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Previously approved in the second annual report

Design and Launch of a Shared-Use Kitchen/Food Processing Center at the Hartford Regional Market

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Project Summary

Connecticut specialty crop producers have limited access to a shared-use commercial kitchen meeting local, state and federal regulatory standards for processing, freezing, or production of value added products such as sauces, jams or other products which utilize their specialty crops. Working with a university partner, Rutgers Food Processing Center, a layout/design and governance structure was established for a food processing center at the Hartford Regional Market (HRM).

The HRM, is a state-owned, statutorily authorized distribution terminal for agricultural products. It covers 32 acres, houses more than 230,000 square feet of warehouse space, contains 144 open air farmers' market stalls and is centrally located near the intersection of interstates I-84 and I-91 in Hartford. It is also the largest food distribution facility between New York City and Boston.

The HRM currently has numerous tenants whose activities range from simple distribution of produce, to re-packing and basic light processing. To date, processing conducted at the HRM has been limited to individual tenants' businesses located at the market with specialized infrastructure specific to their business needs. There are no facilities available to farmers with a desire to process their specialty crop products.

Further, the Governor's Council for Agricultural Development, charged by the Connecticut legislature with increasing sales of Connecticut Grown fresh produce, cited in its first report, dated December 2012, that "Connecticut lacks adequate infrastructure to aggregate, process, and distribute many Connecticut Grown farm products."

Given the above, the Connecticut Department of Agriculture (DoAg) recognized that specialty crop farmers in Connecticut would benefit significantly if a low cost option was available to process their specialty crop farm products, thereby extending the period when Connecticut specialty crop and specialty crop products can be sold. With four (4) vacant stalls in the HRM (at the time of grant application), comprising a total of 8,640 square feet of space, all of which were under the custody and control of DoAg, an opportunity existed to meet the demand and need expressed by the industry.

Project Approach

The project approach, as originally designed, was to include two phases. Phase I included the analysis, design and governance for the shared use kitchen, and phase II would have included the construction phase.

Only thirty three percent (33%) of the grant funds committed to the project were used, specifically those covered in Phase I of the project. In this portion of the project, we contracted with the Rutgers Food Processing Center to define processing needs, completed the layout/design of the shared-use kitchen, and developed a governance structure for the kitchen. A final report for this phase was issued September 30, 2014.

Unfortunately, the construction phase of the project could not be undertaken due to the lack of availability of funding and the unanticipated high cost (in excess of $1.5 million) for the project to be completed. After examining various options for moving forward, DoAg will be seeking a modification to enable continuation of promotion and marketing efforts at HRM. Should funds become available to proceed with the construction phase of this project, DoAg will utilize the work product from this grant in that endeavor.

Goals and Outcomes Achieved

The expected goals and outcomes for the project were as follows:

Goal	To establish a food processing center at the Hartford Regional Market.
Performance Measure	Needs will be analyzed, a design and governance structure will be established, and the food processing center will be launched. This will be accomplished by soliciting stakeholder input and cooperating with other established food processing centers.
Baseline	No baseline currently exists.
Target	At least three (3) producers will apply to utilize the center the first year after launch.

While we were unable to begin construction and obtain commitments from producers to utilize a food processing center at the market, the project report produced by Rutgers will be very beneficial as the Department presses forward with its redesign of the HRM. The report contains an initial design, equipment specifications and governance options for the kitchen, and is based on actual field measurements and observations of an experienced project manager and design engineer from the Rutgers Food Processing Center.- it is expected that, as redesign of HRM moves further, this shared-use kitchen design can easily be incorporated into that work.

Beneficiaries

If the shared-use kitchen proceeds into the construction phase, it is expected the project will increase sales of specialty crops by providing farmers a low-cost option for processing their produce, making Connecticut Grown products more accessible on a year-round basis. Consumer interest in Connecticut Grown farm products continues to rise, and with a limited growing season in Connecticut, value added products are one avenue for farmers to increase sales of their specialty products.

With an effective marketing strategy, it is expected that the shared-use kitchen could become a valuable learning tool for farmers looking to start new ventures with their Connecticut Grown specialty crops. After a simple application and approval process (which will ensure only specialty crop products are being processed at the kitchen), farmers will have the ability to use a kitchen space dedicated to processing Connecticut Grown specialty crop products, and also be able to temporarily store the products which they manufacture at the facility.

Lessons Learned

Clearly, the biggest lesson learned is to ensure, to the extent practicable, there is a good estimate of total project costs before proceeding with a project such as this. While we went into this with an expectation that the costs would be significant, we did not expect the costs to be in excess of $1.5 million. As such, DoAg will be looking at other options to repurpose the rest of the grant funds, likely for continuation of a promotion and marketing program for HRM.

Additional Information

The project results can be found on the agency website here:
http://www.ct.gov/doag/lib/doag/regional_market/2015/hartfordmarket-finalreport-dec2014.pdf

Trap Cropping for Spotted Wing Drosophila Control

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Project Summary

Spotted wing drosophila (SWD) is a new invasive insect pest that was first discovered in the USA in California in 2008 although not identified until 2009. It was discovered in Michigan in 2010 (Isaacs, et al, 2010) and entered Connecticut in mid-season 2011. The arrival of SWD caught CT growers, university extension and researchers off-guard resulting in almost complete loss of late season blueberries and fall berry crops in 2011. The SWD lays its eggs in berries as they are maturing and the resulting larvae then feed on berries making them unmarketable. This has wreaked havoc with most of the 343 berry growers in CT, particularly with berry crops that are harvested mid-summer through the fall as the SWD populations increase exponentially throughout the growing season. Late season blueberries, late summer blackberries and brambles, fall brambles and day-neutral strawberries (fall strawberries/ever-bearing strawberries) are some of the preferred crops that now require pesticide applications every 3-7 days in order to maintain close to a SWD-free harvestable product.

A survey was sent to fruit growers by Concklin in the fall of 2012 to gather information regarding losses and increased costs due to the SWD. Crop losses were reduced, not eliminated, from 2011 to 2012 by many growers due to awareness of the pest and use of available pesticides. Organic growers continued to incur heavy losses because of the limited availability of effective organic insecticides. Survey comments included “the organic pesticide did not work. Tried it since there was a zero day harvest interval and that was very important for brambles.” “Have increased from a 10 day spray interval for blueberry maggot to a 3 to 5 day schedule.” “Had to take a week off from picking and return to Delegate.” “Pest control costs have almost doubled. Modifications made to sprayer to enable spraying blueberries under bird nets.” “Damage about the same as last year with our later berries basically a total loss.” And, “spraying is a new cost for us directly attributable to SWD.”

Perimeter trap cropping has been successfully utilized in vegetable crops for many years. This project proposed to use that concept by using an established planting of fall brambles as the trap crop for the SWD, planted around a day-neutral strawberry planting. A separate field of day- neutral strawberries was established without the brambles planted around them. The brambles and strawberries were monitored for the presence of SWD with traps and fruit inspections. Insecticide applications were made only to the brambles, spraying from the inside of the block out, to avoid spraying the day-neutral strawberries. It was expected that the brambles would intercept the SWD and the pesticide applications would control them before they had a chance to infest the day-neutral strawberries. If successful, this would provide another management tool for berry growers to use to control SWD without applying pesticides to the strawberries.

For the first two years SWD had been in CT, commercial berry growers had one management tool available to them with varying degrees of success – pesticides. Materials are applied every 3-7 days (Concklin 2012 survey) and growers must rotate between pesticide classes to reduce the potential for resistance development. Organic growers have two pesticides available to them for SWD, spinosad (Entrust) and a pyrethrin (Pyganic) (Concklin, 2013). Unfortunately, the pyrethrin has a 0 to 2 day efficacy and the females have been known to be knocked down, bounce back and lay eggs. Non-organic growers have several more chemical options available.

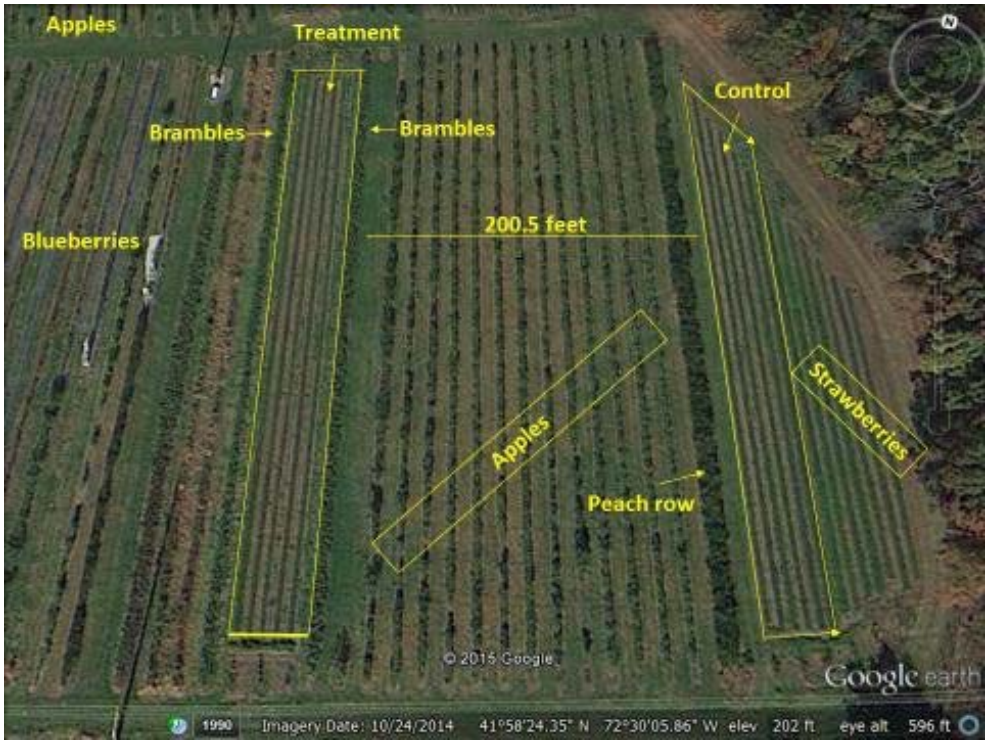
Past pesticide applications have been minimal to non-existent in berry crops in CT. Many blueberry growers had never applied a pesticide to their crops, bramble growers would apply an occasional fungicide for *Botrytis* fruit rot, depending on the season, and with dry summers that was not necessary, day-neutral strawberry growers could skip the usual insecticides that were often needed with June strawberries because of pest life cycles and occasionally applied a fungicide for *Botrytis.* (Concklin knowledge of berry growing practices) The advent of the SWD increased costs by the inclusion of pesticide applications, the purchasing of pesticide application equipment and monitoring. It reduced the number of days many farms would be open for pick- your-own to allow for pesticide applications and the required pre-harvest-interval of the particular pesticide material. (Concklin 2012 survey; personal communication with many growers).

In CT and other states impacted by the SWD, a variety of trap colors and styles have been tested to try to determine which is most effective. Red cups with small holes were used in New England and CT in 2012. In 2013 red cups with black tape were used. It had been shown that the SWD are attracted to the black on the cup (April 24, 2013 New England SWD Team meeting, Windsor, CT). Baits that are hoped to be more appealing to the SWD than the ripening fruit are being developed and trialed. Michigan preferred apple cider vinegar (Isaacs, R, 2010). New England and CT used that same bait in 2012 but found it is not a first indicator of when the SWD have entered a field. In 2013 a yeast-whole wheat flour bait was used that was found by Dr. Richard Cowles, CAES, to be more effective (http://www.uvm.edu/vtvegandberry/SWD/2013_SWD_Trapping.pdf), but again it was not a first detector. In 2013, 'trapping out' was tested in CT, RI and ME using baited traps every 20' throughout the planting. It was not success or cost effectiveness. Kumbucha lure and Trece lures were found to be very effective in monitoring for SWD but not as a first detector.

