



Program Contacts:

Debbie Ball, 615-837-5384, debbie.ball@tn.gov

Greer Gill, 615-837-5163, greer.gill@tn.gov

USDA/AMS Agreement Number 14-SCBGP-TN-0047

Final Report

November 17, 2017

Table of Contents

Project Title: Pick Tennessee Conference 2016 Scholarships	3
Project Title: Growing Your Business with Marketing and Education	5
Project Title: Tennessee Christmas Tree Farm Manual and Educational Program.....	7
Project Title: Reducing the Impacts of Federal Imported Fire Ant Quarantine Regulations on the Tennessee Nursery Industry	9
Project Title: Establishing the White Lightning Wine Trail	32
Project Title: Direct Farm Marketing Initiative	45
Project Title: Improving Northeast Tennessee Buyer-Producer Networks and Building Innovative Marketing.....	58
Project Title: Local Specialty Crop Marketing in Memphis to Increase Sales and Income for Tennessee Specialty Crop Producers	62
Project Title: USDA Specialty Crop Block Grant 2014 “Providing Wholesome but Unmarketable Produce to the Hungry in Northeast Tennessee”	65
Project Title: Youth Urban Farm Training Program	69
Project Title: Providing Marketing Opportunities for TN Nursery Producers and Garden Centers	72
Project Title: Farm to School Nashville, Connecting the Dots	74
Project Title: Wine Trail of West Tennessee.....	77
Project Title: Local Sourcing Foodservice Industry Program (Phase II).....	79

Project Title: Pick Tennessee Conference 2016 Scholarships

Submitted and approved as final report in 2016 annual report

Project Summary:

The Pick TN Conference has the mission to support local Speciality crop producers and enhance their access to suppliers, education and training, provide networking opportunities and increase the competitiveness of specialty crops throughout the state. The conference is vital to the survival of the member organizations: TN Fruit and Vegetable Association, TN Farm Wine Growers Association, TN Agritourism Association, TN Organic Growers Association and TN Flower Growers Association. Without an annual conference that is well attended, these organizations would struggle to maintain membership and offer networking and educational opportunities for their members. The focus on this conference is to increase specialty crop growers' knowledge and income. Scholarships were given for the 2016 Conference held in Knoxville, TN February 11-13, 2016 in order to allow more specialty crop growers to attend. Approximately 438 attendees benefited from the SCBG Grant for \$49,920.00.

Project Approach:

Each association was responsible for their own list of classes and speakers specific for their associations. The board made sure that the schedule was well rounded and classes were specific for specialty crops. Responsibilities for the conference were equally distributed between the participating associations. Marketing for the conference was done through each association, through the extension agents and through the TN Department of Agriculture. A website was made and attendees registered online and were able to view the class schedule online. UT extension created a survey that was distributed to all attendees at the conference to enable us to gauge impact and effectiveness of the conference.

The 2016 conference was a great success. Attendees were given a partial scholarship to attend, enabling more farmers the chance to benefit from the classes to improve their specialty crop productions.

Project Goals:

The goal of scholarships is to provide an opportunity to assist local producers to enhance the agricultural specialty crops in TN, and provide networking and educational opportunities. The Pick TN Conference is vital to the survival of the 6 member associations and offers education and training, access to suppliers through the tradeshow and networking opportunities.

Outcomes Achieved:

An evaluation collected at the end of the conference showed an increase in associations memberships and helped us gauge the effectiveness of the conference. Associations reported the following increase in memberships:

- 11 new Flower Growers Association members
- 41 new TN Fruit and Vegetable Growers Association members
- 22 new TN Farmers Market Association members
- 39 new Agritourism Association Active members and 11 new associate members

Attendees reported an increase in knowledge to increase specialty crop competitiveness and expressed the desire for a better tradeshow in future conferences.

The four areas/topics in the after conference survey were: Production of fruits, vegetables or plants/flowers, Production of Value-added products or experiences, Marketing Concepts or techniques and Risk Management (food safety, regulations, etc).

After the conference, on average, participants indicated at least some knowledge of all topics with a mean of 3 or higher and a positive change in the mean rating (AFTER-BEFORE). The number of respondents experiencing at least one knowledge step were calculated. Respondents were asked to rate their level of agreement/disagreement with four statements related on a scale of Strongly Disagree(1), Somewhat Disagree (2), Somewhat Agree (3) or Strongly Agree (4). For each statement, responses ranged from Strongly Disagree to Strongly Agree, however, more than 90 percent responded with a Somewhat or Strongly Agree. Mean ratings for all statements were between Somewhat Agree (3) and Strongly Agree (4).

On average, respondents indicated they will change at least one practice based on what they learned at the conference and gained knowledge or skills to improve revenue from the operation. More than 90% of respondents agreed they would recommend this conference to others and planned to attend the conference in 2017.

Beneficiaries:

The specialty crop beneficiaries are divided into two groups: associations who are participating in the Pick TN Conference and producers of qualified specialty crop commodities who attend the Pick TN Conference. There were 438 attendees of the 2016 conference.

Lessons Learned:

It has been important to maintain communication with the PTC board made up of members of each association and it was important to hire an executive director to ensure the success of the conference to be self-sustaining by 2018. The post conference evaluations showed us the importance of the tradeshow and we worked to increase tradeshow vendors for the 2017 conference. Post conference evaluations also helped us in choosing topics and speakers for the 2017 conference. We are looking forward to another successful conference in 2017.

Contact Person:

Frank Trew

Chairman of Pick TN Conference Board

615-473-0600

info@picktnconference.com

Project Title: Growing Your Business with Marketing and Education

Project Summary:

This project was written to enhance the specialty crop industry in Tennessee by providing marketing opportunities for Tennessee nursery growers and promoting the tradeshow in major trade magazines. Funding was also used for the TNLA Executive Director to go to Canada for an annual meeting of all Nursery and Landscape Executives in the US and Canada.

Project Approach:

The Tennessee Nursery & Landscape Association secured exhibit and meeting room space at the Nashville Music City Center and also secured a show decorator to provide carpet and forklift service, and contracted a printing and mailing company to design ads and print and mail registration information to prospective show attendees. TNLA also secured speakers for the 2015 and 2016 educational programs. TNLA mailed out contracts to former and new exhibitors for the 2015 and 2016 expos and also contracted with trade magazines for ads for both the 2015 and 2016 expo. The 2016 expo was held at the McMinnville Civic Center.

Goals and Outcomes Achieved:

The goal was to enhance the specialty crop industry by providing a marketplace for industry growers and green goods and services providers to showcase their products in Tennessee. This is the only trade show in Tennessee for the nursery industry since the Middle Tennessee Nursery Association has partnered with TNLA to do one joint show. The goal was for growers to meet new customers, meet old customers and to increase their sales from exhibiting at the show. **According to the survey responses, the goals were achieved.**

Exhibiting at the TNGIE provided you an opportunity to showcase your plants or products.

Did you benefit from this opportunity?

2015= 90.9% said they benefited from exhibiting at the trade show

2016=94.7% said they benefited from exhibiting at the trade show

How many new leads or previous customers did you connect with at the show?

2015= 45.5% said they received 1-5 new leads; 27.2% said they got 6-10 leads; 18.1% got 11-15 leads and 9% got 16-20 leads.

2016= 57.8% said they received 1-5 new leads; 15.7% said they got 6-10 leads; 15.7% got 11-15 new leads.

Exhibiting at the show helped me to increase my sales

2015 = Less than 2% 36.3%; 2-4% 27.2%; 5% 18.1%; 10% 9.0%; more than 20% 9.0%

2016 = Less than 2% 10.5%; 2-4% 31.5%; 5% 15.7%; 10% 10.5%

Beneficiaries:

Nurseries, landscapers, garden centers and suppliers of equipment, soil mixes, mulch, and chemical companies all benefited from attending and exhibiting at the 2015 and 2016 TNGIE.

In 2015, there were attendees from 20 states and Canada.

In 2016, there were attendees from 27 states and Canada.

Lessons Learned:

Exhibiting at the Music City Center did not bring the attendees that TNLA thought would come. The expense of being in downtown Nashville was just too costly for those exhibiting and attending. Even those who did not stay downtown had to pay to park and then walk a long way to get to the exhibit hall and the meeting rooms for education. Both the MTNA and TNLA boards agreed that the show needed to come back to McMinnville.

Contact Person:

Louree Walker, Executive Director

Tennessee Nursery & Landscape Association, Inc.

P O Box 57

McMinnville, TN

louree.tnla@gmail.com

Project Title: Tennessee Christmas Tree Farm Manual and Educational Program

Project Summary:

The Tennessee Christmas Tree Production manual was completed and 3000 copies were printed utilizing the University of Tennessee print shop. The final version is 52 full size pages and include a color front cover and color photos of numerous insects to aid producers when identifying insects. To save time and expense in the development process the lead author handled the final layout and insertion of all photos and graphics. The manual is now available to Extension offices across the state and online via the UT Extension website. The manual fills a long existing void (over 30 years) of needed basic information on growing Christmas trees in Tennessee. Workshops were conducted in multiple locations to educate current and potential Christmas tree producers along with Extension personnel.

Project Approach:

Multiple authors were utilized with various backgrounds and expertise to write portions of the manual and to provide the information to Extension agents across state to disseminate it to potential growers. Workshops were conducted using the manual and a power point presentation program on the process of successfully growing Christmas trees to improve the successfulness of current and new growers. Additional workshops will be able to be conducted in the future because of the availability of the manual.

Goals and Outcomes Achieved:

The main goal was to write and create a publication which could be useful for many years and to begin the process of educating Extension agents and potential Christmas tree growers. 383 copies of the manual have been requested across the state and in surrounding states. The evaluation of the workshops conducted showed a significant increase in knowledge of the growing of Christmas trees and understanding of the potential of a successful Christmas tree farm. The manual was rated as a highly valuable resource. Participants noted the manual provided information they had not located elsewhere. Participants rated the quality of the presentation and materials at 4.88 on a 5 point scale and estimated they achieved a 44% increase in knowledge. The ultimate outcome has been achieved by now having a resource to help Christmas tree growers and Extension agents.

Beneficiaries:

The current and future Christmas growers in Tennessee and surrounding states and the Extension agents who help answer the questions from potential growers in the future.

Lessons Learned:

All projects take much longer than expected. Due to a variety of writing delays, the manual was not completed until 2017. This meant the information which should have been in the hands of potential growers was delayed. Individuals coordinating similar projects in the future need to establish concrete deadlines and endeavor to meet those deadlines. When members involved in the effort leave or retire during the process, replacements should be identified and recruited immediately to ensure the project continues as planned.

Contact Information:

Alan B. Galloway

Phone: 931-526-4561

Email: agallow2@utk.edu

Project Title: Reducing the Impacts of Federal Imported Fire Ant Quarantine Regulations on the Tennessee Nursery Industry

PROJECT SUMMARY:

Imported fire ants (IFA) now infest 64 full or partial counties in Tennessee and are still expanding their range in the state with additions made to 4 new counties in 2017. With the addition of DeKalb County to the Federal IFA Quarantine (FIFAQ) in 2017, all of the primary nursery-growing counties in Tennessee are now regulated. The FIFAQ continues to be problematic to Tennessee and southern nursery growers due to the expense of treatments and the interference with trade flow. A high percentage of Tennessee nurseries are field-grown producers, which have even fewer FIFAQ options than container producers.

At the present time, there are only 3 options approved for treating field-grown nurseries, including: 1) a pre-harvest broadcast bait followed with granular chlorpyrifos, 2) post-harvest root ball dip in chlorpyrifos or bifenthrin, or 3) a post-harvest multi-drench treatment in chlorpyrifos. Although the pre-harvest FIFAQ treatment is still allowed in the Federal program, the treatment is no longer available to growers because there are not presently any granular chlorpyrifos formulations on the market that allow the high 6 lb ai / acre application applied twice in the same year. Therefore, growers only have the post-harvest dip or drench available. Both the dip and drench treatment options have been improved as a result of data generated from this and other projects in our program and by our USDA-APHIS cooperator (Anne-Marie Callcott).

First, the new dip option

(<http://fireants.utk.edu/documents/New%20IFA%20Treatments%202013.pdf>) now allows the use of bifenthrin, which gives growers a certification period of 2, 4, or 6 months depending on rate selected, whereas the previous chlorpyrifos option only allowed 1 month of certification before treatments had to be reapplied. A new Onyx Pro Insecticide label amendment also was needed for this treatment to be utilized by nurseries. Although dip treatments have been shown to be the most effective treatment method against IFA, dips are not used frequently due to labor costs, human exposure hazard, waste disposal issues, and plant soil disruption. Most nursery growers still prefer the FIFAQ drench option over the dip.

The FIFAQ drench option also has been improved

(https://www.aphis.usda.gov/plant_health/plant_pest_info/fireants/downloads/DA-2015-15.pdf) and data on water and pesticide movement likely facilitated the USDA decision-making process to modify the treatment. The previous protocol required growers to drench post-harvest root balls twice daily for three consecutive days in chlorpyrifos (a total of 6 drenches with workers re-entering the treated area five times before the chlorpyrifos restricted entry interval [REI] had expired and with increasing chlorpyrifos contamination on each re-entry).

The new protocol allows growers to drench root balls, wait 30 minutes before rotating the plant, and then drench the other side. The new option eliminates 4 worker re-entries into the pesticide treated area, lowers environmental contamination, and cuts labor costs by 67%. It also allows growers to ship plants after the 1 day REI rather than waiting 4 days (i.e., 3 days of drenching and 1 day REI), which can be very problematic with trucking schedules.

Although the current FIFAQ allows two drenches to satisfy root ball treatment requirements, and even though we and our USDA-APHIS cooperator have extensive data demonstrating drench efficacy against newly mated queens (see Gulfport-Biloxi IFA Annual Reports on (https://www.aphis.usda.gov/aphis/ourfocus/planthealth/sa_domestic_pests_and_diseases/sa_pests_and_diseases/sa_insects/sa_fire_ants/ct_imported_fire_ants), drench treatments still have an issue with controlling existing IFA colonies that may be hiding inside the root ball at harvest time. Most of the work in this project dealt with addressing this issue of eliminating hidden colonies from root balls.

A number of other accomplishments were made during this project, which will benefit nursery growers. More details are given below in outcomes achieved and lessons learned sections, but here are some of the highlights. Several insecticides were identified that have the potential to rapidly eliminate IFA and could be used in the FIFAQ programs. To address current USDA concerns about existing FIFAQ drench treatments not adequately controlling IFA colonies in nursery plant root balls, moisture movement of various injection and drench methods were investigated, as well as dye and bifenthrin movement. Bioassays with IFA workers were performed with one promising injection protocol. Testing overall indicates considerable variability in moisture movement among root balls and injection techniques. Signal green dye was a good predictor of bifenthrin movement and concentrations sufficient to kill IFA workers in bioassays. The take-home message is we now know which chemicals are effective at rapidly killing IFA, we have several promising injection and/or injection + drench methods to achieve optimal moisture movement in root balls, and we can predict bifenthrin levels sufficient to control IFA using colored dye movement in plants with a high level of consistency. Two primary project goals in our original proposal (i.e., rapid turn-around treatment with less drenches and a longer residual than the current chlorpyrifos 30-day limit) have been addressed by the new FIFAQ drench protocol and new bifenthrin treatments that extend certification from 2 to 6 months over the previous 1 month certification. More work will be needed to address treatment of larger sized plants because no treatments in this study were completely effective with smaller plants, and treatments are likely to be even more problematic with larger soil volumes.

PROJECT APPROACH:

A brief summary of the project approach is provided for all tests previously reported in the project, as well as new activities since the last report. The project had the following goals and objectives: Goals: 1) Rapid turn-around treatment with less drenches and 2) Longer residual than current chlorpyrifos 30-day limit. Objectives included: A) Evaluate injections applied at the same time as drenches to improve treatment efficacy and allow fewer drenches, B) Identify insecticides that can rapidly kill colonies that may harborage in root balls, C) Develop procedures for injecting different sized root balls to ensure growers can “consistently” treat plants and meet Federal Quarantine efficacy requirements, and D) Investigate treated burlap as a possible substitute for drenches when used in combination with injections. To address the overall goals, the following tests were performed with the objective covered in brackets:

A. Development of Improved Injection Protocols (Objectives A and C). Multiple injection procedures, as well as drenches and a dip comparison, were evaluated with 30-cm diameter balled and burlapped (B&B) root balls (Fig. 2). B&B root balls were obtained from Moore Nursery and had an average soil bulk density of $1.32 \pm 0.012 \text{ g / cm}^3$, % sand of 70.2 ± 1.11 , % clay of 6.4 ± 0.36 , and % silt of 23.4 ± 1.02 ($\bar{x} \pm \text{SE}$, $n = 25$) with a soil texture of sandy loam to loamy sand. Root balls were injected with Signal™ Green Spray Pattern Indicator (Precision Laboratories, Waukegan, IL) at a rate of 5 ml / liter water. Our initial plan was take before and after TDR moisture sensor readings at various levels and depths to gauge moisture movement after treatment. We were unable to pursue this plan because pre-treatment readings with TDR sensor probes created channels for the treatment solution to leak from the B&B and modified results. Consequently, we modified our plans to include a B&B that received an injection, drench, or dip treatment and a B&B that did not receive a treatment (check). The average changes in moisture difference between the treated and check B&B treatments were compared (Fig. 2) after adjusting moisture to a percentage scale using a 1 part soil to 1 part water as a 100% saturated standard (Fig. 1). Because of the modification of a check B&B treatment, we had to purchase additional TDR moisture sensors. Likewise, our initial plan was to measure moisture at different locations in the root ball by moving TDR moisture sensors among locations for each reading. We determined that this was unfeasible because readings were highly erratic when TDR sensors were moved (see Fig. 1 in 2016 Annual Report). Because TDR sensors could not be moved among sample sites, it limited us to one replication per day based on the number of TDR sensors we had available (and to keep the added cost of extra sensors within reasonable budget limitations). Because of the limitation in treatment numbers and replicates that could be processed, our research focus began with the highest moisture solution considered feasible for an injection (i.e., 6 quarts / ft^3 or a 20% root ball volume), which also is the current required drench volume in the FIFAQ to be applied over two consecutive treatments (see Table 1, yellow highlights). Lower solution volumes of 1, 2, 3, and 4.5 quarts / ft^3 ultimately were not performed because results with 6 quarts / ft^3 were erratic for most

treatment methods (Fig. 2), and therefore, we determined lower treatment volumes would be impractical.

For each treated or check B&B, a short 3.5 cm (shallow depth) or long 7.5 cm (deep depth) TDR sensor probe was randomly assigned to top, top lateral, middle, middle lateral, bottom, or bottom lateral position (Fig. 2 [right images]) on the root ball and readings were taken at intervals of 0.5, 1, 1.5, 2, 4, 6, and 22 hours. The reading interval was more frequent than the originally proposed (i.e., 2, 4, 6, and 24 hours) because the time interval closest to injection appeared to have the greatest amount of change in sensor water readings. However, we did not detect any significant differences among moisture readings at the different monitoring intervals (see Table 1 in the March 2017 progress report). Therefore, moisture sensor reading data were pooled across all of the sensor times for each sample site location and sample depth (Fig. 2).

Table 1. Planned injection protocols.

Plant Trmt Label	B&B Size (inches)	Treatments					Solution Injected (ml)		
		Solution Volume	Injection Technique			Reps	Per Injection	Total	
			Location	Points	Visual Image				
A	12	1/30 Root Ball Volume (1 qt/cuft)	Single Front	1		4	349	349	
B	12	1/15 Root Ball Volume (2 qt/cuft)	Single Front	1		4	697	697	
C	12	1/10 Root Ball Volume (3 qt/cuft)	Single Front	1		4	1046	1046	
D	12	1/7.46 Root Ball Volume (4.5 qt/cuft)	Single Front	1		4	1397	1397	
E	12	1/5 Root Ball Volume (6 qt/cuft)	Single Front	1		4	2086	2086	
F	12	1/30 Root Ball Volume (1 qt/cuft)	Two Front	2		4	175	349	
G	12	1/15 Root Ball Volume (2 qt/cuft)	Two Front	2		4	349	697	
H	12	1/10 Root Ball Volume (3 qt/cuft)	Two Front	2		4	523	1046	
I	12	1/7.46 Root Ball Volume (4.5 qt/cuft)	Two Front	2		4	699	1397	
J	12	1/5 Root Ball Volume (6 qt/cuft)	Two Front	2		4	1043	2086	
K	12	1/30 Root Ball Volume (1 qt/cuft)	Four Front	4		4	87	349	
L	12	1/15 Root Ball Volume (2 qt/cuft)	Four Front	4		4	174	697	
M	12	1/10 Root Ball Volume (3 qt/cuft)	Four Front	4		4	262	1046	
N	12	1/7.46 Root Ball Volume (4.5 qt/cuft)	Four Front	4		4	349	1397	
O	12	1/5 Root Ball Volume (6 qt/cuft)	Four Front	4		4	522	2086	
P	12	1/30 Root Ball Volume (1 qt/cuft)	Single Angled (Top)	1		4	349	349	
Q	12	1/15 Root Ball Volume (2 qt/cuft)	Single Angled (Top)	1		4	697	697	
R	12	1/10 Root Ball Volume (3 qt/cuft)	Single Angled (Top)	1		4	1046	1046	
S	12	1/7.46 Root Ball Volume (4.5 qt/cuft)	Single Angled (Top)	1		4	1397	1397	
T	12	1/5 Root Ball Volume (6 qt/cuft)	Single Angled (Top)	1		4	2086	2086	
U	12	1/30 Root Ball Volume (1 qt/cuft)	Two Angled (Top)	2		4	175	349	
V	12	1/15 Root Ball Volume (2 qt/cuft)	Two Angled (Top)	2		4	349	697	
W	12	1/10 Root Ball Volume (3 qt/cuft)	Two Angled (Top)	2		4	523	1046	
X	12	1/7.46 Root Ball Volume (4.5 qt/cuft)	Two Angled (Top)	2		4	699	1397	
Y	12	1/5 Root Ball Volume (6 qt/cuft)	Two Angled (Top)	2		4	1043	2086	
Z	12	1/30 Root Ball Volume (1 qt/cuft)	Four Criss-Crossed	4		4	87	349	
AA	12	1/15 Root Ball Volume (2 qt/cuft)	Four Criss-Crossed	4		4	174	697	
BB	12	1/10 Root Ball Volume (3 qt/cuft)	Four Criss-Crossed	4		4	262	1046	
CC	12	1/7.46 Root Ball Volume (4.5 qt/cuft)	Four Criss-Crossed	4		4	349	1397	
DD	12	1/5 Root Ball Volume (6 qt/cuft)	Four Criss-Crossed	4		4	522	2086	
EE	24	Determined from optimal treatment above							

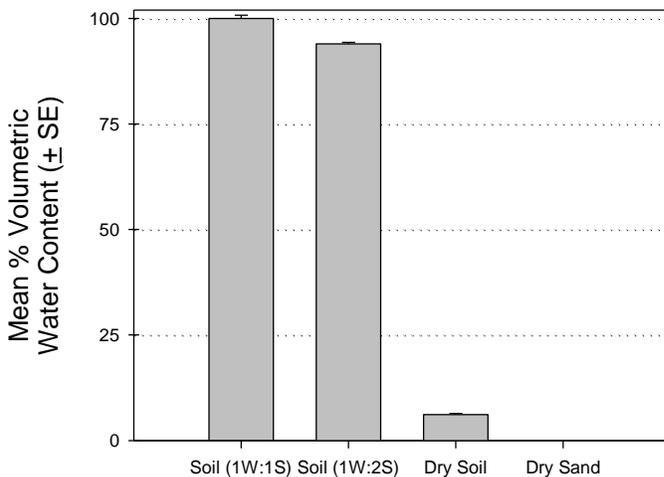


Fig. 1. TDR moisture sensor readings of 100% saturated (1 part water to 1 part soil), 50% saturated (1 part water to 2 parts soil), and apparently dry soil and sand. The 100% saturated reading was used to standardize moisture readings in injection studies.

