agricultural agency service providers, and private agricultural-related businesses ensured a broad view of the needs in the state as well as emerging trends and concerns. Recommendations from the Governor's Council on Agricultural Development also were included in program development and implementation.

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
- Use Internal Focus Groups
- Open Listening Sessions
- Use Surveys

Brief explanation.

CAES: Evaluation forms distributed to meeting attendees are used for stakeholder input. E-mail messages and letters written by state residents are directly addressed by Station staff. A complaint requires a response and follow-up contacts by administrators. Participation of on over 180 advisory boards of civic or professional groups allows staff to identify of users of Station research, receive stakeholder input, and to identify problems that need to be addressed. For example, current research on harmful algal blooms were initiated based on public inquiries. Field research on specialty crops continues to be responsive to stakeholder input, including minority residents. Members of the microbrewery industry requested research on barley and hops; research is now active and supported by a well-attended annual. Our annual Open House event and frequent use of displays at public meetings provided opportunities to meet stakeholders, and to hear about the problems that need attention. Approximately 845 talks and interviews were given; discussion following presentations effectively collects stakeholder input. Research priorities in program areas are often modified based on public input. Phone and email inquiries and stakeholder access to diagnostic services also reveal important problems, such as the growing difficulty of bed bug control. The Station has a Facebook Page and Twitter account; inquiries are forwarded to appropriate staff for response. Google Scholar identifies external scientists who recognize Station work.

UConn: Progress continues in soliciting and receiving increased stakeholder input. The State Extension Partner's Council meets at least twice a year and is comprised of representatives of County Extension Councils and other affiliated organizations such as 4-H camp boards, International Foreign Youth Exchange (IFYE), and the CT Master Gardener Association (CMGA). Greater rotation of participant representatives has been encouraged. Each Extension Partners group or organization is expected to conduct a general public needs assessment for statewide programming, involving Connecticut residents who are not members of the specific partners' group or organization. Periodic updates from the Dean with reports on his conversations with stakeholders and clientele are sent to all faculty and staff via email, and are available on the CAHNR website. Use of online tools to solicit input from potential and current clientele and stakeholders continues to increase. The Dean's College Advisory Board addresses the broad needs of Connecticut in their meetings

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
- Survey of selected individuals from the general public

Brief explanation.

CAES: Written and electronic stakeholder input received during this reporting period was effective in collecting public input on CAES programs. Giving research reports, providing displays, and attending meetings of dozens of traditional stakeholder groups allowed the direct collection of traditional and non-traditional stakeholder input. Survey or evaluation forms were forwarded to Department Heads and the Director. Staff provide sufficient time following invited talks for questions and discussion, allowing all attendees to provide input. Inviting high school students and teachers to see CAES laboratories and to hear presentations on research also enables collection of stakeholder input. The approximately 23,760 diagnostic tests performed for individuals also yielded 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 input on research results and budgetary matters.

UConn: Traditional stakeholders such as vegetable producers and town officials provided input through end-of-session evaluations of programs with suggestions for improvements, as well as current and future needs. The CAHNR blog is available to the public and promoted through email, social media, and websites. It highlighted research and extension efforts, with comments solicited. The Sea Grant program collected input from aquaculture producers and town officials that directed change in programming focus and direction. Meetings with state boards such as the Food Policy Council and Farm Services Agency staff provided additional stakeholder input. The Farm Risk Management Advisory Group, comprised of more than 40 agriculture-related stakeholders from both traditional and non-traditional perspectives, provided input on a regular basis through facilitated discussions at meetings. Increased use of the Internet, through email, social media and websites, provided input from a wide range of current and potential clientele.

3. A statement of how the input will be considered

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

Brief explanation.

CAES: All stakeholder input received by e-mail, letters, survey/evaluation forms, Facebook/Twitter, or by other means were reviewed by Station staff and by the appropriate Department Head when establishing research priorities or initiating new studies. Within the Department of Plant Pathology and Ecology and the Valley Laboratory, 5,118 inquiries and stakeholder requests were answered. Pathogen infections of crops and other plants have economic impacts and were reported the National Plant Diagnostic Network (NPDN). In addition, many other inquiries by other CAES Departments. Specific ethnic and minority stakeholders requested assistance on specialty crops; subsequent experiments were conducted on dozens of cultivars of 6 specialty crops. Additional topics of stakeholder concern included adulterated foods, forest health, ticks, mosquitoes/viruses, invasive species, indoor mold and pests of grass turf and crops. All written comments received by the Director were discussed with appropriate Department Heads, and specific objectives may be included in the managers' performance goal programs.

UConn: Input was used to redesign programs, initiate new programs, as the basis for grant proposals, and as a means for acquiring diverse perspectives when the College considers restructuring programs. The College developed a new Academic Plan in response to the University's Academic Plan. The CAHNR Academic Plan was shared with stakeholders to ensure that it met their needs and interests. College administration met regularly with stakeholders, the legislature, and agency heads to both listen to and discuss stakeholder input.

Brief Explanation of what you learned from your Stakeholders

CAES: Our experience has been that stakeholders have extensive knowledge that is of direct benefit to our research programs. Potential environmental, economic, or public health impacts from these interactions have been significant and can be used to re-align existing research priorities and establish new research projects. As a detailed example, public interest and concern over the impact of neonicotinoid insecticides in pollinator decline resulted in several research projects at CAES that span multiple Departments. Based on stakeholder interest, investigations are underway investigating specific plants and pollinator groups. Another brief example involves studies on the distribution and biological control of Emerald Ash Borer and other similar pathogens; here, stakeholder involvement is a critical component for the success of surveillance and diagnostic work.

UConn: Agricultural stakeholders continued to be concerned about federal agricultural programs that require significant paperwork, and programs that are not available in Connecticut. In addition, small scale Connecticut producers feel at a disadvantage.

IV. Expenditure Summary

Institution Name: Connecticut Agricultural Experiment Station -

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	982019	0

Institution Name: University of Connecticut - Storrs

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
2223043	0	1278256	0

Institution Name: Connecticut Agricultural Experiment Station -

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	982019	0
Actual Matching	0	0	5115395	0
Actual All Other	0	0	1052444	0
Total Actual Expended	0	0	7149858	0

Institution Name: University of Connecticut - Storrs

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	1771988	0	947193	0
Actual Matching	1771988	0	947193	0
Actual All Other	4100666	0	4021550	0
Total Actual Expended	7644642	0	5915936	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

S. No.	PROGRAM NAME
1	Food Safety
2	Food Security and Food Systems
3	Human and Animal Health
4	Sustainable Environments
5	4-H/Youth Development
6	Community and Economic Development

V(A). Planned Program (Summary)

Program # 1

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
306	Environmental Stress in Animals	0%		2%	
307	Animal Management Systems	0%		15%	
502	New and Improved Food Products	0%		16%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	50%		50%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	50%		17%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

University of Connecticut - Storrs

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	3.5	0.0
Actual Paid	1.4	0.0	0.4	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

Connecticut Agricultural Experiment Station -

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	3.5	0.0
Actual Paid	0.0	0.0	6.2	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Institution Name: University of Connecticut - Storrs

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
170315	0	46236	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
170315	0	46236	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	195466	0

2. Institution Name: Connecticut Agricultural Experiment Station -

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	101794	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	155013	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	44189	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

At CAES work under this program is developing more efficient and sensitive analytical methods to detect toxic chemicals and heavy metals in food and other related consumer products, and to determine if these products contain allowable amounts of these constituents. Decisions on whether or not foods are "safe" depends contaminant-specific tolerance levels established by the US Environmental Protection Agency (EPA) or the Food and Drug Administration (FDA). Progress was made on all objectives in this program. The activities, services, and events are designed to assist a broad, diverse group of stakeholders by 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 outputs include numbers of food and consumer product samples tested, scientific publications, and talks and interviews. For example, the Department of Analytical Chemistry reported out results on more than 3,165 samples in the current period, with 80% being food or food-related. The following activities were executed: (1) new analytical methods were developed or validated and new instrument platforms were evaluated, (2) information on analytical test results to visitors at open house events, in scientific displays at agricultural fairs, and in scientific publications, (3) oral presentations were given to

civic groups and professional societies, 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 allows public input on the program. Non-traditional stakeholders are reached at agricultural fairs and other public venues when they visit Station displays. Results of these activities lead to specific outcomes, such as removing tainted or adulterated food items from the markets and greater public awareness of research on food safety.

UConn: Extension and Storrs Agricultural Experiment Station research activities included:

- Developed an advisory group including farmers and regulators, to gather information regarding education and other needs
 - Developed training curriculum, "Processing Food for Sale From Your On-farm Residential Kitchen"
 - Provided 3 two-day training sessions, 2 in CT and 1 in RI
 - Conducted a webinar to introduce the materials to regulators, extension personnel and other interested participants
 - Published 8 peer reviewed journal articles
 - Participation in 3 Hatch Multistate projects
 - Presented research finding through oral and poster presentations

2. Brief description of the target audience

A diverse group of targeted audiences includes all individuals with a stake in providing a safe food supply. Audiences for this planned program include 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

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3205	30148	308	44

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

Patent Applications Submitted

Year: 2015
 Actual: 0

Patents listed

n/a

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	3	18	21

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Expert services, consultations

Year	Actual
2015	108

Output #2

Output Measure

- Formal Extension outreach programs

Year	Actual
2015	11

Output #3

Output Measure

- Face to face general group education sessions/workshops

Year	Actual
2015	75

Output #4

Output Measure

- Fact sheets, bulletins and newsletters written or edited

Year	Actual
2015	15

Output #5

Output Measure

- Training of undergraduate, graduate and post doctoral students

Year	Actual
2015	36

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of stakeholders gaining knowledge about food safety
2	Number of state and federal regulatory agencies making decisions on test results
3	Improve food safety through adoption of safe food practices by producers, processors and/or consumers
4	Approaches/techniques developed for inactivating foodborne pathogens

Outcome #1

1. Outcome Measures

Number of stakeholders gaining knowledge about food safety

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1928

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There is great concern over the contamination of food with toxic chemicals or heavy metals. Food producers, retail operators, consumers, and consumer advocacy groups want assurances that foods 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 and processed products. For chemicals such as mycotoxins, which are metabolites produced by mold and other fungi that can contaminate food, severe toxicity is evident at very low concentrations (parts per billion) and detection at such levels in complex foods is difficult. As new methods and analytical platforms become available, these protocols must be validated and shown to be both accurate and robust.

