Missouri Department of Agriculture
Susan Bennett, SCBGP Program Coordinator
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Final Performance Report
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Project 1: Winter Specialty Crop Production Project

Webb City Farmers Market
Eileen Nichols
Final Performance Report

Project Summary

The Winter Specialty Crop Production Project was a coordinated outreach effort to address the need for increased production of fruits and vegetables in both fresh and value-added form for winter markets in southwest Missouri. The project included two-day conferences in January, 2016, and in February, 2017, that with in-depth presentations on issues of interest to growers (both current and prospective). The project also includes a 2-day Better Processing School to enable specialty crop producers to produce value-added products for sale during the winter.

Consumers, both individual and institutional, in southwest Missouri are increasingly demanding access to fresh, local food year-round. Southwest Missouri farmers are increasingly interested in retaining their customer base year-round and extending their income-generating capacities. Winter production, season extension and value-added opportunities address these needs and opportunities. Training is a critical component of bringing these opportunities to fruition.

This project built on two previous and very well-received winter production conferences, one of which was funded by a specialty crops grant. The other was funded by a Local Foods Matching Grant.

Project Approach

All aspects of the Better Processing School were completed as specified by the work plan. We missed our goal of 25 growers attending the school by only one. All attendees of the school completed the work and received their certificate.

A lasting impact of the project was a significant change in where the annual school is held. When we first began investigating hosting the school we were told there was no way it would be moved from the University of Missouri – Columbia where it had always been held. However declining attendance made the organizers ripe to the invitation to move it in 2015 to Webb City. The organizers were so pleased with the results of the location and the dramatic increase in attendance in part because it was so much more accessible to growers in Southwest Missouri that the school is now moved from region to region using a local host. (In 2014 only 3 people signed up for the school in Columbia.) In 2016 it was held in Kansas City and in 2017 in Sedalia.

The Winter Production Conferences were rescheduled from the originally proposed dates so the first could dove tail with the Missouri Farmers Market Association annual meeting which was also held in Webb City. In retrospect, that may not have been a good choice as attendance was less than anticipated. It could have been that attendees were not willing to budget and schedule four days to attend both.

On-site and follow-up surveys were completed for the conference. Here is the completed survey link: Winter Production Conference Survey.

Goals and Outcomes Achieved

The Better Processing School fell short by one attendee meeting its goal of 25 to attend and complete the course.

2016 - The Midwest Winter Production Conference was held on Thursday and Friday, January 22 and 23, 2016. Seventy persons attended, most of whom were professional farmers, our target audience. While attendance was below our goal, survey responses demonstrated that conference was well received and of value.

2017 – As we reviewed past survey responses and recognized that many of the attendees now had three conferences of training and that this would likely be our last winter production conference for the foreseeable conference, we determined to take a slightly different approach. This conference would be designed to be a master class for experienced growers and a top-notch introduction for novices. Our on-site surveys indicate we were successful. Held on February 13 and 14, 2017, the conference was attended by 87 growers from as far away as the Texas panhandle (it was the second Webb City conference in a row that the Texas farmers had attended).

An important goal of the project was to increase the amount of produce available to the public through farmers market during the winter. The Webb City Farmers Market provided the bench mark and follow-up data. One significant measurement was the number of high tunnels serving the market:

2014 – the market was supplied by seven farms who had a total of nine tunnels. None of these farms supplied any other markets.

2017 – the market was supplied by 13 farms who have a total of 27 tunnels. Six of these farms now supply other markets as well as Webb City.

Most of these tunnels are in year-round production, increasing the amount of high quality produce available in Southwest Missouri in all four seasons.

Sales at the Webb City Farmers market are documented by market day but are not broken out as to how much is produce vs value added. However since most of the market vendors are growers the information is strongly influenced by produce sales. Data by vendor could be pulled out but would require significant time and effort.

Data is presented here by season. The Winter Market is considered to be from November through mid-April. The market is open on Saturday mornings during this period. Because this project built on a previous specialty crop grant, information is included from the year before that initial conference through this year.

2012 – 2013 - $36,640 (First Winter Production Conference held 2/4-5/2013*)
2013 – 2014 - $68.550
2014 – 2015 - $79,806 (Second Winter Production Conference held 11/11- 12/2014**)
2015 – 2016 - $105,111 (Third Winter Production Conference held 1/22 – 23/16***)
2016 – 2017 - $130,860 (Fourth and final Winter Production Conference held 2/13-14/2017***)

*funded by previous Specialty Crop Block Grant Program
** funded by Local Food Matching Grant
***funded by current Specialty Crop Block Grant Program

Anecdotal evidence of the project's benefit is clear. Sixty miles away is one of the larger markets in the state. Only one of their growers attended the conferences even though the market does have a winter market. Approximately 75% of the Webb City market's growers attended at least one conference. Some attended several or all. Distance was not a serious factor as growers at other Springfield markets did attend as well as growers from much farther away. The difference was probably demographic. Most of this Springfield market's farmers are retirement age or older. Apparently they are not interested in investing in new technology. Most of the Webb City market's farmers are mid-40s and younger. They are looking forward to long careers farming specialty crops.

This past winter it was apparently common to have no produce at this Springfield market – just value added and meat. Photos of the two markets on December 10, 2016, show a clear contrast between the two markets.

Market's open. Come get stocked up on all your favorite meat products, jams, honey, and winter vegetables.

The Springfield market's only facebook photo on December10, 2016.

A casual photo taken about the same time on the same day at the Webb City Farmers Market. Photos of the Webb City market also taken on December 10, 2016, follow.

Webb City Farmers Market added 4 new photos — with Shannon Newby Johnson.

Published by Eileen Nichols [?] · December 10, 2016 ·

The market is open today from 9 to noon. And, baby, it's warm inside the pavilion.

Santa is here along with Mrs. Claus. Bring your camera! Stewart's Bakery is serving breakfast and the Pommerts are singing Christmas. The Polar Bear Express is running and seats are available!

Here is who is here:... See More

All of the photos above show the produce of farmers who have attended one or more of the Winter Production conferences. Obviously the market, with city, state and federal support, has invested much time and materials in the success of the winter market from the sidewalls and heaters (financed by USDA-RD and FMPP) to events and activities to the publicity, in addition to the Winter Production conferences. All these efforts are directed towards providing a successful year-round venue for our specialty crops farmers.

Our project team believes the results thus far show that the training provided by the project was both timely and effective and we would urge other regions with climates conducive to protected growing and a supportive venue with an adequate customer base to consider replicating the project to increase the year-round sustainability of specialty crops growers as well as year-round access by consumers to local foods.

Beneficiaries

1) Attendees of the Better Processing School, all of whom received certification allowing them to proceed in their plans of value-adding their produce.

   As reported, 24 people attended and completed the School. No survey was conducted in conjunction with the school but a cursory email survey sent in response to this request yielded six responses:

   - "Have not used information gained and have no plans to do so."
   - "I make a line of fruit preserves, using cherries, oranges, strawberries, pineapple, lemons, blackberries, peaches, and more, about 1,000 units a year."
   - "I haven't done anything professionally yet with the knowledge I gained from attending the Webb City Better Processing School. I have done some home canning of pickles and jams. 2018 plans include bringing canned fruits and pickles into our market mix, we are finally able to invest in it. Thank for you hosting the school. It was very informative."
   - "Have not used it yet. Yes, intend to use it hopefully this next growing season and I am really pleased that I attended. I do pass on the value of the knowledge I learned and why it is important to know this and apply to the canning process. Safety first!"
   - "I have experimented with salsa and sauerkraut recipes using my farm's produce. I have not gone into production yet, but plan to do so. The training was comprehensive on helping me to understand canned foods, canning and the required safety regulations. The reference material provided is detailed. I appreciate that the training was offered locally and I benefited from receiving a scholarship to the training."
   - "We developed a recipe for tomato/peach salsa that is unique. We built a greenhouse, a 36' X 4' raised bed and a 40' X 4' raised bed to allow us to grow our own produce for this product."