B. Signal Green Dye Extraction and Analysis for Injection Probe Studies (Obj. A & C). To complement the moisture movement with TDR sensors, Signal Green dye applied during injections, drenches, or dips was extracted from different locations in the B&B root ball (Fig. 5). Root balls were allowed to dry for over a month. Final dry weights also were taken on root balls to facilitate soil bulk density estimation. After weighing, soil samples were removed from seven locations around and in the root ball (Fig. 5). The soil in each sample was mixed thoroughly and Signal Green dye extracted with a known volume of water. Signal Green was quantified using a UV-Vis spectrophotometer (Epoch Microplate Spectrophotometer, BioTek, Winooski, VT) reading at maximal absorbance of the dye (630 nm).

C. Signal Green and Bifenthrin Extraction and Analysis for Correlation Study (Obj. A & C). In a separate test independent from injection probe moisture studies, Signal Green dye (5 ml dye / liter) and Onyx Pro Insecticide (bifenthrin) (0.115 lb AI / 100 gal [highest approved FIFAO bifenthrin dip rate as a starting place, since there is presently no bifenthrin injection rate approve]) were injected simultaneously into B&B root balls to determine whether Signal Green dye can be used as a substitute marker for bifenthrin. Four root ball replicates received a 10% root ball volume applied using a single angled injection. Soil samples were collected from the same seven root ball locations as before (Fig. 5). Soil in each sample was dried and mixed thoroughly. Signal Green was extracted and quantified as previously described. Bifenthrin was extracted using a QuEChERS method (QuEChERS Extraction Packets, EN Method; Dispersive SPE 2ml, Fatty Samples, AOAC; Agilent Technologies, Wilmington, DE) (Fig. 6, 7). Extraction samples were analyzed on a Shimadzu QP-2010 GC-MS on a DB-1 column and quantified using an external analytical standard (Bifenthrin, Sigma-Aldrich, St. Louis, MO).

D. Fire Ant Laboratory Mortality Bioassay and Relationship with Signal Green Dye and Bifenthrin Concentration (Obj. A & C). In addition to bifenthrin and dye soil quantification (describe above), a fire ant mortality bioassay was conducted to determine whether quantities of bifenthrin detected in the soil were sufficient to kill fire ant workers (Fig. 8). Ten worker IFA were held in vented plastic vials with sugar water. Ants were field collected from colonies at a commercial nursery known to previously be hybrid IFA. Mortality of ants was assessed at 1, 7, and 14 DAT (Fig. 8). The quantity of dye where bifenthrin mortality fell below 100% was determined (Fig. 9).

E. Development of Treatments to Eliminate Whole Colonies From Root Balls (Obj. A, C, &D)

(USDA-APHIS Cooperator Anne-Marie Callcott): Field grown boxwood shrubs with small IFA colonies (at least several hundred worker ants) were machine harvested as 40-cm diameter root balls on 24 August 2015. To keep ants in B&B, plants were carefully handled to avoid colony disturbance and wrapped in burlap lightly treated with bifenthrin (0.05 lb ai / 100 gal delivered in 0.25 gal), which based on previous studies is sufficient to keep ants in the B&B, but not kill the colonies. Infested root balls were transported the day of harvest to the Biloxi facility and divided into three insecticide treatments and one check treatment (replicated 3 times) (Table 2). Treatments were applied the day after harvest using a 15-gallon spray tank equipped with a battery operated High-Flo Gold series pump (Model 5275704; 45 psi; 3.8 gpm) with a hose connecting the spray wand or injection probe to the spray tank. Drench and injection applications were applied at 1 gal / min rate using a common garden wand or a B&G 430 Versagun Termite injection rod applicator with a 1.6 cm diameter rod and 360° tip. Volume delivery was determined using a stop watch. As in Tennessee injections (Fig. 2), the total solution volume delivered to each root ball was 1/5 the root ball volume (calculated at 1.35 gal / root ball) and equally divided between the drench and injection applications. Drenches were performed first with a 0.34 gal drench to each root ball side (~15 min between root ball side treatments) in an effort to contain the ant colonies. Injections of bifenthrin or lambda-cyhalothrin were either applied through a single injection point or through 4 injection points (Table 2), and injections were done in a manner consistent to procedures described on past Chlorpyrifos 4EC labels. For injections, root balls were stood on the base with the shrub facing directly upwards and the injection rod was placed at a 30 to 45° angle at either one (0.68 gal) or four (0.17 gal per injection) injection points around the plant stem. The injection rod was stopped near the middle of the root ball. Nine root balls were treated per insecticide treatment rates and 3 check root balls and at 1, 2, and 7 d post-treatment, 3 insecticide and 1 check root ball were disturbed to determine IFA colony survival (Table 2).

F. Identification of Treatments to Rapidly Kill IFA Colonies – Scimitar Mound Treatments (Obj. B)

Scimitar GC (lambda-cyhalothrin) was evaluated in a field test because it had demonstrated potential in previous testing by USDA cooperator (Anne-Marie Callcott) for faster elimination of IFA colonies than other pyrethroids. During 3 Nov. 2014, IFA colonies previously flagged were broadcast treated with Advion Fire Ant Bait (indoxacarb [1.5 lb bait / acre]), Award II Fire Ant Bait (abamectin [1 lb bait / acre]), or no bait. Conditions were favorable for baiting (see previous reports). Scimitar treatments (0.018 to 0.064 g AI / gal) were applied on Nov. 10 to randomly assigned colonies using a tractor-applied drench from a common garden wand with a water breaker nozzle or a TreeRing Jr. irrigation device placed on the mound (Table 3)). Drenches were applied about 18 inches (45 cm) above the ground and to an approximate 0.9 m diameter area. Colonies were rated for survival at 1, 5, 10, 14, 21, 28, 35, and 71 day after treatment (DAT) by probing with a small wire and considered active if 5 or more workers

appeared. The original planned rating schedule was 2, 3, and 4 DAT (to assess speed of control), but due to low temperatures, cloudiness, and mound inactivity, ratings were ineffective on these dates. The number of live colonies were compared among treatments of interest using conditional logistic regression.

G. Identification of Treatments to Rapidly Kill IFA Colonies – In-Field Mound Drench

Treatments (Obj. B). Several drench tests targeting individual IFA colonies were performed during the project at cooperating commercial nurseries. All tests evaluated one or more insecticides or biopesticides with potential to rapidly eliminate colonies in a 1, 2, 3, and 7 DAT period. Treatments were applied at various rates in 2 gallons of water using a watering pitcher with a water breaker nozzle to a 0.9 m circular area with ~1 gallon applied directly to the mound and the other gallon to the entire area. Treatments included three pyrethroids (permethrin, lambda-cyhalothrin, and bifenthrin), two organophosphates (acephate and chlorpyrifos), a carbamate (carbaryl), and a biopesticide (Essentria IC3 containing 10% rosemary oil, 5% geraniol oil, 2% peppermint oil, and 83% oil of wintergreen and other ingredients), as well as combinations with carbaryl (applied at a very low rate) (Tables 4 and 5). Percentage reduction from the initial total live colony number was determined and data were analyzed using a General Linear Interactive Model (Proc Genmod) assuming a negative binomial with a log link and means separate by LSmeans. Chlorpyrifos also was tested at 2.4 ml product / 2 gal (equivalent to the FIFAQ drench rate) (Table 5).

H. Identification of Treatments to Rapidly Kill IFA Colonies – Drench Water Volume

Assessments (Obj. B). Chlorpyrifos at the 2.37 ml per colony FIFAQ rate was used in this test because it had demonstrated potential for rapid elimination of colonies (Table 5). The dosage was applied in 0.5, 1, and 2 gallons per colony as previously described to evaluate solution volume effects (14 reps per treatment randomly assigned) (Table 6). Colonies were rated for activity at 1, 2, and 8 DAT and data analyzed as previously described.

I. Identification of Treatments to Rapidly Kill IFA Colonies – Biopesticide Drench and Granular

Test (Obj. B). Essentria™ IC3 containing 10% rosemary oil, 5% geraniol oil, 2% peppermint oil, and 83% oil of wintergreen and other ingredients and Essentria™ G containing 2% clove oil (eugenol), 0.6% thyme oil, and 96.5% corn grit and oil of wintergreen were tested on IFA colonies (15 reps) in a Warren County nursery (Table 7). The Essentria IC3 and check treatment were applied in 2 gallons as previously described, and the Essentria G product was applied with a salt shaker only to the mound surface and post-watered by rain the same day. Colonies were rated for survival at 1, 2, 3, and 7 DAT, and data analyzed as previously described.

J. Sesbania Evaluation as Potential Biopesticide for IFA (Obj. B). *Sesbania exaltata* (Rafinesque-Schmaltz) Cory (Fabaceae) has reported IFA repellency in the literature. During this project, we assessed the contact (ant dips and sand digging assays) and fumigant (filter paper volatiles) mortality or repellency of extracts from *S. exaltata* to determine potential of this plant as a biopesticide.

GOALS AND OUTCOMES ACHIEVED:

A. Development of Improved Injection Protocols (Obj. A & C). Injection, drench, and dip methods varied in the ability to increase mean adjusted percentage volumetric water content of root ball soil relative to the untreated check treatment (Figs. 2, 3). Figure 2 presents the percentage volumetric data by TDR probe location and Figure 3 presents the same data pooled across locations (to give an overall picture of total moisture change among treatments). The data in Figures 2 and 3 also are pooled over the 24 hour monitoring period because no significant differences were detected in moisture change from 0.5 to 24 hours post treatment (see Table 1 of March 2017 progress report), which indicates that moisture change remains relatively static immediately after the initial injection, drench, or dip infusion. Interestingly, the water loss measured from root balls was not statistically different from most of the injection treatments (Fig. 4), but the water change did vary by location (Figs. 2, 3). Therefore, it is likely root balls are retaining about the same amount of solution regardless of injection method, but the injection method and quantity does affect the distribution of this moisture within the root ball. Treatments with a more uniform distribution of treatment solution also would likely distribute insecticide treatments more uniformly. The dip treatment had the highest retention of solution and most uniform distribution of soil moisture among treatments (Fig. 2L), while drench only treatments had the lowest solution retention and least uniform distribution of moisture (Fig. 2G-H). The three most effective treatments in terms of quantity of moisture change (>25% at most depths and locations) were the single angled injection, a single frontal injection plus a drench, rotation, and drench (DRD), and the dip treatment (Fig. 2D, 2I, and 2L). The dip and frontal injection plus DRD had moisture changes approaching 50% saturation at some depths and locations (Fig. 2I, 2L). A DRD treatment alone (Fig. 2H) was less than half as effective as the DRD plus frontal injection treatment (Fig. 2I). A drench from only one side was probably the worst treatment in terms of moisture change (Fig. 2G) and water loss from the root ball (Fig. 4). The addition of a surfactant to the single angled injection (Fig. 2K) actually reduced moisture change at top and middle locations relative to the same treatment without surfactant (Fig. 2D). It appears the surfactant allowed solution to drain to bottom areas of the root ball in greater quantity. A modified injection probe that had 4 exit holes near the tip and 4 additional holes 10 cm up the probe also was less consistent than other methods (Fig. 2J). In general, root balls receiving fewer injections (Fig. 2A, 2D, 2I, and 2K) had more consistent water changes at the different TDR sensor locations and depths than treatments with multiple injections (Fig. 2B-C, 2E-F), likely due to less water loss that occurred from channeling when

more injections were made. A single angled injection (Fig. 2D) was better than a single frontal injection (Fig. 2A).

All moisture readings were made during from 0.5 to 24 hours post treatment. In contrast, dye extractions described below were performed at >30 days after root balls had completely dried. There were some differences in where TDR sensors indicated high moisture change versus dye extractions that often had less or more change at the same site. It is likely moisture measurement alone may not be a reliable indicator of where insecticide residues will likely be found in sufficient concentrations to kill IFA. In contrast, dye location was highly correlated to bifenthrin concentration (Fig. 7) as described in more detail below. We feel that TDR moisture sensors do have value for gauging the general uniformity of a treatment technique, but dye extractions or insecticide soil bioassays may be a more reliable indicator of treatment efficacy against IFA.

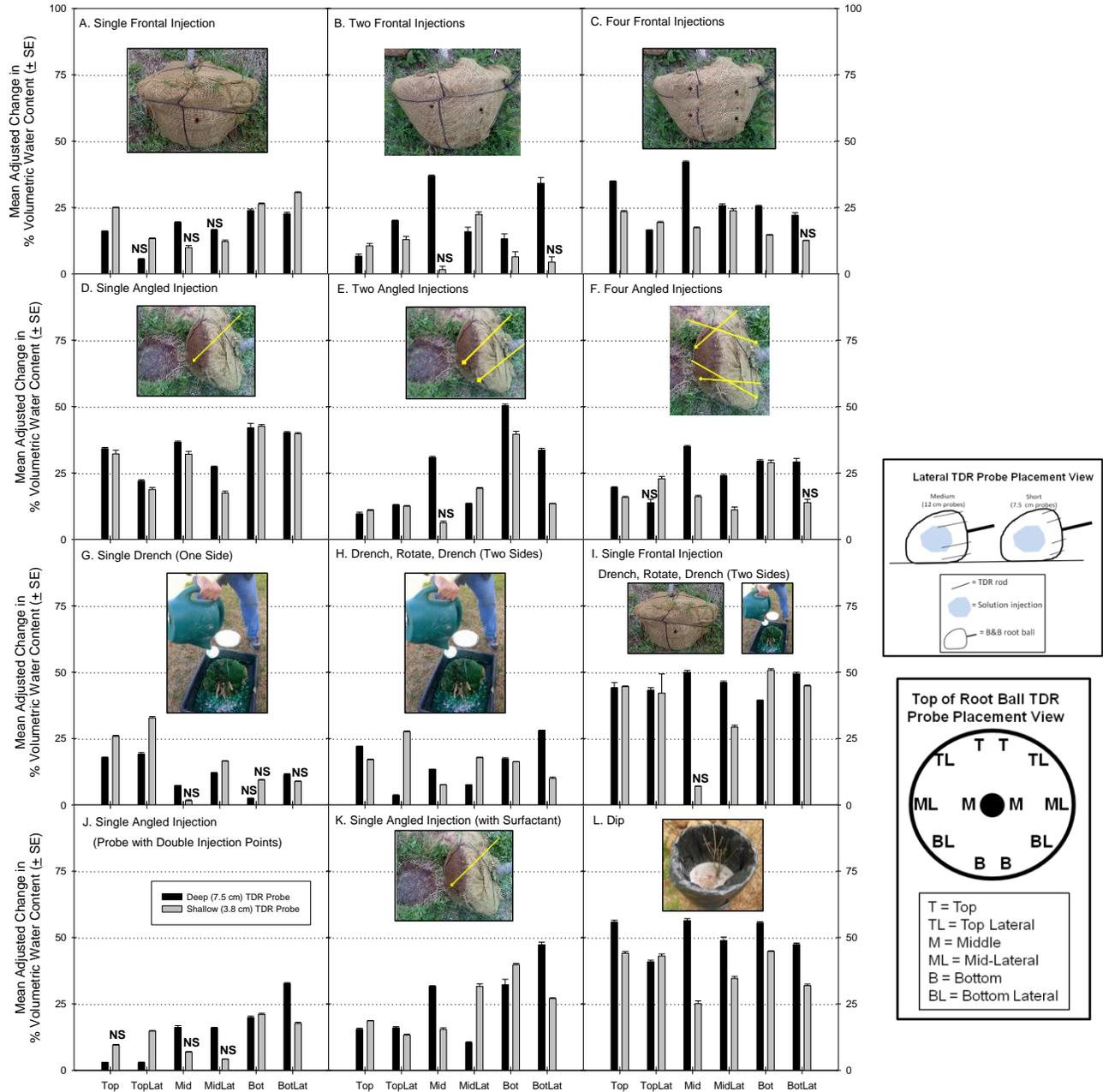


Fig. 2. Change in moisture (percent volumetric content) between treated and non-treated check balled and burlapped root balls during a 22 hour period using a TDR probe with a 3.8 cm (shallow) or 7.5 cm (deep) sensor probe length placed at six locations of Top (T), Top Lateral (TL), Middle (M), Middle Lateral (ML), Bottom (B), or Bottom Lateral (BL). Short and long probe lengths were randomly assigned to the left or right position at each location. Injection treatments all received a 20% root ball volume injection (6 qt / ft³ of soil) divided by the number of injections, including: A) a single frontal injection, B) two frontal injections, C) four frontal injections, D) single angled injection, E) two angled injections, or F) four angled injections crisscrossing from two directions. Drench treatments included a single 1/5 root ball

volume drench G) from one side or H) a 1/10 root ball volume drench on ones side, a root ball rotation after 30 minutes, and a second 1/10 root ball drench on the opposite side (DRD). One treatment received I) a single frontal injection of 1/5 volume and a 1/5 volume DRD treatment. Other treatments included J) a modified probe with four exit holes near the tip and an additional four exit holes 10-cm up the probe placed in the root ball at an angle and left in place during the injection, K) a single angled 1/5 root ball volume injection with Suffusion surfactant, or L) a root ball dip. All TDR moisture readings were taken at 0.5, 1, 1.5, 2, 4, 6 and 22 hours, but bars represent pooled values across hours based on analyzes that indicate no change in moisture readings with time during the first 22 hours. Bars with NS over the top indicated the change in water content between treated and check treatments were significantly different ($P < 0.05$; Proc Ttest).

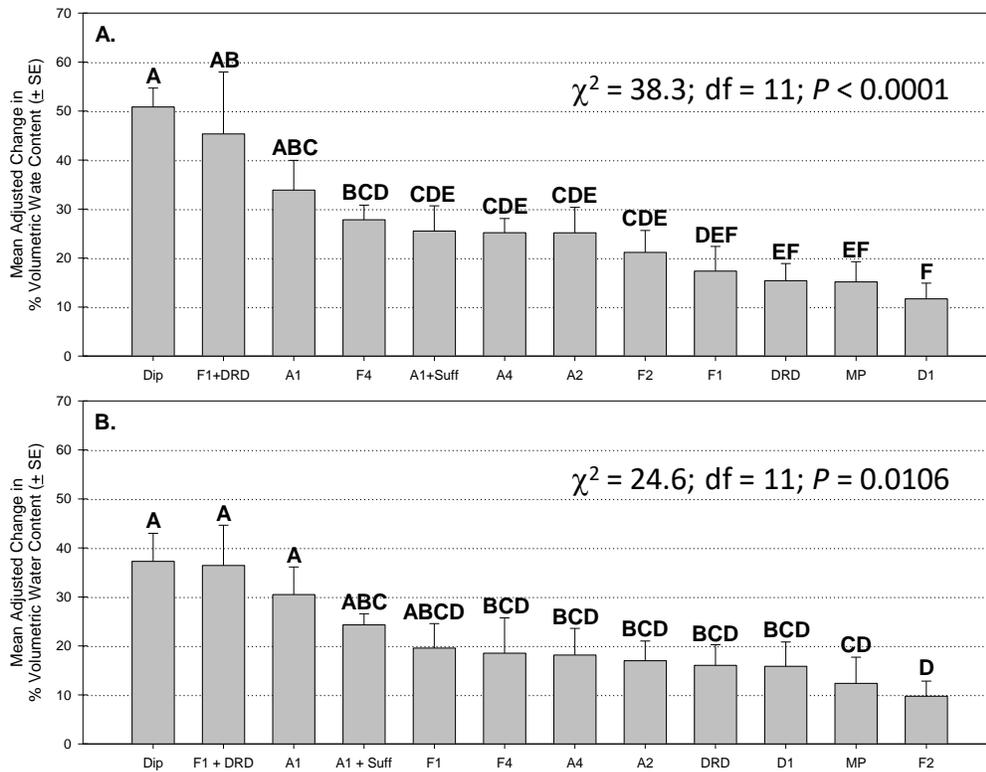


Fig. 3. Average change in % volumetric water content (\pm SE) between the check and treated root ball pooled for all sampling times and all TDR sensor probe locations for A) long (7.5 cm) and B) short (3.5 cm) TDR probes. Treatments included a root ball dip (dip), a single frontal injection plus a drench, wait 30 minutes and rotate, and then a second drench (F1 + DRD), a single angled injection (A1), a single angled injection + Suffusion surfactant (A1 + Suff), a single frontal injection (F1), four frontal injections (F4), four angled crisscrossing injections (A4), two angled injections (A2), a drench, wait 30 minutes, rotate, and drench (DRD), a single drench from one direction (D1), a modified injection probe with four exit holes near the tip and four

10-cm up the probe (MP), and two frontal injections (F2). Bars with different letters were significantly different (Generalized Linear Interactive Model (GLIM; Proc Genmod) with a negative binomial distribution with means separated by LSMeans ($P < 0.05$).