What has been done

The Department of Analytical Chemistry at The Connecticut Agricultural Experiment Station (CAES) is working with the Food and Drug Administration's (FDA) Center for Food Safety and Applied Nutrition (CFSAN) on new analytical method involving liquid chromatography with high resolution mass spectrometry to detect 12 different mycotoxins in three separate food matrices. This effort is a multi-lab validation seeking to evaluate the efficacy of this extraction and analytical methodology for these toxic analytes in food.

Results

Although overall validation success will be determined after comparison among the group of laboratories participating in the validation, CAES results have shown that nearly all analytes can be detected at levels as low as 5 parts per billion in two of the foods but that significant interferences in the third food type greatly compromise sensitivity. Results such as this are critical to the deployment of new methods to the larger analytical community so as to ensure the integrity of the national food safety system.

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

Number of 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
2015	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Department of Analytical Chemistry at The Connecticut Agricultural Experiment Station (CAES) is asked by other state and federal agencies to analyze specific foods for adulteration with pesticides and heavy metals as part of surveillance activity to ensure safety of the food supply. When foods are found to be contaminated with these constituents at unacceptable levels, food products may be removed or prevented from entering the marketplace.

What has been done

In response to increasing cultivation of seaweed for direct sale to local restaurants, the CT Department of Agriculture Bureau of Aquaculture has requested chemical analysis of the seaweed prior to releasing the product for sale and distribution in the state. Chemical analysis at CAES consists of extraction in solvent or digestion acid with simultaneous analysis for pesticides (a screen for approximately 1000 analytes) by both liquid and gas chromatography with mass spectrometry (LC-MS; GC-MS), as well as for polychlorinated biphenyls (PCBs) by gas chromatography with dual electron capture detection, and select heavy metals by inductively coupled plasma mass spectrometry.

Results

All analyzed samples were found to be free of organic contaminants and to contain low/background levels of heavy metals. As such, products were released for sale, ensuring both food safety and encouraging local commerce.

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Improve food safety through adoption of safe food practices by producers, processors and/or consumers

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Food regulators are being urged to adopt regulations that allow farmers to enhance farm profitability by processing value-added foods in their on-farm home kitchens. Some states allow non-farmers to process food products in their home kitchens for general sale, however the rules vary among states in their ability to mitigate risk from food borne illness from the products produced. Training is needed to address business and food safety risks, food safety processing controls and sanitation in the home processing environment.

What has been done

A UConn Extension training program was developed to provide safe food handling training for on farm-based home food processors. Program achievements include:

1. Developed an advisory group (including farmers and regulators) to gather information regarding education and information needs.
2. Developed training curriculum, Processing Food for Sale From Your On-Farm Residential Kitchen.
3. Provided three two-day training sessions, two in Connecticut, one in Rhode Island.
4. Conducted a webinar to introduce the materials to regulators, extension personnel and other interested participants from four additional states.

Results

A total of 60 participants attended three training sessions. In an 8-month follow-up survey, the following outcomes were indicated:

1. 29% currently have an on-farm residential processing business; 70% of those without a business, plan to start one.
2. Of those with current businesses, 100% stated the program provided enough information so that they would be able to implement sanitation practices and procedures.
3. Of those with current businesses, 100% stated that the program provided enough information so that they would be able to implement safe food processing practices and procedures.
4. Participants identified six Good Manufacturing Practices (GMPs) or sanitation practices they plan to adopt and three safe processing practices they plan to or have adopted since attending the program.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #4

1. Outcome Measures

Approaches/techniques developed for inactivating foodborne pathogens

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Unpasteurized milk and milk products can be a vehicle of foodborne illness and small-scale producers are often considered a higher risk. With consumer interest driving explosive growth of small-scale dairy manufacturing operations throughout the United States there is a need to better understand and identify the risks associated with this industry. Based on previous outbreak information and the lack of validated control strategies, there is a critical need for actionable, science-based interventions to mitigate these threats.

What has been done

A Hatch Multistate research project is underway that integrates risk-based research and outreach to improve food safety. Activities included: 1. A risk assessment of >240 environmental samples collected from surfaces in artisan cheese production facilities. Using the data collected, an audit checklist was developed for use by extension educators, producers and consultants to assess the food safety practices utilized by small-scale artisan cheese producers and to increase food safety practices. 2) Provided technical assistance and training to 6 small-scale cheese producers to implement changes to control and eliminate contaminants in their facilities; 3) Developed and presented risk-based management recommendations at 4 regional workshops, and inclusion in the American Cheese Society code of Best Practices and other training materials.

Results

- 1) One-on-one audit and training conducted at 6 small-scale cheese producers resulted in the application of new techniques and practices and increased the number of raw milk and artisan cheese producers implementing preventive controls. Follow up visits at these sites indicate improved control of pathogens from contaminated sites and prevention of re-entry and cross contamination.
- 2) Increased awareness and knowledge of risks and effective intervention to improve the safety and quality of small-scale artisan cheese production. Regional workshops provided training in best management practices for pathogen control, preventive controls, sanitation, testing, and environmental monitoring to approximately 105 cheesemakers, retailers, and regulators.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

At CAES, one scientist vacancy within this planned program remains open and if state budgetary constraints permit, an additional Ph.D. position will be hired to work on emerging contaminants of concern in food. Separately, four Postdoctoral Research Scientists are working on federal grants (US FDA, USDA AFRI) directly related to work under this program. These are critical positions because the discipline requires the testing of toxic organic chemicals and heavy metals in range of products by a number of advanced methods on sophisticated equipment. Other staff scientists and technicians, who were working entirely on state projects with state funds, have been reassigned to part-time status on Hatch-funded programs. Although objectives and goals were met, we do note that competitive federal grant-funded positions are now a critical component of this

V(I). Planned Program (Evaluation Studies)

Evaluation Results

At CAES, information on research and service results was obtained during the program by written and oral comments received at public meetings, our annual open house event, guided tours of the laboratory, civic groups' meetings, professional conferences and at Station exhibits. Observations made during interactions with stakeholders revealed positive sentiment about program effectiveness and value.

Key Items of Evaluation

The key items of evaluation and data collection were stakeholders' written and oral responses concerning food analyses; constructive written feedback from grant peer-reviewers for a competitive grants; and responses and corrective actions by the State of Connecticut, USDA, and US FDA to remove suspect or adulterated products from commerce. Google Scholar indicated that articles written in previous years by CAES scientists were recognized and cited by scientists in this field (total citations were exceeded 1137 during the reporting period).

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Food Security and Food 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	10%		10%	
205	Plant Management Systems	25%		13%	
206	Basic Plant Biology	10%		20%	
211	Insects, Mites, and Other Arthropods Affecting Plants	10%		8%	
216	Integrated Pest Management Systems	10%		20%	
601	Economics of Agricultural Production and Farm Management	10%		15%	
603	Market Economics	0%		3%	
604	Marketing and Distribution Practices	5%		0%	
605	Natural Resource and Environmental Economics	5%		8%	
607	Consumer Economics	10%		3%	
704	Nutrition and Hunger in the Population	5%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

University of Connecticut - Storrs

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	5.0	0.0	15.3	0.0
Actual Paid	3.4	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

Connecticut Agricultural Experiment Station -

Year: 2015	Extension		Research	
	1862	1890	1862	1890

2015 University of Connecticut - Storrs Research and Extension and Connecticut Agricultural Experiment Station - Research
 Combined Annual Report of Accomplishments and Results

Plan	5.0	0.0	15.3	0.0
Actual Paid	0.0	0.0	24.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Institution Name: University of Connecticut - Storrs

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
259943	0	47281	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
259943	0	47281	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
435143	0	390929	0

2. Institution Name: Connecticut Agricultural Experiment Station -

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	579298	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	3307753	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	626062	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

CAES: This program's objectives are to develop pest control methods requiring decreased pesticides, as well as to isolate high yield crop cultivars that are inherently resistant to insect and plant pathogens. Significant progress was made on these objectives during the reporting period. Outputs such as activities/events, services, and new crops assisted a diverse group of stakeholders both domestically and potentially internationally by providing products and information that will be used by growers and the general public to solve problems. All activities are designed to ensure that stakeholders have equality of service and access to research findings. Direct contacts are derived from persons served or those in attendance at meetings, as well as those directly requesting service in our inquiry offices. Indirect contacts with youth were obtained from educators receiving CAES assistance and information that could be incorporated into science curricula. Activities included: (1) CAES scientists conducted workshops or

special meetings for stakeholders, (2) CAES scientists partnered with stakeholders and participated as members or officers in over 180 organizations and societies (3) experiments were performed on both CAES research farms and growers' properties, (4) cultivar trials on peppers, sweet corn, broccoli, melons, and hops were completed, (5) composting strategies using oak and maple leaves were investigated, (6) pathogens of tree species were investigated, (7) stakeholders received information and training on IPM strategies, (8) written information on research findings was disseminated by scientific displays at agricultural fairs and giving talks and interviews to civic groups, (9) staff members utilized traditional and social media to provide information on scientific discoveries, (10) staff members educated teachers and thereby, indirectly reach youth, and (11) diagnostic services were provided to stakeholders. Field experiments solved problems or provided information on new crops, and where possible, were conducted on stakeholder properties. Collectively, these output activities led to specific outcomes, including reduced pesticide use, greater control of insect or plant disease pathogens, development of resistant cultivars, the introduction of new specialty crops, and increased farm income. Public service is an important component for all output measures. For example, CAES staff directly addressed 19,189 citizens' inquiries and conducted 20,185 diagnostic tests during the current reporting period. CAES staff serve as members or officers in at least 187 stakeholder or professional organizations, which enables stakeholder to directly comment on research and findings. Non-traditional stakeholders were reached at agricultural fairs when they visited or inquired about CAES displays, as well as through traditional and social media. Our annual open house event allowed over 1,130 stakeholders, including nearly 150 children, to hear oral presentations on research results and to offer comments. Approximately 780 talks, including 154 involving the media, were given to stakeholder or professional groups to convey research findings and to receive direct public feedback. Scientific publications in peer-reviewed journals (56) or articles written for the general public (37) reached traditional and non-traditional groups of stakeholders.