   The school had been held at the University of Missouri-Columbia since it was begun several years earlier but in 2014 had very poor attendance (3 attendees). The organizers of the school were so pleased with the results of the Webb City School, that in 2016 it was held in Kansas City with 20 attending and in 2017 it was held in Sedalia with 12 attending. It was back in Columbia in 2018 and with 5 days until it was scheduled only 3 had signed up. The organizers are determined to take it out to other parts of the state in future and hope to replicate Webb City's success.

2) Growers who attended the Winter Production conferences were able to determine whether protected growing made sense for their operation and, if so, incorporate lessons learned to reduce failure and accelerate success in winter production.

Our project partner Patrick Byers conducted a post conference survey of all participants in the four winter production conferences the market has held. We used email addresses of 156 attendees. Some attendees, of course, did not have email addresses and were not contacted. Others no doubt had changed their address. We had a total of 46 respondents or about 30%, a fairly good response considering some had attended the conference as long as 4 years previously. The survey results may be found at https://www.surveymonkey.com/results/SM-QCHK35MP/#

- Of those responding, between 14% and 59% had initiated on their farms one or more of the practices that were discussed during the conferences.
- 32.61% reported planting a new variety of crop as a result of information gained at the conferences.
- 41.3% reported planting a new crop as a result of the conferences.
- 11.1% reported adding staff since attending the conference to meet the needs of winter production. 26.57% reported selling produce at a winter market or CSA since 2013 when the first conference was held.
- 31.82% reported going from part time to full time commercial farming since 2013.
- In the four years since the first winter production conference in 2013, 7.32% report pretax farm income of more than $50,000 attributable to winter production, 7.32% report $25,000 to $50,000, 7.32% report $10,000 to$25,000. Please see survey results for complete data.

The responses to two questions indicated the need for future conferences:

- 15.22% report being able to meet the demand at winter markets where they sell produce, while 23.9% say they cannot meet the demand.
- 95.56% report that they would like the Winter Production Conference continued.

3) Farmers markets able to stay open longer and provide larger produce selection due to their farmers being better trained in protected growing

   As stated in the original proposal, data was kept only for the Webb City Farmers Market. The benefit of the conferences is clear:

   - 2014 – The market was supplied by seven farms who had a total of nine tunnels. None of these farms supplied any other markets.
   - 2017 – The market was supplied by 13 farms who had a total of 27 tunnels. Six of these farms supplied other markets in addition to Webb City.

Most of these tunnels are in year-round production, increasing the amount of high quality local produce available in Southwest Missouri in all four seasons.

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In other words winter market sales increased by more than 350% in four years.

4) Customers able to access fresh local produce year-round

   As shown above, produce sold to customers at the Webb City Farmers Market increased by approximately 350% in the four years that Winter Production Conferences were held.

5) Farmers from across the nation will benefit because the selection of the primary presenters for the final conference triggered a partnership between the presenters in which they used the conference as the pilot for a "road show". They created a template that they hope to use at winter production conferences across the country.

   Michael Kilpatrick reports that while no conferences are scheduled for the presenting team until next winter, the material "has been shared to hundreds of other farmers through the slides and social media. Unfortunately I don't have exact numbers."

Lessons Learned

From an administrative stand point, we learned that reviewing the work plan at specified intervals is important. We will in future calendar dates for review so that items aren't neglected or skipped. Had we done that from the start we would have completed the follow-up surveys in a timelier manner.

Other details, like the importance of a good sound system both at the conference site and on the farm visit, need attention. Including locally raised produce in the conference menu was an effective tool to demonstrate the possibilities of winter production. We would have loved for the attendees to actually attend the Webb City Farmers Market and see the commerce possible at a winter market but it was impractical since some of the attendees actually sold at the market and could not attend the conference if held on a Saturday and the farmer presenters needed to be at their own market on Saturdays.

We learned that a combination of local, regional and national presenters which included both academic and successful farmers who are also capable speakers results in a conference of interest and value.

And finally we learned that while the conferences were very useful to native born farmers, they did not prove to be very helpful to our Hmong farmers who make up about 35% of our market's farmers, many of whom are interested in year-round growing. The language barrier, even with translation, the cultural barriers, even among friends with bonds of trust, reduced the value of the conferences to the point that the two first Hmong farmers to acquire tunnels had partial or total crop failures their first two years despite attending all the conferences. To address this we created, with the help of a Specialty Crops Grant, an education center on a centrally located Hmong farm where the Hmong could learn from the Hmong. Now half way through its second year, it is proving to be very effective.

Contact Person

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Additional Information

2016 conference

2017 conference

Below – 2017 farm tour at Oakwoods Farm included stops at two high tunnels, inoculated log stacks for mushrooms, value-added drying area, cooling/cold rooms for holding produce, seed starting structure, post production structure, winter field management station and hand tool station.

Acidified Foods Workshop 2015

Monday and Tuesday, March 23-24, 2015 in Webb City, MO

Workshop details are on the reverse and also at
http://foodscience.missouri.edu/afw/.

An "acidified food" is defined by FDA (in 21 CFR 114.3 (b)) as a low acid food to which acid(s) or acid food(s) are added to produce a product that has a finished equilibrium pH of 4.6 or below and a water activity greater than 0.85.
*Examples include: acidified artichoke hearts, bean salads, peppers or pimentos; marinated beets or mushrooms; fresh-pack pickles; certain pasta sauces, salsas, dips.**

The Webb City Farmers Market has received a Specialty Crops grant for a limited number of partial scholarships in the amount of $200 per person. Currently 12 scholarships remain available and will be awarded on a first come-first serve basis to qualified registrants. This scholarship is available to specialty crops growers only (which includes fruits and vegetables and many other crops – for a complete listing go to http://www.ams.usda.gov/AMSv1.0/scbgpdefinitions).

To register for the school or the scholarship, contact Eileen Nichols – 417 483-8139 or eileennichols@sbcglobal.net.

If you are considering processing your produce into value added products, this is an opportunity not to be missed. It is the first time the workshop has been held outside the Columbia area in Missouri and the only time scholarships have been available.

**An acidified food is a canned product that has been formulated or treated (by addition of an acid or acid food) so that every component has a pH of 4.6 or less within 24 hours after completion of the thermal process. Furthermore, acidified foods have a water activity above 0.85.*

Low acid foods like okra, cucumbers, cauliflower, quail eggs, peppers, and onions that are pickled to achieve a pH below 4.6 are acidifed. Salsa is often a tomato-based product, but the peppers, onions, corn and similar included ingredients are low acid and thus most salsa is deemed to be an acidified food. Canned corn is a low acid food and is not qualifying as an acidified food unless it is a pickled corn relish. The workshop is not intended for producers of low acid canned food. Those persons are referred to the BPCS in either Oklahoma State University (June) or University of Arkansas (November) or any other qualified BPCS.

Getting the category for the food identified is one of the key steps in complying with the regulations. Small or low volume processors who sell their product are not exempt from the regulations – specifically Title 9 Part 113 – for acidified foods. Makers of low acid products must comply with Title 9 Part 114 for low acid canned foods.

The word "can" is not limited to metal containers as jars and bottles and pouches qualify for use under the definitions for canned foods.

Acidified Foods Workshop 2015

Monday and Tuesday, March 23-24, 2015 in Webb City, MO

Providing assistance and training for processors in Missouri, Arkansas and Oklahoma. Processors from other states are welcome!

This workshop is a Better Process Control School (BPCS) event specifically for processors of acidified food products and meets the requirements of 21 CFR Part 114 for FDA regulated food manufacturers. Please contact Dr. Andrew Clarke at the University of Missouri Food Science Program (573-882-2610) or ClarkeA@missouri.edu) if you have any questions about the Acidified Food Workshop.

Processors of low acid canned foods should attend a BPCS event designed for thermal processing (retorting) of low acid products such as one offered at Oklahoma State University (http://fapc.biz/workshops/processcontrol.html) June 10-12, 2015 or at the University of Arkansas (http://www.uark.edu/depts/ifse/bpcs2.html) November 3-5, 2015.