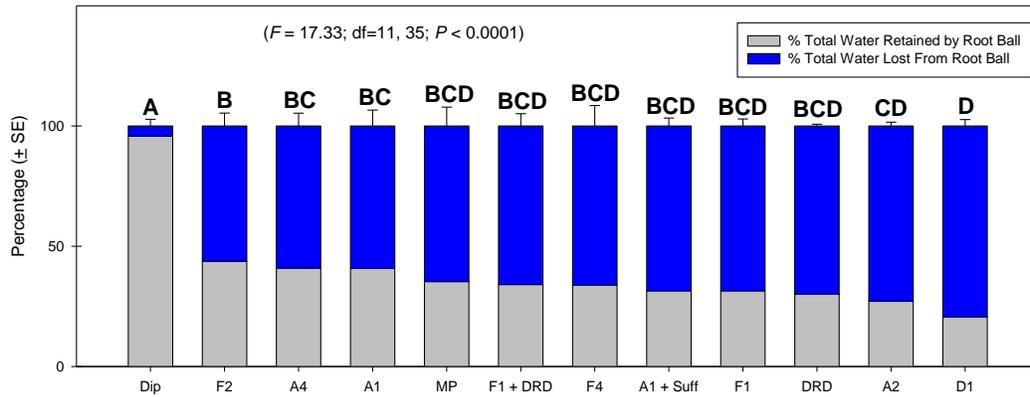


Fig. 4. Average percentage of treatment water retained (gray portion) or lost (blue portion) from root balls (\pm SE) following treatment, based on weight change of the root ball or gravel beneath the root ball. Treatments left to right included a root ball dip (dip), two frontal injections (F2), four angled crisscrossing injections (A4), a single angled injection (A1), a modified injection probe with four exit holes near the tip and four 10-cm up the probe (MP), a single frontal injection plus a drench, wait 30 minutes and rotate, and then a second drench (F1 + DRD), four frontal injections (F4), a single angled injection + Suffusion surfactant (A1 + Suff), a single frontal injection (F1), a drench, wait 30 minutes, rotate, and drench (DRD), two angled injections (A2), or a single drench from one direction (D1). Each bar represents the average of four replications. Bars followed by different letters were significantly different using a Generalized Linear Model (GLM; Proc GLM) with means separated by Least Significant Difference Test ($P < 0.05$).

B. Signal Green Dye Extraction and Analysis for Injection Probe Studies (Obj. A & C). Signal Green dye concentrations varied by location on the root ball within treatments and between injection methods (Fig. 5). Locations 1, 3, 5, and 6 were analogous to 7.5 cm TDR deep sensor probe depths of top, bottom, middle, and middle lateral positions, while location 2 was analogous to the 3.8 cm shallow TDR sensor probe at the middle position (Figs. 2 and 5). The top of the root ball (location 1) routinely had a low quantity of dye with the exception of the single drench treatment (Fig. 5). The quantity of the dye in the internal samples (locations 5 and 7) varied with the type of treatment (Fig. 5). Increasing the number of injections did not increase the quantity of dye recovered, likely because the additional injection sites allowed more of the treatment liquid to flow out of the channels created by the previous injection sites, reducing the amount of liquid and dye retained by the root ball. Location 2 (base of tree trunk)

produced both high and variable dye levels in some treatments, probably because some root balls lost a lot of dye solution at this location during injections, and others had little solution exit the root ball. Root architecture in the root ball likely was a factor in whether high or low volumes of dye solution exited the ball at location 2.

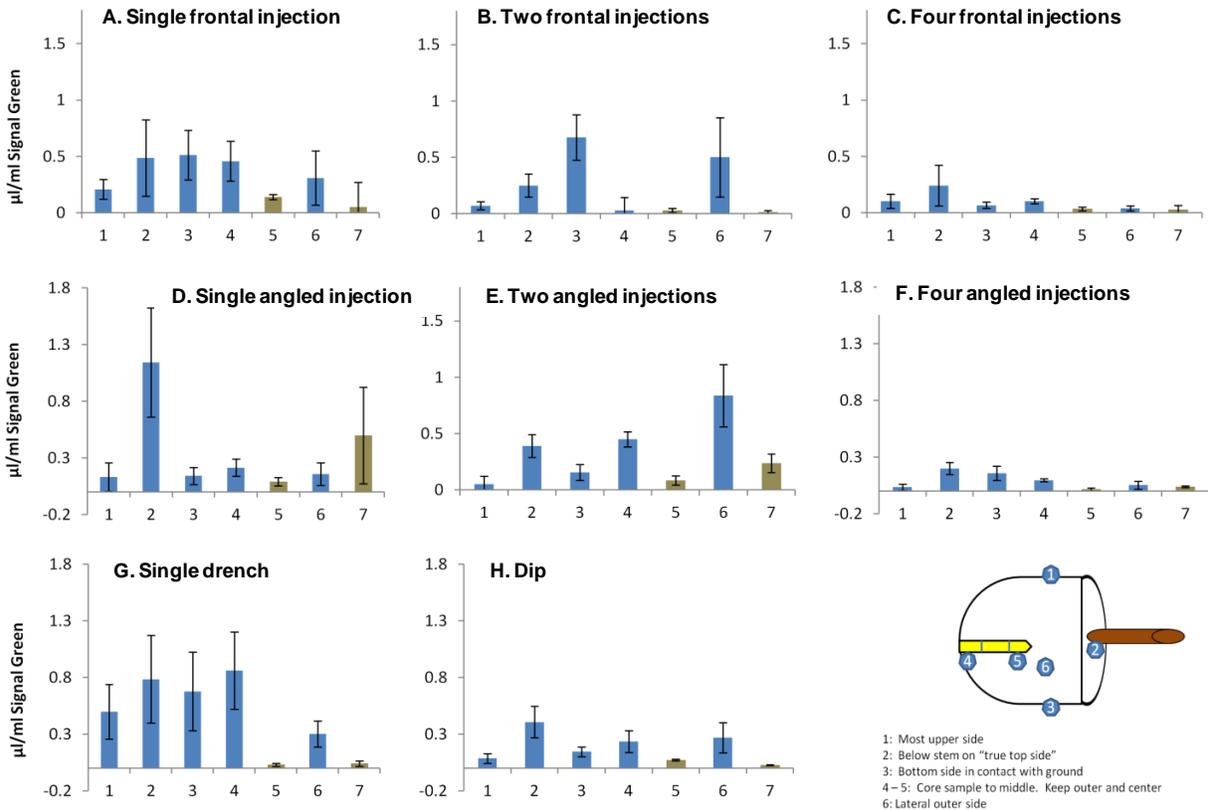


Fig. 5. Quantification of Signal Green dye in 7 root ball locations in under different treatment conditions. Bars in blue are external root ball samples. Bars in brown are internal root ball samples. Location 7 (not shown) is internal to location 6.

C. Signal Green and Bifenthrin Extraction and Analysis for Correlation Study (Obj. A & C). As in root ball moisture injection studies, the quantity of bifenthrin varied with site location in the root ball following a single angled injection (Fig. 6). The correlation between Signal Green dye optical density readings and bifenthrin was high ($R = 0.9538$) at the range of 0 and 14 μg bifenthrin / gram of soil (Fig. 7).

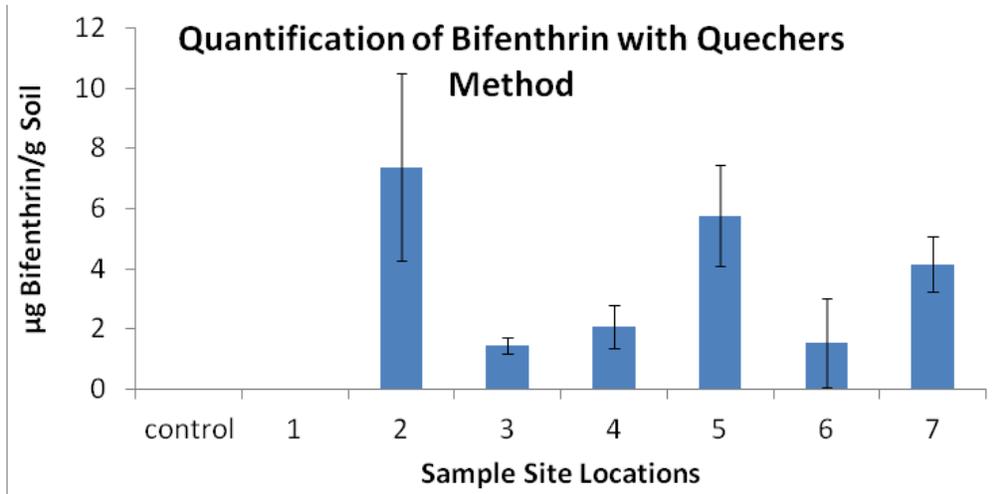


Fig. 6. Quantification of bifenthrin extracted from soil using QuEChERS method analyzed by GC-MS.

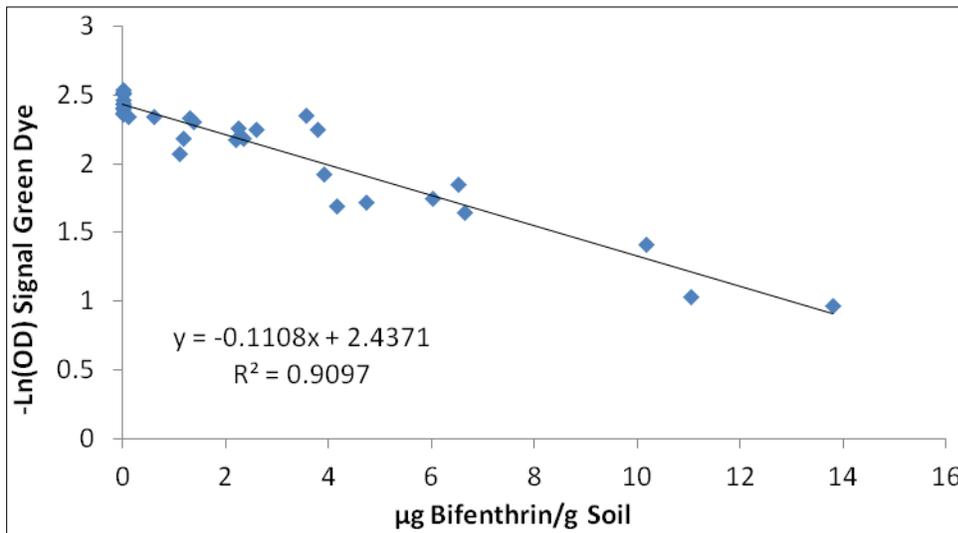


Fig. 7. Correlation between extractions of bifenthrin and Signal Green dye from root ball soil samples.

D. Fire Ant Laboratory Mortality Bioassay and Relationship with Signal Green Dye and Bifenthrin Concentration (Obj. A & C). Mortality in control treatment soil and in location 1 (top of root ball) of the treated root ball did not differ (Fig. 8). Treated locations 3, 4, 5 and 7 had 100% mortality by 7 DAT. Treated locations 2 and 6 failed to achieve 100% control even at 2 weeks (Fig. 8). In both cases, no bifenthrin was detected at the site in at least one of the replicates, which lead to mortality levels in those replicates equal to untreated control soil.

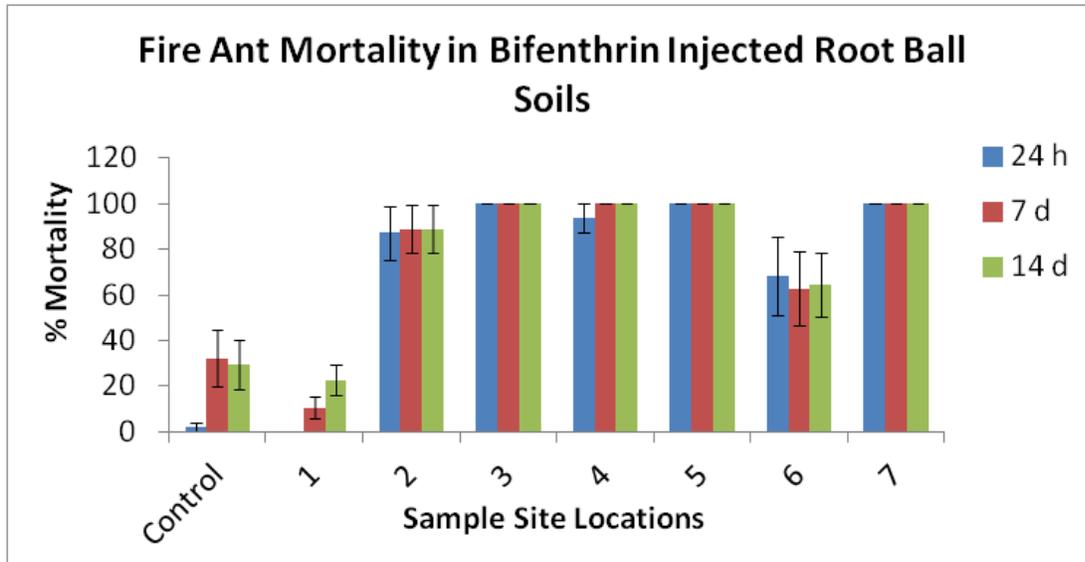


Fig. 8. Mortality of ants exposed to single-injection bifenthrin treated soil samples from root balls for 1, 7, and 14 d (\pm SE).

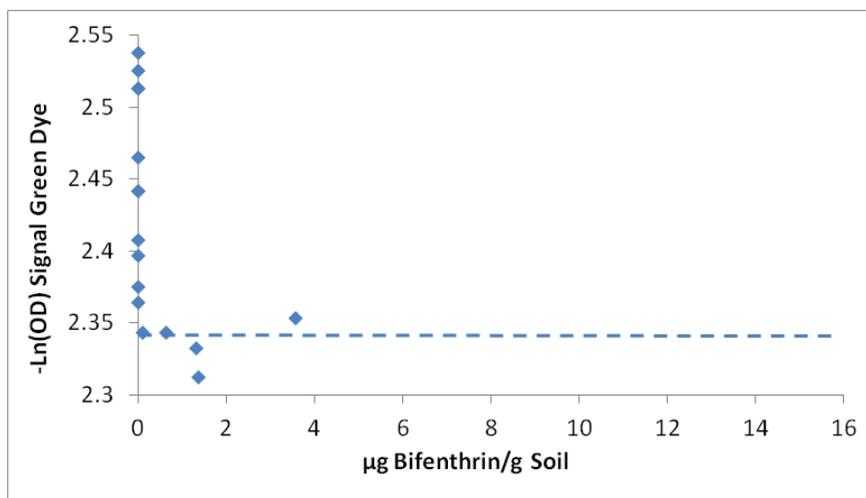


Fig. 9. Cutoff value of Signal Green dye where mortality drops below 100% in most trials. Outlier is circled in orange.

E. Development of Treatments to Eliminate Whole Colonies From Root Balls (Obj. A, C, & D) (USDA-APHIS Cooperator Anne-Marie Callcott).

All non-treated check root balls were active at 1 and 2 DAT, but two root balls lacked ants at 7 DAT (Table 2). The water injections in the untreated checks may have disturbed these colonies sufficiently for the ants to leave the root ball by 7 DAT. It is recommended any future studies like this one use plastic containers treated with Fluon[®] to contain the check or treated colonies. All treated root balls had no IFA colonies remaining at 7 DAT, although a single ant was found in the first replicate of the bifenthrin single root ball injection (Table 2). No treatment completely eliminated IFA colonies with 2 DAT, but

in most cases the ant numbers were reduced (i.e., 10 to 100 ants) from original numbers when the plants were field harvested (i.e., 300+). The test demonstrated that injection treatments do have the ability to eliminate IFA colonies harboring in the interior of B&B root balls.

Table 2. Imported fire ant colony infestation of balled and burlapped root balls following treatments rated at different days after treatment.

Chemical	Rate (lb AI / 100 gal)	Injection Number	Drench ^a	Rep	Activity (Days After Treatment) ^b			
					0	1	2	7
Bifenthrin	0.2	1	DRD	1	A	0	+++++	1 ant
				2	A	++	+	0
				3	A	++	0	0
Bifenthrin	0.2	4	DRD	1	A	0	+	0
				2	A	+	+	0
				3	A	+++++	+	0
Lambda-Cyhalothrin	0.034	4	DRD	1	A	+	++	0
				2	A	++++	0	0
				3	A	0	0	0
Check	0	4	DRD	1	A	A	A	0
				2	A	A	A	+++++
				3	A	A	A	0

^a DRD=Drench, wait 30 minutes, rotate root ball, and then drench opposite side

^b Green color=root ball actively infested on date based on either ants observed or ants still in root ball at a later date.

Pink=root ball had 0 to 1 ant. Symbols: 0=no ants seen; +=5 to 50 ants (multiple +=about 50 ants per +; A=active but root ball not disturbed for an ant count at the time.

F. Identification of Treatments to Rapidly Kill IFA Colonies – Scimitar Mound Treatments (Obj. B).

Several key findings were made from this test evaluating the ability of a pyrethroid to rapidly eliminate IFA colonies (Table 3), including: 1) The addition of a bait treatment did not significantly improve control of colonies treated with Scimitar drenches or tree ring treatments, but Advion did reduce the number of satellite mounds that formed near treated mounds, 2) No bait was effective alone at meeting FIFAQ level control, 3) Award II bait caused more colony movement than Advion bait, 4) By 10 DAT, all Scimitar low volume drench treatments were 100% effective at eliminating colonies with or without bait, 5) Low volume drenches were much more effective than TreeRing drenches, 6) Low volume drenches also were much more effective at preventing satellite colony formation, which is important in reducing the risk of ants moving to another nearby nursery tree, 7) Although bifenthrin, permethrin or other pyrethroids were not evaluated in this study, in general, ants treated with Scimitar appeared to be in worse condition more quickly than we have observed with past drenches of other pyrethroid insecticides. It is therefore likely Scimitar may have usefulness as a rapid mortality inducing treatment.

Table 3. Percent reduction in colony survival for mounds treated with lambda-cyhalothrin drenches and broadcast bait treatments (2014-2015).

Broadcast Bait Treatment ^a	Insecticide Treatment ^b	Rate (ml Product / L Water)	Method ^c	Percent Mound Reduction from Initial Total at Different Days After Treatment ^d									
				0	1	5	10	14	21	28	35	71	
None	Water (Control)	0.00	Drench	0	10	10	0	0	0	0	10	10	
None	Scimitar GC	0.32	Drench	0	90*	90*	100*	100*	100*	100*	100*	100*	
None	Scimitar GC	0.63	Drench	0	80*	100*	100*	100*	100*	100*	100*	100*	
None	Scimitar GC	0.19	TreeRing	0	30	40	70	90*	100*	100*	100*	100*	
None	Scimitar GC	0.38	TreeRing	0	50	70	70	100*	100*	100*	100*	100*	
χ^2				----	10.37	13.87	16.24	21.06	22.27	22.27	19.43	19.43	
df				----	4	4	4	4	4	4	4	4	
P				----	0.0347	0.0347	0.0027	0.0003	0.0002	0.0002	0.0006	0.0006	
Advion	Water (Control)	0.00	Drench	0	0	20	10	0	10	20	20	20	
Advion	Scimitar GC	0.32	Drench	0	50	100*	100*	100*	100*	100*	100*	100*	
Advion	Scimitar GC	0.63	Drench	0	40	100*	100*	100*	100*	100*	100*	100*	
Advion	Scimitar GC	0.19	TreeRing	0	10	70	90*	100*	100*	100*	100*	100*	
Advion	Scimitar GC	0.38	TreeRing	0	20	40	80*	100*	100*	100*	100*	100*	
χ^2				----	2.33	13.86	16.09	22.27	19.43	16.64	16.64	16.64	
df				----	4	4	4	4	4	4	4	4	
P				----	0.6755	0.0077	0.0029	0.0002	0.0006	0.0023	0.0023	0.0023	
Award II	Water (Control)	0.00	Drench	0	0	30	10	10	10	40	40	50	
Award II	Scimitar GC	0.38	TreeRing	0	20	90*	100*	100*	100*	100*	100*	100*	
χ^2				----	0.22	5.06	9.25	9.25	9.25	5.49	5.49	4.27	
df				----	1	1	1	1	1	1	1	1	
P				----	0.637	0.0245	0.0024	0.0024	0.0024	0.0192	0.0192	0.0387	

^a Advion = Advion Fire Ant Bait (1.5 lb bait / acre) (indoxacarb) and Award II = Award II Fire Ant Bait (1 lb bait / acre) (abamectin) applied broadcast to the plot areas containing mounds with a Herd GT-77 spreader.

^b Scimitar GC contains the pyrethroid lambda-cyhalothrin.

^c Drench = 7.6 liters solution applied to a 0.9 m diameter circular area using a hand wand with a water breaker nozzle supplied by tractor roller pump, so that half solution went directly on mound and half over the entire area. TreeRing = 18.9 liters of solution applied through a slow-drip TreeRing Junior irrigation device placed directly on the mound surface.

^d All treatments had an initial 10 active colonies. Percent reduction calculated as: $(\text{Initial colony number} - \text{Current colony number}) / \text{Initial colony number} \times 100$. Percents followed by an * were significantly different from the "None" treatment within a Broadcast Bait group at the 0.05 level using Proc Genmod with a negative binomial distribution on the original mound count data and LSmeans to separate treatments. Lavender colored cells indicate quarantine level control was achieved on that day after treatment.

G. Identification of Treatments to Rapidly Kill IFA Colonies – In-Field Mound Drench

Treatments (Obj. B). Multiple tests were performed evaluating different insecticides and biopesticides for ability to rapidly eliminate IFA colonies and potential serve as candidates for root ball injections.