Project Approach

Brian Kelliher, participant grower, laid the plastic mulch and drip tape the beginning of May 2014 in the trap crop plot and the check plot. The strawberry order was picked up at Nourse Farms on May 16, 2014.

The trap crop plot (TCP) consisted of five 350 ft. long double rows of Seascape strawberry, surrounded by an established 365 foot long row of Caroline fall raspberry located 12 feet to the east, and 6 feet to the north and south; and a 365 foot long row of Polana fall raspberry located 12 feet to the west of the Seascape strawberry. The check plot (CP) consisted of five double rows of Seascape strawberries planted 200.5 feet to the east of the trap crop plot with mature apple and peach trees located between the treatments.



Drip irrigation was installed on the strawberries and the north and south end raspberries. Drip irrigation already existed on the east and west raspberry rows. Straw mulch was applied in late fall 2014 to all the strawberries.

Mature strawberry and raspberry fruit were randomly sampled weekly for the presence of SWD larvae beginning the end of July 2014 & 2015, and continuing through October in 2014 and through September in 2015. 100 fruit samples from each of CP strawberries, TCP strawberries and raspberries were placed in salt water for approximately 15 minutes. An Optivisor 10X lens was used to detect larvae.

Kumbucha lure trap was initially used in 2014 but was changed to the commercially developed Trece traps and SWD lures with vinegar as the drowning solution. Traps were set out in the raspberries and strawberries and checked weekly. The drowning solution from the traps was collected weekly and poured through coffee filters. The filters were placed under a microscope for ease of counting SWD adults. New drowning solution was added to the traps weekly.

One larvae was found in the raspberries and 1 male SWD in a trap on July 30, 2014. No SWD found in the TCP or CP strawberries. Pesticide applications began on the raspberries on August 5. No additional No signs of SWD were found in the TCP or CP strawberries until September 4. At that time 6 SWD larvae were collected in the raspberries, 1 larvae in the control strawberries and 0 larvae in the treatment

strawberries. Few SWD were caught in the Kumbucha lure traps in the treatment or control plantings. The traps and lure were changed to the Trece traps and lures which had been shown in other states to be as good or better than the Kumbucha lure for monitoring SWD populations (noted at the SWD Regional meeting held in Highland, NY on

September 16, 2014). At the same time, the number of SWD observed flying around the CP strawberries increased drastically. Only moderate numbers of SWD adults were observed flying around the treatment strawberries. Trap counts of adult SWD went up with the new lures. SWD larvae infested fruit increased slightly in the control strawberries in October whereas the strawberry treatment infested fruit was almost nil. Monitoring and data collection ended on October 23, 2014 for the first season.

Monitoring of Spotted Wing Drosophila (SWD) commenced on August 18, 2015 based on observations in 2014 as well as fruit phenology, with fruit inspections which consisted of random sampling of ripe fruit collected and put in a salt-water solution. Larvae present would float to the surface to be counted. Trece traps and lures were set out in the treatment and control areas to monitor for the presence of the SWD in the planting. This continued on a weekly basis through September 28, 2015.

Fruit in the check plot diminished significantly by September 22, 2015 resulting in a lower number of fruit than the norm for larvae detection. On September 28, there was virtually no ripe fruit in the control plot.

B. Kelliher sprayed the brambles for SWD with insecticide plus sugar. In 2014, eight applications were made on a 4-12 day schedule, and in 2015, nine applications were made on a 5-9 day schedule. No insecticides were applied to either the trap crop strawberries or check strawberry plot. Spray applications were applied from a single side of the sprayer toward the brambles and away from the strawberries.

In 2014, larval infestation (4%) in the strawberries protected by the trap crop lasted for a single week which ended on October 2nd. The raspberry larval infestation occurred during a five week period from September 4 through October 2, and ranged from 2% to 18%. The infestation in the check plot strawberries began September 4 and continued off and on weekly through October 16, with infestations of 2%, 0%, 4%, 0%, 6%, 12%, and 24%.

In the strawberries protected by the trap crop, no SWD were caught in traps the first three weeks although they were present in the traps in the raspberries during this interval. Trap captures began in the trap crop plot strawberries September 11, peaked October 2 and continued in lower numbers through October 23. Raspberry SWD trap captures were immediate beginning on August 21 and sustained throughout until Oct 23. Although SWD were present in the trap crop plot strawberry trap, they appeared to prefer the raspberry fruit over the strawberry fruit. SWD trap captures in the check plot strawberries began August 29 and continued through October 23.

In 2015, larval infestation in the strawberries protected by the trap crop occurred only during two weeks, August 24 and September 8, at 2% each week. The raspberries were infested beginning August 24 and continuing through September 28 with a range of 2% to 14 % with the sole exception of the week ending on September 8 which had zero fruit infested. The check plot strawberry infestation was almost identical to the trap crop-protected strawberry infestation: two weeks at 2% each, the remainder weeks had 0% infestation. Although there was a difference between the strawberry fruit infestation in the two plots in 2014, there was no significant difference in 2015.

The goal for this project was to achieve at least 90% SWD-free strawberry fruit in the trap crop protected strawberries. Based on these results, the use of raspberries surrounding the strawberries made a difference in the strawberry fruit infestation of SWD. Trap crop-protected strawberries never had less than 96% SWD-free fruit in either year, so fruit were marketable throughout the experiment.

Infestation rates of the check plot strawberries were expected to be very high as no insecticides were applied. However, infestation rates in the check plot were lower than expected and well within the 90% SWD-free goal, with the exception of the weeks of October 9 and 16, 2014. During those two weeks in October, SWD-free fruit dropped to 88% and 76% respectively – an unacceptable level for commercial production. Those two weeks also correspond to the highest SWD trap captures in the check plot.

It is possible the distance between the two plots at 200.5 feet, even with tree fruit between, was not enough to overcome the attractiveness of the raspberries in the trap crop plot, and resulted in low populations in the check plot strawberries.

Data from the two years of this study indicate that raspberry fruit are more attractive to SWD than strawberry fruit and can function as an effective trap crop for strawberries. This pilot study shows promise for the use of PTC for SWD management. Trials are needed at additional farms to discern if the relationship holds in different environments.

Project Partner: Brian Kelliher was an integral part of this project by providing the project location, planting labor, weed management, irrigation and pest management.

Goals and Outcomes Achieved

Goal**:** Develop a spotted wing drosophila management tool utilizing the trap crop concept that presently works with vegetables. If successful, this method will reduce pesticide applications that are currently required to produce a SWD-free marketable crop.

> Actual: All activities are listed above that were completed in order to achieve the goal. Pesticide applications were reduced using perimeter trap cropping for SWD. Without the brambles

to intercept the SWD, the strawberries would have been sprayed on the same schedule as the brambles resulting in an additional $436 in 2014 and $505 in 2015 spent on pesticides, labor and application equipment.

Measurable outcome and Target**:** The amount of harvestable day-neutral strawberries within the treatment area as compared to the day-neutral strawberries located away from the treatment area. Day-neutral strawberries will be at least 90% SWD-free within the treatment area and 100% infested in the untreated check day-neutral strawberries. Economic analysis will be conducted looking at cost benefit.

Actual: The treatment strawberries exceeded the target of 90% SWD-free. They ranged from 96%-100% SWD-free throughout the 2-year project. The check plot strawberries were also within the 90% SWD-free zone throughout the project with the exception of two weeks in October 2014 when the SWD-free rates were 76% and 88%.

The cost of treating the 0.23 acres of brambles was $436 in 2014 and $505 in 2015. This covered the cost of the pesticides, labor and application equipment. A single pass was made on each of the bramble rows spraying from the inside towards the outside to avoid spraying the TC strawberries. The cost of treating the TC strawberries would have been an additional $436 in 2014 and $505 in 2015. The 5 rows of strawberries would have been treated in a single pass on the east side blowing to the west and a single pass on the west side blowing east using the same amount of material, labor and equipment as was used on the brambles. By eliminating the pesticide applications to the TC strawberries, the growers saved $941 while producing a strawberry crop virtually free of SWD for two years.

Beneficiaries

Berry growers throughout the northeast USA benefit from the information generated from this project because it has provided important information regarding another practical SWD management option available to them. Many growers of brambles also grow strawberries so encompassing their day-neutral strawberry fields with a single row of fall brambles would be a simple solution. For those organic growers who stopped growing day-neutral strawberries because of the SWD now have an effective tool to utilize. This method also allows growers to save money on pesticide applications by spraying only the brambles, while providing two crops (brambles and strawberries) of SWD-free fruit. Day-neutral strawberries planted alone or not in the vicinity of brambles would require insecticides for SWD-free fruit.

Lessons Learned

This project, as designed, was valuable in answering the questions of whether perimeter trap cropping would work for berry crops, whether it is economical, and also valuable because it generated additional questions that now need to be investigated. I

would implement this study on several farms so the data could be replicated making sure the check plot is further away from the brambles than in this trial. I would also include farms that did not already have brambles planted so that the only brambles would be those on the perimeter of the strawberry field. This comparison between brambles only on the perimeter versus brambles nearby, should provide a better understanding of the effectiveness at intercepting the SWD and help to better understand why the check plot strawberries in this study were not totally decimated by the SWD.

By September 22, 2015 fruit in the check plot diminished significantly resulting in a lower number of fruit than the norm for larvae detection. On September 28, there was virtually no ripe fruit in the check plot. It would have been advantageous to have been able to carry data collection into October to compare to the 2014 data which is when the number of SWD infested fruit in the check plot increased.

Additional Information

A factsheet, titled *Perimeter Trap Cropping for Spotted Wing Drosophila,* was produced and distributed at the CT fruit grower summer twilight meeting on June 15, 2016, Belltown Hill Orchards, S. Glastonbury, CT. It is also on the UConn IPM website (www.ipm.uconn.edu) and was advertised to growers and related industry via the UConn fruit email listserv. It will also be made available at the November 29, 2016 CT Pomological Society's Annual Conference and the UConn Vegetable and Small Fruit Conference on January 9, 2017. The factsheet is attached.

Results of the study were published in UConn's Crop Talk newsletter (Vol 12, No 2, Pages 1, 3), in the UConn fruit grower newsletters distributed via email, and in the UMass Extension Berry Notes newsletter (April 2016, Vol 28, No. 4. Pages 9-10).

Results of the study were discussed with growers as part of a formal presentation about SWD management at the CT Wine and Grape Growers twilight meeting held on August 9, 2016 at Paradise Hills Vineyard in Wallingford CT. The factsheet was also made available at that venue.

Increasing the Value of CT Specialty Crops through Increased Labeling and Access

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Project Summary

Over the last decade there has been a renaissance within the local agricultural sector, especially for specialty crops. Local food sales in 2012 are up by 27% from their 2008 levels to an estimated $6.1 billion. Specifically within Connecticut (CT) local food expenditures in 2012 were estimated to be around 2.5% of total food expenditures (Warner et al. 2012). Taking into account non-food products the impact of local products on the CT economy is considerable. For instance, it is estimated that up to 60% of plants are locally produced. Given the nursery and greenhouse sector is the largest agricultural sector, pre-processing, in CT, the value of local products may rival that of food products (Lopez, Plesha, and Campbell, 2014).