Workshop Faculty

Andrew Clarke, Ph.D.
University of Missouri-Columbia

Steve Seideman, Ph.D.
University of Arkansas

William McGlynn, Ph.D.
Oklahoma State University

Registration

The registration fee is $425 for the first person from a company and $325 for each additional person from the same company or farm. There are a limited number of $200 scholarships available for specialty crop growers. All participants will be provided with workshop materials as well as lunch and refreshments during breaks.

Space is limited and early registration is encouraged.

Registration is limited to 50 participants. Registration deadline: March 9, 2015.
To register, please send an e-mail with contact information (participant name, company name, address, telephone and e-mail) to: eileennichols@sbcglobal.net

We will confirm your registration and provide directions to the meeting location by e-mail reply. If you have any questions or do not have e-mail access for registration, please contact Eileen Nichols, 417-483-8139.

Cancellations
Cancellations, with refund, will be accepted until two weeks prior to the start of the course. Cancellations after March 16, 2015 will be charged $100 to cover preparation costs.

Lodging Information

There are limited lodging facilities available in Webb City, Missouri but more options are available in Joplin, Missouri about 15 minutes away. The Holiday Inn at 3615 Rangeline Road in Joplin, MO has a group rate of $87 per room per night, including breakfast for two (ask for the Better Processing School rate) at 417 782-1000. Reservations must be made by March 15. Other options do exist and most chains provide directional advice on their websites. Participants make their own reservations and lodging is not included in the cost of registration for the Acidified Food Workshop.

Workshop Location

The workshop will be held at the Webb City Public Library at 101 S. Liberty, Webb City, MO.

Details

Manufacturers of Acidified Food Products are invited to send representatives to our new Acidified Foods Workshop at the Webb City Public Library on March 23-24, 2015. This workshop was developed in conjunction with partners at the University of Arkansas and Oklahoma State University to satisfy regulatory requirements for processors of acidified foods. The workshop will help participants to understand basic food safety principles and comply with 21 CFR Part 114.

The two-day (7:30 a.m. to 5 p.m.) workshop is best for managers or process operators responsible for the safety of acidified foods. New or relatively inexperienced employees are welcome and a reduced registration fee will be available for multiple representatives from a single company. The registration fee will cover all educational materials, exams, and a food safety textbook plus refreshments. In addition, the registration fee includes a laboratory analysis of the pH and water activity for one product per participant.

At the end of the program, there will be a "walk-through" of the paperwork needed to file an acidified food process with FDA conducted by a Process Authority. Every participant that successfully completes the workshop will receive a certificate that may be used to verify the training for FDA or Missouri Department of Health and Senior Services records.

The Better Process Control School for thermally processed low acid foods and the Acidified Food Workshop for acidified foods are available for companies or agencies at their site. Please contact Dr. Andrew Clarke at 573-882-2610 or ClarkeA@missouri.edu for more information and scheduling.

HACCP

The University of Missouri will also host a workshop for Implementation of HACCP for the Meat and Food Industry on March 25-27, 2015. Separate registration is required for this workshop which is accredited by the International HACCP Alliance for certificate-based instruction that satisfy USDA and FDA training requirements. Contact either Andrew Clarke

at ClarkeA@missouri.edu or Starsha Ferguson at FergusonSD@Missouri.edu for more information about the HACCP Workshop.

Schedule

Day 1

7:30-8:00 AM	Registration	
8:00-8:10	Welcome and Course Introduction	Dr. Andrew Clarke, MU
8:10-8:45	FDA Regulations (Chapter 1)	TBD, Consumer Safety Officer, FDA
8:45-10:15	Microbiology (Chapter 2)	Dr. Steve Seideman, UA
10:15-10:30	Break	
10:30-11:45	Acidified Foods (Chapter 3)	Dr. Andrew Clarke, MU
11:45-12:45	Lunch	
12:45-1:45	Principles of Thermal Processing (Chapter 4)	Dr. William McGlynn, OSU
1:45-3:00	Food Plant Sanitation (Chapter 5)	Dr. Andrew Clarke, MU
3:00-3:15	Break	
3:15- 4:30	Food Container Handling (Chapter 6)	Dr. William McGlynn, OSU
4:30	Questions & Discussion	
4:45	Adjourn*	

Day 2

7:30- 8:00 AM	Exam Retakes	
8:00- 9:30	Records for Product Protection (Chapter 7)	Dr. Andrew Clarke, MU
9:30-10:30	Process Room Instrumentation, Equipment and Operation (Chapter 8)	Dr. Steve Seideman, UA
10:30 10:45	Break	
10:45-12:00	Closure of Glass Containers (Chapter 16)	Dr. Andrew Clarke, MU
12:00-1:00	Lunch	
1:00-2:15	Closures for Semi-rigid and Flexible Containers (Chapter 17)	Dr. Steve Seideman, UA
2:15-4:00	Process Authority Services and Filing Process Schedules with FDA	Dr. William McGlynn, OSU
4:00	Questions, Evaluations	
4:30	Workshop Concludes	

* A confidential analysis of pH and water activity of one product per participant is included in the workshop registration. Additional products can be tested for a fee (please contact Andrew Clarke at ClarkeA@missouri.edu for rates)

Midwest Winter Production Conference

Thursday & Friday,
January 21 & 22, 2016
Joplin, Missouri

Winter production! The demand for locally grown vegetables & fruit knows no season & the opportunity for innovative farmers to expand production into the winter months is huge.

Back by popular demand, this conference features national & regional presenters with hands-on experience in winter production.

REGISTRATION IS LIMITED TO 100 PARTICIPANTS

Sponsors of the Conference:

UNIVERSITY OF MISSOURI Extension

1866 LINCOLN University

The Webb City Farmers Market

Eat local – Eat fresh

MISSOURI AGRICULTURE

The Missouri Department of Agriculture has funded a portion of this project, through a Local Food Matching grant.

Midwest Winter Production Conference

Thursday and Friday, January 21 and 22, 2016 *

Continental Banquet Center (immediately behind Granny Shaffer's, 2728 North Rangeline, Joplin, MO 64801)

Thursday, January 21

Registration – 8 to 9 am

9:00—Welcome

9:20 am - 10:20 - concurrent sessions – pick one

> **For Beginners –** High tunnel siting, choices of equipment, costs and returns - *Shon Bishop and Patrice Gros*
>
> **Garlic, a favorite through the centuries, only seems to get more popular every year** - Patrick Byers and Tammy Sellmeyer will discuss the history, background and classification of garlic, as well as production and post-harvest handling of this crop which can add sales during fall and winter.

10:20 - 10:30 - break

10:30 - 11:30 - **If you grow it, will they buy it.. and will you make money doing it? *Economics and marketing for winter grow leafy greens.*** *(Adam Montri)* High tunnels and hoophouses have allowed for winter production of leafy greens like spinach, kale, and Swiss chard, but just because we can grow these crops doesn't mean we can sell them. If we can sell them that also doesn't mean we are making money on them. This session will focus on production and planning for winter leafy crops, selling and marketing them, and determining prices to make sure you are making money on these leafy greens.

11:30 - 12:30 pm - lunch (included in registration fee)

12:30 – 1:45 - **Farmer Symposium** - top winter producers from Missouri's winter markets discuss their favorite winter production tools, crops and techniques. Patrice Gros of Arkansas and Adam Montri of Michigan will join in.

1:45 - 2:00 - break

2:00 - 3:00 – **Marketing Strategies for Winter Sales (Dru Montri)** Marketing your product during the winter can require a strategy different from your peak season approach. Learn more about planning, target marketing, building relationships with your customers and communicating with them regularly. After a review of lessons learned from other winter markets, you'll leave this session thinking about ways to increase your profits and make your winter market more successful.

3 - 3:15—break

3:15 - 5:15 - concurrent sessions – pick and choose (each will be approximately 50 minutes)

Track A:

Tammy Sellmeyer - Adding value and expanding your profit through storage crops and dried products. Turn your surplus summer produce into extra winter sales through drying. Make your stand the go-to place for storage crops.

Dan Kuebler - Dan spoke at our first conference about his moveable high tunnel. This year he shares his extensive knowledge about **lacto fermentation of sauerkraut and dill pickles** and the profit it can add to your winter market sales.