In one test, several insecticides (bifenthrin, lambda-cyhalothrin, and chlorpyrifos completely eliminated colonies by 1 DAT and kept the mounds IFA free for the 7 day rating period (Table 4). Carbaryl provided 100% control after 2 DAT and acephate after 3 DAT (Table 4). The rates selected in this study were based on preliminary data from USDA-APHIS (Anne-Marie Callcott), supporting rates likely to achieve 100% colony control. The permethrin rate in this study was very low based on based on labels and was completely ineffective. None of the treatments were statistically different, likely due to the low number of mounds (n=5 per treatment) that were available for testing at the nursery. Chlorpyrifos was the only insecticide that resulted in no new satellite colonies forming near the originally treated mound, but carbaryl also had low numbers of new satellite colonies forming (data not shown). Chlorpyrifos would be considered a good product for rapid IFA colony control based on the speed of colony kill and absence of new satellite mounds. The biopesticide Essentria was inconsistent and also killed vegetation near the mound, so it could pose a phytotoxicity hazard to nursery plants. At the conclusion of this test, all of the non-treated check colonies at the nursery site were treated with chlorpyrifos at 2.37 ml / gal (6.25 times lower than initial test rates and equivalent to FIFAQ chlorpyrifos rate (i.e., 0.125 lb AI / 100 gal). For the 8 colonies treated, chlorpyrifos was 100% effective on a

1 and 2 DAT evaluation (data not shown), and therefore, the lower rate also would have potential for FIFAQ usage as a potential injection treatment.

In another test, all insecticides tested provided significantly greater control than the non-treated check on 1 and 2 DAT (Table 5), but on 3 and 7 DAT differences were not statistically significant (likely because of increasing numbers of inactive check treatment colonies). All of the treatments showed promise as potential rapid colony eliminating agents. The high rate of chlorpyrifos with or without Sevin was the only treatment providing 100% colony control at 1 DAT, and all other treatments were 100% effective at 2 DAT. The addition of a low rate of carbaryl did not enhance any of the insecticide treatments over just using the insecticide alone. The higher ornamental permethrin rate (2.37 to 4.73 ml) was more effective than the rate (0.17 ml) tested in an earlier test. In this test, bifenthrin and permethrin generally had the lowest total number of new mounds (data not shown).

Table 4. Insecticide drench treatments evaluated for speed of fire ant colony control during summer 2015.

Insecticide Treatment	Active Ingredient	Rate (Product / 7.6 L Water)	Method ^a	Percent Mound Reduction from Initial Total at Different Days After Treatment ^b				
				0	1	2	3	7
Water (Control)	None	0.00	Drench	0	40	20	40	20
Perm-Up 3.2 EC	Permethrin	0.17 ml	Drench	0	0	40	60	80
Orthene 97	Acephate	8.5 g	Drench	0	60	80	100	100
Sevin SL	Carbaryl	44.4 ml	Drench	0	80	100	100	100
Essentria IC3	Rosemary, geraniol, peppermint, and wintergreen oils	236.6 ml	Drench	0	100	80	60	100
OnyxPro Insecticide	Bifenthrin	9.9 ml	Drench	0	100	100	100	100
Scimitar GC	Lambda-Cyhalothrin	11.8 ml	Drench	0	100	100	100	100
Chlorpyrifos SPC4	Chlorpyrifos	14.8 ml	Drench	0	100	100	100	100
			χ^2	----	10.06	7.9	5.41	6.93
			df	----	7	7	7	7
			P	----	0.185	0.3412	0.6105	0.436

^a Drench = 7.6 liters solution applied to a 0.9 m diameter circular area using a sprinkle can with a water breaker nozzle, so that half solution went directly on mound and half over the entire area.

^b All treatments had an initial 5 active colonies. Percent reduction calculated as: $((Initial\ colony\ number - Current\ colony\ number) / Initial\ colony\ number) \times 100$. No significant differences were detected between the "None" treatment and the other insecticide treatments using Proc Genmod with a negative binomial distribution on the original mound count data and LSmeans to separate treatments. Lavender colored cells indicate quarantine level control was achieved on that day after treatment.

Table 5. Insecticide combination treatments evaluated for speed of fire ant colony control during fall 2015.

Insecticide Treatment	Active Ingredient	Rate (ml Product / 7.6 L Water) ^a	Method ^b	Percent Mound Reduction from Initial Total at Different Days After Treatment ^c				
				0	1	2	3	7
Water (Control)	None	0.00	Drench	0	13.3	33.3	66.7	66.7
Perm-Up 3.2 EC	Permethrin	2.37	Drench	0	73.3*	100*	100	100
Perm-Up 3.2 EC	Permethrin	4.73	Drench	0	86.7*	100*	100	100
Perm-Up 3.2 EC + Sevin SL	Permethrin + Carbaryl	2.37 + 0.16	Drench	0	86.7*	100*	100	100
Perm-Up 3.2 EC + Sevin SL	Permethrin + Carbaryl	4.73 + 0.16	Drench	0	86.7*	100*	100	93.3
OnyxPro Insecticide + Sevin SL	Bifenthrin + Carbaryl	1.89 + 0.16	Drench	0	93.3*	100*	100	100
OnyxPro Insecticide + Sevin SL	Bifenthrin + Carbaryl	3.79 + 0.16	Drench	0	80.0*	100*	100	93.3
Scimitar GC + Sevin SL	Lambda-cyhalothrin + Carbaryl	2.96 + 0.16	Drench	0	73.3*	100*	100	100
Chlorpyrifos SPC4	Chlorpyrifos	1.18	Drench	0	93.3*	100*	100	100
Chlorpyrifos SPC4	Chlorpyrifos	2.37	Drench	0	100*	100*	100	100
Chlorpyrifos SPC4 + Sevin SL	Chlorpyrifos + Carbaryl	1.18 + 0.16	Drench	0	93.3*	100*	93.3	100
Chlorpyrifos SPC4 + Sevin SL	Chlorpyrifos + Carbaryl	2.37 + 0.16	Drench	0	100*	100*	100	100
			χ^2	----	30.22	30.49	11.08	10.83
			df	----	11	11	11	11
			P	----	0.0015	0.0013	0.4368	0.4572

^a Perm-Up tested at the ornamental (4.73 ml) and half the ornamental (2.37) rates. All Sevin rates are the ornamental rate. Onyx was tested at half and one-fourth the ornamental rate. Scimitar rate is one-fourth the labeled individual mound treatment rate. Chlorpyrifos at 2.37 is both the ornamental rate and the approved Federal Imported Fire Ant Quarantine rate and 1.18 is half the ornamental rate.

^b Drench = 7.6 liters solution applied to a 0.9 m diameter circular area using a sprinkle can with a water breaker nozzle, so that half solution went directly on mound and the other half over the entire area.

^c All treatments had an initial 15 active colonies. Percent reduction calculated as: $((\text{Initial colony number} - \text{Current colony number}) / \text{Initial colony number}) \times 100$. Percents followed by an * were significantly different from the "None" treatment at the 0.05 level using Proc Genmod with a negative binomial distribution on the original mound count data and LSmeans to separate treatments. Lavender colored cells indicate quarantine level control was achieved on that day after treatment.

H. Identification of Treatments to Rapidly Kill IFA Colonies – Drench Water Volume Assessments (Obj. B).

In this test, all treatments were statistically more effective at colony control than the check treatment (Table 6). Only the higher water volume chlorpyrifos treatments (i.e., 1 or 2 gallon volumes) eliminated colonies at 1 DAT (Table 6). The lower water volume chlorpyrifos treatment (i.e., 0.5 gallons) was not 100% effective until the 10 DAT (Table 6). Cold weather prevented evaluations from 3 to 10 DAT. Few satellite colonies formed near the 1 and 2 gallon drench treatments. The study demonstrated that solution volume is a factor in successful elimination of a colony, when amount of active ingredient is held constant, which could be a factor in root ball injections.

Table 6. Percentage reduction in imported fire ant colonies and number of new colonies formed (i.e., satellite mounds) following treatments of Chlorpyrifos SPC4 applied at different drench volumes during fall 2015.

Insecticide Treatment	Active Ingredient	Amount of Chlorpyrifos 4E Product / Colony (ml) ^a	Method ^b	Percent Mound Reduction from Initial Total at Different Days After Treatment (DAT) ^c				Number of New Satellite Mounds at Different DAT		
				0	1	2	10	1	2	10
Water (Control)	None	0.00	None	0.0 a	0.0 a	0.0 a	7.1 a	2	2	1
Chlorpyrifos SPC4	Chlorpyrifos	2.37	0.5 gal drench	0.0 a	71.4 b	71.4 b	100.0 b	1	1	3
Chlorpyrifos SPC4	Chlorpyrifos	2.37	1.0 gal drench	0.0 a	100.0 b	100.0 b	100.0 b	0	1	0
Chlorpyrifos SPC4	Chlorpyrifos	2.37	2.0 gal drench	0.0 a	100.0 b	100.0 b	100.0 b	0	1	0
			χ^2	----	24.39	24.39	27.26	----	----	----
			df	----	3	3	3	----	----	----
			P	----	< 0.0001	< 0.0001	< 0.0001	----	----	----

^a Chlorpyrifos at 2.37 is both the ornamental rate and the approved Federal Imported Fire Ant Quarantine rate.

^b Drenches were applied with a drench wand containing a water breaker nozzle supplied by a tractor roller pump. A stop watch was used to calibrate and time delivery volumes. About half of the drench solution was applied directly on mound and half over a 91 cm diameter area with the mound centered in the dispensing area.

^c All treatments had an initial 14 active colonies. Percent reduction calculated as: $((\text{Initial colony number} - \text{Current colony number}) / \text{Initial colony number}) \times 100$. Treatments followed by a different letter were significantly different at the 0.05 level using Proc Genmod with a negative binomial distribution on the original mound count data and LSmeans to separate treatments. Lavender colored cells indicate quarantine level control was achieved on that day after treatment.

I. Identification of Treatments to Rapidly Kill IFA Colonies – Biopesticide Drench and Granular Test (Obj. B).

Essentria IC3 ranged from 86 to 100% control, while Essentria G never achieved complete colony control and performed worse than the check treatment at 2 and 3 DAT (Table 7). It is doubtful Essentria IC3 will have value as a FIFAQ injection treatment, because it did not achieve 100% control in this test or at twice the rate used in this test (see section G above). At twice the rate used in this test, Essentria IC3 also caused grass phytotoxicity, so it could be an issue for nursery plant safety.

Table 7. Percentage reduction of imported fire ant colonies and number of new colonies formed (i.e., satellite mounds) following treatments of Essentria biopesticide liquid and granular formulations during fall 2015.

Insecticide Treatment ^a	Rate	Method ^b	Percent Mound Reduction from Initial Total at Different Days After Treatment (DAT) ^c					Number of New Satellite Mounds at Different DAT			
			0	1	2	3	7	1	2	3	7
Water (Control)	0.00	Drench	0.0 a	46.7 a	80.0 a	80.0 a	66.7 ab	2	3	4	3
Essentria Granular	118.3 ml volume of granules	Salt Dispenser	0.0 a	20.0 a	20.0 b	20.0 b	33.3 a	3	1	3	3
Essentria IC3	118.3 ml	Drench	0.0 a	93.3 b	100.0 a	86.7 a	93.3 b	3	2	2	1
			χ^2	----	11.8	14.63	10.03	8.58	----	----	----
			df	----	2	2	2	2	----	----	----
			P	----	0.0037	0.0007	0.0067	0.0137	----	----	----

^a Essentria IC3 contains 10% rosemary oil, 5% geraniol oil, 2% peppermint oil, and 83% wintergreen oil and other ingredients. Essentria G contains 2% clove oil (eugenol), 0.6% thyme oil, and 96.5% corn cob grit and wintergreen oil.

^b Drench = 7.6 liters solution applied to a 0.9 m diameter circular area using a sprinkle can with a water breaker nozzle, so that half solution went directly on mound and the other half over the entire area. Essentria G was dispensed directly onto the mound surface and was not followed with post-irrigation because rain was forecast for overnight and did occur.

^c All treatments had an initial 14 active colonies. Percent reduction calculated as: $((\text{Initial colony number} - \text{Current colony number}) / \text{Initial colony number}) \times 100$. Treatments followed by a different letter were significantly different at the 0.05 level using Proc Genmod with a negative binomial distribution on the original mound count data and LSmeans to separate treatments. Lavender colored cells indicate quarantine level control was achieved on that day after treatment.

J. Sesbania Evaluation as Potential Biopesticide for IFA (Obj. B). Bioassays with acetone, ethanol, and hexane extracts were inconsistent (see 2016 annual report). Additional work is presently on-going outside of the project period with whole plant and water extracts, but it seems unlikely this plant has much potential for use in IFA nursery management programs. If IFA activity is detected with whole plant or water extracts, then efforts will be made to isolate active compounds and continue to pursue mortality and repellency bioassays.

PROJECT BENEFICIARIES:

Field-grown nursery producers will be the primary beneficiaries of this project, once the information is applied by regulatory personnel to treatment regulations, to improve treatment options. USDA-APHIS also is already using the information from this project to modify on-going research and develop improvements to the Federal Imported Fire Ant Quarantine (FIFAQ). Information from the project has already been shared with Anne-Marie Callcott (USDA-APHIS), who is the person making decisions about what nursery treatments to or not to submit to the FIFAQ. We anticipate some of the knowledge gained from this project could also benefit nursery plant treatments for other soil-borne pests like the Japanese beetle, and thus, the National Plant Board (NPB) and the growers affected by NPB regulations like the Domestic Japanese Beetle Harmonization Plan could be beneficiaries. USDA recently allowed nursery growers to perform a drench, rotation, and drench treatment to meet FIFAQ requirements for shipping field-grown nursery plants. USDA also knows this treatment is not 100% effective since fire ant colonies can retreat to the center of the nursery plant and avoid treatment. It is likely if fire ants begin to be found in receiving states, we could lose the current drench, rotation, drench option without an intervention, like the injection studies done in this project. Hence, growers ultimately will benefit from this project if they are allowed to continue shipping their plants.

LESSONS LEARNED:

A number of lessons were learned from the research study that could have future value to FIFAQ regulations and treatment options available to nursery growers. Some of the highlights of key findings including:

- Moisture sensors had value for gauging the general uniformity of an injection and drench technique, but dye extractions or insecticide soil bioassays may be a more reliable indicator of treatment efficacy against IFA.
- As expected, moisture changes in B&B root balls treated with either injection or drenches alone were not as uniform as when injections and drenches were combined (Fig. 2I). If moisture levels are indicative of the uniformity of insecticide distribution in the root ball soil, then an injection alone or drench alone will not provide adequate FIFAQ level control. A drench + injection combination treatment produced moisture changes in the root ball that were almost equivalent to a dip treatment, which is the most effective method known to treat a root ball for IFA. However, a dip is not a labor-friendly method to treat plants, so the drench + injection may be a valuable alternative treatment method for growers.
- Drenches and injections combined provided the most optimal moisture change throughout the root ball and were comparable to a dip treatment (the most effective technique known for IFA treatments).
- Certain injection angles were clearly more effective than others for achieving greater uniformity of moisture change in the root ball (e.g., single angled injection [Fig. 2D]).

- We did not test injection or drench solution volumes below 20% of the root ball volume because it was difficult to achieve adequate uniformity of moisture in B&B root balls even at 20% volume. Likewise, one of our original objectives to evaluate treated burlap in combination with injections was avoided because data from our USDA-APHIS cooperator indicated the treatment would not be sufficient. It was difficult to achieve sufficient IFA control with a drench + injection treatment (Table 2), and USDA considered it unlikely that treated burlap + injection would provide acceptable IFA control. Low dosage bifenthrin burlap treatments are presently used by USDA to contain IFA colonies inside B&B before other treatments are tested.
- The most important finding of this project may be the close relationship of Signal Green dye concentration in root ball soil to bifenthrin concentrations. Previous work with Signal Green dye provided the basis for the prediction that the two compounds do move similarly in solution within soil, since wherever dye was visibly present, the pesticide treated soil was normally toxic to IFA (Anne-Marie Callcott, pers. comm.). To evaluate the relationship between dye and bifenthrin movement, we took the best injection treatment above (Fig. 2D) and repeated the experiment with dye and bifenthrin to create a predictive model of bifenthrin and dye. A strong correlation was observed between the quantity of dye and bifenthrin ($R=0.9538$). This strong relationship between the movement of dye and bifenthrin should allow future studies to be conducted with Signal Green dye as a substitute for bifenthrin in early tests. The dye is safer for both handlers and the environment, as excess bifenthrin treated soil will not be discarded. Once preliminary tests are completed with dye, bifenthrin can be added to confirm treatment efficacy against IFA.
- In addition to tracking pesticide movement in soil, the dye-bifenthrin model can help predict where pesticide levels will be too low for ant kill by relating those values back to the dye concentration without the need for successive behavioral bioassays. Based on the bioassays performed in this study, an $-\ln(\text{OD} [\text{optical density}])$ value of 2.34 was the highest value for the green dye that still exhibited 100% mortality of IFA. The 2.34 value of dye equated to $0.105 \mu\text{g}$ bifenthrin/g soil. Higher values of $-\ln(\text{OD}) = 2.36$ and above were observed in untreated controls and in treatments where fire ant mortality was less than 100% (Note that OD measures the amount of light passing through a sample without interference, so higher values indicate more light passing without interference, and therefore lower concentrations of the material being measured. Hence, high OD values are inversely related with lower dye concentrations and corresponding lower bifenthrin levels). The OD value provides a threshold for future studies of dye where we can predict mortality of ants based on optical density values of dye.
- Signal Green optical density values just below 2.35 were indicative of bifenthrin concentrations that would not be sufficient to achieve 100% control. The dye to bifenthrin relationship will allow us to pursue more in-depth studies of root ball treatment methods with other root ball sizes to determine potential IFA efficacy of treatments.
- The amount of dye located in each zone of the root ball was not always closely related to locations with high or low moisture sensor readings. The dye samples were taken after the root ball soil had dried for over 1 month and not within the first 24 hours like the TDR moisture sensor readings. The dye may be a closer representation of the long-term distribution of pesticide in the root ball.

- All of the B&B used in this study had similar soil bulk density values (average 1.32 g / cm³) and sand, clay, and silt percentages of 70.2, 6.4, and 23.4, respectively. The sand percentage was higher than expected and it is likely that soils with higher percentages of other texture ingredients like clay or silt might affect solution and dye movement differently during and following injections. More future work is needed with other soil types using the optimal injection procedures identified in this project.
- Injection plus drench combination treatments of bifenthrin (0.2 lb AI/100 gal water) or lambda-cyhalothrin (0.034 lb AI/100 gal water) to eliminate existing IFA colonies from B&B plants were successful. These rates were the highest labeled single application rate and were higher than past bifenthrin (0.01-0.05 lb ai/100 gal water) and lambda-cyhalothrin (0.034-0.069 lb ai/100 gal water) injection rates tested (data not shown), which were highly variable and often required 1 to 4 weeks to eliminate colonies. At least 7 DAT was still needed to achieve 100% with the 0.2 and 0.034 bifenthrin and lambda-cyhalothrin rates, respectively. The testing demonstrated that existing colonies can be eliminated with injections, which satisfies one USDA concern that IFA colonies may be able to avoid drench treatments by retreating into root ball middles.
- Several additional mound drench studies were performed with field IFA colonies and demonstrated that bifenthrin, lambda-cyhalothrin, permethrin, and chlorpyrifos were the most effective treatments for rapid colony elimination. Future injection studies that will continue after this project will utilize these insecticides and the rates identified as effective in this study (see Tables 3-6).
- The addition of low rates of carbaryl with other insecticides applied by drench did not improve IFA colony elimination and would only increase cost to growers.
- Overall, chlorpyrifos was probably the most effective insecticide tested in terms of capability to quickly kill a colony and prevent surviving ant relocation into satellite colonies.
- Essentria liquid and granular biopesticides were insufficient to be used as injection treatments for FIFAQ. Likewise, evaluations of extracts from *Sesbania*, a plant purported to have repellent and toxic properties to IFA, indicated insufficient merit for FIFAQ usage.
- Data are being used from this project already to guide additional on-going injection work with IFA infested B&B by our USDA-APHIS collaborator, Anne-Marie Callcott. We anticipate new treatments will result from this work to benefit the ability of nursery growers to treat and ship nursery stock from FIFAQ restricted areas.

CONTACT PERSONS:

Dr. Jason Oliver: 931-668-3572; joliver@tnstate.edu
 Dr. Karla Adesso: 931-815-5155; kaddesso@tnstate.edu
 Dr. Sam Dennis: 615-963-5822; sdennis@tnstate.edu
 Anne-Marie Callcott: 228-385-9278; anne-marie.a.callcott@aphis.usda.gov

Project Title: Establishing the White Lightning Wine Trail

Submitted and approved as final report in 2016 annual report

Project Summary:

Tennessee wineries and Tennessee wines are under-recognized, limiting the growth of Tennessee specialty crops, primarily wine grapes. In a recent state wide survey conducted by Hughes et. al., only 16% of respondents indicated they were knowledgeable or extremely knowledgeable about Tennessee wines. According to Stonebridge, Tennessee wines represent only 3% of wines found on retail shelves in Tennessee.

This initiative was focused on increasing demand for Tennessee specialty crops used in wine production. When wineries are successful, the entire specialty crop industry thrives. The project initially envisioned collaboration with seven (7) wineries to establish the White Lightning Wine Trail, launch of a state-of-the-art web presence and E-Passport for the trail and conduct of a marketing campaign consisting of brochures, print ads, social media, and point of sale materials to promote the wine grape industry along with the Tennessee wineries that made up the trail. The project was scaled down to meet the funding limit of \$25,000.00 for new applicants established by the Tennessee Department of Agriculture. A subsequent grant was funded the following year to accomplish the marketing portion envisioned as part of the overall project. This report necessarily includes results from the combine efforts of establishing and marketing the Wine Trail.