UConn: Extension and Storrs Agricultural Experiment Station activities in the Food Security and Food Systems planned program included:

- Conducted an Urban Agriculture and IPM training project in Fairfield County, targeting Hispanic adults
 - distributed over 4,000 pounds of locally produced organic vegetables
 - translated 4 CT Master Gardeners' curriculum modules into Spanish
 - donated over 1,200 volunteer hours working in the urban garden
 - served 250 low income families through farmers' markets
- Conducted 215 workshops, webinars, and other expert services
- Developed 11 YouTube videos and 1 mobile apps, with several others in production
- Provided training in Integrated Pest Management (IPM), vegetable production, fruit production, and agricultural risk management to relevant stakeholder audiences
 - Participated in stakeholder organizations, including the Connecticut Food System Alliance, New Connecticut Farmers, and Connecticut Farm Bureau Association
 - Individual consultations and assessments were delivered in agricultural risk management, vegetable crops production, fruit crop production, agricultural water use, and greenhouse production
 - Produced online resource material such as fact sheets, impact statements and newsletter articles for agricultural audiences, local and regional newspapers, and trade publications
 - Conducted 3 Hatch research projects

2. Brief description of the target audience

CAES and UConn serve a variety of stakeholders that grow vegetables, fruits, nursery stock, cattle/livestock, and flowers. CAES staff worked with the UConn 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. Research goals at both institutions include work on forestry, agricultural, aquaculture, and environmental problems. Accordingly, target audiences include landscapers, landscape architects, conservation officers, foresters, arborists, beekeepers, seed

agricultural producers and those 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, high school teachers, environmental regulators, Extension specialists, and municipal officials. Programs from both organizations are designed to reach the general public, farmers, service providers, and agricultural producers. Homeowners with interests in agriculture and forestry have access to research findings and have equality of service from both CAES and UConn. Efforts are made to reach minority and under-represented populations, as well as educators and students.

3. How was eXtension used?

CAES does not receive Extension funding and is not an official institution with eXtension. However, several CAES staff members are registered in eXtension with 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). At UConn, the Home and Garden Education Center is registered as an eXtension Ask the Expert and responded to 266 phone calls during the reporting year. eXtension was not used at UConn in any of the other programs.

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	25645	150223	2585	1136

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

Patent Applications Submitted

Year: 2015
 Actual: 1

Patents listed

Transcription factor for modification of lignin content in plants. Patent. (June 2, 2015).

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	5	34	39

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Face to face general group education sessions/workshops

Year	Actual
2015	320

Output #2

Output Measure

- Individual consultations

Year	Actual
2015	533

Output #3

Output Measure

- Fact sheets, bulletins and newsletters written or edited

Year	Actual
2015	40

Output #4

Output Measure

- Training of undergraduate, graduate and post doctoral students

Year	Actual
2015	50

Output #5

Output Measure

- Formal Extension outreach programs

Year	Actual
2015	54

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of homeowners, growers, students and/or media reporters gaining knowledge on insect pests and plant pathogens
2	Number of growers gaining information on IPM practices
3	Reduce food insecurity in the state of Connecticut and across the Northeast.
4	Increase the percent of locally grown food that is purchased by Connecticut citizens.
5	Increase sustainable, diverse and resilient food systems across scales
6	Improved national and global capacity to meet growing food demand.

Outcome #1

1. Outcome Measures

Number of homeowners, growers, students and/or media reporters 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
2015	28499

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Fire blight, caused by the bacterial pathogen *Erwinia amylovora*, is one of the most serious diseases currently limiting apple and pear production in Connecticut and in the United States. Application of antibiotic streptomycin during bloom is the only management option available that provides a high level of control efficacy. The intensive, long term use of streptomycin, however, has resulted in the evolution of streptomycin resistance in *E. amylovora*. Since the first report in California in 1971, streptomycin resistance has been commonly detected in *E. amylovora* in most apple producing regions of the United States, including Washington, Oregon, Michigan and New York, making streptomycin ineffective in these locations. In 2014, severe fire blight outbreaks occurred throughout the New England region. Growers suspected that the streptomycin resistance may have existed in New England region.

What has been done

CAES is conducting a regional survey to understand the streptomycin susceptibility of the fire blight pathogen populations in New England. 52 fire blight diseased samples as well as 55 apple and pear flower samples were collected and tested the presence of *E. amylovora* and the streptomycin resistance gene *strA-strB*.

Results

Our results suggested that all *E. amylovora* isolates collected from CT, MA, VT, ME, RI, NY are susceptible to streptomycin. However, the streptomycin resistance gene *strA-strB* was detected in environmental, non-pathogenic bacterial isolates in New England orchard. These results suggest that streptomycin remains as an effective management options for fire blight in New England region; however, there is a potential risk of streptomycin resistance development in *E. amylovora* population in New England orchard in the future, as the *strA-strB* genes may be able to transfer from the non-pathogenic bacteria into the fire blight pathogen *E. amylovora*. Results from this research provided valuable information regarding if streptomycin is still effective in the

New England region. The observation that strA-strB genes are already present in the environmental bacterial population also addressed the need of developing replacement of antibiotics in controlling fire blight in the near future.

4. Associated Knowledge Areas

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

Outcome #2

1. Outcome Measures

Number of growers gaining information on IPM practices

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	318

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Fire blight, caused by the bacterial pathogen *Erwinia amylovora*, is extremely difficult to control, in large part due to the limited control options. Antibiotics are the only effective option for controlling fire blight, but have begun to lose effectiveness in many regions of the U.S. due to the development of antibiotic resistance in the pathogen populations. In addition, agricultural use of antibiotics raises concerns for the environment and human health. In October 2014, the NOSB terminated the use of streptomycin in organic fruit production in the U.S. Effective, environmental friendly, non-antibiotic management options of fire blight are in urgent need.

What has been done

In collaboration with Biosafe Inc, we tested the efficacy of various combinations of non-antibiotic treatments in comparison to antibiotic treatment in controlling fire blight. A plant-sanitizing

product (Oxidate 2.0) is combined with a biological control agent (BlossomProtect) at two different rate (0.3% and 1%) and was applied to Gala apple trees infected with fire blight pathogen. The disease incidence was evaluated two weeks after the inoculation.

Results

Trees treated with Blossom Protect (one time application at 80% bloom) followed by 0.3% Oxidate (applied at 100% bloom and 24 hours afterwards) exhibited significant reduction in blossom blight (25%); the response was similar to streptomycin (20%, one application at 100% bloom). These results suggest that the combination of the plant sanitizing material with a biological control may be an effective organic fire blight management strategy in the Northeast.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems

Outcome #3

1. Outcome Measures

Reduce food insecurity in the state of Connecticut and across the Northeast.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	14670

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Contemporary global and national food systems have been shaped to maximize efficiency and produce large volumes of inexpensive food, without much attention to demand-side issues of

inequity and food justice, nor long-term questions about sustainability. In Connecticut, 12% of households experience food insecurity, 1/3 of children are overweight or obese (more than half of whom are Hispanic and Black), an estimated one out of 5 residents eat no vegetables daily, 1/3 of our census tracts live more than a half mile from a healthier food retailer, and only 10% of our cropland is used to harvest fruit and vegetables. A sustainable food system needs economically viable and environmentally sound methods that sustain farmers, greater availability of healthy food options, and communities that are empowered economically to access foods.

What has been done

UConn Extension has the following programs to support reducing food insecurity:

- FoodCorps CT - a service-learning program, placing individuals in 15 high-need communities. FoodCorps CT service members focus on three reinforcing pillars to improve school food environments: promoting farm-to-school programming, establishing school gardens, and providing nutrition education.
- CT Food Justice VISTA Project - A service-learning program placing 5-7 individuals in community-based non-profits to build capacity for their food-related programming.
- Community Food Security in CT - A research project measuring and ranking community food security variables across 169 towns.

Results

The combined impact of these programs increase public awareness and support of local food systems, and improve access to healthy food.

- 14,670 school children have improved knowledge of healthy, nutritious eating.
- 64 school gardens supported, 11 community gardens supported.
- 15,167 summer meals were served as a result VISTA Summer Associate outreach.
- 329 volunteers recruited to assist with education, outreach and referrals in food justice programming logging a cumulative 1,200 hours of service.
- 66 organizations across Connecticut have increased capacity to work with their community and address issues of food insecurity.
- 42 adult individuals are better able to serve their organization and community as a result of food justice & racial equity training.
- 65 young adults with new leadership skills and knowledge to help improve food systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
607	Consumer Economics
704	Nutrition and Hunger in the Population

Outcome #4

1. Outcome Measures

Increase the percent of locally grown food that is purchased by Connecticut citizens.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	600

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The average Connecticut citizen spends 2.5% of their food and gardening purchases locally. The Governor's Councils for Agricultural Development has recommended increasing this number to 10% to support agriculture in the state and strengthen local economies. Strong local food economies also have the power to improve health through knowledge, engagement and access.