As more consumers seek out local food products, understanding the value of locally grown specialty crops is becoming increasingly important. Notably, determining the value of buy local campaigns (e.g. Connecticut Grown) is critical given many producers rely on local labeling to differentiate their product. However, the value of the CT Grown label is not well understood. Furthermore, how well the CT Grown label attracts and holds consumer attention (ISSUE/PROBLEM) is not understood. Assuming the CT Grown label provides benefits (e.g. increased preference or higher premiums), it is essential to understand reasons producers and retailers are not using this label and the barriers facing CT consumers have in purchasing locally grown specialty crops (ISSUE/PROBLEM). This project conducted research and extension outreach in order to 1) better understand how the CT Grown label attracts and holds consumer attention for fruits/vegetables and ornamental plants via eye tracking technology; 2) identify barriers for fruit/vegetable and ornamental plant producers and retailers to use local labeling; and 3) identify and address CT consumer access to specialty crops via consumer survey (OBJECTIVE). As a result of this project, CT specialty crop producers will better understand how to strategically display buy local labeling to capture consumer attention. Furthermore, policy leaders and industry stakeholders will better understand how to overcome barriers to buy local labeling adoption, while also identifying strategies to increase awareness and consumption by CT consumers that do not have access to specialty crops (IMPORTANCE).

This project meets the state and federal priority issues of “increasing child and adult nutrition knowledge and consumption of specialty crops” and “increasing food access.” Furthermore, this project meets four of the CT Department of Agriculture’s priority issues of: 1) promotion of the CT Grown brand for specialty crops; 2) increasing consumption of CT agricultural products; 3) increasing consumer awareness/education of local agricultural products; and 4) increasing access to healthy, local food.

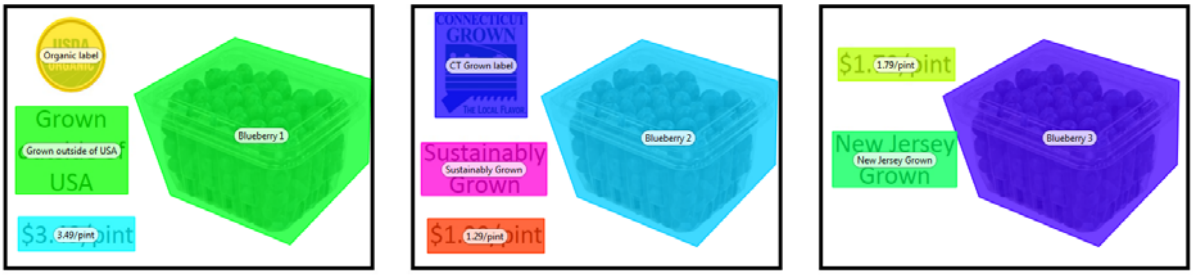
Project Approach

In order to assess consumer valuations and awareness of the CT Grown label a field experiment and online survey were utilized. The field experiment consisted of a choice experiment in conjunction with eye tracking technology. Within the field experiment four products were evaluated (apples, blueberries, sweet corn, and impatiens). The field experiment consisted of 400 consumers (100 per specialty crop) sampled from various farmer's markets as well as in a lab setting. A traditional choice experiment was implemented whereby consumers were asked to evaluate a set of products and choose the one they would purchase. As consumers were doing the choice experiment we were also evaluating their visual attention to various labels using eye tracking technology (ETT).

Consumers sort through numerous product attributes to decide which product to purchase. For instance, in purchasing an apple or impatiens, the consumer might consider attributes such as price, production practices, external appearance, or product origin. Of particular interest to this project we wanted to understand consumer preference and willingness to pay (WTP) for a CT Grown label (both logo and in text form) and how preference may change across different specialty crops. Until recently, businesses have relied mainly on surveys or experiments to identify important attributes; however, innovative new technologies allow businesses to "see what the consumer sees." ETT which works by tracking a consumer's eye gaze across a computer screen and mapping the gaze to the image (e.g. video or picture) being shown. Currently, ETT is used by most Fortune 500 companies to improve packaging, labeling, and displays to increase product attention and increase sales. This project used ETT to: determine if the CT Grown label attracts and hold a consumer's attention; determine if the CT Grown label is more/less effective with fruit/vegetables compared to ornamentals; determine if consumers seeking local specialty crops view the label differently than consumers not seeking local specialty crops. The results of the ETT and choice experiment research, discussed below, will help drive the other objectives of this project which will look at identifying barriers to the CT Grown label by CT producers and retailers and increasing access and availability to CT consumers, notably those in food insecure areas.

Example stimuli

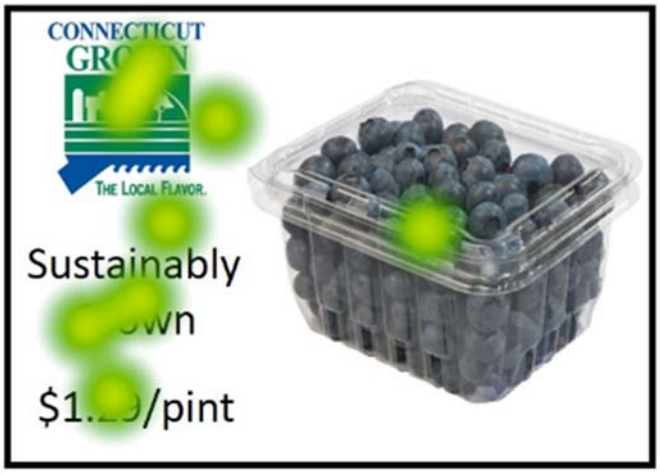
Eye tracking areas of interest



We also implemented a consumer survey of around 1200 Connecticut consumers to better understand the barriers to purchasing more specialty crops as well as to better understand the value of local labeling. Utilizing an online panel provider, consumers were invited to participate in the survey and were asked a variety of questions about their specialty crop purchasing as well as barriers to purchase.

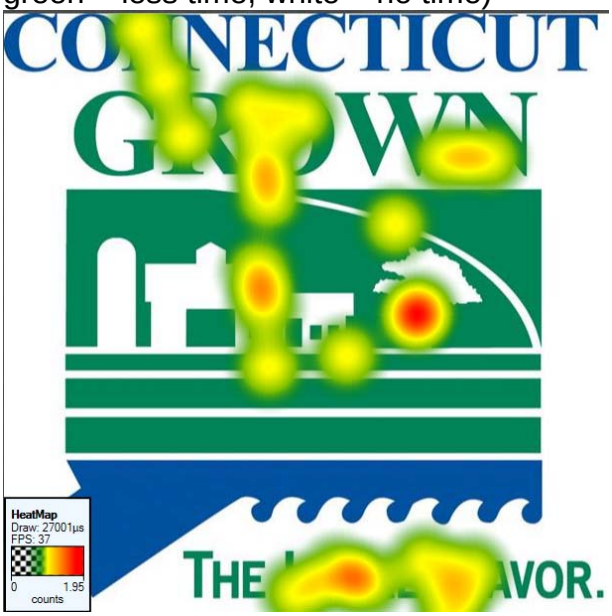
Results from the project found that consumers have specific barriers to increasing purchasing of local specialty crops. Notably price and lack of product are important barriers. With respect to barriers directly related to this project, one in five consumers indicated that lack of labeling was an important barrier. We also found that the CT Grown logo is preferred to a CT Grown text sign as well as the logo gaining and keeping visual attention compared to the text sign.

Example heat map for where consumers looked (red = most time; yellow = more time; green = less time; white = no time)



With respect to the label in general, the CT Grown label received good coverage as respondents by and large looked at the whole label.

Example heat map for where consumers looked (red = most time; yellow = more time; green = less time; white = no time)



Furthermore, approximately 60% of consumers were willing to pay $0.50 (per pound of apples) to $2 more (per half dozen sweet corn) for a CT Grown logo labeled product. Given this was a hypothetical experiment, the true value is most likely $0.25 to $1 more per pound of apples and a half dozen ears of sweet corn, respectively. The CT Grown text label generated about half the premium as the logo. The other 40% of consumers were not likely to pay a premium for a local label. This is what makes charging premiums difficult as retailers must know if their consumers are the ones willing to pay a premium.

Goals and Outcomes Achieved

Goal:	Gain an understanding of the consumer awareness of the CT Grown label
Performance Measure:	Utilize eye tracking technology to measure how the CT Grown label captures consumer attention for fruit/vegetable and ornamentals
Benchmark:	Measure how displays without CT grown labeling catch consumer attention and compare it to displays with labeling.
Target:	Identify 5 barriers which prevent people from being aware (seeing?) the CT Grown label in retail settings and disseminate the information to key policy makers, industry leaders, fruit/vegetable producers, and ornamental producers.

Overall barriers

Consumers participating in the large Connecticut based consumer survey indicated that price and failure to carry local products are key barriers to purchasing more local produce and plants. However, of interest, produce (17%) and plant (26%) consumers indicated that local is not labeled where they shop, thereby, limiting their ability to

purchase more local specialty crops. This is an easy barrier for businesses to tackle as making signage easily seen can help increase local sales.

What are the barriers to your purchasing more locally produced

Attribute	Fruits and Vegetables	Plants
High prices	56%	49%
Lack of products I want	30%	30%
Quality issues	16%	12%
Local not labeled where I shop	17%	26%
Lack of unique products available	12%	25%
Shops do not carry local foods/plants	24%	26%
Consider local a marketing gimmick	6%	6%
Other	10%	10%

Results of the eye tracking experiment and consumer survey provide insights and potential recommendations to current barriers associated with local labeling.
Barriers Identified from this study (4 major barriers were identified):

- Failure to label
    - Around 20% of consumers indicate that local products are not labeled as such where they shop.
    - Solution: Education campaign to retailers of local specialty crops indicating the importance of labeling as 1 in 5 consumers note failing to label is a barrier to increased purchasing.
- Busy displays make seeing CT Grown labeling harder
    - The CT Grown logo provides a more effective way of getting consumers to see locally grown messaging as the logo is seen faster and fixated on longer
    - Solution: In displays where there is a lot of product variety or other outside stimuli the CT Grown logo can grab and keep attention better than CT Grown in text format. The CT Grown logo would also be preferred in locations, e.g. grocery stores, where consumers are moving through at a rapid pace.
- Use of CT Grown in text format.
    - Using text instead of a logo to denote local was found to not be as important (valuable) as using a logo. This applies to valuation of the message as well as how long it takes to find the message. Across all four specialty crops tested, the logo generated a higher premium than text.
    - Solution: The CT Grown logo seems to be providing extra value (potentially more validation, similar to a certification) for many consumers so the logo not only generates faster and longer visual attention but also more value.

- One size fits all approach.
    - All CT consumers will not respond to local labeling, especially if the produce has a higher price. Local labeling can help to differentiate local produce and plants making it easier for those seeking local to find it.
    - Solution: Businesses need to understand that not everyone will purchase local and not everyone will pay a premium. However, many consumers will purchase if it is labeled in some way, with the logo being preferred over text.