The White Lightning: Thunder Road to Rebels Trail is a recently established Tennessee Byway and all of these wineries are on or near the trail, which facilitated trail establishment and marketing. The project supported the United States Department of Agriculture's (USDA) Strike Force Initiative and Tennessee's Agricultural 10 Year Strategic Plan. The Tennessee grape and wine industry is poised to make major gains and this grant helped ensure adequate resources were available for marketing and promotion of these newest Tennessee wineries producing and utilizing specialty crops. Wine Trails Are Pathways to Dollars for rural agriculture and rural communities and a growing wine industry supports a growing specialty crop industry. Available data suggest wine trails are responsible for on average 25% of gross income of participating wineries.

Unforeseen issues discussed later in the report, resulted in renaming the original "White Lightning Wine Trail," The Great Valley Wine Trail. Small wineries like those on the Great Valley Wine Trail face a tough challenge - attracting consumers' attention to their products, much of which must be sold directly to consumers at the winery. It usually takes five years before a growing winery is into a positive cash flow situation, necessitating outside funding in the early years, particularly for marketing efforts. Many times, spending on marketing is minimally funded, if at all.

According to USDA, 85 percent of our country's persistent poverty counties are in rural America, and Union, Grainger, Johnson and Cocke County, four counties where wineries on this trail are located, represent some of those with the greatest need in East Tennessee. Growing the economy by investing in these rural communities has increase opportunities for the families in these economically distressed areas and is critical to rebuilding the historical agricultural backbone of rural East Tennessee.

Each dollar in wine sales equates to \$31 in overall economic impact. For every 1,000 gallons increased production, 5-7 FTEs are created in winery, vineyard and tourism associated activities. Economic summary analysis from a number of Stonebridge reports estimates .1 FTE per acre of established vineyard, one FTE per 1,000 gallons production and five FTEs from direct employment as a result of wine tourism. The wine and wine-grape industry also generates significant tax dollars, benefiting federal, state and local governments. Tax dollars are raised through sales taxes, excise taxes, income taxes, estate and gift taxes, payroll taxes, property taxes and other business taxes and fees.

Much work remains, however it is clear from the data presented in this report that USDA and the Tennessee Department of Agriculture's investments in the grape and wine industry are making a difference in Tennessee's Agricultural landscape, and offering opportunity to many young and beginning farmers and enhancing economic development in Tennessee's rural and poorest counties.

Project Approach:

This project had two main overarching goals:

- 1) Increase the demand for Tennessee specialty crops by Tennessee wineries.
- 2) Increase the numbers of specialty crop growers and expand production of current growers

This project had four performance measures that were used to track progress towards achieving the main overarching goals:

- 1) Increased wine sales by trail wineries during the grant period.
- 2) Increased specialty crop purchases by trail wineries during the grant period.
- 3) Trail passport completion during the first 12 months of operation, along with annual growth during the grant period.
- 4) Webpage "hits" to the wine trail webpage during the first 12 months of operation, along with annual growth during the grant period.

Work-plan tasks of the project:

- Establish the White Lightning Wine Trail
- Establish fee for service contract with winery marketing consultant
- Establish fee for service contract with freelance writer
- Establish fee for service contract with web development firm, social media expert, and graphics artist
- Coordinate with Tennessee Department of Tourism on use of White Lightning: Thunder Road to Rebels Trail logo on promotional material
- Meet with participating Wineries/Vineyards and develop template for the trail passport and trail website and social media campaign
- Finalize template for trail passport and trail website
- Procure 2,000 paper copy trail passports

The target measures of success for the project:

- Combined increase in wine sales of 20 percent annually during the grant period
- Combined increase in specialty crop purchases of 20 percent annually during the grant period
- Two thousand (2,000) passport completions during the first 12 months of operation, along with 20 % annual growth during the grant period
- Three thousand (3,000) "hits" to the wine trail website

Data obtained and presented in this report are a combination of this initial grant to establish the Wine Trail and a subsequent grant the following year to market the Wine Trail.

Data indicate outcomes have far exceeded expectations. From 2015 - 2016, sales increased three fold year-over-year at the rural winery in Grainger County. Initial annual sales, Oct 2015 – Oct 2016, exceeded expectation by over 300% at the newly established rural winery in Union County with wine club memberships growing 30 percent month over month, now exceeding 1,000 members, with production of almost 10,000 gallons in the first year of operation. Remarkable results for a rural winery open only 15 months.

The number of vineyards, acres of grapes in production and quantity of fruit produced in Tennessee is on the rise; with 905 acres in production, a 56% Acre Change increase over 2007.

Approximately 35,000 wine trail brochures have been distributed as of the date of this report. Key media, to include dozens of press articles and news appearances were used to "kick-start" a continuous and sustainable social media marketing effort. We have over 1,400 likes on the Wine Trail Facebook Page, <https://www.facebook.com/GreatValleyWineTrail/>, have established Industry Partner pages on TNVacation.com, 9LakesEastTN.com, America's Wine Trails, Wine Trail Adventures, Visit Knoxville, and Tennessee River Valley Geotourism and were recently feature in the TN Depart of Tourism Trip Tales, receiving over 70 shares in social media in the first two weeks on this post. The most successful Social Media Post had over 300 shares and a

reach of over 26,000. Several posts have been shared hundreds of times. The current combined reach of our trail and trail wineries on Facebook alone is over 3M. The web site, <http://www.greatvalleywinetrail.com/>, receives over 1,000 hits each month. A blog is published two to three times a month and software is used to connect the digital platforms so blogs are shared across platform; blog post may also advertise participant winery activities and events.

Constant Contact is used as the e-mail service and almost 1,000 individuals receive the monthly Wine Trail newsletter and blog. The trail has been featured numerous times in local print media, news reports, and several interviews have been done by local news agencies. A sampling of the press coverage can be referenced at <http://www.greatvalleywinetrail.com/in-the-news/>.

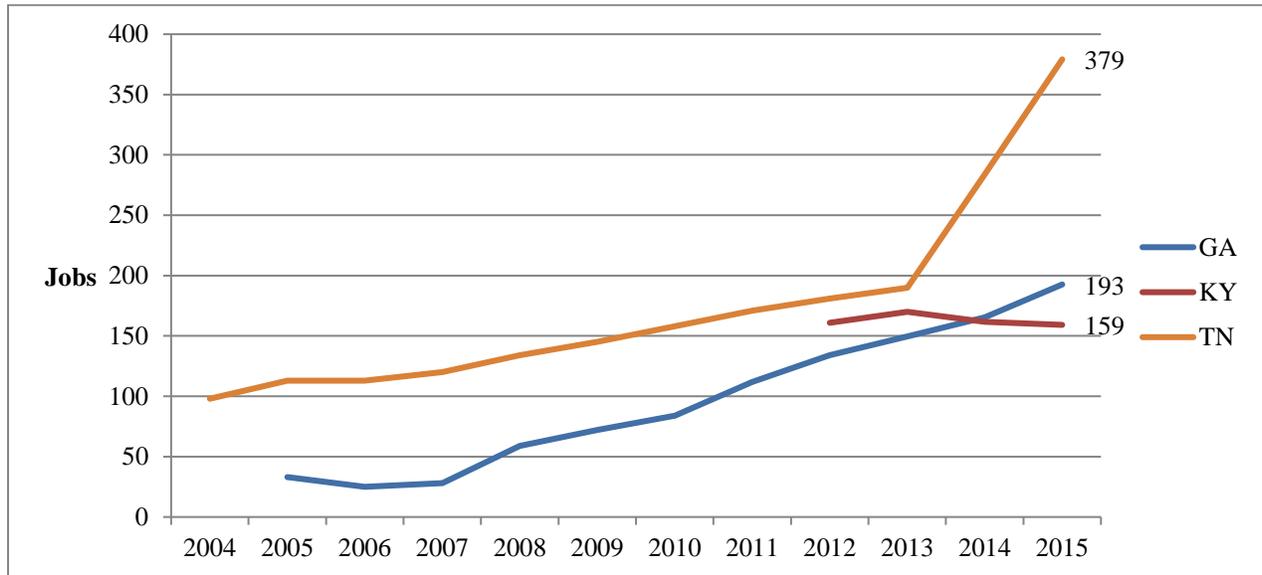
Goals and Outcomes Achieved:

From 2004 through 2012, the Tennessee wine industry grew in a relatively steady manner. The United States Department of Agriculture (USDA) and the Tennessee Department of Agriculture started making an investment in the Tennessee's grape and wine industry in 2011, funding 12 projects from 2011 – 2016, including SCBGP-TN0007 "Establish the White Lightning Wine Trail".

Industry growth accelerated sharply starting in 2013 and has continued through the first half of 2015, as increases in reported employment and wages outstripped growth rates for the industry nationally and in all neighboring states¹.

Reported covered employment to the Bureau of Labor Statistics indicates strong growth for the Tennessee wine industry with especially strong growth starting in 2013¹. According to Hughes and colleagues¹, total annual employment at these reporting establishments has increased from 98 jobs in 2004 to 190 jobs in 2013 to a quarterly average of 379 jobs by the middle of 2015 (a 286.9% increase from 2004).

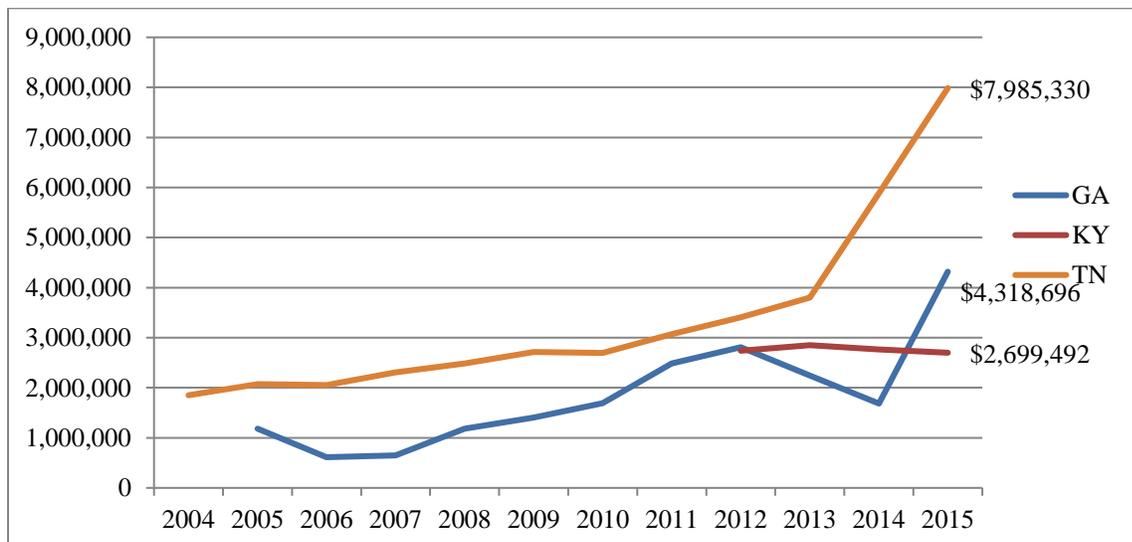
Growth in Covered Employment, Tennessee Wineries and Peer Neighboring States, 2004-2015



Source: U.S. Bureau of Labor Statistics, Hughes et al, 2016.

Reported wages and salary data strongly reinforces the recent growth in the Tennessee industry; wages paid by covered Tennessee wineries were \$1.850 million in 2004, a value that increased to a projected \$7.985 million by 2015¹.

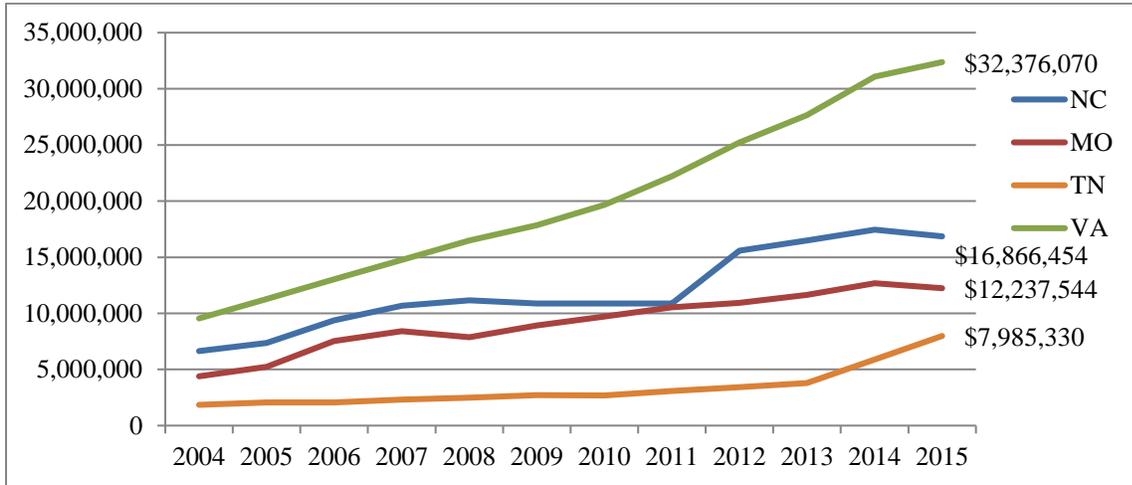
Growth in Wages and Salaries Paid to Covered Employment, Tennessee Wineries and Peer Neighboring States, 2004-2015.



Source: U.S. Bureau of Labor Statistics, Hughes et al, 2016.

Note: Values for 2015 are for the first two quarters.

Growth in Wages and Salaries Paid Covered Employment, Tennessee Wineries and Aspirational Neighboring States, 2004-2015.



Source: U.S. Bureau of Labor Statistics, Hughes et al, 2016.

Note: 2005-2007 values for Virginia and 2010-2011 values for North Carolina are interpolated. Values for 2015 are for the first two quarters.

The number of vineyards, acres of grapes in production and quantity of fruit produced in Tennessee is on the rise; with 905 acres in production.

Grape Acreage and Farms in Tennessee, Selected Neighboring States, and Nationally.

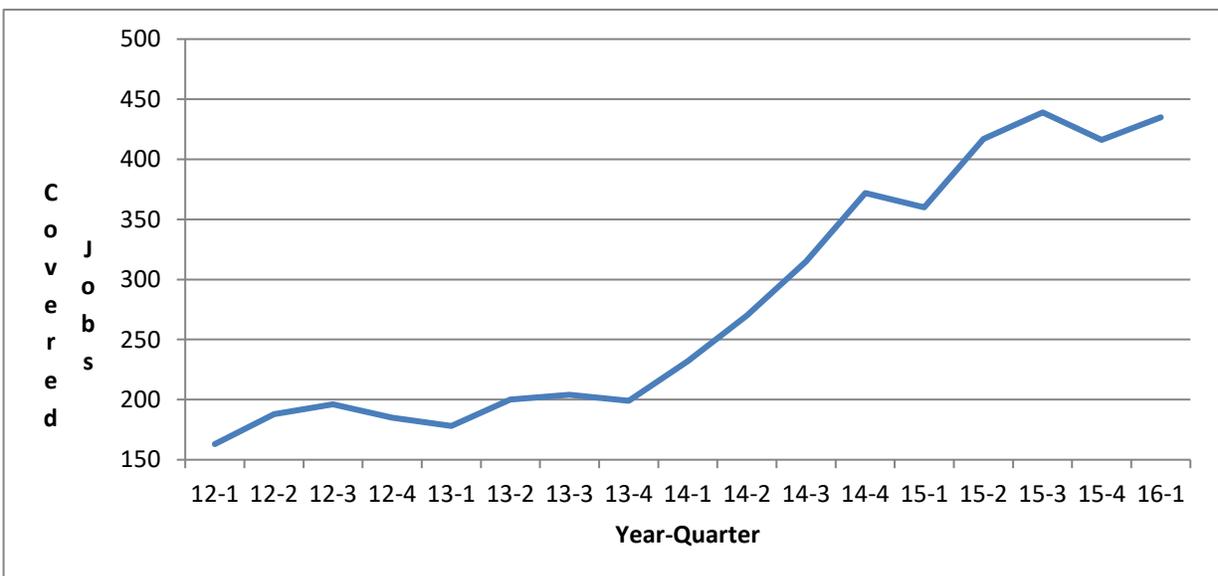
State	Farms	Acres	Acres per Farm	% Bearing Acres	% Acre Change vs 2007
Tennessee	343	905	2.64	71.3%	56.0%
North Carolina	874	3,392	3.88	79.2%	6.5%
Virginia	660	4,371	6.62	85.4%	34.2%
Kentucky	411	626	1.52	73.2%	1.3%
Georgia	387	1,941	5.02	90.5%	17.9%
United States	27,878	1,139,146	40.86	91.6%	8.3%

Source: U.S. Census of Agriculture, 2007 and 2012, Hughes et al, 2016.

Analysis of the most recent data released by the U.S. Bureau of Labor Statistics indicates that the Tennessee wine and grape industry continues to show strong growth. Direct “covered” or hired jobs in the Tennessee winery industry has grown to 435 workers in the first quarter of 2016, which is an increase of over 20 percent from the same time last year. The number of establishments with hired workers has seen a similar increase. Discussions with industry officials and an analysis of bonded winery data provided by the U.S. Tobacco, Firearms and Alcohol indicates that the state now has 72 bonded wineries. Accounting for self-employment (which are not included in these values), Tennessee wineries currently provide well over 500 jobs.

As shown below, the data indicates that the strong growth started in 2013 and observed in analysis by the Tennessee Extension Service has continued to occur.¹ Possible reasons for the growth include a continued and growing industry in local foods and local agriculture, improved quality in the wines produced in Tennessee and continued investment by USDA and the Tennessee Department of Agriculture, especially in Tennessee’s most rural counties. The industry provides economic growth and employment opportunities in many rural areas where job options may be limited.

Growth in Covered Employment in Tennessee Wineries



¹ “Growth Prospects for the Tennessee Wine Industry”, available at <https://ag.tennessee.edu/cpa/CPA%20Publications/PB1844%20web.pdf>

Grant efforts have focused on establishing, building awareness and enhancing the image of this newly established Wine Trail. This has increased the number of visitors to the wineries, increased wine sales and increased demand for specialty crops used in wine production.

Ms. Donniella Winchell, a national winery marketing expert was contracted to assist with developing the wine trail. Ms. Winchell, Executive Director of the Ohio Wine Producers Association, consults with numerous tourism and wine marketing organizations across the country and agreed to lead this effort. Ms. Winchell traveled from Ashtabula Ohio and visited with all participating wineries and worked electronically to coordinate efforts and direct logo development, branding and website development.

A graphics firm in Knoxville was selected to develop the trail logo after deciding to change the trail name from “*White Lightning Wine Trail*” to “*Thunder Road Wine Trail*” to dissociate the branding effort from “White Lightening”, aka moonshine, to the historical route “Thunder Road”. The Tagline “Uncork The History” was chosen for the marketing effort and a mission statement was formulated.

Our mission is to share our passion for rural Tennessee and Tennessee wines and promote agritourism in Union, Grainger, Cocke, and Johnson counties.

Although prior coordination was conducted with individuals having a pending trademark application for the mark “Thunder Road,” as pertains the Tennessee Moonshine, was done before choosing the name “Thunder Road Wine Trail,” the individuals pursuing this mark issued a cease and desist letter on our use of “Thunder Road Wine Trail” for promoting trail tours and interests of the association. To avoid a potentially prolonged and expensive legal effort, a new name for the trail was selected and has been incorporated in our marketing effort; “Great Valley Wine Trail.”

Visits and discussion with the original wineries envisioned as part of the trail resulted in two, Nolichucky Vineyard and Farm Winery, 6600 Fish Hatchery Road, Russellville, TN 37860 and Lach Amore Winery, 1968 Chestnut Hill Rd., Dandridge, TN 37725, electing not to participate because of current operational, financial and organizational issues.

Following her initial consultation, one of the core suggestions from Ms. Winchell was a recommendation to form a Winemakers Roundtable to work on the issue of wine quality among the trail’s wineries. The two most important aspects of a successful winery are wine variety and quality an “order qualifier” (necessary to be a player in the industry) and good customer service which is an “order winner” (the main competitive advantage) for wineries. As wine quality is the most important factor in industry growth, this roundtable evaluates the wines from the wineries on the trail, makes recommendations on how to improve the wines as necessary and picks the best wines to be labeled as Winemakers Select.

Another important point Ms. Winchell made was the need to have a significant prize contest for anyone visiting all six wineries on the trail. She recommended a weekend stay at a Watauga Lake B&B because of the beauty of the area. Ms. Winchell made numerous other recommendations which were implemented as part of the overall project.

The URL was procured and the Avada Wordpress Template was selected for the web theme. Avada is a clean, super flexible and fully responsive Wordpress design, in addition to being the number one selling Wordpress theme. All the wineries developed and built content for the website. This involved numerous visits to the wineries and back and forth dialog among our media consultant, web developer, Ms. Winchell and the wineries.

One of the unique aspects of the trail website is our integration of the beauty and history of East Tennessee as you travel from one winery to the next on the White Lightning: Thunder Road to Rebels Trail Tennessee Bi-Way. Integral to the trail website will be our use of social media. Pinterest, Facebook, Constant Contact, Google Business, etc. accounts for the trail and our wineries were established. All content was optimized for SEO. The website went live 1 August 2015.

The Constant Contact uses three introductory messages, timed during the period after sign-up; followed by monthly newsletters. The news letters are posted to Facebook as are the Blog posts.

The Trail Passport was developed and an initial 8,000 copies obtained. Individual winery stamps were procured and the passports stamped at each visit.

Signage requests for the TODS and Trailblazer sign program with the Tennessee Department of Transportation were submitted and qualifying wineries signage procured/installed.

Trail Bi-Laws were written and agreed to by the wineries.

Analytic reports are reviewed monthly to include Facebook activity, web hits, newsletter sign-ups, and regional interests. Significant activities are reported to the wineries; as recommended by Ms. Winchell, a Facebook Group has been established to aid in communication and efforts at sustainability have been put in place.

Kickoff events for the trail were advertised on social media and held at each winery throughout the month of October 2015. Senator Frank Nicely, Mayor Mike Williams and other dignitaries did the official Wine Trail ribbon cutting on Thunder Road at The Winery at Seven Springs Farm on 3 October 2015.