What has been done

UConn Extension collaborated with non-profit partner CitySeed on the buyCTgrown website, which is a public engagement tool introducing residents to Connecticut agriculture. UConn Extension also operates a Community Supported Agriculture (CSA) tool kit for producers as a guide to operating a CSA in their business. Research is conducted each summer collecting the average price on CSAs for consumers.

Results

Over 600 farm and food businesses have increased marketing capabilities to consumers through better access to new buyers and tools on the buyctgrown.com website and the CT 10% Campaign. Through UConn Extension's work, 121 producers/distributors reported selling products to local schools. Over 800 farmers received a copy of the CSA toolkit, gaining new knowledge about the CSA farm business model as well as average summer CSA pricing in the state. Since work began educating farmers in 2012, the number of CSAs has grown from 65 in the state to 89 in 2015, a 26% increase.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management

604	Marketing and Distribution Practices
607	Consumer Economics
704	Nutrition and Hunger in the Population

Outcome #5

1. Outcome Measures

Increase sustainable, diverse and resilient food systems across scales

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	3780

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to United Nations, in 2008 more than three billion people were living in urban areas; exceeding for the first time the number of those living in rural areas. Urban population growth coupled with unemployment and food insecurity issues have resulted in food deserts, which USDA defines as areas with limited access to affordable and nutritious food. Food deserts are commonly found in predominantly lower income neighborhoods and communities. In Connecticut, food deserts are mainly found in Fairfield County, where Bridgeport and Danbury are located (two of the poorest cities in Connecticut), which also report the two largest Hispanic populations with 32% and 24% respectively.

What has been done

UConn Extension implemented an urban agriculture and IPM training project in Fairfield County, targeting Hispanic adults.

- 21 students completed a yearlong program, including 180 hours of classroom instruction covering: botany, vegetable production, entomology, crop risk management and IPM.
- Students worked at land provided by Candlelight Farms, donating more than 1,200 hours maintaining an acre of organic vegetables. Their produce was sold at a local farmers' market.

Results

- Distributed more than 4,000 pounds of locally produced organic vegetables and served 250 low-income families at Danbury Farmer's Market.
- 3,780 hours were spent by the students on classroom instruction

- By learning organic production methods, students who completed the urban agriculture program have significantly reduced the use of chemical fertilizers and pesticides.
- Urban agriculture students who completed their year round training continue maintaining the urban garden at Candlelight Farms. This garden was recently (December 2015) expanded to include tree fruits. All former students are invited, at least twice a year, to attend updated training and enrichment workshops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
216	Integrated Pest Management Systems
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

Outcome #6

1. Outcome Measures

Improved national and global capacity to meet growing food demand.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Micronutrients are critical in the defense against crop disease and to maximizing yield. Many host defense products are synthesized by enzymes that are often activated by micronutrients. One problem is that low element availability in neutral and slightly acidic soils often restricts a sufficient supply of micronutrients like Cu, Mn, or Zn. The application of micronutrients to shoot tissues is ineffective since most micronutrients are not basipetally translocated. The use of nanoscale micronutrients (<100 nanometers) to suppress crop disease and subsequently enhance growth and yield is a novel idea, but large knowledge gaps still exist. Consequently, the use of nanoparticles (NP) of metal oxides Cu, Mn, and Zn as micronutrient formulations may offer a highly effective novel platform for crop disease suppression. Nanotechnology has the potential to play a critical role in increasing global food production.

What has been done

Research at CAES was initiated to explore the role of NP of metal oxides Cu, Mn, and Zn for suppression of Verticillium wilt of eggplant caused by Verticillium dahlia and Fusarium wilt of watermelon. Three to 4 week-old transplants were foliarly treated once with NP formulations and compared to the bulked equivalent of each metal oxide along with untreated controls. Both greenhouse and field experiments were conducted with eggplant and watermelon transplants in 2015.

Results

Of five NP tested, only NP copper oxide increased eggplant and watermelon growth and yield when compared to controls. Increasing rates of NP of CuO were examined on eggplant. Based on 2013-2015 field plots, yield was greatest at 500-1000 ppm of NP of CuO and was superior to the bulked equivalent. NP of CuO were compared the other forms of Cu at the same rate on watermelon. Increased watermelon yield was observed only with NP of CuO. These findings suggest the unique size of NP may favor their entry and transport in plants and may have a role in disease management and yield enhancement. We estimate that one treatment of NP with CuO would cost less than \$45.00, but could potentially increase eggplant yield in infested soil by more than 50 percent.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
607	Consumer Economics
704	Nutrition and Hunger in the Population

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

CAES: The vacant weed scientist position noted last year was filled. A number of scientists have IPM and related investigations as part of their research and all goals laid out under this planned program were met. In addition, all 3 new scientists hired in this program (2 in 2014, 1 in 2015) have established active lines of research within this planned program. As such, meeting and/or exceeding future targeted outcomes is anticipated.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

CAES: A number of evaluation studies were conducted during this reporting period and verified that there were knowledge changes in stakeholders. Moreover, 318 site visits and 258 talks enable direct evaluation of acceptance of new crop cultivars, IPM strategies, and cultivation practices.

Key Items of Evaluation

CAES: Google Scholar verified recognition of published articles within this program written by CAES staff. There were 1,407 citations for this program; direct contacts within the program exceeded 25,000, including nearly 2,300 with youth. Indirect contacts exceeded 3,200; including over 1000 youth. On-site observations and evaluations verified success in increased use of IPM and new cultivars, as well as control methods.

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
301	Reproductive Performance of Animals	0%		2%	
303	Genetic Improvement of Animals	0%		2%	
305	Animal Physiological Processes	0%		8%	
311	Animal Diseases	32%		10%	
315	Animal Welfare/Well-Being and Protection	0%		1%	
501	New and Improved Food Processing Technologies	0%		2%	
701	Nutrient Composition of Food	0%		9%	
702	Requirements and Function of Nutrients and Other Food Components	0%		6%	
703	Nutrition Education and Behavior	15%		1%	
704	Nutrition and Hunger in the Population	4%		1%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	34%		1%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	0%		3%	
722	Zoonotic Diseases and Parasites Affecting Humans	0%		43%	
723	Hazards to Human Health and Safety	15%		11%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

University of Connecticut - Storrs

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	9.7	0.0

Actual Paid	0.8	0.0	0.7	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

Connecticut Agricultural Experiment Station -

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	9.7	0.0
Actual Paid	0.0	0.0	6.8	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Institution Name: University of Connecticut - Storrs

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
97795	0	396641	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
97795	0	396641	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1147246	0	1704243	0

2. Institution Name: Connecticut Agricultural Experiment Station -

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	248582	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	800068	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	176756	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

At CAES, primary Program objectives include investigating the mosquito vectors of encephalitis and related viruses, blood meal sources in mosquitoes, if biological control strategies can control vectors, and

which vertebrates serve as reservoirs for arthropod-transmitted pathogens. New research on the role of mosquito midgut proteins and other metabolites in controlling flavivirus susceptibility were initiated. Another new project is assessing the potential of a rodent-targeted vaccine for Lyme disease control. Investigations on the role of invasive plants such as Japanese Barberry as refuges for disease-carrying ticks continued, as did assessments of and the deer populations on tick-borne Lyme disease prevalence. Last, investigations on bed bug presence and control were continued. Significant progress was made on all objectives, and measured outputs benefitted federal, state, and local public health officials, physicians, veterinarians, and the general public. The primary state-generated outputs are noted below and include education sessions/workshops, publications, training of students, and outreach programs. All program activities strongly emphasize public service to traditional and non-traditional stakeholders. An annual open house event allowed over 1,000 citizens, including approximately 100 children, to view presentations of research findings and to offer direct feedback and comment to CAES staff. These planned activities have and/or will lead to specific measurable outcomes, such as more rapid and effective monitoring of disease causing agents and to more effective methods of control for disease carrying arthropods so as to decrease instances of human illness.

UConn: Extension and Storrs Agricultural Experiment Station research efforts included the following programs/activities in the Human and Animal Health planned program.

- Characterizing the connection between dietary components and the potential biochemical nutritional bases for disease
- Developed evidence-based programs for improving healthy lifestyles
- Conducted workshops and webinars
- Developed YouTube videos, and mobile apps
- Provided training to relevant stakeholder audiences
- Provide individual counseling and assessments
- Produce online resource materials such as fact sheets, impact statements and news articles
- Participation in 10 Hatch Multistate research projects, and 14 Hatch projects

2. Brief description of the target audience

Target audiences include all individuals with a stake in preventing disease and improving the health of humans and animals. This includes producers, processors, retailers, regulators, members of the scientific community and consumers. This program benefits a broad range of stakeholders, including local and national public health officials, elected officials, regulators, and the public at large.

CAES: The general public was reached by means of agricultural fairs, open house events, and through traditional and social media. Public displays were designed to be of interest children as well as adults. Oral presentations were given to public health officials, civic groups, and professional societies. Research findings were published in peer-reviewed journals, directly conveying program results to the broader scientific community. Stakeholders submit ticks through local health departments for identification and if engorged, the organism is analyzed for presence of the primary Lyme disease agent *Borrelia burgdorferi*, as well as two other pathogens; *Babesia microti*, *Anaplasma phagocytophilum*. Results of this analysis are returned to public health officials and residents. Fact sheets and other Program information are posted on the CAES website. Information on ticks and mosquitoes was printed in Spanish and a fact sheet on bed bugs has been printed in Spanish, Chinese, and French. Four Spanish-speaking staff members are available to assist at the public inquiry offices as needed.