Goal:	**Fruit/vegetable and ornamental producers/retailers will utilize the CT Grown label**
Performance Measures:	Survey various retailers of fruit/vegetables and count the number using CT Grown labeling; Ask fruit/vegetable and ornamental producers/retailers attending one of the project workshops if they are currently using CT Grown labeling; after attending the workshop ask if they intend to use CT Grown labeling
Benchmark:	Give a pre-workshop survey of those attending the workshop to benchmark how many are using CT Grown labeling
Target:	25% of those attending the workshops sponsored by this grant that are not currently using CT Grown labeling will begin using CT Grown labeling

Smart Marketing = More Customers, More Profits
CAES in New Haven, CT on November 3rd that was co-sponsored by CT DOAG 59 attended including wholesale and retail greenhouse growers, wholesale nurseries, garden centers, landscape firms, and industry support (education). Of those that completed evaluation forms, 100% rated the conference as useful to very useful, 93% stated that they learned something that would cause them to adopt a new practice within the next year and 93% stated that they would benefit economically as a result of the program.

Some comments included:
- *Great panel discussion*
- *I loved the survey results of consumer perceptions of pest controls. Good information about us labeling positive messaging and our telling our story*
- Your lecture *on Marketing in Connecticut was* well received. 100% rated it as useful to very useful on their evaluation forms.

Growing Container Grown Greenhouse Vegetables
Litchfield County Extension Center in Torrington, CT. Dec 16, 2014 and was co-sponsored by CT DOAG.

The conference was attended by 61 wholesale and retail greenhouse growers, vegetable growers and educators. Of those that completed evaluation forms, 90% stated that they would adopt a new practice within the next year as a result of what they learned, and 88% would benefit economically.

Some comments included:

- *Reinforced what is currently being done*
- *All the speakers were good.*

Other industry programs:
CT Vegetable and Small Fruit Growers' Conference, South Windsor, CT, Jan. 15.

Additional detail on academic presentations and publications is submitted below (under Additional Information)

Beneficiaries

The main beneficiaries of this project included fruit/vegetable and greenhouse/nursery producers and retailers. As noted by the comments made on the evaluation forms, the conference attendees found the program useful and over 90% indicated they would be putting information they learned in practice within their operation.

Key results for beneficiaries:

1) Local products should be labeled. It will not help with all consumers but can help with some.
2) The CT Grown logo works well for busy displays
3) Approximately 60% of consumers were willing to pay $0.50 (per pound of apples) to $2 more (per half dozen sweet corn) for a CT Grown logo labeled product. Given this was a hypothetical experiment, the true value is most likely $0.25 to $1 more per pound of apples and a half dozen ears of sweet corn, respectively.

Lessons Learned

- Not all consumers are willing to pay a premium for locally labeled specialty crops.
- The CT Grown logo is preferred to a CT Grown text sign as well as provided the added benefit of being seen faster and keeping visual attention longer.
- Four key barriers were identified:
    - Failure to label
        i. Solution: Education campaign to retailers of local specialty crops indicating the importance of labeling as 1 in 5 consumers note failing to label is a barrier to increased purchasing.
    - Busy displays make seeing CT Grown labeling harder
        i. Solution: In displays where there is a lot of product variety or other outside stimuli the CT Grown logo can grab and keep attention better than CT Grown in text format. The CT Grown logo would also be preferred in locations, e.g. grocery stores, where consumers are moving through at a rapid pace.
    - Use of CT Grown in text format.
        i. Solution: The CT Grown logo seems to be providing extra value (potentially more validation, similar to a certification) for many

consumers so the logo not only generates faster and longer visual attention but also more value.

- One size fits all approach
    i. Solution: Businesses need to understand that not everyone will purchase local and not everyone will pay a premium. However, many consumers will purchase if it is labeled in some way, with the logo being preferred over text.

Additional Information

Review/Working Papers

Katz, M.*, B.L. Campbell. "Valuation and Visual Attention Associated with Local Labeling: Logo versus Text."

Qi, L.,* A. Rabinowitz, Y. Liu, and B.L. Campbell. "Buyer and Non-Buyer Barriers to Purchasing Local Food." Accepted Agricultural and Resource Economic Review

Zaffou, M.,* A. Rihn, B.L. Campbell, H. Khachatryan, and O. Hoke*. "Influence of Product Type and Perceptions on the Geographic Boundary of Local Plants and Food." In-Review

Academic: Conference Presentations

Campbell, B.L., M. Katz,* and Y. Liu. 2015. **"**The Role of Product and Experiment Location." Invited Track Session (Behavioral Economics**):** Investigating Decision Making: The Inclusion of Eye Tracking in Economic Experiments. Agricultural and Applied Economics Association (AAEA): San Francisco, CA; July 26-28. (Speaker)

Katz, M.,* B.L. Campbell, Y. Liu. 2015. "Using Eye Tracking Technology to Provide Improved Policy and Marketing Strategies." Southern Agricultural Economics Association (SAEA): Atlanta, GA; Jan. 31-Feb. 3. Invited Symposium within the Eye Tracking and Neuromeasurement Tools for Marketing Research session.

Industry Presentations:

Campbell, B.L., 2015. "Introduction and Overview of Marketing in CT." Smart-Marketing = More Customers, More Profits workshop sponsored by a CT Department of Agriculture Specialty Crop Block Grant, New Haven, CT, Nov. 3.

M. Katz,* B.L. Campbell, and Y. Liu 2015. "Examining the Effectiveness of CT Grown Labeling with Eye-Tracking Technology." CT Vegetable and Small Fruit Growers' Conference. South Windsor, CT, Jan. 15. (Speaker)

Katz, M.,* B.L, Campbell, and Y. Liu. 2014. "How Connecticut Grown Labeling Catches Customer Attention and Impacts Decision Making." Growing Container-Grown Greenhouse Vegetables Workshop, Torrington, CT, Dec. 16th. (Speaker)

Katz, M.,* B.L, Campbell, and Y. Liu. 2014. “How Organic Local and Organic Labeling Influence Consumers.” New York Produce Show and Conference, New York City, NY, Dec. 3rd.

Campbell, B.L. 2015. “Consumer Eye Tracking Technology: Marketing and Labeling.” Agricultural Retail Benchmark member meeting by Farm Credit East, Norwalk, CT, June 15. (Speaker)

Campbell, B.L. 2015. “The Role of Labels: What is the Right Label for You?” Intensive Plant Nutrition Workshop for Fruit Growers, South Windsor, CT, March 17. (Speaker)

Development of sterile, non-invasive burning bush (Euonymus alatus 'Compactus') for the CT and US green industry

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Project Summary

Burning bush (*Euonymus alatus 'Compactus*) is a popular ornamental plant because of its bright red fall color. Although the plant is an important cash crop for the US green industry, with a sale of $39 million/year, it is highly invasive and has been banned in MA and NH and also on warning lists of many states. As such, development and release of sterile, non-invasive burning varieties are in high demand by the green industry, environmentalists and the public. We developed triploid burning bush plants that may be sterile and non-invasive. We propagated these triploid burning bush plants and evaluated their ornamental and non-invasive (seedless) traits under greenhouse and field environment, and also conducted DNA sequencing analysis in order to develop useful DNA markers for the sterile cultivars identified. Our goal is to develop non-invasive burning bush plants for the public use and for the green industry.

Project Goals and Approaches

Goal 1: Propagating and growing 500 stock plants from our triploid plant lines for evaluation experiments

We proposed to use the triploid plant lines we produced for vegetative propagation in tissue culture (micro propagation, under sterile conditions). Our goal was to produce 500 stock plants from the triploid plant lines for ornamental trait evaluations under greenhouse and field environment.

Goal 2: Grafting triploid shoots on mature diploid burning bush plants to confirm sterility of the triploid burning bush plants

We proposed to graft triploid shoots on mature diploid burning bush plants to confirm sterility of the triploid burning bush plants. Burning bush reaches its reproductive stage in 4-5 years but grafting experiments may save 1-2 years' time to confirm the sterility of the triploid plants. Our goal was to produce 50 grafts between triploid shoots and diploid plants, with a 70% survival rated.

Goal 3: Conducting two year evaluation of the triploid plants under field conditions

We proposed to use the vegetatively propagated triploid burning plants in greenhouse and field conditions to evaluate their horticultural and ornamental performance, and sterility. We planned to record their growth habits, their responses to environmental stresses and their general growth performance under field conditions. The parameters we examined include growth rate, branching patterns and tolerance to abiotic and biotic stress factors. Also we planned to carefully evaluate any alterations in growth and developmental patterns.

Goal 4: Developing DNA markers unique to the sterile varieties of burning bush

We proposed to isolate genome DNA from a diploid and representative triploid plants of burning bush, and use the DNA for sequencing analysis. We planned to compare the DNA sequences to identify unique DNA fragment present or absent in these representative triploid plants. Unique DNA markers developed may be useful by the US ornamental industry to reduce unauthorized propagation.

Project Goals and Outcomes Achieved

Goal 1: Propagating and growing 500 stock plants from our triploid plant lines for evaluation experiments

We have vegetatively propagated 510 plants from 12 triploid burning bush plant lines and 430 had been planted in field while the rest have been maintained in greenhouses (See Fig. 1A). In 2016, conventional (diploid) burning bush plants planted in 2013 flowered, and produced normal amounts of seeds. However, many plants of the triploid burning bush plant lines produced no or much reduced seeds. All of these plants will be further evaluated in 2017 and sterile lines will then be identified.

Goal 2: Grafting triploid shoots on mature diploid burning bush plants to confirm sterility of the triploid burning bush plants

We have produced 50 grafts between triploid shoots and diploid plants (See Fig. 1B), with about 36 survived. Some of these grafted shoot produced flowers. However, the number of flowers from these grafts is small and most of these flowers dropped prematurely and thus no fruits were produced. We will evaluate their flowering, fruiting and sterility/seedlessness in 2017.

Goal 3: Conducting two year evaluation of the triploid plants under field conditions

Under both greenhouse and field conditions, most triploid plant lines displayed no obvious differences in morphology and stress responses, and vegetative organ growth and development when compared to the conventional diploid burning plants (See Fig. 1C and D). However, one triploid burning bush plant line displays dwarfism and compactness phenotype (See Fig. 1E). The line may be of commercial value because dwarfism is highly desirable for ornamental plants.

We have observed some triploid burning bush plants produced fruits in 2015 and 2016. However, most of these plants produced very few seeds (less than 10 per plant) while the same age diploid plants grown under identical conditions produced hundreds or thousands of fruits per plant. We have also observed that some triploid burning bush plant lines have better root systems when grown in containers under greenhouse conditions but the phenotype needs to be confirmed under field conditions.

We have been closely working with Prides Corner Farms on field evaluation experiments. A woody ornamental plant expert from Prides Corner Farms periodically visited us and inspected our field evaluation site during the growth

seasons, and provided us feedback and suggestions regarding the plant evaluation and releases. We should be able to identify and release some triploid burning bush plant lines to Prides Corner Farms and other nurseries in 2017.

Goal 4: Developing DNA markers unique to the sterile varieties of burning bush

We have conducted DNA sequencing analysis for two representative triploid and one diploid lines. Because of the amount of work involved in analyzing the DNA sequencing data and identifying unique DNA sequences present or absent in the triploid burning bush lines, no meaningful results can be provided at this time.

Beneficiaries:

It is expected that after we release the sterile triploid burning bush, many states, such as Connecticut, New York, New Jersey, Maine and Illinois, will likely use our sterile varieties. The Connecticut Nursery and Landscape Association has announced pending switch to sterile burning bush we developed once we release the plant. Experts anticipate that the sterile burning bush varieties may help restore the shrub's prominence in the commercial market place. Further, burning bush is highly popular and also invasive in many regions in Canada. The sterile burning bush varieties may provide an excellent opportunity for the US green industry for both domestic and international markets.