Track B:

Jennifer Morganthaler of Missouri State University - **Raspberry Production in High Tunnels -** an on-going research project examining the cost benefits and challenges of high tunnel raspberry production, including bag growing.

Adam and Dru Montri of Ten Hens Farm will present on their **diversified marketing strategy.** This session will focus on building relationships with buyers, communication, marketing and sales strategies. Ten Hens Farm currently sells on farm, to other farms, to food trucks, restaurants, specialty grocers, and a medium-sized distributor.

Friday, January 22

8:30 to 10 – **Winter Storage Crop Production and Economics.** (Adam Montri) Winter storage crops such as beets and specialty turnips add to a farm's product list but are not always the most economically viable crops to grow in a winter high tunnel. In this session we will focus on summer and fall production of root crops for winter storage. Plant spacing, weeding and cultivation options, when to harvest, winter storage requirements and options, labor needs, packaging and pricing will all be discussed along with how the storage crops help to sell other winter high tunnel grown products.

10:15 to 11:45 **Integrated Pest Control in Tunnels** - a panel discussion including Dr. Jaime Pinero and case studies presented by local high tunnel farmers.

Noon to 1 – lunch (included in registration fee)

1 – 2 – **Starting your own plants for winter production** (Patrice Gros) Seed selection, crop varieties, seeding time table, cost, quality control

2:15 – Update on grants, food safety and other government programs and opportunities

3 – 5 – Farm tour

* *All presentations subject to change.*

Presenters

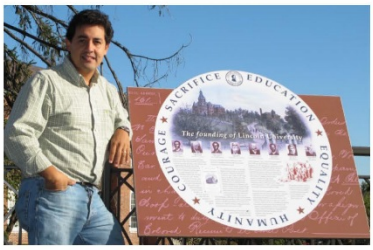
Adam Montri spoke at our 2013 Winter Production Conference. He is an outreach specialist in the Michigan State University Department of Horticulture where he works with farmer throughout the state on high tunnel funding, construction, year-round production, marketing, and economics. He and his wife Dru (see below) own and operate Ten Hens Farm in Bath, Michigan, where they farm outdoors in-season and year-round in 17,900 sq ft of high tunnels. They sell their products through a variety of outlets including restaurants, food trucks, an on-farm stand, a year-round farmers market, other farms, a specialty grocery store and a medium-sized distributor.

Dru Montri, who holds a Ph.D. in horticulture, has been director of the Michigan Farmers Market Association since its inception in 2006. Now a 400 member organization, the association gives Dru contacts with farmers markets throughout the state. As a board member of the Farmers Market Coalition board she also has experience with some of the best markets in the country. As an owner of Ten Hens Farm, Dru has extensive experience in winter production and winter sales.

Patrice Gros has been a passionate organic farmer since 1995. In 2006, Patrice started Foundation Farm, a 5-acre USDA certified organic farm in Northwest Arkansas. Foundation Farm follows a no-till/no-machine, low-input system which provides high yields in a beautiful natural setting. On an average year, 20,000 pounds of produce are harvested and sold within a 50-mile radius. Foundation Farm welcomes season-long trainees in its farming school program as well as day-volunteers from nearby communities.

Dan Kuebler has been growing organic produce since 1989 on his 30 acre farm, The Salad Garden, in southern Boone County Missouri, and selling at local farmers markets and restaurants in Columbia, MO. Among many interests, Dan has pursued lacto fermentation of sauerkraut and dill pickles, including it in his product mix and holding workshops on the processes.

Tammy Sellmeyer, with her husband Greg, have raised fruits & vegetables on their farm since 2000. That year Greg built their first greenhouse. Since then they have added a second greenhouse & four hoop houses. They sell at the Columbia and the Fulton Farmers Markets, and have a CSA. Their winter sales include a wide variety of storage crops and dried products from produce raised on their farm.



Dr. Jaime Piñero is native to Mexico and in the year 2005 he earned a Ph.D. in entomology from the University of Massachusetts - Amherst. After spending time abroad, he joined Lincoln University in the year 2010. His current research projects focus on the development of effective and affordable ecologically-based pest management strategies that are compatible with sustainable /organic agriculture. He serves as the State Integrated Pest Management specialist for Lincoln University.

Jennifer Morganthaler is a graduate student pursing a Masters in Plant Science at Missouri State University in Springfield. She is currently researching High Tunnel Raspberry Production at the State Fruit Experiment Station in Mountain Grove. After graduation Jennifer plans to continue working in horticulture outreach and plant research.

Patrick Byers is Regional Horticulture Specialist with the Greene County office of University of Missouri Extension. Patrick has provided educational and hands-on training in all aspect of high tunnel design, construction, and management. His background includes degrees in horticulture from the Universities of Nebraska, Missouri, and Arkansas. Over his career of 25+ years he has provided outreach education for producers of fruits and vegetables commercially grown in the Mid-west. In recent years he has focused on challenges facing high tunnel producers, particularly those related to long term production in fixed high tunnels. Patrick has a specific interest in promoting fruit production in high tunnels.

Shon Bishop has been working for Lincoln University Cooperative Extension in the Southwest Region of Missouri since 2011. Currently, he is the Small Farm Specialist for the Innovative Small Farmers Outreach Program (ISFOP) which serves Barry, Lawrence, McDonald, Newton, Jasper, and Greene counties. Over the past 5 years Shon has helped many farmers construct their high tunnels while holding workshops open to the public at their farms in Southwest Missouri. Shon implemented the high tunnel construction took kit program of the Webb City Farmers Market recently expanded to kits in the Kansas City and St. Louis areas, as well as southwest Missouri. The kits were underwritten by the Missouri Department of Agriculture through a Local Foods Matching Grant, the Missouri Farmers Market Association and the Missouri Vegetables Growers Association. They are available on loan at no charge. Shon also owns and operates Bishop Gardens L.L.C. which sells early season tomatoes and strawberries to the public.

Registration Form—

Full registration includes lunch each of the two days and materials Additional registrations from the same farm or group each include lunch each of the two days but no materials. **Materials** included with $50 registration: New Seed Starters Handbook by Nancy Bubel and the 2016 Midwest Vegetable Production Guide for Commercial Growers.

Mail with check made out to Webb City Farmers Market to : Webb City Farmers Market, PO Box 1, Webb City, MO 64870. Questions? Call Eileen at 417 483-8139.

_____ Name

_____ Farm/Business Name

_____ PO Box/street address

_____ E-mail address

_____ Town/State/Zip

_____ Telephone

Additional person(s) attending:

_____

_____ Email or mailing address if different from above

Fee(s):

Full registration ($50) $_____

Additional registrations (____ persons x $35 each) $_____

Total enclosed: _____

Dietary or other information:

Directions to conference:

From the south—Take US 49 to the Zora Street exit. Turn west on Zora, turn north on Rangeline Road. The Continental Banquet Center is located behind Granny Shaffers on the left about .2 miles after you turn.

From the east— From I-44, take the exit 15, go north on US 49 to the Zora Street exit. Turn west on Zora, turn north on Rangeline Road. The Continental Banquet Center is located behind Granny Shaffers on the left about .2 miles after you turn.

From the west— Mo 171 to Webb City, turn right on Madison which turns into Rangeline in Joplin. The Continental Banquet Center is located behind Granny Shaffers on the right about 1.7 miles after you turn onto Madison.

From the north— US 71 to Mo 171, turn west toward Webb City. In Webb City, turn south on Madison which turns into Rangeline in Joplin. The Continental Banquet Center is located behind Granny Shaffers on the right about 1.7 miles after you turn onto Madison.

Accomodations— Attendees have two options for over night stays.

The Comfort Inn, 2400 South Rangeline, is offering a rate of $75 per night, plus tax. The rates are good for Wednesday through Friday, January 20—23. To reserve your room, call 417 627-0400 and say that you want the Webb City Conference rate. The hotel is 15 to 20 minutes from the conference site. Reserve by January 6 to secure the conference rate.