3. How was eXtension used?

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2740	4551	494	796

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

Patent Applications Submitted

Year: 2015
 Actual: 3

Patents listed

1. N-linked glycosylation alteration in E0 and E2 glycoprotein of classical swine fever virus and novel classical swine fever virus vaccine. Patent. (February 24, 2015).
2. Virulence determinant within the E2 structural glycoprotein of classical swine fever virus. Patent. (September 30, 2014).
3. Vibrio-based delivery system and immune suppression. Patent. (October 9, 2014).

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	6	115	121

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Faces to face general group education sessions/workshops

Year **Actual**
 2015 295

Output #2

Output Measure

- Individual consultations

Year	Actual
2015	76

Output #3

Output Measure

- Fact sheets, bulletins and newsletters written or edited

Year	Actual
2015	23

Output #4

Output Measure

- Training of undergraduate, graduate and post doctoral students

Year	Actual
2015	697

Output #5

Output Measure

- Formal Extension outreach programs

Year	Actual
2015	23

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
3	Human and animal health improved through adoption of dietary and other behavioral activities by practitioners and consumers.
4	Behavioral-based nutrition interventions to combat childhood obesity
5	Reduce the impact viral diseases have on the U.S. swine industry

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
2015	8982

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The prevalence of Lyme disease, human granulocytic anaplasmosis (HGA), and human babesiosis cases continue to increase in the United States. There were 33,461 confirmed and probable cases of Lyme disease reported to the Centers for Disease Control and Prevention in 2014. However 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. One estimate of the mean cost per Lyme disease patient in 2014 dollars is about \$10,769. We found that there is zoonotic expansion of the human babesiosis in Connecticut and 11% of 2450 Ixodes scapularis ticks tested by CAES in 2015 were positive for Babesia microti. The pathogens for babesiosis attacks red blood cell and the disease can be fatal. 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

Results from the first two years of the study showed that natural product application and the bait boxes reduced host-seeking nymphal blacklegged tick populations on residential properties by an average of 78.4% and significantly reduced the number of ticks on the white-footed mouse reservoir host. 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
2015	46

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Reporters and other members of the media often seek information on mosquitoes, ticks, bed bugs and associated disease causing organisms. There is also interest in information on how arthropod vector densities impact the spread of disease. West Nile, Eastern Equine Encephalitis (EEE), and related 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 over tens of thousands of people resulting in nearly 2000 deaths. During this reporting period, there were six human cases of West Nile virus in CT, but no deaths were reported. The first human fatality of EEE virus occurred in CT during 2013 and was identified post-mortem during 2014. 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 46 reporters who sought information on bed bugs, mosquitoes and encephalitis viruses by interviewing CAES scientists. Stakeholders specifically note concerns over viruses such as West Nile and Eastern Encephalitis that cause human illnesses. Last year more than 229,000 mosquitoes were tested for viruses. Viruses cultured from mosquitoes were identified by advanced molecular techniques. Results were conveyed to the general public via

press releases, social media and through coordinated efforts with the CT Department of Public Health. Tens of thousands of residents and stakeholders were kept informed of recent research findings and the significance of new scientific advances.

Results

Twenty two separate reporters wrote articles on bed bugs, ticks, mosquitos and other disease carrying arthropods. The original articles were re-distributed by dozens of additional media venues that ran the original stories and content. 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 continues to be healthy human and domestic animal populations.

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Human and animal health improved through adoption of dietary and other behavioral activities by practitioners and consumers.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Behavioral-based nutrition interventions to combat childhood obesity

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	349

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Obesity is recognized as the number one nutritional problem in America. Prevention in early life is one of the most powerful strategies for combating the current obesity epidemic. Parents including fathers, have a strong influence over a child's eating and physical activity habits. While key behaviors have been identified to prevent childhood obesity, effective nutrition education interventions for families within the community are lacking. Furthermore, a disproportionate risk for childhood obesity exists among lower income and/or minority families.

What has been done

A UConn Hatch project studied the childhood obesity prevention resources available to low-income families and found that current resources are not effective in combating childhood obesity. They lack important content and cultural appropriateness. Research also compared and contrasted mothers' and fathers' challenges and influences in feeding practices for their young children. Childcare centers policies and practices were assessed and found to lack support for healthy eating habits of young children. Research findings on childhood obesity prevention of preschool age children were published in four peer reviewed journal articles.

Results

1) A cross sectional study of fathers with preschool aged-children showed a father's perception of his role at mealtime was associated with higher responsibility for child feeding and lower use of pressure to eat. 2) A study assessed the accuracy of consumers (n=349) ability in identifying common whole grain foods, results indicate that the ability to identify whole grain foods may be a barrier to consuming adequate amounts especially for minority and less educated sub-populations. 3) Child care centers serving preschool children located within low-income rural communities (n = 29) were also assessed to determine current nutrition practices and policies. Study findings report Centers do not fully implement (<80% of the time) recommended nutrition-related policies or practices, do not consistently serve a variety of fruits (48%), vegetables (45%), and only 48% of the centers participated in the Child and Adult Care Food Program. Overall, centers lacked parental outreach, staff training, and funding/resources to support nutrition. Results provide insight into where child care centers within low-income, rural communities may need assistance to help prevent childhood obesity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #5

1. Outcome Measures

Reduce the impact viral diseases have on the U.S. swine industry

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The U.S. swine industry is hampered with infectious disease problems that increase production costs and negatively affect animal health. Recent studies estimate the economic impact of porcine reproductive and respiratory syndrome virus (PRRS) in production losses to the swine industry at \$644 million annual. Together with animal health costs, biosecurity and other outbreak-related costs, cumulative costs of the disease are estimated at more than \$1 billion/year. In addition, other viruses such as porcine epidemic diarrhea and African swine fever negatively impact on the swine industry.

What has been done

Two UConn researchers participating in Multistate Project NC229 are conducting research to develop new protocols and management techniques for the control and elimination of PRRS and other swine viruses. Activities included: Studies on regulation of apoptosis by PRRS non-structural proteins and virulence factors of African Swine Fever Virus (ASFV); development of a series of anti-swine IFNB monoclonal antibodies (mAbs) to be utilized for assessment of IFNB in immunoassays and bioassays; mentor/train two graduate student; two conference presentations and three journal articles.

Results

UConn researcher's worked in collaboration with Plum Island Animal Disease Center (PIADC), ARS, USDA, on a project that has led to the development of recombinant African Swine Fever Virus (ASFV) attenuated viruses containing multiple deletions and used them as vaccine candidates in swine; 2 patents are pending.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

CAES: A combination of federal and state grant funds were available for this program, although shifts in scientists' work times from state projects to Hatch projects did occur. There were no delays in re-hiring temporary workers on grant funds, which is critical as traps and other techniques used require technical expertise not present among the general public. There were no changes in public policy, priorities, or research areas that impacted this program

V(I). Planned Program (Evaluation Studies)

Evaluation Results

CAES: As in previous years, "during program" and "after only" evaluations were conducted to assess effectiveness. Verbal feedback from municipal and public health officials, as well as the general public, indicated significant ongoing interest in work conducted and results generated under this planned program.

Key Items of Evaluation

CAES: Data were collected mainly by on-site evaluations conducted following talks to specific civic or professional groups, as well as at our annual open house event and other public venues. Significant direct interactions with traditional and social media, as well as with stakeholders, continued. Direct interactions were 2,619 individuals, including 144 youth; there were 46 direct interactions with reporters and the media. During this reporting period, there were a total of 667 citations in Google Scholar for scientists in this program.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Sustainable Environments

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
102	Soil, Plant, Water, Nutrient Relationships	100%		100%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

University of Connecticut - Storrs

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	5.6	0.0
Actual Paid	7.6	0.0	1.1	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

Connecticut Agricultural Experiment Station -

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	5.6	0.0
Actual Paid	0.0	0.0	8.3	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Institution Name: University of Connecticut - Storrs

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
622337	0	416440	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
622337	0	416440	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1349025	0	1529520	0

2. Institution Name: Connecticut Agricultural Experiment Station -

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	52345	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	852561	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	205437	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

CAES: The primary objectives are to identify processes that characterize the fate of pollutants in the environment, to develop methods to remediate contaminated soil and water, and to identify methods to control invasive aquatic plants. The fate and remediation program covers both fundamental and applied aspects, and deals with pesticides, volatile organic compounds, dyes, hormones and hormone-mimicking compounds, pharmaceuticals, petroleum hydrocarbons, munitions chemicals, and engineered nanomaterials. Two examples of studies that have been conducted include: bioavailability of polycyclic aromatic hydrocarbons in soot using an in vitro human gastrointestinal model and synthesis of a new polymer to remove organic matter from drinking water sources. The objectives of the Invasive Aquatic Plant Program (IAPP) are to track occurrences of invasive aquatic plants, test novel controls and provide public outreach via talks, workshops and an invasive aquatic plant webpage. The webpage is an online repository for aquatic vegetation maps, herbarium specimens, and research results. Since its inception in 2004 IAPP has surveyed over 200 lakes. The program has found approximately 60 percent contain one or more invasive plant species. IAPP has published numerous research articles, and presented at hundreds of public education events. IAPP boasts one of the largest "Long Term Ecological Research" lake databases in the US. IAPP outputs include; new scientific findings, scientific publications, newsletters, bulletins, talks and interviews. In addition, a large number of state residents are served directly by visitations to infested lakes and ponds, identification of problems, and assistance with management. In new work, cases of sudden vegetation dieback (SVD) have been observed across coastal wetlands of the

Northeast. When the plants die, SVD sites have the potential to switch from net sinks of carbon from the atmosphere to net sources. We are monitoring cases of SVD throughout Connecticut and Rhode Island, and, as part of this assessment, we are measuring soil gas fluxes to determine the extent that SVD affects soil carbon cycling as well as characterizing how the soil microbial communities respond to SVD.