Lessons Learned

Some triploid plants produced very small number of flowers or fruits in 2015 and 2016 but many produced no flowers and fruits/seeds and thus these plants could be sterile. Based on the two years' data, we could have concluded which ones were sterile and releases these plants to nurseries as we proposed in the proposal. However, with a small number of flowers and fruits produced, we feel that additional data from 2017 or even 2018 are needed before releasing them to the industry.

The reason for the delay in flowering and fruiting observed in our triploid burning bush in the triploid burning bush planted in the field is not known. One possibility is that all triploid burning bush plants were propagated through micro-propagation. Developmental stages of micro-propagated plants can be very different from those of stem cuttings derived from shoots of mature burning bush plants. Theoretically, plants from micro-propagation and also derived from endosperm tissues directly could have a longer juvenile phase. Another possibility is that the delay in flowering and fruiting observed the triploid burning bush plants could be due to the change in chromosome numbers. The diploid burning bush plants, however, flowered and fruited normally in 2015 as we originally anticipated.

We also learned that some triploid burning bush lines produced fruits with seeds even though the number of fruits/ seeds per plant is much reduced.

Additional Information:

The triploid Burning Bush Project Report

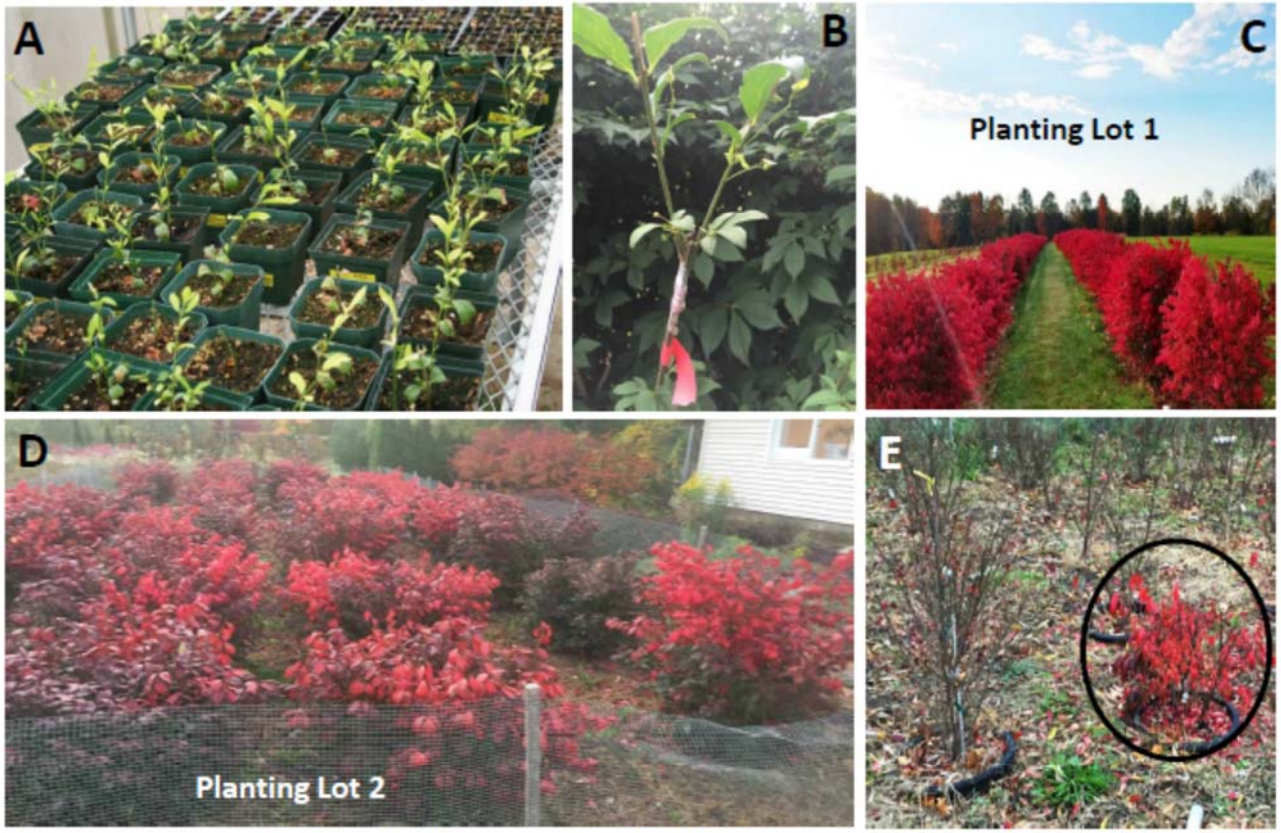

Figure 1: Representative photos for the proposed goals. A) Representative vegetatively propagated triploid burning bush plants grown in a greenhouse before released for the field evaluation (Goal 1). **B)** A triploid burning bush shoot was grafted on a diploid plant to accelerate evaluation of its sterility (Goal 2). **C & D)** Two of the three filed planting lots to evaluate the triploid burning bush plants' ornamental performance and sterility. **E)** One of the triploid burning bush lines (in the circle) chosen for the DNA sequencing analysis. This particular line also displays dwarfism and delay in lead dropping in late fall (Goal 4).

Enhancing the competitiveness of hops as a new specialty crop in Connecticut

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Project Summary

In October of 2012 a meeting was held between craft brewers and growers interested in producing hops as well as Connecticut Agricultural Experiment Station (CAES) researchers and Department of Agriculture representatives. This meeting was organized to share ideas concerning the potential market for locally grown hops and interest in production by CT farmers. The discussion clearly demonstrated a potential new market for local hop production in Connecticut to support the rapidly expanding local craft brewing industry. Representatives of five CT breweries and the CT Brewers Guild President expressed support for local hops production. Hops were grown in the Northeast in the past but production moved west as a result of disease problems such as downy and powdery mildews. New cultivars have been developed with resistance to some of these pathogens and hops have become a successful crop in other Northeast states. For example, New York State has over 30 growers producing over 60 acres of hops and has added a hops specialist to support this new industry. Hop production could result in farm receipts of $18,000 to $22,500 per acre based on potential average yields of 1,500 lbs. per acre at $12 to $14 per pound. Growers in Connecticut were interested, but one conclusion of our October meeting was that 'researchers need to experiment, not farmers', in other words, research to determine the feasibility (benefits and risks) of hop production in CT was necessary before growers would commit the substantial investment required to establish local hop yards.

To follow through on this, we proposed in this project to determine the feasibility of hop cultivation and production at CAES Research Farms in Windsor and Hamden CT. We evaluated a number of high alpha acid disease-resistant hop cultivars as well as traditional high trellis versus low trellis systems. Low trellis systems were constructed to utilize existing tobacco shade tent structures. Plant vigor, cone yields, and disease and insect pest problems were evaluated over the 3 years of this project. Researchers have shared data and conclusions with commercial growers and other researchers or extension personnel interested in producing Connecticut-grown hops in meetings, one-on-one, and in publications. Local hop production would add a new, high value specialty crop in Connecticut and also enhance the local craft brewing industry. This was a multiple grower-requested project that was seen as a necessary first step to the development of this new crop.

Project Approach

To conduct this project we established new high and low trellis hopyards at two locations (Windsor and Hamden) in Connecticut. We grew the plants, learned and demonstrated growing, training, integrated pest management and harvest techniques and demonstrated these techniques to potential growers. We also conducted outreach to educate growers and the public about our findings in a timely manner.

Establish 5 hop cultivars in replicated plots in high and low trellis systems in Windsor and Hamden CT, train bines

Potted hop plants (Summit, Alpharoma, Cascade, Newport and Perle) were obtained and established in replicated field plots in 2013 under high and low trellis systems at the Valley Laboratory Research Farm in Windsor and at the CAES Lockwood Farm in Hamden, CT (Figure 1). Drip irrigation was installed and utilized. In 2014, plants in Windsor were trained and hops harvested. Bines were again thinned trained and grown in Hamden and Windsor in 2015 and 2016. Lower leaves were removed to reduce disease pressure and plants were inspected/scouted on a routine basis to identify pest and disease problems. Hops from the Hamden location were harvested, dried and weighed and samples submitted for quality analyses in 2015 and from both locations in 2016. Fresh (wet) hops were provided to Black Hog Brewery in Oxford CT for quality and brewing characteristics feedback. Black Hog Brewery made an IPA style test brew in 2014, 2015 and again in 2016. The test brew was well received in all years and Black Hog has gone on to purchase wet hops from a commercial hop producer in 2016.

Inspect/scout for insect and disease pests, determine incidence and severity on different cultivars, manage as needed.

Diseases and pests were evaluated consistently (Table 2). The most common diseases and pests are downy mildew, caused by *Pseudoperonospora humuli*, aphids, and mites. In both 2015and 2016, Alpharoma, which is described as tolerant to downy mildew, had by far the most downy mildew leaf symptoms, followed by Summit, Newport and Cascade (Figure 2A and B). Downy mildew seems to spread every year (Tables 3 and 4), but can be controlled with consistent fungicide application and phytosanitary measures. Spraying fungicides, removing weeds and redundant sprouts as well as stripping the upper leaves helps to reduce the spread of downy mildew. During 2013 only the cultivar Alpharoma in the low trellis system showed symptoms. One year later (2014) the pathogen spread to Summit and Perle in the low trellis system. In 2015, downy mildew was observed in Alpharoma, Cascade and Newport in the low and also in the high trellis systems as well as on plants of the cultivar Perle in the low trellis system, however Summit didn't show any symptoms this year. All varieties had some level of downy mildew in 2016. All plants were treated with fungicide after disease evaluation to avoid further spread. No powdery mildew was observed in 2013, 2014, 2015 and 2016. Spider mites were controlled by horticultural oil application before bloom and by the release of commercially available predatory mites (*Amblyseius andersoni*) in June. However, in 2015 and 2016, a novel pest, the potato leafhopper, appeared in the hop yards in Windsor as well as Lockwood and caused severe damage on the leaves (Figure 2C - E). It could be controlled by insecticide application.

Measure shoot weight at the end of the season as an indicator of hop plant vigor

Hops were weeded, trimmed, and trained, regularly. Hop yields were as high as 500 lbs. dried hops per acre in 2014; 235 lbs. per acre (69-78% moisture wet hops) in 2015 (Table 1) and 1600 lbs. dried hops per acre in 2016. Yields in 2015 were lower due to moisture stress and damage due to leafhopper feeding. The harvest data in

2014 to 2016 showed that the varieties Cascade and Summit have the most well-adapted growth process. Perle, a German breeding line, had the smallest growth and lowest yield when compared to the other cultivars. Furthermore, in 2014, the high trellis production system was more fruitful for Cascade, Alpharoma, and Newport compared to the low trellis system. Yields in the low trellis were 4% to 53% lower than yields in the high trellis for Alpharoma, Cascade, Newport and Perle. Summit (a semi-dwarf variety) yield was 49% higher in low than in high trellis. In general, the plants didn't look as healthy as last year and had a low yield, because of the lack of water and the infestation by leafhoppers (Table 2). The cultivar Perle especially but also Summit were badly affected. Perle was underdeveloped and highly susceptible for pests. Perle might be replaced with new varieties customizing the local hop market's demands. However, the quality, the content of Alpha acids, Beta acids, which are responsible for the flavor of beer, and hop storage index, which describes the amount of Alpha acid potential lost in 6 months at 68°F, were assessed by submission of samples to the analytic laboratory of University of Vermont. Perle was not determined because of the low impact and bad condition. All hops, except Newport, showed a high quality compared to the average contents (Table 5).