Home stays in Webb City are available by booking through the Webb City Farmers Market. The rate is $50 per room. Breakfast, if desired, is $5 per person. All proceeds from home stays go to the Webb City School's CARES program which builds partnerships between the community & the school district to ensure that all students have their basic needs met. For further information or to book a home stay email or call Eileen Nichols at eileennichols@sbcglobal.net or 417 483-8139.

Webb City Farmers Market
PO Box 1
Webb City, MO 64870

Midwest Winter Production Conference

Monday and Tuesday,
February 13 and 14, 2017
Joplin, Missouri

Winter production! The demand for locally grown vegetables & fruit knows no season & the opportunity for innovative farmers to expand production into the winter months is huge.

Back by popular demand, this conference features national & regional presenters with hands-on experience in winter production.

REGISTRATION IS LIMITED TO 100 PARTICIPANTS

Sponsors of the Conference:

UNIVERSITY OF MISSOURI Extension

1866 LINCOLN University

MISSOURI AGRICULTURE

The Missouri Department of Agriculture has funded a portion of this project, through a Specialty Crops grant.

The Webb City Farmers Market

Eat local – Eat fresh

Midwest Winter Production Conference

*Monday and Tuesday, February 13 and 14, 2017 **

Continental Banquet Center (immediately behind Granny Shaffer's,
2728 North Rangeline, Joplin, MO 64801)

Monday, February 13

Registration – 8 to 9 am

9:00—Welcome

9:30 am - 11:15 - concurrent sessions

Session For Beginning Winter Producers –

Winter High Tunnel Production - *What you should know before jumping in — Liz Graznak*

Basics of High Tunnels - *Sandy & Paul Arnold*

Session For Advanced Winter Producers —

Advanced Characteristics of Tunnels, including maintenance - *Michael Kilpatrick*

Innovative Heating Systems—*Michael Kilpatrick*

11:30—12:30 - concurrent sessions

Session For Beginning Winter Producers –

Bed, Preparation, Seeding and Record-keeping—*Sandy and Paul Arnold*

Session For Advanced Winter Producers —

Soil Solarization, Flaming, Stale Bedding & Advanced Record-Keeping—*Michael Kilpatrick*

12:30—1:45 - **lunch**

1:45—2:45 **Economics of winter production**—*figuring crops by the numbers, balancing summer and winter—Sandy and Paul Arnold and Michael Kilpatrick*

2:45—3:30 **Filling Out Your Table**—*other crops to supplement winter greens, storage and crop quality—Sandy and Paul Arnold and Michael Kilpatrick*

3:45—5:00 **Principles of Winter Production**—*soil fertility, coverings, ventilation, watering, temperature, systems, dataloggers—*
Sandy and Paul Arnold and Michael Kilpatrick

5:00—5:15 **Recap of day, lessons learned, questions**

Tuesday, February 14

8:30-9:30 **In the Hot Seat**— the operations of Happy Hollow Farm and Urban Roots Farm are critiqued by the Arnolds and Michael

9:30-10:00 **Pests, insects and disease -** *common high tunnel issues and how I dealt with them—Sandy Arnold*

10-15— 11:15 **Harvesting, washing, post-harvest handling**—*Michael Kilpatrick*

11:15—12:15 **Crop Specifics**- *a deep dive into how we grow them —*
Sandy and Paul Arnold and Michael Kilpatrick

12:15-1:15 **Lunch**

1:15—2:15 **Marketing your winter production-** *connecting with your customer, selling at farmers markets, CSA, Wholesale—Michael Kilpatrick*

2:15—2:30 **Wrap -up**

2::30 – **Farm tour**

- *All presentations subject to change.*

Presenters

Paul and Sandy Arnold purchased land in Argyle in 1988, located about an hour north of Albany, NY. They have built Pleasant Valley Farm up from just land to be a thriving fruit and vegetable farm over the past 28 years, which included building barns, a house, a greenhouse, and high tunnels, situated in a scenic valley in Washington County. Their two children, Robert (24) and Kim (20), were both home-schooled, attend college and are an integral part of their family farm.

Over 40 varieties of diverse fruit and vegetable crops are grown with organic methods on about 5 acres of land and the farm is certified through Certified Naturally Grown (grass roots

Continued next page

alternative certification to USDA organic) and they are a NOFA-NY Pledge member. They own 60 acres of land and rent 120 acres from a neighbor; about 4 acres are cover-cropped for rotation, and many acres are for hay, used by a neighboring beefalo farmer. Some of the major crops grown on their farm, which lies in zone 4, include: lettuce, spinach, greens, beets, carrots, potatoes, squashes, cabbage, onions, tomatoes, strawberries, and herbs.

Their produce is sold almost exclusively at near-by farmers' markets year-round and to a few restaurants and health food stores in Saratoga Springs. They attend 3 area farmers' markets each week May 1st to November 1st (Wednesday and Saturday), then 2 Saturday winter markets November 1st to May 1st. Since 2006, the Arnolds have been producing crops for winter markets, but have specialized in winter growing/season extension since 1992; Production for the winter markets was accomplished by constructing three large, unheated high tunnels which are used to grow greens all winter, and by storing many crops in an environmentally-controlled root cellar that stores 24 tons of produce under the barn.

To meet the energy challenges of the farm, the Arnolds have installed radiant-heated rolling benches in their polycarbonate greenhouse and also two photovoltaic-solar systems, totaling 29.2 kW that generate 100% their needed electricity for the entire farm and house. Although neither came from a farming background, they reached their goal 23 years ago of having the farm provide all their family income, and have enjoyed the great lifestyle it offers.

Michael Kilpatrick is a farmer, presenter, inventor and blogger whose goal is helping farmers apply business principles and practical, proven solutions to grow their businesses and simplify their lives. He has managed large certified organic farms and businesses and consulted for industry experts. He is co-founder of In the Field Consultants.

In 2005, he started a highly diversified, year-round, vegetable farm with his brother. The business rapidly scaled till it was managing several hundred acres, with over 20 employees, and sold to farmers markets, CSA, coops, and wholesale buyers. What set his farm apart was the systems that he put in place that allowed him to work less hours and leave for vacation without having to worry that plants were dying or customers didn't get their products. In 2012, Michael took a 4 month leave from his farm and interned at Polyface Farm in Virginia. He met his wife Savannah there and they married in 2013.

In 2015, Michael and his wife decided to move to Ohio to be near family and pursue teaching other farmers who wanted the same kind of growth in their farms without the stress or tension of neglecting what matters most.

Liz Graznak is a Columbia native whose love of gardening and the outdoors is primarily the result of time spent outside with her grandparents growing up. It was in grad school at Cornell University that Liz discovered CSA farms and realized she too wanted to grow vegetables. After working on a number of different farms out east and in the Midwest Liz decided to move back to the Columbia area. She also realized that if she was ever going to be able to afford to purchase her own farm than

she was going to have to have a "real" job for a while. After six years of working at Superior Garden Center Liz & Katie purchased Happy Hollow Farm. CSA farming has provided the opportunity to fulfill Liz's long anticipated goal of growing beautiful, healthy food and sharing it with a community of people that share her enthusiasm and commitment to a local food system. Liz is entering her eighth year of certified organic production and has expanded to nearly 7 acres of veggies, fruit, eggs & flowers that she sells thru the CSA, at the Columbia Farmers Market and to a number of local restaurants and grocery stores.

Urban Roots Farm is a Certified Naturally Grown four season urban vegetable farm located in downtown Springfield Missouri. Owners Adam and Melissa Millsap have worked this 1.7 acre farm since 2010 growing vegetables year round using natural and sustainable techniques.

Registration Form— Full registration includes lunch each of the two days and materials Additional registrations from the same farm or group each include lunch each of the two days but no materials. **Materials** included with $50 registration: **The Greenhouse and Hoophouse Grower's Handbook** by Andrew Mefferd.

Mail with check made out to Webb City Farmers Market to : Webb City Farmers Market
PO Box 1
Webb City, MO 64870

Questions? Call Eileen at 417 483-8139.