UConn: Extension and Storrs Agricultural Experiment Station research conducted the following programs/activities in the Sustainable Environments planned program:

- Used new analytical methods to remove pollutants from soil and water in greenhouse irrigation systems and nutrient management.
- Soil analysis to determine the need for fertilizers in nutrient management programs for dairy farms, fruit production, and home gardeners.
- Evaluation of invasive plants for strategic management practices is conducted through research projects and results are disseminated through peer reviewed articles, reports, fact sheets, workshops and webinars.
- Workshops and webinars were conducted on land use, climate adaptation, geospatial technologies, sustainable landscapes, and invasive plants.
- YouTube videos on climate adaptation were created. The mobile app for rain gardens has been expanded to include 13 states. Mobile apps for the Stormwise program and Integrated Pest Management (IPM) are in development.
- Training is provided to relevant stakeholder audiences through workshops and webinars, online materials, and individual consultations. Additional training methods using online learning are being explored for the pesticide safety education program and geospatial technology.
- Produced online resource materials such as fact sheets, impact statements and news articles. These are available on multiple websites, social media, in Extension offices, and at workshops and conferences.
- Participation in 6 Hatch Multistate projects and 11 Hatch projects

2. Brief description of the target audience

Target audiences include all individuals with a stake in providing sustainable environments including farmers, lake associations, boaters, homeowners, water company officials, environmental organizations, extension specialists, corporate and municipal officials, state environmental and agriculture agency staff, pesticide producers, researchers, city/town volunteers and the general public. As with all programs, additional efforts were made to contact a broad base of under-represented and under-served groups, including members of minority organizations, women, and children.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	80547	3412228	18624	28032

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

Patent Applications Submitted

Year: 2015
 Actual: 0

Patents listed

n/a

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	6	54	60

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Face to face general group education sessions/workshops

Year	Actual
2015	530

Output #2

Output Measure

- Individual consultations

Year	Actual
2015	562

Output #3

Output Measure

- Fact sheets, bulletins and newsletters written or edited

Year	Actual
2015	82

Output #4

Output Measure

- Training of undergraduate, graduate and post doctoral students

Year	Actual
2015	578

Output #5

Output Measure

- Formal Extension outreach programs

Year	Actual
2015	172

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of homeowners gaining knowledge about watershed protection and soil and water quality
2	Number of lakes and ponds surveyed and/or cleared of invasive aquatic plants
3	Improved climate mitigation strategies and their adoption
4	Development of new knowledge in land use resource protection
5	Increase knowledge and use of geospatial technologies
6	Increase awareness of sustainable practices that benefit the local and regional economy.
7	Development of new technologies or products to improve the environment.

Outcome #1

1. Outcome Measures

Number 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
2015	650

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Pollution affects human safety and health and threatens the vitality of the natural environment. We have addressed broad issues related to understanding the fate and biological accessibility of pollutants in the environment and the development of novel methods for removing pollutants from waste streams and decontaminating water and soil. Biomass chars (biochars) have attracted attention as soil additives in agriculture and chars are also naturally present in soil as the charred products of fires. Understanding the mechanisms of adsorption of pesticides to these materials is of great importance for assessing their movement, fate, and bio-availability in soil. Weak acids are used in many technological, commercial, and agricultural applications, and their adsorption to carbonaceous surfaces often plays an important role in their fate, hazardous effects, and remediation in the environment. People, especially children, take in significant quantities of soil and other environmental particles through hand-to-mouth contact; it is important to address the bioavailability of chemical contaminants present in such particles.

What has been done

Projects on fate and remediation of chemical contaminants carried out in 2015 include: the bonding forces controlling adsorption of charged compounds on surfaces of natural organic matter and charred particles; the aggregation of engineered nanoparticles in soil; sunlight-driven reactions of organic compounds and dissolved natural organic matter in marine waters; bioavailability of pollutants in environmental particles in models simulating the human digestive tract. Studies were initiated to investigate the role of charred biomass in emissions of nitrous oxide from fertilizer in soil. Studies were done on optimizing conditions leading to photooxidation of pharmaceuticals and hormones in brackish wastewaters using oxidants such as hydrogen peroxide and persulfate. Methods were developed to remove a commodity fumigant (methyl bromide) in fumigation chamber vent streams. Progress was made on using biochar as an absorbent for remediating crude oil spills on land and at sea. Studies were initiated to investigate the role of charred biomass in emissions of nitrous oxide from fertilizer in soil.

Results

In regard to adsorption processes, our results show that char mesoporosity is critical, that adsorption rate is a function of solute molecular size and charge, that steric effects in the solute largely suppress equilibrium adsorption; EDA forces play a role in triazine polar interactions with the biochar. We have also found that weak acids with pKa values close to those of carboxyl/hydroxyl groups on carbonaceous surfaces have been shown to adsorb by very strong hydrogen bonds. We found that the bioavailability of polycyclic aromatic compounds was much less than 100%, but was significantly increased by changing chemical conditions in digestive fluid accompanied by food ingestion, especially fat intake. We developed a novel quaternary phosphonium cationic polymer, poly(diallyldiethylphosphonium chloride) (polyDADEPC), that could be used to remove organic matter from drinking water sources. The bimolecular redox reaction between hydrosulfide ion and nitroaromatic pollutants is accelerated on graphitic surfaces; the reaction occurs between adsorbed forms of the two reactants and the electron is apparently not transported great distances along the graphite surface

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

Outcome #2

1. Outcome Measures

Number 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
2015	15

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Extensive growths of invasive aquatic weeds, such as Eurasian watermilfoil (*Myriophyllum spicatum*) and Brazilian waterweed (*Egeria densa*) can significantly reduce water quality and alter native aquatic habitats. Stakeholders requested assistance with determining the species of aquatic vegetation and for integrated weed control.

What has been done

Staff mapped native and invasive aquatic vegetation in 6 new and 9 previously surveyed water bodies. The effects of ten years of winter drawdown on invasive plants were quantified in the States largest lake. Tests on controlling a new introduction in the state -Brazilian waterweed (*Egeria densa*) in Fence Rock Lake with bottom placement of herbicide were successful.

Results

After 10 years of surveillance, nearly 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. Tests on controlling Brazilian waterweed found bottom placement of the herbicide Diquat resulted near complete control the following year. We have largely restored Bashan Lake to preinfestation conditions after years of selective fall herbicide applications. Long-term benefits will be protection of native lake ecosystems and prevention of associated economic losses

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

Outcome #3

1. Outcome Measures

Improved climate mitigation strategies and their adoption

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Stormwater runoff is the nation's leading source of water quality impairment, according to the Environmental Protection Agency (EPA). When stormwater (water from precipitation events or snow melt) moves over pavement, it picks up and carries with it fertilizer, pathogens, toxic contaminants, sediment and other pollutants before entering storm drains. These drains lead directly to waterways. As a result of global climate changes, scientists predict that precipitation will increase in the Northeast U.S., leading to a greater volume of runoff. This presents a

challenge, since more runoff means more pollution.

What has been done

UConn Extension developed a rain garden app for Connecticut. Rain gardens are shallow depressions in the landscape that typically include plants and a mulch layer or ground cover. They provide increased groundwater recharge and are expected to provide pollutant treatment. Rain gardens can be used in residential settings to accept runoff from a roof or other impervious surface. The app provides instructions on how to properly install a rain garden at your home, office, or job site through video tutorials, diagrams, and text, and guides you through determining the size and placement, selecting plants, planting and maintenance. It also includes tools for determining soil type.

Results

In collaboration with partners at multiple universities, the app has been adapted to 13 states. The iOS and Android apps have been downloaded a total 5,346 times. UConn's Nonpoint Education for Municipal Officials (NEMO) program conducted rain garden trainings at various locations. Through rain gardens installed using the UConn Extension app, 1.3 million gallons of stormwater are treated each year and prevented from polluting waterways.

For example, as a result of rain gardens installed at two workshops, 61,000 gallons of runoff from 1,920 square feet of urban rooftops is kept out of the sewer system annually. Since the goal is to train others to install more rain gardens, this effect should grow as more rain gardens are installed around the state, through those trained at the above mentioned workshops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

Outcome #4

1. Outcome Measures

Development of new knowledge in land use resource protection

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Increase knowledge and use of geospatial technologies

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	350

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Smartphones and tablets are some of the fastest technologies to become widely adopted by the American public in history. Currently 64% of all American adults own a smartphone, up from 35% just 4 years ago. These multi-function computers have replaced many devices, phones, calculators, alarm clocks, radios, music players, desktop computers (for some), etc. Because they have built-in GPS receivers they also have the potential to replace handheld GPS units, a standby for people conducting field research, monitoring conservation properties, identifying and mapping locations of utilities and resources, mapping trails, and providing data for online maps. The availability of additional tools in a smartphone, such as a camera, microphone, and a cellular connection allowing the ability to update base maps quickly, making them an attractive alternative.

What has been done

Extension faculty in the Geospatial Training Program at UConn's Center for Land Use Education and Research (CLEAR) developed a course focused on using smartphones and tablets to collect geographic data and media (photographs, audio, etc.) in the field and use it to create maps in a variety of programs or formats. In collaboration with the Connecticut Land Conservation Council (CLCC), the course has also been modified to fit the need of land trusts members who are responsible for monitoring the status of their conservation properties, mapping trails, and identifying areas where maintenance is needed.