Conduct education/outreach

Drs. Katja Maurer and Jim LaMondia spoke to attendees of the CAES Plant Science Day open house at the Hamden hopyard demonstration plot in 2015 and 2016. In addition, forty-three people attended the Connecticut Agricultural Experiment Station's first hops research meeting held at the Valley Laboratory on August 20, 2015. Dr. Jim LaMondia and Dr. Katja Maurer welcomed growers and spoke about current hop research, toured field plots and presented production data and management strategies. Dr. Victor Triolo spoke about low trellis hops and greenhouse hops. HopsHarvester of Honeoye Falls NY conducted a demonstration of a PTO-driven hops combine. Brewers, growers and interested participants ended the meeting with a roundtable discussion of the future of the hops industry in Connecticut. Drs. LaMondia and Maurer met with a number of individual growers or potential growers and conducted diagnostics on hops submitted with problems.

Sixty-five people attended the Connecticut Hop Growers Association first grower meeting held at the CT Agricultural Experiment Station Valley Laboratory on June 23, 2016. CHGA President Alex DeFrancesco welcomed growers and spoke about current status of hops and malting barley. Dr. Jim LaMondia and Dr. Katja Maurer spoke about hop culture and pest management research, Steve Schmidt of New York spoke about hop yard construction and Jaime Smith of the CT Department of Agriculture spoke about farm grants for new and current farmers. Dr. Jim LaMondia and Dr. Katja Maurer toured hop and barley field plots and presented production data and management strategies. HopsHarvester of Honeoye Falls NY conducted a demonstration of a PTO-driven hops combine.

Dr. Katja Maurer was interviewed by Judy Benson from The Day about the UConn Extension Master gardener class "Growing Hops" (February 12); attended the hop conference in Colchester, VT (February 19); attended the CAES Tobacco Research Meeting held in East Windsor, CT and presented "Growing hops in CT" (110 attendees) (February 23).

Dr. James Lamondia participated in a grower meeting held at the Valley Laboratory to initiate a Hop Grower Association (November 3, 2015, 23 attendees); participated in a steering committee meeting held at the Valley Lab to initiate the Connecticut Hop Growers Association (February 11, 2016); attended the 2016 University of Vermont Hops Conference in Colchester VT (February 18 and 19); was interviewed about hops and hops research by Paul Dockter and Lamott for HomeBrew, an iCRV radio show (March 3); spoke about the latest research on growing hops and malting barley in Connecticut as part of a program sponsored by the Connecticut Farm Bureau in Lebanon CT (April 13, 67 participants); was interviewed about hops research by Alison Kuznitz and Johnathon Henninger for the Connecticut Post (August 3); was interviewed with Katja Maurer about hops research by Nick Leahey for the Journal Inquirer (August 16); interviewed about hops research and resurgence in CT by Sarah Page Kyrcz for the Shoreline Times (August 29); spoke about 'Hop research and production in Connecticut' to the Eastern region International Plant Propagators' Society in Hartford (September 24, 65 people)

Goals and Outcomes Achieved:

Our project goal was to demonstrate the feasibility of hop production in Connecticut by comparison of hop cultivars for marketability and competitiveness. To do this, our performance measure was to collect data concerning the vigor and yield of high value hop cultivars under high and low trellis systems. The incidence and severity of disease and pest problems were to be recorded and the success of management tools determined. Data were to be collected and provided to Connecticut growers considering hop production in at least 2 meetings and as a Station publication posted on the CAES website. The Station was to host a follow-up meeting with growers and brewers at the Valley Laboratory and present a demonstration plot at our annual Lockwood Farm open house on Plant Science Day. A sample of hops harvested from research plots will be supplied to brewers for quality testing purposes. Our target was to identify 1 or 2 hop cultivars appropriate for successful production in Connecticut. Also, as a result of educational meetings, we were hopeful that at least 2-3 growers would consider hop production.

In a comparison of goals with our achievements, we were able to achieve each of the goals that we proposed. We collected data regarding production, identified promising cultivars, held multiple meetings, collaborated with the CT Farm Bureau to hold meetings, provided brewers with locally grown hops for test batches of beer with fresh and dried hops, have posted information in a pdf presentation on our website, and have assisted multiple growers to successfully initiate the CT Hop Growers Association. Hop

production in CT is now underway where no industry existed before, and hops are now being commercially grown and sold in the state.

Beneficiaries:
The groups that have benefitted from this project have been the growers who are now in production, the CT Hop Growers Association, the CT Farm Bureau, and the CT Craft Brewers Guild. CT Nurseries may benefit in the future if hops are propagated locally. When this project was initiated, there was no commercial hop production in CT and interest was just beginning. We have worked with over 25 hop growers or potential growers to give them information about hops, assist them plan a hop yard or manage diseases and pests in a planted crop. There are currently at least 16 acres under production on at least 3 farms, and there have been multiple new plantings which are being established, but not yet in production. Those numbers are not yet available. We have shared hops for testing with approximately a half-dozen breweries and test batches have been brewed. Commercially produced CT hops are being sold for local beer production. We have answered over 250 inquiries concerning hop culture, varieties, site selection and insect and disease management over the course of this project. The CT Farm Bureau is assisting with legislation to create a CT Farm Brewery designation.

Lessons Learned:
This project was consistently ahead of schedule as hops were planted in 2013, and all milestones were completed on time. We have had good collaboration with potential growers and growers. We demonstrated that leafhoppers and ‘hopper burn’ were significant pests of hops in CT, and will need to be managed. They are not common problems in other areas. Also, certain hops recommended in New York State such as Perle and Alpharoma do not perform well or consistently in CT. Alpharoma is listed as moderately resistant to downy mildew in other locations, but was the most susceptible cultivar in our experiments. Positive results included positive feedback received from brewers using local fresh or dried hops and the enthusiasm we experienced for this crop from the general public, hopefully indicating a high level of support for beers brewed with local ingredients.

Additional Information:
Publications:

Maurer, K. A. B. DeFrancesco and LaMondia J. A. 2016. Evaluation of hop cultivation feasibility in Connecticut. Proceedings of the International Plant Propagator's Society 65: in press.

Maurer, K. and LaMondia J. A. 2016. Evaluation of hop cultivation feasibility in Connecticut based on yield, growing characteristics, and susceptibility to diseases and pests. Phytopathology in press.

Maurer, K. 2016. Hops a new specialty crop in Connecticut. Posted online at: http://www.ct.gov/caes/lib/caes/documents/plant_science_day/2016/psd_2016_maurer.pdf

Figure 1. High and low trellis plots in Windsor (A) and Hamden (B), CT, 2015.

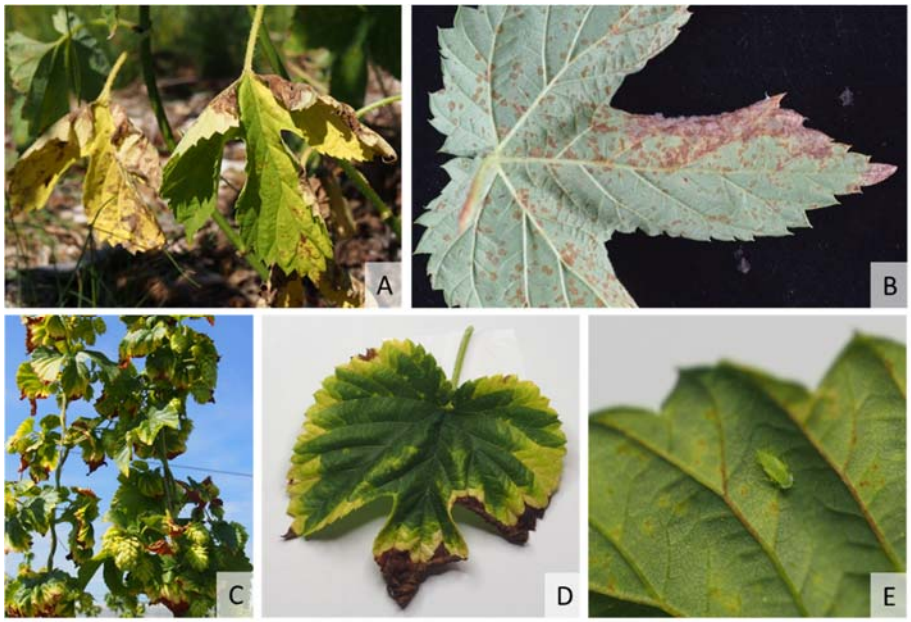

Figure 2. A - B: Symptoms of downy mildew; C - E: Symptoms of leafhoppers and leafhopper burn.

Table 1: Yields (cones) per bine (kg) 2014 through 2016

	High Trellis			Low Trellis		
	2014	2015	2016	2014	2015	2016
Alpharoma	0.53	0.45	----	0.14	0.26	----
Cascade	1.36	0.77	1.31	1.03	0.72	0.88
Newport	0.70	0.33	0.82	0.48	0.30	0.48
Perle	0.29	0.14	0.27	0.29	0.07	0.13
Summit	1.03	0.43	1.40	1.25	0.96	0.54
Cascade	3600 pounds per acre in 2014, 1038 pounds dried.					
	5500 pounds per acre in 2016, 1600 pounds dried					
Newport	1851 pounds per acre in 2014, 533 pounds dried					
	3860 pounds per acre in 2016, 1200 pounds dried					
Summit	3300 pounds per acre in 2014, 950 pounds dried					
	3600 pounds per acre in 2016, 1038 pounds dried					
Perle	770 pounds per acre in 2014, 950 pounds dried					
	1500 pounds per acre in 2016, 430 pounds dried					

Table 2: Date of harvest, moisture content (%), number of downy mildew infected plants, and leafhoppers (average of infected plant per cultivar, 0 = no infection, 1 = little, 2 = moderate, 3 = heavy) 2015

Cultivar	Trellis system	Date of harvest	% moisture	Downy mildew infected plants	Leafhoppers
Alpharoma	high	9/4/2015	78.3	11	1.2
Alpharoma	low	9/4/2015	77.3	13	1.0
Cascade	high	8/19/2015	74.3	1	0.6
Cascade	low	8/25/2015	74.7	6	0.5
Newport	high	8/19/2015	68.9	4	1.2
Newport	low	8/24/2015	72.3	6	1.3
Perle	high	8/24/2015	72.4	0	1.8
Perle	low	8/25/2015		1	1.7
Summit	high	8/19/2015	72.2	0	0.7
Summit	low	8/24/2015	75.6	0	1.5

Table 3: Downy mildew, infected plants 2013, 2014, and 2015; high trellis: Alpharoma, Cascade, and Perle: each 25 plants; Newport: 20 plants; Summit: 5 plants; low trellis: each 20 plants

	high trellis			low trellis		
	2013	2014	2015	2013	2014	2015
Alpharoma	0	0	11	6	6	13
Cascade	0	0	1	0	0	6
Newport	0	0	4	0	0	6
Perle	0	0	0	0	1	1
Summit	0	0	0	0	6	0

Table 4: Downy mildew, infected plants spring 2016 at the Valley Laboratory; high trellis: each 25 plants; low trellis: AlphAroma with 19 plants; Cascade, Perle, and Summit with each 20 plants; Newport with 18 plants

	high trellis		low trellis	
	infected plants	number of spikes	infected plants	number of spikes
AlphAroma	18	7	14	9
Cascade	6	0	5	0
Newport	5	0	9	0
Perle	11	0	4	0
Summit	-	-	15	7

Table 5: Hop quality evaluation as determined by analytical testing in comparison to average published values; HSI = hop storage index

	Alpha Acid	Alpha Acid Average*	Beta Acid	Beta Acid Average*	HSI
Alpharoma	10.2	9	3	3.5	0.210
Cascade	8.5	6	9	5.5	0.210
Newport	11.9	16	7.5	8	0.229
Summit	16.6	17	6.1	4	0.259

* Source: http://beerlegend.com

Keeping it Local for the Next Generation of Apple Consumers

CT Apple Marketing Board
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Project Summary

The main goal of the CAMB efforts was to increase awareness of the apple crops and orchards in Connecticut, and utilize print, web and social media to its best potential. Our website was stagnant and not interactive, we had no childrens' marketing program, and mobile aspects of websites and communications were becoming the norm, instead of a specialty. Our social media was fairly new, our Facebook presence was marginal and we needed to reach out and grab our consumers' attention in any and every way we could. Print advertising was not an asset any longer and there was a need to upgrade our marketing efforts in a broader category and drive consumers to where the orchards are.