_____ _____
Name Farm/Business Name

_____ _____
PO Box/street address E-mail address

_____ _____
Town/State/Zip Telephone

Additional person(s) attending:

_____ _____
Email or mailing address if different from above

Fee(s):

Full registration ($50) $_____

Additional registrations (____ persons x $35 each) $_____
(the $35 rate does not include the book)

Total enclosed: _____

Dietary or other information:

Evaluation: Winter Production Conference – Webb City, MO – January 21, 2016

The information you provide will not be used to identify any program participants. You may refuse to answer any questions. Your answers to the following questions will help University of Missouri Extension make sure that we are presenting valuable programs to a wide range of participants and will aid in future planning and training improvements. We appreciate your time and input. Please circle or mark appropriate answer.

		Poor	Fair	Average	Good	Excellent
		1	2	3	4	5
1.	How would you rate the overall program?	0	0	0	38.70968	61.29032
Average rating (1-5 Likert Scale)		**4.613**				

		Poor	Fair	Average	Good	Excellent
		1	2	3	4	5
2.	How well were your expectations met in this program?	0	0	3.333333	60	36.66667
Average rating (1-5 Likert Scale)		**4.333**				

3. I would recommend this program to others.

YES 100%
NO 0%

4. Overall, after completing this workshop, do you think your knowledge gained of pest management and safe production practices has increased:

a geat deal	a moderate amount	a little	not at all
4	3	2	1
43.33333	40	16.66667	0
Average knowledge gain (1-4 Likert scale)		**3.267**	

Listed below are the topics presented during this workshop. On the left, circle your knowledge of each topic BEFORE the workshop. On the right, circle your knowledge of each topic AFTER the workshop.

How confident you are in using these practices or researching information after the workshop:

5.	Question:	Non-existent	Minimal	moderate	considerable
		1	**2**	**3**	**4**
1	Getting started with high tunnels	0	20	46.66667	33.33333
2	Garlic Production	0	0	58.82353	41.17647
3	Economics of leafy greens	0	12	52	36
4	Marketing Strategies for winter sales	0	7.142857	46.42857	46.42857
5	Stored and dried crops for	0	11.11111	44.44444	44.44444

	winter sales				
6	Sauerkraut and other fermented products	5.555556	11.11111	55.55556	27.77778
7	HT raspberry production	9.090909	9.090909	45.45455	36.36364
8	Diversified marketing	0	8.333333	41.66667	50

Knowledge gain

	Question:	Pre Evaluation score	Post Evaluation score	Knowledge gain (1-4 Likert Scale)
1	Getting started with high tunnels	2.529412	3.133333	0.603922
2	Garlic Production	2.736842	3.411765	0.674923
3	Economics of leafy greens	2.416667	3.24	0.823333
4	Marketing Strategies for winter sales	2.5	3.392857	0.892857
5	Stored and dried crops for winter sales	2.222222	3.333333	1.111111
6	Sauerkraut and other fermented products	2.058824	3.055556	0.996732
7	HT raspberry production	2.166667	3.090909	0.924242
8	Diversified marketing	2.538462	3.416667	0.878205
	Average knowledge gain			**0.863**

6. Please comment on the presenter's skills so that we can improve.
Did presenters encourage questions? Keep me focused and interested? Did the presenters use clear examples? Were they well-prepared?

- Yes, all of them.
- The presenters did very well. I appreciated all of their information and I am confident that other will agree. Thank you for the production. :)
- well prepared. Good speakers.
- I enjoyed and learned from the panel of growers on Thursday after lunch.
- Great presenters.
- yes. Yes except after lunch which was my naptime!! Yes. Yes.
- all very good. Just need to work on speaker microphone working correctly.
- they were all angelic messengers of genius and they could not have done better.
- I thought everyone was very informative on their topic that they covered. I would like training on new social media.
- stored crop session not so informative. -didn't seem organized. All others- top rate.
- very much so!
- Like Shon's presentation, especially for us beginners. The details really count in putting it all together. Patrick was well organized--enjoy and learned much from his low maintenance-organic aspects. Adam does a great job in his presentations, well ordered, and chocked full of information. Tammy and Greg--seem to jump from one thought to another didn't seem to flow-- most of the session dealt with the type of potatoes--not so much on storing and dry produce. Adam and Monti did a wonderful presentation of the history of their business and their success at connecting with the community.
- all presenters had vast knowledge in the topics and were very helpful.
- overall very good and informative.
- social media training.

- Just great. Handouts-always-good. A handout that compiles recommended resources--websites you all mention-- supply companies you mention-- you get the idea. Even organizations to contact who present.
- Great job.
- There was a problem with the microphone that was annoying.

7. What will you do differently as a result of this program?

	Did Before Workshop	*Plan to Do in Next 6 Months*	*No Plans to Use this in My Operation*	*Does Not Apply in My Operation*
Add Garlic to my farm's production	28	52	0	20
Modify the way I grow and sell leafy greens	18	55	18	9
Modify the way I market during the winter	18	55	0	27
Add a fermented product to my farm's products	9	35	35	22
Plant raspberries in a high tunnel	5	40	40	15

8. What else did you learn that you plan to use this year?

- high tunnels--raspberries. Better planning and record keeping. Ginger production.
- all the high tunnel info. Extending the growing season. Marketing our products.
- build tunnel and use row covers.
- slipping sweet potatoes.
- enjoyed listening to different things that didn't work.
- will try the no till methods that Patrick advocates. Would like to put up a moveable H. T.
- training social media.
- Loved fermented topic. Cover crops.
- Specific things from growers-- dehydrating, varieties for winter sales. Value-added products! Fermenting and drying excess.
- Try to do more storage.
- raspberries, garlic --most helpful.
- more drying
- everything was excellent and I intend to utilize the resources that I acquired today. I will see what the future allows by way of planning.
- Shorter bed plan.
- I plan to get a dehydrator and dehydrate lots of things :)

9. What suggestions do you have for making this program more effective?

10. What topics would be of interest to you in future workshops?

- This is my first conference. Thought it was great. Do not really know what to suggest for future.

- 1. Managing bermuda grass and other plants like it. As we begin no till farming -- and the very basics of how to "plow" that field if we aren't going to actually plow it! 2. More info on moving tunnels -- the construction. The concept of timing. Take us Feb-Dec.... 3. Refrigeration/ cold storage ideas -- build your own. How much space is required. 4. Irrigation A-Z.
- Interested in social media.
- Current social media training.
- A really good list of categorized resources would be awesome. All in one packet.
- Watering systems. How to set up raised beds. Samples of produce. Packaging.
- More organic info for high tunnel production.
- 1. Have a restaurant owner and chef do a presentation of how they work with local farmers and what they would like to see improve on the local farming scene. 2. More about value added farm products and store owners who would buy or stock their products.
- natural pest elimination ideas. Ways to encourage bees to our crops.
- training in social media.
- Social media training.
- Would like training on social media.
- Fig tree, bay leaf tree, gooseberry, elderberry. Small fruit chemical spray guide for fruit crops 2017 issue.
- Mushrooms -- myco planting -- spores.
- The variety was good this year. This has been my first time attending but if the production is as good and varied next year, I will certainly hope to return.
- Social media trends per age crop.
- mushrooms. Herbs in the greenhouse/ high tunnel. Tropical fruit in the greenhouse/ Tunnel? Avocados?

WebApps impact reporting

1. **Customer Quotes - What else did you learn that you plan to use this year?**

- high tunnels--raspberries. Better planning and record keeping. Ginger production.
- all the high tunnel info. Extending the growing season. Marketing our products.
- build tunnel and use row covers.
- slipping sweet potatoes.
- enjoyed listening to different things that didn't work.
- will try the no till methods that Patrick advocates. Would like to put up a moveable H. T.
- training social media.
- Loved fermented topic. Cover crops.
- Specific things from growers-- dehydrating, varieties for winter sales. Value-added products! Fermenting and drying excess.
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- more drying
- everything was excellent and I intend to utilize the resources that I acquired today. I will see what the future allows by way of planning.
- Shorter bed plan.
- I plan to get a dehydrator and dehydrate lots of things :)

2. **Learning (Short Term) Outcomes knowledge, skills or attitude change**

When asked to consider the program as a whole, the attendees who responded to the survey (n=26) reported an average knowledge gain of **3.267** on a 1-4 Likert scale, with 4=great deal of knowledge gain. Attendees were surveyed on knowledge of workshop topics before and after the program, and average knowledge gain on a 1-4 Likert scale, with 4=considerable knowledge gain, was the following: Getting started with high tunnels, 0.604; Garlic production, 0.675; Economics of leafy greens, 0.823; Marketing Strategies for winter sales, 0,893; Stored and dried crops for winter sales, 1.111; Sauerkraut and other fermented products, 0.997; HT raspberry production, 0.924; and Diversified marketing, 0.878.The overall knowledge gain was **0.863**. Following the program, attendees reported confidence in understanding these topics at a considerable level, 41%, moderate level, 49%, or minimal level, 10%. The attendees who responded to the survey were asked to describe behavior change as a result of the program. The following actions were planned within the next 6 months: Add garlic to my farm's production, 52%; Modify the way I grow and sell leafy greens, 55%; Modify the way I market during the winter, 55%; Add a fermented product to my farm's products, 35%; and Plant raspberries in a high tunnel, 40%.