Results

- Identified GPS tracking apps that meet needs of land trusts, and field researchers
- Trained over 350 people in smartphone GPS mapping
- At the CLCC Annual Conference attendant by 100 participants, a tutorial presentation was given on smartphone apps. Participants were shown how to replace paper-based monitoring forms with a customized data collection application anyhow to digitize existing paper maps for use in a mobile device.
- At the Northeast Arc Users Group Conference, 125 participants also received training and presentations on smartphone GPS.
- The training was also offered at the Connecticut Association of Conservation and inland Wetland Commissioners Conference for 65 participants. Four smaller training sessions for groups of 15, were held at various locations in CT.
- One participant stated: "this training will revolutionize conservation easement and property monitoring for land trusts"

4. Associated Knowledge Areas

KA Code	Knowledge Area
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Outcome #6

1. Outcome Measures

Increase awareness of sustainable practices that benefit the local and regional economy.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Turfgrass areas including golf courses are a valuable part of urban and rural landscapes in the U.S. Golf courses contribute \$62.2 billion each year toward the national economy (www.golf2020.com) in jobs generated, economic development and tax revenues for communities. However, anthracnose is a destructive disease of weakened or senescent turf caused by fungus *Colletorichum cereale*, and is particularly devastating on annual bluegrass putting greens causing turf loss, disruption of play and economic losses due to increase chemical controls.

What has been done

Research activities conducted by UConn's participation in Hatch Multistate project NE1046 included a series of studies which provided data that was synthesized into best management practices (BMP). Studies included; assessing optimal fungicide application timings; fairway conversion to stress tolerant turfgrass studies; and assessing optimal eradication strategies of existing turfgrass, seedbed preparation methods, and seeder types to establish mature creeping bentgrass and minimize anthracnose contamination.

Results

The semi-annual UConn Turf Field Day was held in July 2015, which provided seminars, demonstrations and research updates to over 100 golf course superintendents and other practitioners.

Research results contribute to NE1046's recommended best management practices BMP for turfgrass practitioners. Adopted BMP improve management strategies for controlling anthracnose

disease, reduce reliance on chemical inputs, provide cost savings, improve plant health and enhance environmental health.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

Outcome #7

1. Outcome Measures

Development of new technologies or products to improve the environment.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Three species of the genus *Aronia* (chokeberries): *A. arbutifolia* (red-fruited); *A. melanocarpa* (black-fruited); and *A. prunifolia* (purple-fruited) a group of largely overlooked eastern U.S. native shrubs, have tremendous potential for use as ornamental landscape plants and as an edible fruit crop. As ornamentals they are useful for their dense habitat, spring flowers, late summer fruit and red fall color. As a fruit crop, the dark-fruited forms produce berries containing the highest levels of antioxidants and flavonoids of any temperate plant. They also contain potential anticancer compounds. However, for *Aronia* to become a significant ornamental and nutraceutical fruit crop, germplasm improvements are necessary.

What has been done

Through UConn's participation in Multistate Project NC7, evaluation trials to enhance the utilization of the genus *Aronia* produced 2 US Plant Patent applications for *Aronia melanocarpa*, (UCONNAM165, and UCONNAM166) with the trade names of Lowscape Rug and Lowscape Carpet. The plants were licensed to the Proven Winners national marketing program and will be marketed for the spring 2016 production year. In addition, plant production is underway for 2 additional *Aronia* (UCONNAM012 and UCONNAM175).

Results

Two new Sorbaronia x Aronia backcross hybrids were identified, propagated, and introduced to Bailey Nursery for trialing and possible inclusion in their First Editions superior plant marketing program. In addition, new breeding efforts focused on intergeneric crosses between Aronia and Sorbaronia, and Soraronia/Aronia crosses with Pyrus communis and Pyrus pyrifolia. Also, plants of 8 new wild aronia accessions were provided to the USDA National Plant Germplasm System: Ames 33069, UC 014, Aronia arbutifolia, Texas; Ames 33070, UC 050, Aronia arbutifolia, Connecticut; Ames 33071, UC 009, Aronia melanocarpa, Maine; Ames 33072, UC 018, Aronia melanocarpa, Maine; Ames 33073, UC 023, Aronia melanocarpa, New Hampshire; Ames 33074, UC 095, Aronia melanocarpa, Pennsylvania; Ames 33075, UC 008, Aronia x prunifolia, Massachusetts; Ames 33076, UC 117, Aronia x prunifolia, Massachusetts.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Competing Public priorities
- Other (Staff changes)

Brief Explanation

There were no external factors that negatively affected outcomes during this reporting period. However, 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

CAES: Before and after" and "during" evaluations were initiated to measure increased knowledge of aquatic plants and select other program issues. "During" evaluations were used to assess advances in stakeholder knowledge on soil and water quality issues. Direct stakeholder participation in the aquatic weed abatement programs, workshops and town meetings remains a value venue for results evaluation.

Key Items of Evaluation

CAES: 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 1271 citations (Google Scholar) 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

4-H/Youth Development

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
205	Plant Management Systems	20%		0%	
307	Animal Management Systems	20%		0%	
703	Nutrition Education and Behavior	20%		0%	
724	Healthy Lifestyle	20%		0%	
806	Youth Development	20%		100%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

University of Connecticut - Storrs

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	7.0	0.0	0.1	0.0
Actual Paid	5.2	0.0	0.0	0.0
Actual Volunteer	35.0	0.0	0.0	0.0

Connecticut Agricultural Experiment Station -

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	7.0	0.0	0.1	0.0
Actual Paid	0.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Institution Name: University of Connecticut - Storrs

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
425885	0	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
425885	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
218055	0	13339	0

2. Institution Name: Connecticut Agricultural Experiment Station -

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	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The Youth Development and 4-H planned program area focused on creating safe, healthy, well educated children and teens through 4-H Clubs, afterschool programs and interactive learning experiences. Science, Technology, Engineering and Math (STEM) curriculum are an integral part of the youth development programs and activities.

Activities included:

- Workshops, including National Youth Science Day Experiments and Adventures in STEM, hosted on the UConn campus with collaborators from the School of Engineering.
- YouTube videos were created by several county 4-H programs, and available to 4-H members and the public on various Connecticut 4-H and the UConn Extension YouTube channels.
- Mobile app - an app was developed with New Mexico State University to evaluate the 4-H FANs program.
- Volunteer training programs are held for all new volunteers in each county. Additional trainings are offered on a statewide basis.
- Online material in the form of fact sheets, impact statements and news articles are available for each of the county 4-H programs. These include weekly and monthly county 4-H newsletters.
- Research-based curricula was developed by Healthy Homes Extension educators at UConn and approved by National 4-H Council. The curriculum is being taught in Connecticut and nationally.

- After-school programs are offered in all eight counties working with varying demographics on STEM based activities.
- Camps and 4-H Fairs are a mainstay of the 4-H program, and continue to attract large numbers of youth participants.

2. Brief description of the target audience

Youth, families, school personnel, youth-serving agencies and organizations, community organizations and agencies. Volunteers involved with youth and adults are also a target audience. Extension educators actively engaged underserved and under-represented audiences through the 4-H program.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	67210	863286	68874	349382

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

Patent Applications Submitted

Year: 2015
 Actual: 0

Patents listed

n/a

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	1	0	1

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Face to face general group education sessions/workshops

Year	Actual
2015	13

Output #2

Output Measure

- Individual consultations

Year	Actual
2015	185

Output #3

Output Measure

- Fact sheets, bulletins and newsletters written or edited

Year	Actual
2015	4

Output #4

Output Measure

- Training of undergraduate, graduate and post doctoral students

Year	Actual
2015	10

Output #5

Output Measure

- Formal Extension outreach programs

Year	Actual
2015	86

Output #6

Output Measure

- After-school programs (sites) conducted or organized

Year	Actual
2015	172

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of youth indicating increased knowledge or skills in one or more of the nine 4-H program emphasis areas
2	Increase in the health and wellbeing of youth participating in 4-H program activities.
3	Increase positive impact on communities through volunteering.

Outcome #1

1. Outcome Measures

Number of youth indicating increased knowledge or skills in one or more of the nine 4-H program emphasis areas

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	11529

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In the US, there is a shortage of scientists and people understanding science. Women and minorities are under-represented in science careers and a diverse pool of trained scientists is needed to frame and solve problems and educate others.

What has been done

CT 4-H programs were conducted in 8 county offices by UConn Extension staff along with 1,210 adult and 213 youth volunteers. Activities included: 4-H FIRST Robotics; 4-H National Youth Science Day Experiment; Connecticut 4-H Adventures in STEM; County 4-H Fair Programs; County 4-H Science Clubs; County 4-H Science Days; Environmental Science Day; in-school, after-school and out of school STEM enrichment programs; state 4-H animal programs; and state 4-H Citizenship Day with a theme of "How to communicate in a Technical World."

Results

CT 4-H programs successfully expanded participants' knowledge and skills in science and technology. In addition, collegiate and teen leaders serve as role models for youth of various ages, and provided the very important role of assisting staff. These programs also provided an opportunity for middle and high school aged youth to practice newly learned skills in a safe and supervised environment. Overall youth involved: increased engagement in science; improved attitudes toward science; increased awareness of science; improved science skills (scientific methods) and knowledge (content areas); and increased awareness of opportunities to contribute to society using science skills. The skills taught are skills that can be applied throughout life.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
307	Animal Management Systems
703	Nutrition Education and Behavior
724	Healthy Lifestyle
806	Youth Development

Outcome #2

1. Outcome Measures

Increase in the health and wellbeing of youth participating in 4-H program activities.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	6808

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The mission of the CT 4-H Youth Development program in relation to Healthy Living focuses on three main areas: proper nutrition and childhood obesity prevention, appropriate and adequate physical activity and overall physical health, and positive social/emotional health. Today's youth are in need of a continuum of developmentally appropriate experiences and opportunities to foster a healthy lifestyle.

What has been done

Healthy living activities included in-school, after-school or community based programs specifically dedicated to goals of healthy living and nutrition education. Programs in every county focused on underserved audiences in urban areas. For example, the CT 4-H FANs IM targeted underserved grade school children in three cities. The program saw the involvement of 708 youth and adults for an annual total of 800 hours of program instruction and facilitation. The program runs for 8 weeks and focuses on nutrition, fitness and self-esteem. Traditional club-based 4-H project areas also focus on healthy living through physical activity, and behaviors that result in positive emotional growth and competency.