Starting on 2 October 2015, kick-off events were begun at Eagle Springs Winery culminating with the final event at Spout Spring Estates Winery and Vineyard on 24 October. Facebook

Boost Ads were done for each event, and we had a lot of coverage in the local press, and saw both a lot of new visitors and tremendous support from the local community at most of the events. The spectrum was most interesting, with several of the wineries absolutely overwhelmed with the most successful sales events ever reported by the participating wineries, generating well over \$5K in wine sales at the more successful events. The weather was a factor at two events, but even with soaking rain and mud, people turned out in droves at The Winery at Seven Springs Farm. Two take home observations 1) It's all about the wine; 2) People enjoy getting out to rural Appalachia.

We use Constant Contact as our e-mail service and have almost 1,000 individuals receiving our monthly newsletter and blog. The trail has been featured numerous times in local print media, news reports, and several interviews have been done by local news agencies. A sampling of the press coverage can be referenced at <http://www.greatvalleywinetrail.com/in-the-news/>.

As a result of this success and collaborative efforts among our wineries, the staff at TN Market Development and USDA, we have proposed additional efforts in subsequent grants which we hope will contribute significantly to continued growth in the grape and wine industry in Tennessee. Our continued efforts include establishing the first Single State American Viticultural Area in Tennessee and a marketing effort to bring Wine Tourism to our rural wineries and rural counties.

Beneficiaries:

According to USDA, 85 percent of our country's persistent poverty counties are in rural America, and Union, Granger, Johnson and Cocke County, four counties where wineries on this trail are located, represent those with the greatest need in East Tennessee. Growing the economy by investing in these rural communities has increase opportunities for the families in these economically distressed areas and will be key to rebuilding the historical agricultural backbone of rural East Tennessee.

Each dollar in wine sales equates to \$31 in overall economic impact. For every 1,000 gallons increased production, 5-7 FTEs are created in winery, vineyard and tourism associated activities. Economic summary analysis from a number of Stonebridge reports estimates .1 FTE per acre of established vineyard, one FTE per 1,000 gallons production and five FTEs from direct employment as a result of wine tourism. The wine and winegrape industry also generates significant tax dollars, benefiting federal, state and local governments. Tax dollars are raised through sales taxes, excise taxes, income taxes, estate and gift taxes, payroll taxes, property taxes and other business taxes and fees.

Grape growing and the establishment of wineries are helping to diversify local economies and keep land in agricultural production as some crops become less viable. By their very nature,

wine and grapes are long-term investments and long-term employers. Not only are these long-term investments but they are inherently tied to “place”: a particular location, soil, landscape and aspect. Unlike manufacturing or service enterprises, vineyards, once planted, cannot simply get up and move to another country which might offer cheaper labor, a better business climate or tax incentives. Wine especially speaks of the soil and climate from which it is drawn. Whether from Michigan, California, New York, North Carolina or any of the other states producing wine, wine speaks of its community and its history. A strong wine industry contributes to the rural economy in agricultural areas, and helps resist the pressures to sell land for development (<http://impact.cals.cornell.edu/project/new-cornell-wine-grape-varieties-protecting-environment-and-improving-rural-economy>).

The financial impact of a winery in rural America goes far beyond the value added to the raw commodity. In addition to the value added by the change in physical state, a rural vineyard/winery has an enormous value-added component as a capital-intensive and labor-intensive industry which generates “wine country” tourism with its economic multiplier effect. “When a winery gets established in a small rural community, it attracts people. It becomes a destination,” according to Paul Read, Professor of Horticulture and Viticulture at the University of Nebraska-Lincoln. When people visit wineries, they patronize the winery and support winery jobs. They also buy fuel at the gas station, drop in at the antique shop around the corner, eat dinner at the restaurant and stay at the Bed and Breakfast. They infuse money into the town’s economy, states Professor Read.

USDA and the Tennessee Department of Agriculture’s investments are making a difference in Tennessee’s Agricultural landscape, and offering opportunity to many young and beginning farmers. Growing grapes can be profitable, replacing the income lost from the traditional agricultural endeavors in rural East Tennessee of dairy and tobacco. Based on analysis by Hughes et al, 2016, Cayuga White production shows a net profit of \$1,296 per acre in the third year of production and an annual profit of \$4,835 per acre in the four through 20 years of production. On a per acre basis, the total accumulated net return is \$284,699 per acre. At a discount rate of 5.5% per year, the total net present value of Cayuga White production over the twenty year planning horizon is \$77,397. The breakeven year of production is year five. The internal rate of return is 40.2%.

Similarly, Vidal Blanc and Chambourcin production both have an estimated net profit of \$2,070 per acre in year three and an annual profit of \$5,175 per acre in the four through 20 years of production. For both Vidal Blanc and Chambourcin on a per acre basis, the total accumulated net return is \$174,469 per acre. At a discount rate of 5.5% per year, the total net present value of Vidal Blanc and Chambourcin production over the twenty year planning horizon is \$52,028

per acre. The breakeven year of production is year five. The internal rate of return is 31.3% for both grapes.

The wine and grape industry has the potential to generate significant economic growth in rural communities of Tennessee and has natural linkages with the state's tourism industry. Based on a 2009 study of the economic impact of wine on North Carolina (Frank, Rimerman, + Co., 2011), the combined wine and grape industry generated 7,600 jobs and \$1.2 billion in total annual economic impact in the state. Particularly noteworthy is the fact that North Carolina's wine tourism revenue grew 27% between 2005 and 2009, with 2009 data indicating 1.26 million wine tourist visits and \$156 million in wine tourism revenue. The states of North Carolina, Virginia and Ohio have developed wine tourism into a billion dollar industry and it is this success that we hope to leverage in rural East Tennessee by growing our rural wineries capacity and increasing demand for locally produced wine grapes.

Lessons Learned:

Given the complexity of the task and funds available, significant results were accomplished. Ms. Winchell was instrumental in making this happen and she is to be commended.

If any one thing stands out it is the inability to obtain adequate signage for the wine trail. At the time of our first annual report, the TDOT sign program was only available at one winery. We have now had signs installed at two wineries and are working on the third. We are continuing to work with TDOT and the TN Department of Tourism to enhance signage, as this is a critical component of successful wine tourism.

We had to change our media consultant and graphic artist, which caused some minor issues.

Of the original wineries projected to be on the trail, Nolichucky Vineyard and Farm Winery and Lach Amore Winery elected not to participate early on because of current operational, financial and organizational issues. The reporting requirement to meet outcome measures of the grant were felt to be too intrusive for Blue Slip Winery, and this winery withdrew as a participating partner. The impact to the overall effort and outcomes of the project have been difficult to assess.

Although prior coordination was conducted with individuals having a pending trademark application for the mark "Thunder Road" as pertains the Tennessee Moonshine was done before choosing the name "Thunder Road Wine Trail", the individuals pursuing this mark issued a cease and desist letter on our use of "Thunder Road Wine Trail" for promoting trail tours and interests of the association. To avoid a potentially prolonged and expensive legal effort, a new name for the trail was selected and has been incorporated in our marketing effort; "Great Valley Wine Trail". The impact to the overall effort and outcome of the project was significant,

but efforts in rebranding and marketing have been successful and we think the new brand offers greater marketing potential.

Contact Person:

James R. Riddle, Col(Ret), USAF, BSC

(865)803-0282

FalconJRR@Earthlink.net

www.GreatValleyWineTrail.com

Additional Information:

Tennessee's search for the right regional terroir-varietal match-up is in the early stages and growers in Tennessee provide less than 25 percent of grapes used in wine production by the more than 70 operating wineries in the state. Tennessee continues to be constrained by an inadequate supply of local grapes; lack of a commercial juice production and storage facility and lack of tank capacity in our rural wineries at harvest are currently the most limiting factors for vineyard expansion in Tennessee.

USDA and the Tennessee Department of Agriculture's investments in the grape and wine industry are making a difference in Tennessee's Agricultural landscape, and offering opportunity to many young and beginning farmers and enhancing economic development in Tennessee's rural and poorest counties.

Project Title: Direct Farm Marketing Initiative

Submitted and approved as final report in 2015 annual report

Need For a Grant:

In a 2013 survey, “A Snapshot of Tennessee Agritourism: 2013 Update”, over 40% of farmers responded indicating that they conducted on-farm retail selling agricultural products and over 30% of farmers responded that they offer Pick Your Own on their farm. With the increase of farms diversifying into new sectors of agriculture, the demand for marketing these sectors increases. Consumers are looking for fresh and locally grown fruits and vegetables. Connecting the gap between the farmer and consumer is a necessity to help increase farm income.

The Tennessee Department of Agriculture (TDA) saw the need to increase educational opportunities for farmers seeking to diversify their specialty crop direct marketing. TDA’s goal was to provide farmers the tools to learn how to market their specialty crops to consumers, ultimately increasing the amount of specialty crops grown on individual farms.

Approach Taken for the Project:

The “Tennessee Direct Farm Marketing Initiative” targeted farmers interested in learning how to better market their specialty crops through educational and networking opportunities. The 2015 North American Farm Direct Marketing Association (NAFDMA) annual convention was held in Tennessee, presenting the perfect opportunity for Tennessee farmers interested in farm direct marketing to take advantage of the educational opportunities made available by this conference.

TDA requested funding to provide competitive scholarships for specialty crop growers to attend the 2015 NAFDMA conference.

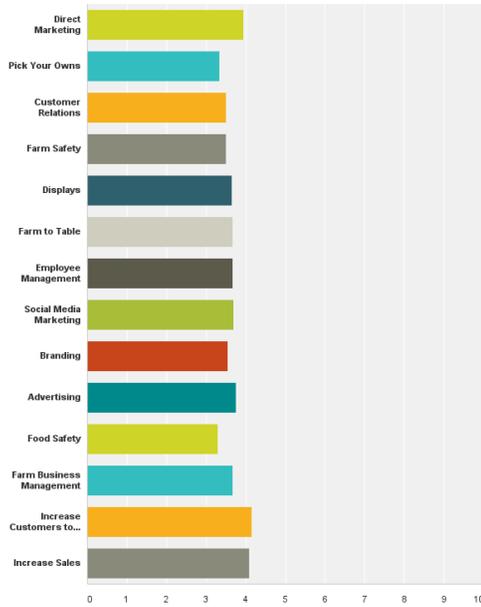
TDA conducted outreach to specialty crop growers across the state announcing the scholarship funds for the 2015 NAFDMA event. A state wide press release was issued; email blasts were conducted to specialty crop growers participating in the Pick Tennessee Products campaign. Our industry partners also shared the information in their newsletters and email. The scholarship application was linked on the TDA Market Development web pages. A copy of the press release and application are listed in the additional information section of this report.

A TDA committee reviewed the applications and selected the scholarship winners. We were able to provide scholarships for 44 specialty crop growers.

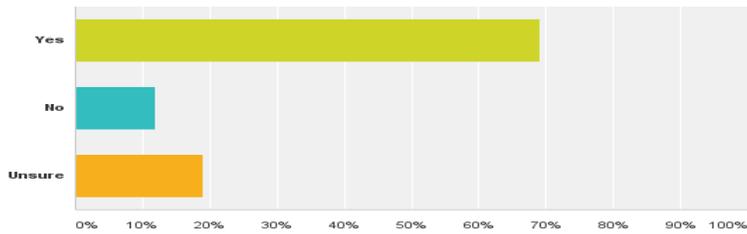
Scholarship winners were notified by email. Scholarship participants were required to complete a pre-convention survey.

Pre Survey Results:

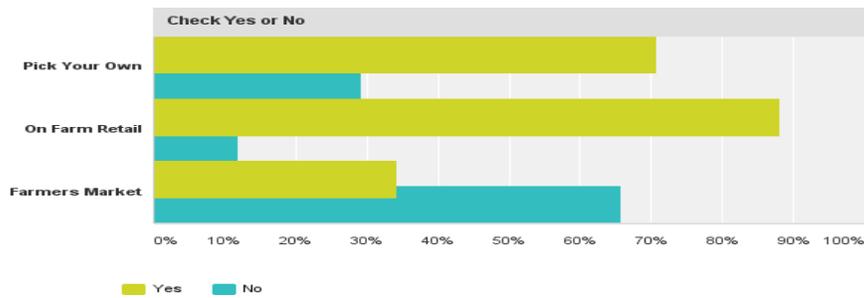
Rank the following on what you want to learn from NAFDMA:



Are you planning to grow crops this upcoming season?



Do you market your specialty crops in any of the following ways?

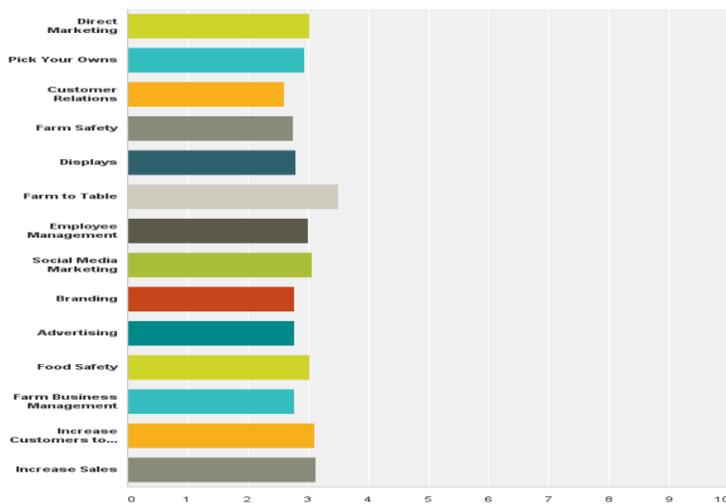


Results of the Program:

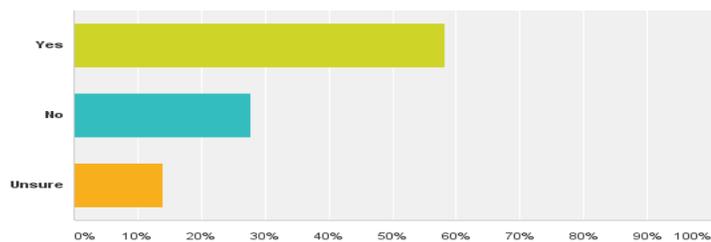
44 farmers were able to attend NAFDMA participating in a wide variety of educational sessions and Specialty Crop Producer farm tours. Educational session topics included: The Joy of Retailing in A Seasonal Farm Market, We Started Our Business 2 Years before We Invited Our First Customer, Ready to Eat Food on the PYO Farm - The Value Added, Creating an Environment Where People Pay More for Your Product, Strengthening Your Business through Personal Financial Management.

Post Convention Survey Results:

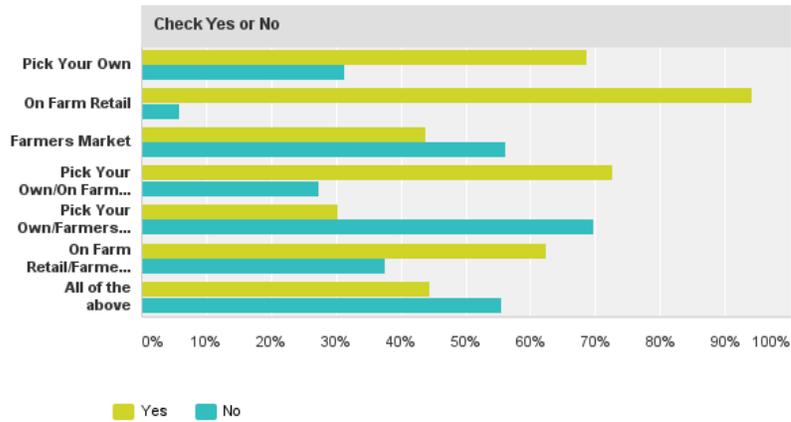
Rank the following on what you learned from NAFDMA:



Did attending NAFDMA change your plans to grow more specialty crops this upcoming season?



After attending NAFDMA which of the following ways do you plan to use to market your specialty crops during 2015?

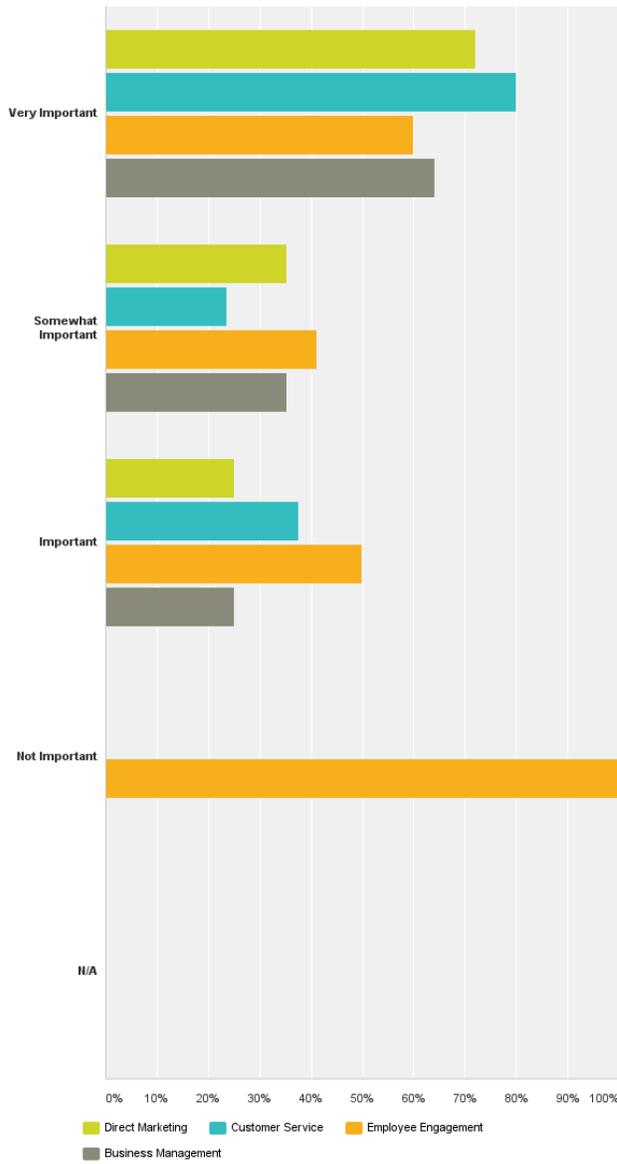


Progress made to achieve the Long-Term Outcome of the Program:

The long term goal for this project is to see an increase in direct marketing of specialty crops. Farmers attending NAFDMA indicated that they planned to increase marketing their crops through On Farm Retail and at Farmers Markets.

Post Growing Season Survey:

Rank the following skills learned at NAFDMA in order of importance



Indicate the percentage increase in direct marketing skills of specialty crops gained at NAFDMA

40% indicated – 25% increase

40% indicated – 50% increase

12% indicated – 75% increase

08% indicated – 100% increase

Indicate the percentage increase in growing specialty crops on your farm as a result of attending NAFDMA.

60% indicated – 25% increase

32% indicated – 50% increase

04% indicated – 75% increase

04% indicated – 100% increase

Indicate increase in on-farm sales of specialty after the 2015 Growing Season.

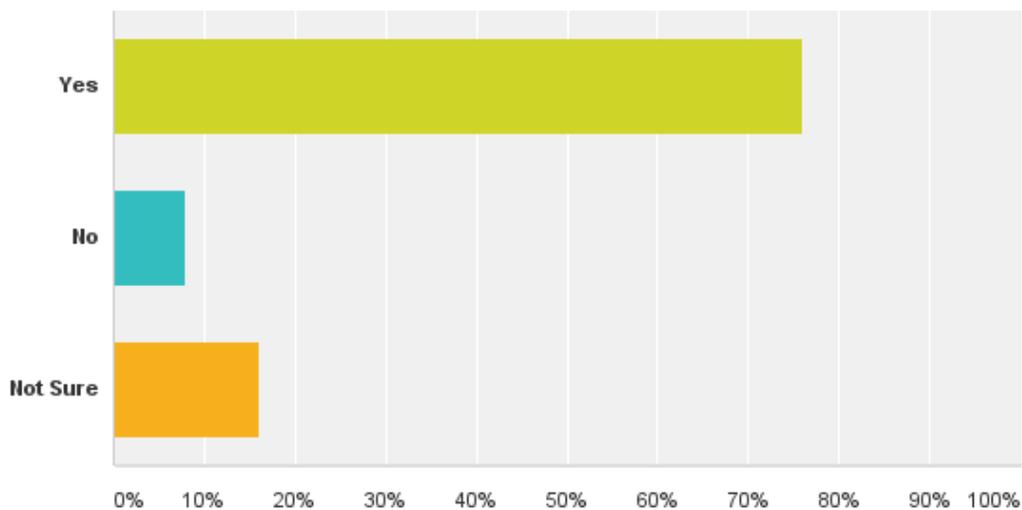
19.23% indicated – 0-10% increase

46.15% indicated – 11-25% increase

26.92% indicated – 26-50% increase

7.69% indicated – more than 50%

Do you plan to grow more specialty crops in 2016?



Beneficiaries:

Specialty crop growers across the state were the beneficiaries of this project.

44 specialty crop growers benefited directly from attending the conference. Scholarship participants shared the knowledge gained by attending NAFDMA with groups of specialty crop

growers across the state in addition to one on one farm visits with producers that could not attend NAFDMA. The groups addressed ranged from The Tennessee Christmas Tree Growers Association, several different beekeeping groups, grape growers, The Tennessee Agritourism Association, 4-H youth groups interested in growing specialty crops for profit, fruit and vegetable growers and Farm Bureau and Young Farmer and Rancher Groups interested in expanding their specialty crop operations. These presentations reached more than 400 additional specialty crop farms across the state.

Lessons Learned:

Many farmers have the desire to expand direct marketing but lack the training and knowledge to implement a marketing plan. In addition to gaining knowledge by attending workshops and seminars we discovered that peer interaction is a valuable tool for farmers. Discussing successes and failures proved to be very helpful to those farmers looking to try new marketing methods. Farmers also actively sought out advice from each other on how to solve specific problems. The networking and sharing of information between farmers across the United States proved to be very helpful.