3. **Customer satisfaction exit survey or comments about the learning experience**

The attendees who responded to the survey rated the overall program as **4.613** on a 1 to 5 Likert scale, with 5=excellent. Attendees reported that expectations were met in the program at a level of **4.333** on a 1 to 5 Likert scale, with 5=excellent. **100%** of attendees reported that they would recommend the program to others.

Please comment on the presenter's skills so that we can improve.

Did presenters encourage questions? Keep me focused and interested? Did the presenters use clear examples? Were they well-prepared?

- Yes, all of them.
- The presenters did very well. I appreciated all of their information and I am confident that other will agree. Thank you for the production. :)
- well prepared. Good speakers.
- I enjoyed and learned from the panel of growers on Thursday after lunch.
- Great presenters.
- yes. Yes except after lunch which was my naptime!! Yes. Yes.
- all very good. Just need to work on speaker microphone working correctly.
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- all presenters had vast knowledge in the topics and were very helpful.
- overall very good and informative.
- social media training.
- Just great. Handouts-always-good. A handout that compiles recommended resources--websites you all mention-- supply companies you mention-- you get the idea. Even organizations to contact who present.
- Great job.
- There was a problem with the microphone that was annoying.

Evaluation: Winter Production Conference – Webb City, MO – January 22, 2016

The information you provide will not be used to identify any program participants. You may refuse to answer any questions. Your answers to the following questions will help University of Missouri Extension make sure that we are presenting valuable programs to a wide range of participants and will aid in future planning and training improvements. We appreciate your time and input. Please circle or mark appropriate answer.

		Poor	Fair	Average	Good	Excellent
		1	2	3	4	5
1.	How would you rate the overall program?	0	0	0	32.25806	67.74194
Average rating (1-5 Likert Scale)		**4.677**				

		Poor	Fair	Average	Good	Excellent
		1	2	3	4	5
2.	How well were your expectations met in this program?	0	0	3.225806	54.83871	41.93548
Average rating (1-5 Likert Scale)		**4.387**				

3. I would recommend this program to others.

YES 100%
NO 0%

4. Overall, after completing this workshop, do you think your knowledge gained of pest management and safe production practices has increased:

a geat deal	a moderate amount	a little	not at all
4	3	2	1
50	46.66667	3.333333	0
Average knowledge gain (1-4 Likert scale)		**3.467**	

Listed below are the topics presented during this workshop. On the left, circle your knowledge of each topic BEFORE the workshop. On the right, circle your knowledge of each topic AFTER the workshop.

How confident you are in using these practices or researching information after the workshop:

5.	Question:	Non-existent	Minimal	moderate	considerable
		1	**2**	**3**	**4**
1	Winter crop storage production and economics	0	3.571429	78.57143	17.85714
2	IPM in a high tunnel	0	15.38462	65.38462	19.23077
3	Starting plants for winter production	0	4	80	16

Knowledge gain

	Question:	Pre Evaluation score	Post Evaluation score	Knowledge gain (1-4 Likert Scale)
1	Winter crop storage production and economics	2.166667	3.142857	0.97619
2	IPM in a high tunnel	1.964286	3.038462	1.074176
3	Starting plants for winter production	2.5	3.12	0.62
	Average knowledge gain			**0.890**

6. **Please comment on the presenter's skills so that we can improve.**
Did presenters encourage questions? Keep me focused and interested? Did the presenters use clear examples? Were they well-prepared?

- Unfortunately, I could not understand 1 pm professor due to language and style of speech.
- Nothing but good things. Please fix P.A.
- Good food.
- Excellent presenters!
- This is our favorite conf - would rather the Nov date - makes it hard with the St. Joe and MOA also in this time frame. The presenters were good. Enjoyed every one good mix of styles, growers et. If Jaime Pinero is presenting we always try to make his talks also try to always make Curtis's talks too.
- All were very knowledgeable. Yes. Yes. Yes.
- Relevant! Valuable to learn from small scale farmers. (Both days!) Excellent quality.
- All were very interesting.
- I thought this session would be on seed starting. [starting plants for winter production.] It seemed like a "review" with a bit more info - from a previous session.
- Great presenters! Really learned from Curtis Millsap! (Would like to hear more.) Enjoyed the variety - both large and small, mechanica/ non mechanical, organic, non-organic, farmers and extension expertise.
- Question: Yes. Focused/ interest: Yes. Examples: some more than others; but generally 'Yes'. Preparedness: the majority - yes.
- All presenters did a great job.
- 1. Yes. 2. Yes. 3. Yes.
- Very good!
- Presenters totally encouraged questions. They did a wonderful job keeping on topic and people engaged. Excellent job. Great visuals!
- Presenters were very good. It's always helpful to have actual farmers present along with specialists.
- Very good presenters. Like actual peer presenters and panels.
- All of the presenters did very well. If they keep doing what they have done this far, the presentations in years to come will be excellent.
- Very good but not enough organic. Next year vermicomposting. Bio char. Essential oils.
- Yes.
- Yes.
- Adam is very well prepared and organized with his presentations. Comes across clearly and his added experience lends much to his presentation. Packed with

info. Dr. Pinero presentation was quite thorough - loved the visuals. Patrick did a good job presenting his program and ideas. Loved Shon presentation about the new 2016 Midwest Veg Prod.

7. What will you do differently as a result of this program?

	Did Before Workshop	*Plan to Do in Next 6 Months*	*No Plans to Use this in My Operation*	*Does Not Apply in My Operation*

8. What else did you learn that you plan to use this year?

- 1 pm talk about predators was wonderful! Grow times, lists, and all very informative. Storage?
- 1. Great resources from the different presenter and the 2016 Midwest Ved Prod Book. 2. The extensive record keeping methods for crop production to cost per item, etc. 3. Crop planting methods -- season to season.
- Pest management and garlic production.
- More on covers -- various types and info re:
- More trap plants.
- Banker plants for natural enemy conservation in plastic structures. Adding sulphur for garlic production.
- Much better knowledge of winter storage crops.
- 1 pm. Structure of high tunnel. Crops that can extend season.
- Winter storage. Check the ranges that certain vegetables need regarding cooling/humidity.
- I plan to improve the quality of my soil in the future. I plan to grow and plant more in the fall and winter months and spend more time considering large scale farming.
- Planting guide for winter production, pest control management with natural methods (IPM)
- "trap crops" Panel questions and answers/ success and failures
- Catch cropping for pests. Not sure it is for winter as much as summer. Planning dates for in the tunnel/ per zones.
- Plan for winter storage crops. Plant trap crop for pest.
- 1. Possibilities of crop storage during winter. 2. IPM managements.
- Indicator plants/ Banker plants. Improvements used. Usefulness of coolers and/or root cellars.