Project Approach

In order to accomplish the projects, materials were gathered, photos and videos were taken, the website was updated, graphics for print and digital mediums were created and plans were put into motion. Projects included:

1) A new and improved highly visual website readily available from desktop, tablet or smartphone. http://www.ctapples.org/

2) New CT Apples mobile APP, making it easy to find orchards and information from any smartphone or tablet. It allowed push notifications to any specific geographic area.

3) Updated print information for distribution at orchards, presentations and public venues including:
    - Childrens' Brochures
    - Growers Brochures
    - Variety Brochures
    - Postcards
    - Apple Variety Posters
    - "How Does an Apple Grow" poster
    - 24 page PowerPoint "How an Apple Grows"
    - "What's New in 2015" for Orchards
    - Educational Sequence cards to accompany "The Apple Riddle" with Ag in the Classroom Volunteers
    - Signage

4.) Created QR Codes for:
    - Orchard Row Signs (21 the most popular apple varieties)
    - Point-of-Purchase signage (21 the most popular apple varieties)
    - Web graphics
    - Mobile APP signage

- Web signage
- Downloadable PDF for retail use and educational activities.

5.) Loyalty Programs:
- Children's Passport and tote bag
- Mobile APP loyalty program
- Loyalty Card Program

6.) Radio and Print Ads
- 2/3 page print ad and medium digital ad for "CT Grown" Magazine , Jan 2017
- 15 second radio ad spots for WNTY and WMRQ (60/68)

7.) Social Media Programs
- Created ads directed to Facebook and Website engagement to increase traffic and fan base.
- Built up our Pinterest boards and promoted on Facebook
- Added Instagram to reach another audience and also cross-promote posts efficiently on Facebook and Twitter at the same time.

Project partners instrumental in getting the word out, which included (but not limited to) : CT Department of Agriculture , Start with Half A Cup, CT Department of Education'CT Department of Administrative Services, UCONN Extension;' CT Pomological Society, CT Food Corp, End Hunger CT ' Buy CT Grown

Goals and Outcome Achieved

Our website, mobile APP and Social Media sites became a hub of activity and a resource for consumers and orchards alike. We networked with Industry Partners to spread the word and get the most use out of all of our projects. Our original 696 Facebook base increased to over 11,933 fans. We increased our Pinterest, Twitter and Instagram following, which had no baseline at the beginning of the project.

The Children's brochure was extremely popular and requests for reprints or files the orchards could print themselves were requested. Posters for "How an Apple Grows" and "Apple Varieties" were requested and reprinted. They were handed out at presentations, and sent to Food Corp and CT Food Service Directors for distribution throughout the CT schools.

The children's programs were well received between Ag in the Classroom and our Story-telling educator. Over 40 classes received sequence cards to go along with the book. Six schools were involved with the story telling / educational programs. Each school ranged from 2-3 classes to the entire school to learn about apples.

Expected measurable outcomes:

- Total budget: $3,000/year ($6,000 over 2 years); entirely from CAMB
- 5 types of coupon or loyalty program redemption:
  - *Loyalty program via smartphone app***:** $4.00 discount as reward after four visits (with purchase). Allocate $600/year; allows for up to 150 redemptions (result of 600 visits to orchards). Outcome: 125 redemptions / $500
  - *Non-smartphone loyalty program (punch-card):* $4.00 discount for four visits (with purchase). Allocate $480/year; allows for up to 120 redemptions (result of 480 visits to orchards). Outcome: No reported redemptions
  - *Single-use coupon printed from Apple Marketing Board website:* $2.50 discount to apply to any apple purchase at a member orchard. Allocate $480/year; allows for up to 192 redemptions (result of 192 visits to orchards). Outcome: No reported redemptions
  - *Single-use coupon distributed at live outreach educational marketing events:* Same $2.50 discount to apply to any apple purchase at a member orchard. Allocate $480/year; allows for up to 192 redemptions (result of 192 visits to orchards) Outcome: 2 coupons redeemed $4.00
  - *Children's loyalty program:* "Passport" (activity booklet): $4.00 discount for completion of the passport's 4 activity pages (1 per orchard visit). Allocate $960/year; allows for up to 240 redemptions (result of 960 visits to orchards) *Outcome:* 115 redemptions / $460 / 4.6%
  - *Increase use of online sources to increase consumer interest and knowledge of CT Apples:* Outcome: Baseline Facebook 2012 - 696 fans / 4425 reach per week 2016- 11,933 fans =1614% increase / average 30,634 weekly reach= 592% increase
  - *Show an increased impact of online/social media and mobile app for orchard traffic and sales.* Outcome: 597 Android sessions / 586 Apple sessions (no baseline)
  - *Increase orchard traffic and sales using outreach program at schools. Outcome: Due to poor participation in other coupon programs we shifted our efforts to more posters and education via our storyteller/educator and Industry Partners. It is difficult to establish the financial outcome.*

Goal 1: Increase use of online resources to increase consumer interest and knowledge of Connecticut apples / Collect and analyze usage statistics for ctapples.org, Facebook page, and mobile app.
Target: 25% increase per year

Outcome:
Facebook Accesses per week: Total views
(2013 average) no record 2013
2014: 206450
2015: 1332706 / 545% increase
2015: 2455150 / 84% increase

Facebook Fans

Year	Start	End	Increase	increase %
2013	696	4843	4147	595
2014	4843	9231	4388	90
2015	9231	10071	840	9
2016	10071	12100	2029	20
Total	696	12100	11404	1638

Facebook engagement and reach				
Year	Average weekly engagement	increase	Average weekly reach	increase
2014	219		3713	
2016	230	5%	6689	80%
2016	282	22%	7365	10%

Mobile App:

2014: 0
2015: 224 Apple 166 Android
2016: 586 Apple 597 Android
203% Increase

Web visits:
2014: no data available
2015: 5070 sessions
2016: 5748 sessions

Goal 2: Show an increased impact of online/social media and mobile app for orchard traffic and sales. / Single-use coupons and a loyalty program for frequent customers) available via website, Facebook and mobile app; redeemable at orchards. We will count the number of accesses, number redeemed; Track website, Facebook and mobile app statistics separately. Distinguish between one-time coupon usage or loyalty programs.
Target: There will be at least a 10% redemption rate of one-use coupons and completed loyalty programs

Outcome:
5% redemption Loyalty Cards

Goal 3: Increase orchard traffic and sales using outreach program at schools. / Discount coupons, redeemable at member orchards, will be distributed at schools and will be counted as they're redeemed /
Target: There will be at least a 10% coupon redemption rate

Outcome:
We had planned to do a CT "Ag Mag to go with the book presentations with Ag in the Classroom presentation, along with the sequence cards. Ag in the Classroom decided NOT to print the Ag Mags, where the coupons would have been. Consequently we had no vehicle to distribute coupons to the schools utilizing this program.
Redemptions: 0

Goal 4 :Create a passport for children to use at orchards to increase orchard traffic and sales / Children's' loyalty program as passport booklets (educational info, activities, to be filled in with sticker on each page, rewarded at completion with customized children's apple tote) We will distribute at children's presentations and at orchards, usable at any member orchard; Tally the number of passports distributed and number of coupons (coupon on last page is redeemable upon completion of 6 orchard visits) redeemed.
Target: At least 10% of the passports distributed will be completed and redeemed.

Outcome:
4.6% redemption Passports

Some social media progress not in the baseline factors included:

Jan 3, 2014- Sept 2016: Facebook: 4,843 fans to 11,933 fans (59% increase)
Jan 1- September 29, 2016: Facebook: 11,933 fans (up 1861)
Weekly Page Engaged Users: The number of people who engaged with your Page. Engagement includes any click or story created. (Unique Users): 69,046

Daily Total Reach: The number of people who have seen any content associated with your Page. (Unique Users) 334,046

Weekly Total Reach: The number of people who visited your Page, or saw your Page or one of its posts in news feed or ticker. These can be people who have liked your Page and people who haven't. (Unique Users) 1,593,008

Weekly Organic Reach: The number of people who visited your Page, or saw your Page or one of its posts in news feed or ticker. These can be people who have liked your Page and people who haven't. (Unique Users) 569,345

Weekly Paid Reach of Page posts: The number of people who saw your Page posts in an ad or sponsored story. (Unique Users) 934,148

Weekly Total Impressions of your posts: The number of impressions that came from all of your posts. (Total Count) 3,359,061

Weekly Paid Reach: The number of people who saw a sponsored story or ad pointing to your Page. (Unique Users) 1,023,633

Weekly People Talking About This: The number of people sharing stories about your page. These stories include liking your Page, posting to your Page's timeline, liking, commenting on or sharing one of your Page posts, answering a question you posted, responding to one of your events, mentioning your Page, tagging your Page in a photo or checking in at your location. (Unique Users) 34,550

Twitter: 173 Followers
Instagram: 181 Followers

2016:
Pinterest: Average Monthly Views: 1,539 (up 276.24%)
Average Monthly Engaged Users: 22 (Up 393.33 %)
23 Boards / 962 pins / 177 followers (+ 33%)

2014-2016
Pinterest: Views: 1,680,823
Average Monthly Engaged Users: 26,430

Website: Aug 2015-Sept 2016: 8,807 Sessions / 7,481 Users / 15,541 Pageviews / 1.75 pages per session /1:04 Session Duration / 67.23 % Bounce Rate 84.85% New Sessions

For documentation support this information go to: http://www.ctapples.org/scbg-recap

Beneficiaries:
The general public, farmers markets, schools and other educational programs, orchards, industry partners and businesses that purchase from the orchards all benefited from the efforts of the marketing programs. There was a lot of cross-promotion on all materials,

especially children's materials with our industry partners. QR code signage in the orchards benefited the orchards (in knowledge base and time saved) and consumers (ready access). Mobile phone users were the strongest hits on the website analytics. We gave them an easier option to find orchards, one they may not have followed through on if there was no app. A large portion of our Facebook fans are from NY, the orchards benefitted from the ads reaching out beyond the borders into NY, RI and MA. The Facebook statistics showed that our biggest customer base was women 24-45, the biggest family demographic. Advertising directed to our fan base was sure to influence family decision making on purchases that included adults and children.