Additional Information:



M E D I A R E L E A S E

STATE OF TENNESSEE
DEPARTMENT OF AGRICULTURE

FOR IMMEDIATE RELEASE
OCTOBER 27, 2014

CONTACT: CORINNE GOULD
615-837-5207 OR 615-598-1563
Corinne.Gould@TN.gov

SCHOLARSHIPS OFFERED TO SPECIALTY CROP FARMERS

NASHVILLE - The Tennessee Department of Agriculture Market Development Division as part of its Direct Farm Marketing Initiative is offering scholarships to the North American Farm Direct Marketing Association Convention, to be held Feb. 1-6, 2015 in Nashville and Knoxville. These scholarships are competitive and target farmers who want to learn how to improve marketing of their specialty crops.

To be eligible for a scholarship farmers must:

- Produce a specialty crop, including fruits, vegetables, tree nuts, dried fruits, horticulture, and nursery crops or floriculture
- Submit an application postmarked by Nov. 7
Faxed and emailed applications will not be accepted.
- Agree to complete a pre and post-conference survey
- Agree to participate in direct marketing and specialty crop sessions and tours
- Agree to present lessons learned to at least one specialty crop association (Tennessee Association of Farmers Markets, Tennessee Christmas Tree Growers Association, Tennessee Fruits and Vegetables Association, etc.)

You can find the application at <http://www.tn.gov/agriculture/marketing>. Contact Pamela Bartholomew at 615-837-5160 or pamela.bartholomew@TN.gov for more information.

The scholarship will cover the registration fee for attendance but does not include travel expenses to or from the convention, or the cost of association membership.

This scholarship opportunity is funded through the USDA Specialty Crop Block Grant (SCBG) program.

Learn more about the North American Farm Direct Marketing Association Convention at <http://www.farmersinspired.com/TN2015/>.

###

ELLINGTON AGRICULTURAL CENTER
BOX 40627, NASHVILLE, TN 37204
Tennessee.gov/agriculture



Direct Farm Marketing Initiative Scholarship North American Farmers Direct Marketing Association Conference

The Tennessee Department of Agriculture Marketing Division as part of its Direct Farm Marketing Initiative is offering scholarships to the North American Farmers Direct Marketing Conference to be held February 1-6, 2015. These scholarships are competitive and target farmers who want to learn how to better market their specialty crops by pick your owns, on farm sales, and farmers markets through educational and networking opportunities. Farmers will be able to gain skills and knowledge to bring back to their farm to help market and increase production of specialty crops.

To be eligible for scholarship farmers must:

Produce a specialty crop. *A specialty crop is one of the following- fruits, vegetables, tree nuts, dried fruits, horticulture, and nursery crops (including floriculture)*

Submit an application. Applications must be postmarked by NOVEMBER 5th. Fax and emailed applications will not be accepted

Complete a pre and post conference survey

Participate in direct marketing and specialty crop sessions and bus tours

Present lessons learned to at least one specialty crop association- Tennessee Association of Farmers Markets, Tennessee Christmas Tree Growers Association, Tennessee Fruits and Vegetables Association, etc.

Scholarship details:

This scholarship only covers the registration fee. It does not cover travel costs to and from the conference, expenditures during the conference, single occupancy room, or NAFDMA association fee (\$250.00).

To attend the conference you will need to be a member of NAFDMA and pay the \$250.00 yearly dues. [NAFDMA Benefits](#)

This scholarship does not cover the cost a single occupancy room. You will be sharing a room with another conference participant.

To find out more information and details about North American Farmers Direct Marketing Association Conference visit: <http://www.farmersinspired.com/tn2015/>.



Direct Farm Marketing Initiative Scholarship
North American Farmers Direct Marketing Association Conference

First Name	Middle Name	Last Name

Street	City	State	Zip Code

Home Phone	Cell Phone	Email

Farm Name	Farm County

List any specialty crop associations you belong to (Fruits & Vegetable, Christmas Tree, Farmers Market, etc)

List the specialty crops that you produce USDA's list of eligible specialty crops

List any dietary needs

Do you have someone you would like to room with that is attending NAFDMA?

Are you willing to fulfill all the requirements if chosen for this scholarship?	Yes	No
---	-----	----

3. What current ways are you marketing your specialty crop(s)?

4. How will attending NAFDMA help your farm?

5. What skills/knowledge do you want to attain from NAFDMA?

6. How will this scholarship affect you being able to attend NAFDMA?

All completed applications must be postmarked by November 5th and mailed to:

Tennessee Department of Agriculture
Marketing Division-Holman Building
ATTN: Pamela Bartholomew
Agritourism Coordinator
P.O. Box 40627
Nashville, TN 37204

Project Title: Improving Northeast Tennessee Buyer-Producer Networks and Building Innovative Marketing

Submitted and approved as final report in 2016 annual report

Project Summary:

The project's purpose is to facilitate sales relationships between local specialty crop producers and local volume buyers, such as restaurants, distributors and grocers. Additionally, after being awarded the project we were approved to expand to enhance the competitiveness of local specialty crop producers through training on year-round production to meet demand for specialty crops during the winter months.

Project Approach:

1) Hosted three regional producer-buyer mixer events in three different locations across NE TN, to facilitate development of sales relationships with volume buyers:

- **2014, Nov 3rd Mixer:** The first buyer-producer mixer, held in Bristol, TN. We had 5 buyers represented (Fresh Market; two distributors; a local grocery; a restaurant) and 20 growers. The mixer was also a specialty crop expo, since growers brought samples of their product, and the food served incorporated product from the growers (such as butternut squash hummus). The format of a mixer is as follows: 2-3 growers are seated at a table and get 20 minutes to take turns meeting each other and assessing each other's needs, as directed by a volunteer facilitator who keeps time allotted fairly. After the 20 minutes are up, the buyers rotate around to the table; and the rounds continue until all buyers have met all specialty crop producers.
- **2015, Feb 23rd Mixer:** The 2nd mixer, held in Jonesborough. We had 7 buyers (2 distributors; 2 local groceries; 2 restaurants; a CSA that sources from other farms) and 20 growers.
- **2015, April 27th Mixer:** The 3rd mixer, held in Johnson City. We had 7 buyers (2 distributors; 1 local grocery; 4 restaurants) and 20 growers.

2) In response to participant feedback, we held a **4-part traveling workshop series on "Growing Year Round for Profit"**, to train growers on the benefits of selling outside the traditional summer peak season. Each session held at a farm with high tunnels and lead by the farmer to talk about their growing season and had the area NRCS District Conservationist to present on grants available for high tunnel installation. Dates were 2015: May 19, 20, 21 & June 29. Reached total of 75 growers.

3) **Wholesale Guide**, 30 pages, that presents the knowledge gained from these events and from the specialty crop producers themselves. It's also a directory for buyers and for buyer-ready specialty crop producers. The guide has 14 buyers and 23 farms. Farm Credit sponsored printing the section for meat and dairy producers. In 2016 the ARC&D **printed 250 copies and did select distribution to more than 100 target restaurants and buyers.**

Goal:

To enable producers and buyers to develop new ongoing business relationships around the year-round sale of specialty crops.

Outcomes Achieved:

- **Number of Attendees:** The mixers reached approximately 25 distinct specialty crop growers, 13 of which had a business ready to be included in the Guide (therefore ten growers were exploring scaling up for these markets). The high tunnel workshops reached 75 growers.
- **Geographic spread:** The 7 events were held in a 6 county radius in Tennessee: Johnson City, Jonesborough, Bristol, Greeneville, Mountain City, Blountville, Rogersville. In addition to Tennessee growers, Virginia growers attended the events.
- **Number of connections:** We had low participation in post-event feedback. In qualitative one-on-one interviews conducted informally in 2016, the best connections were with Boone Street Market (a year-round farmers market that began in 2015), and a small cohort of restaurants in the Tricities. The Rooted in Appalachia delivery service was used by a small proportion of farmers.
- **Sales of specialty crops to buyers:** We understand that in the Tricities there is small cohort of five restaurants who faithfully buy local year round from farms that they met at the mixers and other farms as well. This may equal \$500 or more per restaurant during the peak season. Restaurants were not willing to share specific dollar amounts of buying and we had very low participation rate in post-feedback. Three nonprofits operate markets in the region and all three were present at the mixers: Rooted in Appalachia delivery service, Boone Street Market and Appalachian Harvest wholesale. These markets source regionally NC-TN-VA, but we know they accounted for \$4.3Million of local product sales either directly to consumers, to restaurants and grocers, or through wholesale channels. The largest market being Appalachian Harvest. By the end of 2016 these three markets were serving 147 farmers *regionally*. Boone Street Market (a year round farm store) sold \$261,343.89 worth of *all product* in 2016. After the mixers occurred in 2015, a locally-based distributor specializing in sourcing local product to restaurant customers in the Tricities started their business. We know of 4 farmers who were at the mixers who are selling to this distributor and the business has the reputation of a consistent and profitable buyer. Another new market since 2015 is a restaurant with two branches and a 3rd party cooperative CSA with 125 members. The restaurant runs its own farm to source its restaurant and CSA, but supplements

substantially from other farms in the area and has the reputation of a consistent and profitable buyer.

- **Growing outside the season/high tunnels** we have witnessed more farms requesting high tunnels from the NRCS grant program, in order to meet year-round demand. The Appalachian RC&D Council is in its second year of a coordinating a 10-month beginning farmer workshop series and high tunnels and planning for growing in the "off-season" are featured prominently.

Pictures (clockwise from top left): Growers meet with buyers at Jonesborough Mixer; Growers meet with buyers at Bristol Mixer; Greene County farm high tunnel workshop; Hawkins County farm High tunnel workshop.



Beneficiaries:

Specialty crop producers with a specific market for high quality and consistent produce for retail, restaurants and wholesale buyers.

Lessons Learned:

In the year since the events, we have seen more and more local food reaching restaurants and retail outlets, but there is room for growth. There are around five restaurants in the TriCities with a strong factual reputation for serving locally purchased cuisine. Three are high end and two are medium-end. Some growers find that Knoxville area is a more consistent market. Other growers transport to Asheville, NC. The Boone Street Market's year-round opportunity for growers is a dependable sales base, according to the growers that gave us feedback.

We took our model from a West Virginia buyer-mixer series and we liked the format and would duplicate it again *if we had interest from buyers*. We know there is interest from farms, whereas on the buyer side, it was a challenge to get chefs/buyers to the table. Chefs were more like to attend the event when approached individually (using our personal connections), asked multiple times, and when we ordered samples of their own local food creations catered from them for the event. We would add a short keynote presentation of a success story beforehand to showcase the ideal situation of what can happen when chefs/buyers support local.

Any Additional Information:

None

Contact:

Emily Bidgood, Executive Director

apprcd@gmail.com

423-979-2581

Bring It Food Hub officially dissolved as a nonprofit as of December 29, 2016. All SCBG funds were utilized prior to December 2016. Bring It Food Hub is now a program of Memphis Tilth, but is no longer the nonprofit it was when it was awarded this grant. The answers to the questions below have been answered Memphis Tilth, and not Bring It Food Hub, staff to the best of their abilities. Some information is not available for answering these questions since Bring It Food Hub has dissolved. Please see accompanying dissolution letters for Bring It Food Hub for more information.

Project Title: Local Specialty Crop Marketing in Memphis to Increase Sales and Income for Tennessee Specialty Crop Producers

Project Summary:

“The purpose of this project is to design and implement an effective local food marketing strategy in Memphis for Tennessee-picked fruits and vegetables. It is expected that enhanced marketing activities in the high population urban market of Memphis (1.3M population) will substantially increase access and demand for these local foods. Increased demand for these goods will lead to increased local fruit and vegetable (F&V) consumption; increased acres under production of high value F&V in TN, and increased incomes for local F&V growers.”

Project Approach:

Funds supplied by the SCBG were used in a variety of ways, primarily in the categories of marketing and advertising. Those funds successfully expanded the public’s awareness of the organization and its work to support growers throughout the Mid-South. Additionally, in February of 2016, two Bring It Food Hub staff members travelled to visit Nashville Grown (Nashville, TN) in order to learn more about their wholesale produce operation as we begin to explore increased opportunities within our region for wholesale growth. Bring It Food Hub also began the use of two e-commerce applications to increase the efficiency of sales and marketing of subscriptions and engagement with wholesale markets.

The following work deliverables were completed for the grant:

Project Activity	Date Accomplished
Objective 1: Design & Implement Local Specialty Crop Marketing Strategy to increase awareness of, and demand for, local fruits, vegetables and other specialty crops	Fall 2014
Action 1 - Literature Review	Fall 2014
Action 2- Interviews, focus groups and stakeholder meetings with various consumer market segments, as well as restaurants, caterers, grocery stores and other wholesale markets to help expand the reach of local specialty crop products to 20 new wholesale markets through the use of Bring It’s expanded e-commerce platform	Fall 2014
Action 3- Market research and product testing with consumer focus groups	Fall 2014
Action 4 - Write Report	Fall 2014
Action 5 – Advertising and Promotion increases awareness of, and demand for, local fruits, vegetables and other specialty crops through targeted advertising to approximately 60,000 consumers in Memphis across multiple market segments in 2015	Jan – Oct 2015

Objective 2: Upgrade e-commerce platform to expand the availability, and ease of purchase (i.e. convenience), of 25-100 local fruits, vegetables and other specialty crops for Memphis-area consumers, restaurants, congregations, schools, and other buyers, further increasing sales and income for local specialty crop producers	Jan – Oct 2015
Action 1 – Contract web design team to upgrade Bring It Food Hub e-commerce platform for marketing local fruits and vegetables online	Jan – Apr 2015
Action 2 – Advertising and Promotion of local specialty crops for sale at online marketplace to drive traffic to the site and increase sales of specialty crops for local farmers	Jan - Oct 2015
Objective 3: Expand the farmer network of Bring It from the current 12 specialty crop producers to 25 specialty crop producers within 150 miles of Memphis in 2015	Jan – Mar 2015
Schedule meetings with 30 new farmers to share market information gathered in 2014 and discuss 2015 planting/production/distribution plans so local specialty crop producers are aware of Bring It’s marketing and distribution services	Jan – Mar 2015
Work with farmers and buyers (e.g. restaurants) to identify local specialty crops to grow in larger volumes, and agree upon desired quantities and pricing, thus helping local specialty crop producers incorporate these crops into their 2015 production plans	Jan – Mar 2015

The following marketing deliverables were achieved:

- Event Kit – tent, table, signage, chairs, cooler, booth fees and kitchenware (for food demo)
- Marketing consulting – marketing plan, update e-commerce platform that fully integrates with Bring It Food Hub website
- Marketing collateral - various digital and printed materials (including event kit) were created by local Memphis communications firm, Doug Carpenter & Associates
- PR and Outreach – marketing materials were dispersed via: billboards, TV advertising, radio advertising, print advertising, and digital advertising, especially on social media. Facebook was found to be one of the most effective forms of advertising. All new digital print materials were posted to the website.

Goals and Outcomes Achieved:

Throughout the grant cycle, with increased marketing and advertising, Bring It Food Hub has seen growth in local food subscription customers since past years. This service supported over 450 weekly subscribers throughout the 2016 summer season, and 150 weekly subscribers through the fall. In 2017, we have expanded this service to be year-round with four full seasons. With increased volume and expanded subscription service offerings, we have increased the number of growers in our roster which we regularly work with. At present, BIFH works with far more than the 12 mentioned in the proposal for this project, consistently working with 36 specialty crop growers.

The Bring It Food Hubs e-commerce platform has proven quite successful in the sales and management of subscriber and wholesale activity. These platforms ease the billing and purchase operations and allows for increased staff capacity. Through the processes of increasing our wholesale accounts, we are beginning conversations with our growers to plan for

continued sales growth.

2015 was a very successful year for Bring It Food Hub. The main activity continues to be the Community Supported Agriculture (CSA) program. Subscriptions to the CSA program increased markedly in 2015: while the 2014 spring/summer season peaked briefly at 180 bags per week, the 2015 spring/summer season (May 12-Oct. 2) peaked at 345 per week; and while the 2014 fall season peaked at 130 recipients per week, this year's fall season (Oct. 6-Nov. 20) peaked at 240 per week. This can be attributed to the success from a combination of a) satisfied customers from last year, and b) increased marketing capabilities, largely due to the Specialty Crops Block Grant we received from the Tennessee Dept. of Agriculture in October of last year.

94% of the goods purchased and sold by Bring It in 2015 was farm produce and all SCBG funding was directed towards specialty crops. In financial terms, this year Bring It purchased nearly \$143,000 worth of produce from over three dozen farms within 150 miles of Memphis. While this does not meet the ambitious target of \$250,000 worth of purchases in 2015, as spelled out in our original proposal, it does reflect a near-doubling of the \$72,000 worth of purchases in 2014. With the assistance of this grant, Bring It Food Hub is making a significant impact on both the consumption of local farm fresh produce in Memphis and the livelihoods of local farmers.

More products were able to be sold through the new online platforms, Local Food Marketplace and Farmigo. This largely attributed to the increase of specialty crop sales.

Beneficiaries:

The primary beneficiaries of this project have been the 36 growers in the mid-south which BIFH works with.

Lessons Learned:

Bring It Food Hub has learned through the process that increased marketing of a specialty crop project will increase visibility and sales of local food products. Further, greater efficiencies can be achieved through the utilization of e-commerce platforms for local food distribution operations.

Additional Information:

None.

Contact Information:

Bring It Food Hub
Josh Conley
Memphis, Tennessee
BringIt@memphistolth.org
901-444-3055

Project Title: USDA Specialty Crop Block Grant 2014 “Providing Wholesome but Unmarketable Produce to the Hungry in Northeast Tennessee”

Project Summary:

Second Harvest Food Bank of Northeast Tennessee (SHFBNT) launched a collaborative partnership with Food City, a leading grocery retail store in the area, to increase our ability to access local growers and farmers to encourage donations of wholesome but unmarketable fresh produce to provide to people in need. However, there are costs associated with harvesting, packing and transportation that can make donations of any scale prohibitive for small farms.

The project fostered partnerships with local growers to cover harvest, packing and distribution costs for donated and unmarketable produce from local growers so that Tennessee produce can be provided to the food insecure people in our service area.

Project Approach:

This project initiated and developed relationships with local farmers that allowed farmers to contribute unmarketable produce to Second Harvest Food Bank of Northeast Tennessee (SHFBNT) without costing the farmer to do so.

In the original grant application, SHFBNT planned three primary project activities and are as follows.

1. Locate the produce;
2. Contact growers/ packers to donate produce; and
3. Promote local growers/ packers involvement in the grower-cost offset program.

Between October 2014 and October 2016, Tom Cromie, SHFBNT Senior Operations Director, and Megan Morrison, SHFBNT Food Sourcing Coordinator, identified agricultural associations, located farmers, and then set out to make contact with them. They worked with Appalachian Sustainable Development to locate additional farmers.

Mr. Cromie met with Mike Tipton of K-VA-T Foods/Food City to identify farms who supplied the stores' produce so the farmers would have an outlet to donate produce rejected by Food City for cosmetic or overstock reasons. Mr. Cromie and Mrs. Morrison attended numerous meetings with local agricultural associations to inform members of the opportunity to partner with SHFBNT and develop relationships with growers and packers. Mr. Cromie and Mrs. Morrison worked with Extension Agents from each county to gain access to farmers as well. A couple of the Extension Agents came to the food bank to learn more about our services and how they could better recommend farmers that would consider participating. Mrs. Morrison visited farmers in Jonesborough, Gray, Bristol and Unicoi to learn more about their interests and ways that would make donating products easier and at no cost to them. Staff members were able to recruit several farms to participate although few remained active throughout the grant period.

Mr. Cromie and Mrs. Morrison were successful in recruiting a couple of farms and they promoted the farms with whom we worked. Sunset Farms was one such business. We promoted them and acknowledged their donations in newsletters, on our website and through local media. They indicated that their business increased so much that they did not have excess to give to the food bank anymore.

Goals and Outcomes Achieved:

Since June 2017, SHFBNT was able to acquire over 80,000 pounds of fresh produce with funding support from the Specialty Crop Block Grant.

Between June 22, 2017 and August 7, 2017, SHFBNT staff members made nine trips to Scott's Farms in Unicoi, Tennessee, to pick up assorted local produce, most frequently strawberries and tomatoes. A total of 10,131 pounds of excess and unmarketable produce were picked up for an average weight of 1,126 pounds per trip.

This has been the only consistent farmer relationship that we have been able to maintain throughout the grant period. In October 2016, our Food Sourcing Coordinator went on maternity leave. SHFBNT staff members were expecting her to return to work at the food bank after the birth of her child. After she informed staff members of her decision to stay at home with her child, the hiring process was begun. This position was left vacant for a few months during this transition. In March 2017, we were able to hire a new Food Sourcing Coordinator, Ashley Basilicato. Ms. Basilicato has been very effective in developing relationships with food suppliers and we feel that she could have effectively marketed the value of this program while meeting new farmers in the region.

SHFBNT staff members were also able to acquire two loads of fresh green beans from Crossville, Tennessee. These loads resulted in more than 70,000 pounds of nutritious food for people who so badly need it.

We conducted produce surveys at five selected Mobile Food Pantry (MFP) distributions and have learned some surprising things over the years as a result. Key information that we have identified from the 2017 surveys includes the following:

- 75% to 100% of the MFP clients have attended for 1 year or more
- 80% to 100% report that they like berries, tomatoes, corn, and potatoes
- 27% to 63% report that they like zucchini
- 73% to 95% report that they like green beans
- The percentage of MFP clients report eating the following number of servings of fruits/vegetables per day
 - 0% to 27% report eating 1 serving
 - 25% to 50% report eating 2 servings
 - 13% to 32% report eating 3 servings
 - 0% to 21% report eating 4 servings
 - 5% to 33% report eating 5 or more servings

Clients that we serve responded that they obtain fruits and vegetables most often from the MFP. When they do purchase produce, they report that they purchase it most frequently from the grocery store. They also purchase produce at roadside stands and farmer's markets but less frequently. Of the clients surveyed at the five sites, between 31% and 58% of the respondents reported that they have their own gardens.