Results

There were a total of 6,808 enrolled 4-H members who reported involvement in healthy living project areas.

Youth at the Healthy Hands After-school 4-H club at Windham Middle School report they learned gardening skills, kitchen/food safety and basic cooking skills through preparation of daily snacks. Personal responsibility was increased through responsibilities for cleanup and decision making of all club goals and tasks. Youth continually asked for the recipes in order to recreate the snacks at home. As often as possible, they were provided with produce and other ingredients to take home in order to make the recipe with their families. Being able to cook and prepare a meal for their families gave them great pride.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
806	Youth Development

Outcome #3

1. Outcome Measures

Increase positive impact on communities through volunteering.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	70000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The mission of the CT 4-H Youth Development program is to help youth to make good decisions, develop leadership and citizenship skills while improving self-confidence. All youth need support and positive experiences to grow to their fullest capacity and to become productive adult citizens.

What has been done

85% of enrolled 4-H members and adult leaders participated in service learning and community service activities in 2014-2015. Activities included food drives, camp and public space clean-up and maintenance days, holiday baskets/caroling, mitten/hat drives, educational outreach, collecting school items, filling backpacks for military children, and donations for senior centers and

animal shelters. While some are strictly community service in focus, many go further as service learning opportunities through youth involvement in decision making, planning, and completion and follow-up of projects.

Results

An estimated 70,000 hours of service can be attributed to 4-H volunteer time and community service projects conducted by 4-H members. This number includes volunteer hours provided by the youth and adult volunteers conducting the programs. Based on the value of volunteer hours provided by the Independent Sector estimate of \$26.79 per hour for Connecticut hours, 4-H volunteer time in 2014-2015 was worth more than \$1,875,300 to the communities served.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Staff members have used the following methods for gathering data:

- Pre- and post-event survey (written and/or interview)
- Mail and on-line survey
- Focus group
- Face-to-face (marketing) interviews
- Participant observation

In addition the CT 4-H program will implement common measures that were developed for use nationally in the 4-H program.

Key Items of Evaluation

The 4-H FANs IM program found the following evaluation from their program in one city. Data includes the preliminary report for 13 complete sets pre and post. Observations and preliminary conclusions:

Many students were already consuming few servings of unhealthy foods (e.g., French fries, chips, flavored milk, sweets, fast food). However, the current evaluation showed that after

the evaluation, students consumed even fewer servings of flavored milk, sweets, and fast foods, and increased their intake of white milk and beans. These results may indicate students increased knowledge and behavioral change on eating habits. The intervention should continue to consistently focus on these areas. Overall, the current results indicated that students felt they learned about healthy foods, what a balanced diet included, and how to make better choices about food and exercise. This was reflected in students' responses about the appropriate amount of fruits and vegetables they should be consuming per day at post-intervention, as well as students perhaps more accurate perception of their own eating habits not being as healthy as they thought prior to the intervention. Students also reported they less often avoided foods with fats. However, overall students did report they were making less healthy choices about food, specifically eating fruit for lunch, at the end of the intervention. (Mudrick H., Farrell A., UConn Center for Applied Research in Human Development, Winter 2014 Report).

Future evaluation is expanding to include a larger cross section of program participants at all three sites using data from the AskBoard app developed by New Mexico State University for the program.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Community and Economic Development

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
703	Nutrition Education and Behavior	25%		50%	
724	Healthy Lifestyle	25%		50%	
801	Individual and Family Resource Management	25%		0%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	25%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

University of Connecticut - Storrs

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	0.1	0.0
Actual Paid	1.9	0.0	0.1	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

Connecticut Agricultural Experiment Station -

Year: 2015	Extension		Research	
	1862	1890	1862	1890
Plan	1.0	0.0	0.1	0.0
Actual Paid	0.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Institution Name: University of Connecticut - Storrs

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
195713	0	40595	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
195713	0	40595	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
951197	0	188053	0

2. Institution Name: Connecticut Agricultural Experiment Station -

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	0	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	0	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The Community and Economic Development planned program focused on providing Connecticut citizens a link to UConn Extension specialists and current research priority areas identified by our stakeholders. Programs also focused on improving conditions for families and communities through leadership development, community planning, and technology training.

Activities included:

- Workshops and health fairs
- YouTube videos for children on healthy homes
- Volunteer training programs
- Online material such as fact sheets, impact statements and news disseminated through social media
- Develop a children's book in collaboration with the Department of Energy and Environmental Protection on car emissions
- Researcher participated in 1 Hatch Multistate project and 2 Hatch projects

2. Brief description of the target audience

Parents, youth, children, teachers, elected officials and policy makers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2015	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	4805	22854	6344	3456

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

Patent Applications Submitted

Year: 2015
 Actual: 0

Patents listed

n/a

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2015	Extension	Research	Total
Actual	2	10	12

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Face to face general group education sessions/workshops

Year	Actual
2015	23

Output #2

Output Measure

- Individual consultations

Year	Actual
2015	90

Output #3

Output Measure

- Fact sheets, bulletins and newsletters written or edited

Year	Actual
2015	0

Output #4

Output Measure

- Training of undergraduate, graduate or post doctoral students

Year	Actual
2015	39

Output #5

Output Measure

- Formal Extension outreach programs

Year	Actual
2015	54

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of program participants indicating increased leadership, parenting, or financial management skills
2	Increase knowledge about healthy home environments

Outcome #1

1. Outcome Measures

Number of program participants indicating increased leadership, parenting, or financial management skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	45

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Teens and college students often have limited preparation for some of the big financial decisions they will make as young adults. They are often unfamiliar with the costs associated with common expenses and the challenge of making financial decisions. As many may consider or already have a student loan to help finance their further education, it is important that they understand how a college loan will fit within their budgets as young working adults. Parents and other adults often recognize this, but may not know how to address it. Few students have access to personal finance classes in high school.

What has been done

The Welcome to the Real World, Connecticut Edition Simulation, adapted from the Welcome to the Real World Program developed by University of Illinois Extension, was held in several locations around the state. This learning activity gave young people an opportunity to imagine their lives as young working adults making financial decisions about their monthly expenses and incorporates a student loan for those planning on occupations requiring a college education.

The simulation exercise has been adapted for use at the college level and expenses have been updated. The educators presented a brief overview of the workshop at the orientation session for First Year Experience Course instructors for the Fall 2015 semester.

Results

Approximately 15 volunteers participated in a brief overview of the program along with orientation to their specific roles in assisting participants with the expense tables. Seventy-two young people participated in the simulation at 6 locations.

Forty-five participants completed the end of the program evaluation. All 45 agreed or strongly agreed that participating in the Real World simulation gave them a chance to think more concretely about their future and helped them apply financial concepts. As a result of the exercise, they had an opportunity to use their knowledge and skills to:

- pay themselves first by saving: 36 (80%)
- balance income and expenses: 38 (84%)
- consider spending priorities: 39 (87%)
- deal with the unexpected: 31 (69%)

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management

Outcome #2

1. Outcome Measures

Increase knowledge about healthy home environments

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2015	676

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

According to the U.S. Environmental Protection Agency, most people spend more than 90% of their time indoors, much of that time in their own homes. CDC states that poorly maintained housing increases the risk for injury and illness and affects the health of millions of people (adults and children) of all income levels, geographic areas, and walks of life in the United States. Environmental concerns that impact the health of occupants include: indoor air quality, lead poisoning prevention, safe use of household products, allergens, asthma triggers, mold and moisture, carbon monoxide, tobacco smoke, IPM, home safety, radon, and home energy conservation. A healthy home reduces exposure to environmental hazards and is based upon clean, dry, and safe (no carbon monoxide), with fresh air, in good repair, and no pests or dangerous chemicals.

What has been done

UConn Extension's Healthy Homes and Communities program activities included:

- Created social media pages for the Healthy Homes Partnership on Facebook, Twitter and Pinterest and publish content regularly
- Conducted workshops for people on school grounds (175 attendees) and unhealthy homes (200 attendees)

- Published a children's story on car emissions and distributed to all 169 towns in the state at elementary schools, libraries, daycare centers and pediatric offices
- Created an advisory board with partner organizations to provide ongoing assessment of UConn Extension Healthy Homes projects

Results

Program activities promoting the well-established principles of healthy homes by identifying common health measures with unhealthy homes reached 676 people directly. The program recognizes and educates on practical solutions to unhealthy home problems. Consumers are encouraged to maintain their home water and septic systems for human, animal, and community safety. The program encourages consumers to maintain safe homes in diverse areas. Engagement on social media has been strong and continues to grow the various platforms. Pinterest has been an active social media site.

Over 500 people have been reached through Facebook; popular Facebook posts were:

- Infographic on Fire Prevention: 156 reached, 4 likes, comments or shares.
- Link on Toy Safety for your family: 66 reached, 3 likes, comments, or shares.
- Infographic on child safety and prevention: 153 reached, 7 likes, comments or shares.
- Article on Asthma: 58 reached, 2 likes, comments, or shares.
- Article/Webinar on IPM post: 70 people reached, 4 likes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Social media was evaluated for the Healthy Environments and Healthy Homes program through Facebook counting software and Sprout Social Analytics. The majority of contacts include youth and adults, ages 3 - 49 years of age. These contacts consist of diverse races, including African American, Asian, Caucasian, Hispanic, Latino and Native American. Exhibits were presented to a diverse audience at Eversource and Mystic Aquarium.

Key Items of Evaluation

Data is reported in the state defined outcomes.

VI. National Outcomes and Indicators

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
0	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes with climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
0	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
0	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
0	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.