- CAMB Orchards benefitted from the website, social media coverage, social media graphics, brochures, coupons, QR codes, radio ads, Ag reports and all of the Industry Partners efforts in spreading the word about apples, their uses and the orchards. It is difficult to attribute a number to it.

- CT Department of Agriculture utilized our brochures, web information and social media presence. Weekly Agricultural Reports each year reached a distribution of 1831 email subscribers and 300 hard copy subscribers for each report (at least 4 concerning apples) and were also shared and co-promoted on their CT DoAG and CT Grown social media sites. Orchard information was collated and shared to use on the CT DoAG website.

- CT Pomoligical Society Annual Meetings (3) average 90-100 attendees per meeting received information and updates at their Annual meetings on the progress of the social media efforts and website updates. This gave them sources to draw on for their own marketing.

- School children benefitted from the children's brochures, passports, photo board opportunities, posters in school, Put Local on Your Tray, Food Corp interaction and Food Service Directors useage of our materials. Approximately 5,000 childrens brochures a year and 1500 "How an Apple Grows" posters a year were distributed in 2015 / 2016. It is difficult to judge how many times the PowerPoint was utilized.

- BIG E (5 days in 3 years) Approximately 50,000 attendees come through the CT Building each day. Each day 10 cases of apples were handed out along with personally engaging attendees, answering questions, handing out information, encouraging them to sign up for mobile APP and social media sites, and handing out coupons.

- SNACT School Nutrition Association of CT: Over 200 attendees that brought back info to over half the schools in CT. Posters, brochures, digital information and direction to the educational resources online were presented.

- CT Ag Day at the State Capitol: 2014, 2015, 2016 / The annual Ag Day at the Capitol drew more than 40 agricultural-related exhibitors and a crowd of

attendees including farmers, students and members of the General Assembly. CT Apple Marketing Board handed out apples, literature and answered questions on growing, varieties and more.

- CT Pomological Society Twilight Meetings: 2014, 2015, 2016: An average of 30-40 industry attendees were apprised of grant progress at each meeting.

- Coventry Farmers Market Apple Tasting 2016 Approximately 400 people received samples of apples at the apple tasting and were exposed to posters, postcards and brochures. There was a marked increase in apple sales that day alone at the 3 orchards vending.

- Orchard visits: Contractor took Sam the Scarecrow photoboard to orchards and photographed customers, handed out and delivered marketing materials. 12-14 visits with an average of 100-500 customers engaged each weekend.

- Passport and Loyalty card redemption: Redeemed $935 in coupons ranging from $2.50 to $4.00

Networking: The CAMB offered support, materials (print and digital) and reciprocity with the following agencies (and more)

- CT Department of Agriculture
- Start with Half A Cup
- CT Department of Education
- CT Department of Administrative Services
- UCONN Extension
- CT Pomological Society
- CT Food Corp
- End Hunger CT
- Buy CT Grown

Lesson Learned

The biggest lesson was if you can't give a program to every single orchard attendee at every single orchard, the program has a higher chance of failure. We had higher expectations of the children's passport and the loyalty programs. Two things in particular hindered a better redemption on them. 1.) We gave 50-100 passports to each orchard. This was because of printing and (possible) projected redemption costs. Consequently, if they could not hand one out to every child, they would hand out fewer or none. Some orchards used them for one class project, with success. The loyalty cards were an extra effort in a busy and hectic retail situation and the orchards were hesitant to hand them out because it required more work and training for an already stretched, seasonal work staff. It was a banner year for apples when we handed out the materials (2015) and extremely busy in all retail situations. Smaller orchards that have a more personal, one-on-one rapport with their customers fared better. The mobile APP was also extra work.

While smartphones are increasing, some growers still rely on older phones and don't always have a comfort zone with the mobile app. Even though we supplied training posters and support for staff, it was daunting to train their cashiers because of the large crop and busy retail atmosphere. There is not an easy way to support a standardized loyalty / coupon program when each orchard is so diverse, from small scale to large wholesale production.
The social media and website visits increased heavily, but it is difficult to quantify the results in purchases.

Additional Information
Samples and supporting documents can be found at: http://www.ctapples.org/scbg-recap

This is a non-public page but can be reached by link. The password for the Growers Pages is: Macsuga

Promoting the Availability of Connecticut Specialty Crops at the Hartford Regional Market Farmers' Market

Connecticut Department of Agriculture
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Project Summary:

The Hartford Regional Market, known as the largest perishable food distribution center between New York and Boston, is also home to one of the oldest and largest wholesale and retail farmers' markets in the state. The farmers' market at the Regional Market was once a thriving market frequented by local residents. Over the years, consumer awareness has diminished due to competition from other markets and a lack of available promotional funds. The main goal of this project was to expand upon the Connecticut Department of Agriculture's (DoAg's) public relations and marketing campaign for specialty crops sold at the Regional Market Farmers' Market in Hartford (HRM), in order to significantly enhance the competitiveness of the specialty crops available at this food hub by heightening consumer awareness and increasing sales through a multimedia approach using radio advertisements, public transit signage, billboards, social media, and vendor signs.

Project Approach:

In order to heighten consumer awareness of specialty crops and increase sales a wide-scale multi-media campaign was implemented. Projects included:

1. Radio/Digital Ads
    a. Bomba (independent Spanish station): Placed 273 :30 second audio spots with matching online streaming over 13 weeks
    b. CBS Radio (WTIC-AM 1080): Placed 450 :15 and :30 second audio spots over 15 weeks
    c. WNPR: Placed 35 sponsor ID's, 70 promos and 70 marketing spots over 7 weeks on Where We Live, Colin McEnroe Show, and AM/PM drive times
    d. iHeartRadio: Placed 2,194 :15 second audio spots with matching online streaming over 14 weeks
    e. CBS Digital, Ad Messenger: ran 14 weeks, resulting in 351,474 impressions and 4,419 clicks to website

2. Signage
    a. Billboard/Mural: Designed, produced and installed updated creative promoting specialty crops and farmers' market hours on the billboard adjacent to I-91 and on the mural located on the Regional Market grounds and visible to I-91 traffic. I-91 is the second most traveled road in Connecticut
    b. Dry-Erase Signboards: Procured 50 A-frame 24"x36" dry-erase signboards and distributed to farmers' market vendors for them to highlight specialty crops on a weekly basis

3. Transit: Worked with Signal Outdoors, the exclusive advertising company for CT Transit, to place a King (30”X144”) curbside graphic in English and Spanish on 10 buses with routes throughout the Hartford region for 12 weeks. This signage directed viewers and bus riders on which route would take them directly to the Regional Farmers’ Market.

4. Print Media
    a. North End Agents (African American newspaper, circulation: 40,000): Placed three half-page, color ads in September/October
    b. White Eagle Media (Polish-American newspaper, Connecticut edition): Placed three full page, color ads in September/October plus complimentary banner ad for 2 months in online edition. Connecticut has a Polish American community of 284,272 people
    c. Journal Communications, Connecticut Grown magazine, distribution: 10,000): Placed one full page, color ad with accompanying leaderboard on website, www.farmflavor.com

5. Social Media www.facebook.com/HartfordRegionalMarket
    a. Created graphics to promote availability of specialty crops on a weekly basis to increase Facebook traffic and fan base
    b. Placed 22 boosted Facebook posts to increase post engagement, reaching 126,928 people and resulting in 6,083 actions.
    c. Increased total number of fans on page from 1,657 as of January 1, 2016 to 2,706 at the close of the funded grant period.

6. Surveys: Utilized SurveyMonkey to create, distribute and aggregate online surveys to farmers’ market vendors participating in the spring, summer and/or fall market seasons. Responses to the surveys were used to determine the change in cash receipts as compared to the previous year.

Goals and Outcomes Achieved:

GOAL: Increase awareness of specialty crops and traffic at the HRM.
PERFORMANCE MEASURE: A survey will be conducted periodically throughout the duration of the 2016 farmers’ market and at the conclusion of the marketing efforts to track an increase in sales over time.
BASELINE: A baseline will be established at the beginning of the marketing campaign.
TARGET: A five percent (5%) increase in sales reported by survey respondents.

The online survey proved to be helpful in evaluating the effectiveness of the various mediums used to promote specialty crops at the Regional Farmers’ Market. In the spring survey, 100% of respondents believed that the radio ads contributed to their increase in sales and 37.5% believed that social media was a contributing factor. In the fall survey, 75% of respondents believed that the radio ads contributed to their increase in sales and 25% cited word of mouth.

The radio ads enabled us to highlight specific specialty crops on a regular basis, not only educating consumers about what was in season, but letting them know exactly when and where they could purchase them. By running these ads in conjunction with nearly weekly Facebook posts reiterating which specialty crops farmers would be bringing to the market, we were able to consistently reinforce the message sent to consumers. Some of our partnering radio stations began requesting that market staff call-in and be featured on-air while they were at the market on the weekends. Consumers who hadn't been to the market in years returned, while those who had never been started a new tradition of coming down during the early morning hours for a one-of-a-kind experience. They shared photos of their purchases on our Facebook page and tagged friends to join them on the next trip. In essence, we created a positive buzz around what was happening at the Regional Farmers' Market and increased awareness of specialty crops.

Unfortunately, this did not transalate into increased sales for our market vendors. In the spring survey 31.7% of respondents reported an increase greater than 5%, 4.5% of respondents reported an increase up to 5%, 27.3% remained the same and 36.4% reported a decrease in cash receipts. It should be noted however, that at least one survey respondent reported an increase greater than 50%. The summer/fall survey results proved to be more disappointing as only 18.9% of respondents reported an increase of more than 5%, while 18.8% remained the same and 56.3% reported a decrease in cash receipts.

An informal survey of market vendors regarding the decrease in sales yielded the following insights:

- Weather
    - A hard freeze during what had been a mild winter caused nearly 100% loss of the peach crop in the state and also impacted the quantity and quality of apples.
    - Extremely dry summer and fall conditions lead to the first ever drought watch in 6 of the 8 counties in the state, which also impacted the availability of certain crops.

One could conclude that the challenges posed by the weather resulted in reduced yields of certain specialty crops, which contributed to the decrease in cash receipts.

Beneficiaries:

The promotion of specialty crops at the Regional Farmers' Market benefits a number of groups and individuals. Connecticut has at least 500 nursery/greenhouses growers, 500 fruit and 637 vegetable growers, 135 maple producers, 165 apiaries, and 287 herb growers. Of these, the Regional Farmers' Market featured 54 unique specialty crop vendors during the market seasons who benefited from the promotions. Other beneficiaries include: general public, industry partners and businesses, and regional market tenants.

Lessons Learned:
The most important lesson learned is the strong impact (both positive and negative) that the weather plays in determining the financial success each growing season. Poor weather negatively impacts turnout at the market by shoppers and also weighs heavily on the crop yields, which ultimately impacts the cash receipts reported by vendors.

On a cost/value analysis, the social media and digital ads achieve the highest results in terms of reach and clicks for the least amount spent. However, we are unable to measure if those people then became buyers of specialty crops at the regional farmers' market.

Per our survey results, the radio ads were a key factor in sales increases despite the high cost of ad placement.

Lastly, despite on-going efforts to communicate with growers that the reporting requirements would be an average of all vendors, and not specific to one farm, there was still a hesitation to report on the status of their cash receipts.

Additional Information:
Samples and supporting documents can be found at:
http://www.ct.gov/doag/cwp/view.asp?a=3243&Q=588758&PM=1