The primary reason 67% to 100% of the clients surveyed said that they do not purchase fruit and vegetables is that it is too expensive. Clients also reported that the reason they do not purchase fruits and vegetables frequently is that it spoils too quickly. Surprising results include that no one reported that they did not know how to prepare or cook the fruits and vegetables. Only 8% of the respondents said that fresh produce took too long to prepare. Between 63% and 92% of the clients reported that they tried new produce as a result of the outreach. We expect that as people try produce and like it, they will purchase it in the future. We promote produce as healthy choices for people.

Beneficiaries:

There were two beneficiaries of this funding. The primary beneficiary is the farming community. Participating farmers have been enabled to donate edible and wholesome produce that was unmarketable usually due to cosmetic blemishes. This grant funding enabled SHBFNT to purchase bins, totes and other supplies that allowed for easy collection and pick up with no cost to the farmer. SHFBNT promoted the participating farmers through newsletters and connecting farmers with local chefs who would use their produce. This was highly successful since one of the farms that donated to us had such an increase in his sales that he discontinued providing the excess or marketable produce, having found a local chef who purchases it from him. Annually, SHFBNT hosts a gala called "The Farmer and the Chef" and the participating farmers are asked to participate. This is an excellent opportunity for farmers to meet chefs and potential customers.

The secondary beneficiary is the group of people who receive healthy, edible produce that would otherwise be unaffordable to them. SHFBNT staff think that clients will develop a preference for fresh produce and will begin purchasing it more frequently. We hope to change their patterns of eating by exposing clients to new types of produce and developing their preferences for produce.

Lessons Learned:

As a first time grantee with this program, we have learned some things and would have progressed differently if we could begin again.

SHFBNT proposed in our application for funding that we would work closely with K-VA-T Foods/Food City Produce Manager to cultivate relationships with farmers to access different local produce types. Our goal was to reach 10 local farmers. We mistakenly thought that this would be an opportunity for farmers and that the farmers would enthusiastically participate in the program. This project did not have the results that we

thought it would. The first hurdle was the low number of large scale commercial growers in our area. We were able to build a new relationship with one local grower, Sunset View Farms in Gray, Tennessee, owned by Adam and Abby Borden, who provided donations of produce. Mr. Borden reported to us that his sales increased as people became more aware of his farm as a result of donations to SHFBNT. Additionally, SHFBNT has had a long relationship with Scott Farms located in Unicoi, Tennessee, and we anticipate that our working relationship will continue.

Although the grant is completed and the funding period has ended for this particular grant, SHFBNT will maintain a positive working relationship with Scott Farms and will continue to pick up excess and unmarketable produce. We will work to cultivate additional relationships with other farmers as well. SHFBNT holds an annual fundraiser called the Farmer and Chef and we have been successful in locating small-scale local farmers to participate in that event. SHFBNT publicizes and markets this event throughout the region. We highlight the local farmers and chefs that participate. In turn, they use this event as a publicity and marketing opportunity as well. The annual event provides both farmers and chefs with the opportunity to work together, network and meet potential buyers for their products. SHFBNT was also able to serve as a liaison between the farmers and TN Department of Agriculture to market the Pick TN initiative. We will plan to work with the farmers who participate in this event more closely to consider donating their excess product to us.

SHFBNT may consider applying for Specialty Crop Block Grant funds in the future and would work closely with Tennessee Department of Agriculture staff members to identify operational improvements. The supplies that were purchased with these funds have proven to be extremely beneficial and will continue to serve the farmers and SHFBNT as we strive to improve access to healthy food while reducing food waste. These supplies will be used to continue to grow the program. Thank you for the opportunity to participate in this grant activity.

Contact Information:

Rhonda Chafin, Executive Director

423-279-0430 X 206

executivedirector@netfoodbank.org

Angie Sproles, Development Manager

423-279-0430 X 227

developmentmanager@netfoodbank.org

Project Title: Youth Urban Farm Training Program

Project Summary:

Our Youth Urban Farm Training Program teaches the nutritional value of specialty crops, the benefits of discipline, dedication and hard work. By virtue of their involvement in our training program, young people have been exposed to careers in agriculture including food safety, food traceability, horticulture, botany/biology, ecology, food processing and other applied science related fields such as accounting, business management and computer science.

As a result of building dual high tunnels we have extended our growing season. We are bringing specialty crops to market earlier and specialty crop production is lasting for longer periods of time. Overall, we are experiencing larger harvests versus open field growing and are able to transplant fall specialty crops from open field growing into high tunnels to maintain specialty crops throughout the winter. The dual high tunnels have allowed us to provide continuous specialty crops for our food pantry clients and farmers market patrons year-round.

Our internet presence has increased patronage at our farmers market. Both google AdWords and our website have guided customers to us who otherwise may not have solicited our farmers market.

Project Approach:

The teenagers we enlist into our Youth Urban Farm Training Program now come from a variety of sources including the local high school (Melrose High School), the community where our facility is located (Orange Mound) and juvenile court. Trainees are provided with a copy of the gardening book we wrote. We teach trainees a combination of good urban farming practices such as soil preparation, planting, cultivating, crop rotation, composting, seed harvesting, food canning, beekeeping and basic record keeping for produce traceability.

We emphasize the importance of worker hygiene and food safety. We allow trainees to experience different aspects of growing specialty crops in an effort to create well rounded, knowledgeable workers who develop a good feel for the work they like best and perform well at doing.

In the spring our trainees take compost developed the previous year and fold it into the crop beds of our high-tunnels and in the field beds. Thereafter, they commence with seed planting and plant transplanting. In our high-tunnels the irrigation system is first set in place and weed-blocker with holes for planting is placed over crop beds and stapled to the ground. We reverse the order of crops from the previous season and place tomato seeds in the crop beds that grew okra and plant okra in the crop beds that had produced tomatoes. Alongside these seeds the trainees' plant garlic that we had peeled and

soaked in water until roots and sprouts grew. The garlic serves two purposes; it is a pest deterrent and once it grows to maturity we offer the bulbs to the public. Likewise, trainees take sweet potatoes, split them in half into glass jars filled with water and when the sweet potatoes develop roots and sprouts, we use tires so trainees can identify the one's they planted. As the sweet potato vines grow, we place an additional tire and dirt on the base tire to a maximum of three tires per plant. During fall break they harvest 6 to 10 sweet potatoes per tire tier. Also, in the spring, trainees' plant onion slips in field beds and during the summer dig the onions, and then place them in our burlap sacks to dry. Once cured, the onions are ready to be offered to the public.

We only had one young lady interested in working our bees. We showed her how to identify the queen, the drone and bee larvae; she helped extract honey too. In the field we have short crop beds and long crop beds. In the short beds trainees' plant alfalfa, buckwheat, agricultural mustard, white clover, bunching onions, arugula and zinnia flowers. These crops are used to attract beneficial insects and help soil fertility when turned into the soil, save the bunching onions and arugula. At both ends of the long beds they plant cilantro, which is both popular with our patrons and a pest deterrent. We allow a portion of our cilantro plants to go to seed and offer coriander to the public.

Every day before commencing work, trainees are gathered to discuss the previous day's assigned duties and give account of progress and/or difficulties. We value their opinions and seek to find teachable moments with group participation. Work gloves are provided and are frequently washed or replaced. Trainees perform a spot check on the plastic mini hand carry shopping baskets we use to either carry jars of seeds, seedlings or harvested crops. The spot check is to verify the baskets are clean and usable. Also, we walk the grounds looking for anything unusual. Holes dug by animals, bird feces on crops or crops that look distressed.

Trainees plant multiple crops in the field that we use and have a market for including carrots, romaine and spring mix lettuce, straight eight and boston pickling cucumbers, spinach, swiss chard, cabbage, bell peppers, purple hull and crowder peas. Our sugar snap and sweet peas only last about six weeks and trainees get to work only Saturdays when school is in session. Yet, during the summer months the trainees are an integral part of our harvesting. We allow trainees to take some specialty crops home and get good feedback on how their families enjoyed the specialty crops.

Goals and Outcomes Achieved:

Our hands-on approach to training has yielded a few youth who aspire to attend college with agriculture as their major course of study. We currently have two former trainees who are majoring in the applied sciences at Tennessee State University.

Also, as of May, 2017 we commenced a second Youth Urban Farm Training Program that has been fully funded by Barnhart Crane & Rigging Company. The youth training is being performed at their facility located at 1701 Dunn, Memphis, TN. 38112. We are replicating the program that was funded by this grant in the Landmark Training @ Barnhart Youth Urban Farm Training Program. The trainees for this program primarily come from the local high school in their area (Hamilton High School). We currently have 12 trainees and 1 assistant working and a waiting list of over 20 applicants.

Beneficiaries:

We believe there are more beneficiaries as a direct result of this grant funding than we realize based upon what can be termed as "the ripple effect"; that is those whose lives are indirectly effected by our efforts such as the parents of our trainees who did not have the money to purchase school clothes and/or school supplies for their child. Some of those who we can identify as beneficiaries include our food pantry clients, farmers market patrons our trainees and according to the former Tillman Police Commander, our community has seen a reduction in criminal activities since we began this youth training program.

We have probably been the biggest beneficiary because without this grant funding, we probably would not have the degree of positive reputation we possess in our community and probably would not have benefitted from the interaction we have had with the youth who have participated in our training program. For this we are humbly grateful.

Lessons Learned:

Teaching the basic and practical applications for growing specialty crops is highly rewarding. Utilizing composting and safe applications of the same help maintain soil fertility which in turn helps to bring high quality specialty crops to market.

High tunnels are essential to extending urban farmer growing season which can give an advantage by bringing specialty crops to market earlier in the growing season and having different specialty crops to offer the public year round.

Contact Info:

Mike Minnis
Landmark Training Development Company
901-620-9558
landmarktrainingdc@yahoo.com

Project Title: Providing Marketing Opportunities for TN Nursery Producers and Garden Centers

Project Summary:

This project was written to provide marketing opportunities by participating in the “Plant Something” national campaign as a partner and also to print and update a new buyers’ guide listing plants, products and services of the nursery, landscape and garden center industry in Tennessee. However, since there was a dramatic slowdown of the industry starting in 2008 and a dramatic rebound of the industry starting in 2015, many producers did not have sufficient plant material to list in the buyers’ guide. TNLA asked to rewrite the grant to allow 15 active members to travel to Portland, Oregon for the Far west (green industry) trade show and also for those participants to tour the nurseries and garden centers on the Far west show tours.

Project Approach:

The Tennessee Nursery & Landscape Association became a partner with other state nursery and landscape associations to promote the Plant Something campaign. This campaign is a nationwide promotion with 23 states participating <http://plant-something.org/>. TNLA ordered plant something banners and distributed them to all TNLA active nurseries, garden centers and landscapers in Tennessee. In August 2017, the TNLA executive and 15 nursery or garden center owners traveled to Portland, Oregon for the Far west trade show and also to tour nurseries and garden centers.

Goals and Outcomes Achieved:

The goal was to promote the industry by encouraging the general public to buy more plant materials. The “Plant Something” banners encouraged people to plant something. TNLA believes this is a very valuable promotion for the green industry.

The FarWest Show and tours allowed garden center and nursery growers to travel to Portland Oregon to visit with plant suppliers and also to look at the garden centers. Those making the trip were encouraged to take photos of new plants and ideas and share them with the industry at the Tennessee Green Industry Expo. There will also be a link on the TNLA website where members can view some of the photos. The link will be TNLA Goes West “Farwest”.

TNLA was not able to participate in lawn and garden shows across the state and promote the “Plant Something” campaign to home owners, however TNLA did purchase outside banners for TNLA active member businesses to use to promote “Plant Something”. TNLA was also not able to print a new buyers guide for the industry because growers did not have plant inventory to list. TNLA does believe that the “Plant Something” banners encouraged home owners to plant flowers, trees, shrubs and that benefitted the industry. The banners will be used again in 2018 to promote “Plant Something” TNLA believes that the industry will see a 2-5% increase in plant sales and a 10% increase in public awareness of the benefits of plants.

The people who traveled to Oregon for the FarWest show and visited with nurseries and garden centers were able to meet with some of their suppliers and also to see some new plant introductions. Since this happened near the end of the grant period, I don't think anyone was able to say that they increased their sales from new plant material in 2017. However, I know that orders were placed for new plants and in 2018 and in future years these plants will be sold in Tennessee increasing sales.

Beneficiaries:

Nurseries, landscapers, garden centers and suppliers of equipment, soil mixes, mulch, and chemical companies all benefited from these not only in Tennessee but nationwide. Tennessee green industry businesses not only sell to local homeowners and retail businesses but to other green industries nationwide. Many of the Tennessee nursery plants are bought as liners from other states and then grown to sell as a finished product. Not only do nurseries buy liners but garden centers also buy plugs in early spring and grow them to sell to the public. This buying and selling is a nationwide business. Allowing nursery growers and garden center owners to travel to other states to see how they are producing these liners and allowing them to see new plant introductions is very beneficial to the industry.

Lessons Learned:

Advertising and promotion are a must to any industry. The green industry needs to promote its benefits more. Those visiting Oregon discovered several new plant varieties and also new ideas that could be used in their businesses. I know several told me they had already ordered some of the new plants for next spring. We also learned that a garden center can be very successful on a small amount of property if the property is maintained. Several talked about the retail garden centers in Oregon being much different than those in Tennessee.

Contact Info:

Louree Walker, Executive Director
Tennessee Nursery & Landscape Association, Inc.
P O Box 57
McMinnville, TN
louree.tnla@gmail.com

Project Title: Farm to School Nashville, Connecting the Dots

Project Summary:

Since its last report in March 2016, “1st Annual Report,” Community Food Advocates has not expended any additional monies from this grant as the organization closed for business in March 2016 due to a combination of lack of sustainable funding and organizational capacity as all staff moved on to work in other, more secure employment positions with other organizations. Community Food Advocates was dissolved by the Board on April 6, 2016, and the Board filed with the State Attorney General a notarized affidavit of dissolution with an official transfer of all assets (see attached). The following report coincides with the first year report in March 2016 regarding project outcomes as no business was conducted after March 2016 due to the dissolution of Community Food Advocates.

Summary: Farm to School is a USDA supported program that already has roots in a number of states and school districts. Nashville did not have a Farm to School program, but Metropolitan Nashville Public Schools (MNPS), through Alignment Nashville, submitted a Farm to School Planning grant to the USDA to develop the program here. Due to a lack of capacity, MNPS leadership had been unable to begin the conversation with farmers to develop long-term planning for the program. With this Farm to School Nashville project, Community Food Advocates (CFA) planned to ease the process through convening a Farmer Advisory Council to meet four times yearly and provide input, as well as develop procurement language and documents for working with MNPS. Community Food Advocates’ Community Outreach Specialist consulted with Nashville Grown to locate MNPS menu items that are produced in local farms, as well as identify current fruits and vegetables that are part of MNPS’ menu that can be adapted to Tennessee grown produce. Additionally, Community Food Advocates planned to host an annual information sharing event for farmers, producers, and other key supply chain actors, in conjunction with the annual Tennessee Local Food Summit to measure success of the program and discover opportunities for growth. Through this capacity building, Community Food Advocates ultimately aimed to increase the amount of Tennessee grown fruits and vegetables on MNPS’ menu to 10% by 2019.

Project Approach:

The overall goal of the project was to build access to Tennessee grown specialty crops in Metropolitan Nashville Public Schools to provide students with healthier, less processed foods, as well as benefit local farmers. Community Food Advocates planned to achieve this goal through identifying available specialty crops that match MNPS’ current menu; assessing availability of locally produced fruits and vegetables that can be adapted to MNPS’ current menu; convening a group of farmers to become part of our Farmer Advisory Council; and

through hosting annual information sharing events for farmers, producers, and other key supply chain members.

Goals and Outcomes Achieved:

The overall goal to build access to Tennessee grown specialty crops in Metropolitan Nashville Public Schools to provide students with healthier, less processed foods, as well as benefit local farmers was met through the following small achievements which we hope will serve as incremental steps toward a larger collective impact in Nashville:

- 1) Meetings were conducted with MNPS representatives and local farmers to assess needs and resources available to establish a procurement process.
- 2) MNPS menu opportunities for locally grown options were identified.
- 3) A seasonal calendar of such locally grown produce options was developed and implemented for procurement in spring 2016 (e.g., strawberries).
- 4) Alignment Nashville has committed to continue the capacity-building conversation started by Community Food Advocates between MNPS and local farmer members of the Middle Tennessee Growers Conference.

Beneficiaries:

Tennessee producers of fruits and vegetables were the key beneficiaries. Additionally, the Farm to School project increased slightly access to locally grown fruits and vegetables to students at all Metro Nashville Public Schools.

Lessons Learned:

While progress has been made establishing capacity for a Farm to School Initiative between local farmers and MNPS, it will take other organizations experienced and visionary about the local food system to carry on the capacity-building work of this project as Community Food Advocates no longer exists as an organization to build on this networking momentum.

Within the project itself, we learned to bring to the problem-solving table particular attention to the capacity of MNPS kitchens to wash, chop and bag fresh produce, which is needed in the processing of produce, especially in the large quantities to make this cost effective for local farmers and the school district. Produce previously has arrived at all MNPS kitchens already cleaned and prepped. Future consideration needs to be given to bring in additional partners for this processing capacity and/or to design for such in school kitchens.

Contact Info:

Community Food Advocates

Juan Escarfuller, former President of the Board for Community Food Advocates

Email: juan.escarfuller@vanderbilt.edu

Phone Number: 615.636.7618

Project Title: Wine Trail of West Tennessee

PROJECT SUMMARY:

The grant money was a success in that awareness of the 7 wineries involved in the Wine Trail of West Tennessee was increased, and those wineries off the main route benefitted by increased client traffic.

PROJECT APPROACH:

Being a new Wine Trail and it being our first grant, we were a bit slow about what would be the best way to spend it with the best results, and immediate results in some cases. It took us a couple of meetings for us to realize that specifically “rack cards” and a very good website were the first things needed. We did those then looked at our first winter and noticed that traffic was slow, so the second year we advertised across the West Tennessee area on 3 different radio stations to cover a good diversity of clients. We will say that Debbie Ball and her group were able to guide us and give us feedback on our ideas when we needed it.

GOALS AND OUTCOMES ACHIEVED:

Goal #1 was to increase client traffic throughout the WTWT and this was achieved as the individual wineries used the website and more importantly the “rack cards” that were distributed by the individual wineries to those visiting and from those given out by the 5 visitors centers located in what is considered West Tennessee. All 25,000 of the original batch printed have been handed out, and another 30,000 are being printed as this report is being submitted. The outcome is that all the wineries did and still do receive traffic on a daily basis specifically because of the “rack cards”

Goal #2 was to use the WTWT to have the member wineries cooperate for the betterment of the trail. The fact that the members were able to quickly vote and approve the uses of the grant money and to push the client to go down the road and visit another member of the WTWT will attest to their cooperation. The outcome is that we learned that the wineries being spread out it was not easy to get together for meeting, but through social medial, i.e. emails and such, we were able to hold votes on ideas and to receive ideas almost immediately.

Goal #3 was to establish ourselves as a legitimate wine trail and be recognized by the wineries in the other regions, and the outcome is that many of our members became members of the statewide TWFA, and are recognized across the state.

BENEFICIARIES:

The 7 main wineries benefitted by increased traffic and increased revenue with the help of the grant money.

LESSONS LEARNED:

Although there are specific written instructions and guidelines about how and on what the grant could be spent and what it could not be spent on, I think that another written guide highlighting past proven methods and ideas be given to the grant receivers. We learned, after a slow start, that we need to get all the information possible from the state on how to properly use the grant, as we were new and had not used a grant before. Also, the number one lesson is what works in advertising and what doesn't. Another lesson was how to get the "bigger bang for our buck". Rack cards, a website, social media and radio advertising (at specific times of the year) proved to be the best use of our grant.

I think a small brochure for future recipients of similar grants would go a long way in seeing that they understand what the grant is for, and what has worked for past recipients would be a big help.

Contact Information:

Jim Wilson

President, Wine Trail of West Tennessee

901-484-9633

jthegent@aol.com

Project Title: Local Sourcing Foodservice Industry Program (Phase II)

Project Summary:

The Tennessee Department of Agriculture completed Phase II of the Local Sourcing Foodservice Industry Program in 2017 by providing education, marketing and outreach fostering relationships between Tennessee's food service operations and agricultural producers. The project allowed us to host events that educated farmers and chefs on the ways they can work together effectively and then also to host events that promoted networking and developing a rapport that previously was lacking in the main food markets of Tennessee: Memphis, Nashville, Chattanooga and Knoxville.

Project Approach:

TDA leveraged the Pick TN Products brand to provide a database of specialty crop growers who were interested in selling to restaurants and then reached out to community partners to find restaurants who were interested in buying locally. With these two categories in place, we developed educational workshops to teach how to work together and provided educational materials to ensure the success of these partnerships. Then, we provided networking events in major cities across TN to promote community building and the connections made at these events resulted in sales for specialty crop growers in Tennessee.

Goals and Outcomes Achieved:

Our first goal was to provide outreach for participation in the program and that was achieved thanks to the thoroughness of Pick Tennessee Product's database, the use of industry partners including Tennessee Hospitality Association and local food magazines, and through on the ground outreach at restaurants, farmers markets, and day-to-day regional duties for our staff.

Our second goal was to provide the farmers and chefs with tools to utilize to make sure they could maintain these profitable relationships, and this was achieved through the development of the "Tennessee Farm and Restaurant Alliance Local Food Sourcing Guide" which is available on our Tn.gov website as well disseminated at the networking and educational events.

The third goal was to connect food service industry representatives with farmers for the purpose of the sale of specialty crops to food service locations, and this was achieved through the added steps of education and networking. Once the farmers and chefs had tools to use, they could then utilize the tools at the networking events to secure business arrangements that were mutually beneficial.

Beneficiaries:

Specialty crop growers and restaurants in Tennessee.

Lessons Learned:

The TN Department of Agriculture has learned through this process that working with our partners is the most key piece of this puzzle, as well as teaching them to work together. Farmers and food service professionals work with the same products, but have a different language and means of communicating. Finding the common ground between the two was a challenge, though it was something we ultimately were able to find.

Contact Information:

Greer Gill

615-837-5163

greer.gill@gmail.com