- Using a trap plant with systemic insecticide outside high tunnel to control squash bugs and cucumber beetles on the inside. Storage techniques for winter gardens.
- Trap cropping and banker plants and indicator plants.
- The idea that you must bring plants to maturity prior to shortened sunlight hours. Orientation of tunnels is to wind/ not light.
- Networking with other growers. Not till beds. More long term planning.
- 1. Add storage crops to my crop plan. 2. Take another look at using my Earthway. Tape every other hole ont eh lettuce to radish plate. 3. Check out the grounds Keeper Rake II.
- To use other plants to keep bugs off the plants you want a crop from. Better weed control.
- Website farm hack. -increasing root crop storage. -changes in our IPM. -looking at adding value added (dehydrating). -adding mechanical cultivation
- Storage of beets in wood shaving (like beets) Under cutter -- tool to lift vegetable
- The raspberries were excellent. Great high tunnel objectives to be successful and IPM, very informative for both inorganic and organic producers.

9. What suggestions do you have for making this program more effective?

10. What topics would be of interest to you in future workshops?

When is the best time to hold the conference?

Winter (Dec-Feb	Spring (Mar-May)	Summer (Jun-Aug)	Fall (Sept-Nov)
23	2	1	6

How frequently would you be interested in attending a winter veg production conference?

Every Year	Every Two Years
23	12

WebApps impact reporting

1. **Customer Quotes - What else did you learn that you plan to use this year?**

- 1 pm talk about predators was wonderful! Grow times, lists, and all very informative. Storage?
- 1. Great resources from the different presenter and the 2016 Midwest Ved Prod Book. 2. The extensive record keeping methods for crop production to cost per item, etc. 3. Crop planting methods -- season to season.
- Pest management and garlic production.
- More on covers -- various types and info re:
- More trap plants.
- Banker plants for natural enemy conservation in plastic structures. Adding sulphur for garlic production.
- Much better knowledge of winter storage crops.
- 1 pm. Structure of high tunnel. Crops that can extend season.
- Winter storage. Check the ranges that certain vegetables need regarding cooling/humidity.
- I plan to improve the quality of my soil in the future. I plan to grow and plant more in the fall and winter months and spend more time considering large scale farming.

- Planting guide for winter production, pest control management with natural methods (IPM)
- "trap crops" Panel questions and answers/ success and failures
- Catch cropping for pests. Not sure it is for winter as much as summer. Planning dates for in the tunnel/ per zones.
- Plan for winter storage crops. Plant trap crop for pest.
- 1. Possibilities of crop storage during winter. 2. IPM managements.
- Indicator plants/ Banker plants. Improvements used. Usefulness of coolers and/or root cellars.
- Using a trap plant with systemic insecticide outside high tunnel to control squash bugs and cucumber beetles on the inside. Storage techniques for winter gardens.
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- Storage of beets in wood shaving (like beets) Under cutter -- tool to lift vegetable
- The raspberries were excellent. Great high tunnel objectives to be successful and IPM, very informative for both inorganic and organic producers.

2. **Learning (Short Term) Outcomes knowledge, skills or attitude change**

When asked to consider the program as a whole, the attendees who responded to the survey (n=31) reported an average knowledge gain of **3.467** on a 1-4 Likert scale, with 4=great deal of knowledge gain. Attendees were surveyed on knowledge of workshop topics before and after the program, and average knowledge gain on a 1-4 Likert scale, with 4=considerable knowledge gain, was the following: Winter crop storage production and economics, 0.976; IPM in a high tunnel, 1.074; and Starting plants for winter production, 0.620. The overall knowledge gain was **0.890**. Following the program, attendees reported confidence in understanding these topics at a considerable level, 18%, moderate level, 75%, or minimal level, 7%.

3. **Customer satisfaction exit survey or comments about the learning experience**

The attendees who responded to the survey rated the overall program as **4.677** on a 1 to 5 Likert scale, with 5=excellent. Attendees reported that expectations were met in the program at a level of **4.387** on a 1 to 5 Likert scale, with 5=excellent. **100%** of attendees reported that they would recommend the program to others.

Please comment on the presenter's skills so that we can improve.

Did presenters encourage questions? Keep me focused and interested? Did the presenters use clear examples? Were they well-prepared?

- Unfortunately, I could not understand 1 pm professor due to language and style of speech.
- Nothing but good things. Please fix P.A.
- Good food.
- Excellent presenters!
- This is our favorite conf - would rather the Nov date - makes it hard with the St. Joe and MOA also in this time frame. The presenters were good. Enjoyed every one good mix of styles, growers et. If Jaime Pinero is presenting we always try to make his talks also try to always make Curtis's talks too.
- All were very knowledgeable. Yes. Yes. Yes.
- Relevant! Valuable to learn from small scale farmers. (Both days!) Excellent quality.
- All were very interesting.
- I thought this session would be on seed starting. [starting plants for winter production.] It seemed like a "review" with a bit more info - from a previous session.
- Great presenters! Really learned from Curtis Millsap! (Would like to hear more.) Enjoyed the variety - both large and small, mechanica/ non mechanical, organic, non-organic, farmers and extension expertise.
- Question: Yes. Focused/ interest: Yes. Examples: some more than others; but generally 'Yes'. Preparedness: the majority - yes.
- All presenters did a great job.
- 1. Yes. 2. Yes. 3. Yes.
- Very good!
- Presenters totally encouraged questions. They did a wonderful job keeping on topic and people engaged. Excellent job. Great visuals!
- Presenters were very good. It's always helpful to have actual farmers present along with specialists.
- Very good presenters. Like actual peer presenters and panels.
- All of the presenters did very well. If they keep doing what they have done this far, the presentations in years to come will be excellent.
- Very good but not enough organic. Next year vermicomposting. Bio char. Essential oils.
- Yes.
- Yes.
- Adam is very well prepared and organized with his presentations. Comes across clearly and his added experience lends much to his presentation. Packed with info. Dr. Pinero presentation was quite thorough - loved the visuals. Patrick did a good job presenting his program and ideas. Loved Shon presentation about the new 2016 Midwest Veg Prod.

Evaluation: Winter Production Conference – Webb City, MO – February 13, 2017

The information you provide will not be used to identify any program participants. You may refuse to answer any questions. Your answers to the following questions will help University of Missouri Extension make sure that we are presenting valuable programs to a wide range of participants and will aid in future planning and training improvements. We appreciate your time and input. Please circle or mark appropriate answer.

		Poor	Fair	Average	Good	Excellent
		1	2	3	4	5
1.	How would you rate the overall program?	0	1.960784	3.921569	43.13725	50.98039
Average rating (1-5 Likert Scale)		**4.431**				

		Poor	Fair	Average	Good	Excellent
		1	2	3	4	5
2.	How well were your expectations met in this program?	0	0	5.882353	41.17647	52.94118
Average rating (1-5 Likert Scale)		**4.471**				

3. I would recommend this program to others.

YES 100%
NO 0%

4. Overall, after completing this workshop, do you think your knowledge gained of pest management and safe production practices has increased:

a geat deal	a moderate amount	a little	not at all
4	3	2	1
43.39623	47.16981	7.54717	1.886792
Average knowledge gain (1-4 Likert scale)		**3.321**	

Listed below are the topics presented during this workshop. On the left, circle your knowledge of each topic BEFORE the workshop. On the right, circle your knowledge of each topic AFTER the workshop.

How confident you are in using these practices or researching information after the workshop:

5.	Question:	Non-existent	Minimal	moderate	considerable
		1	**2**	**3**	**4**
1	Using low tunnels	0	7.692308	61.53846	30.76923
2	Using high tunnels	0	1.960784	43.13725	54.90196
3	Economics of winter production	0	3.846154	53.84615	42.30769
4	Planting dates for winter vegetables	2	16	60	22
5	Types of vegetables for winter production	0	3.921569	43.13725	52.94118

Knowledge gain

	Question:	Pre Evaluation score	Post Evaluation score	Knowledge gain (1-4 Likert Scale)
1	Using low tunnels	2.634615	3.230769	0.596154
2	Using high tunnels	2.865385	3.529412	0.664027
3	Economics of winter production	2.192308	3.384615	1.192308
4	Planting dates for winter vegetables	2.490566	3.02	0.529434
5	Types of vegetables for winter production	2.830189	3.490196	0.660007
	Average knowledge gain			**0.728**

6. Please comment on the presenter's skills so that we can improve.
Did presenters encourage questions? Keep me focused and interested? Did the presenters use clear examples? Were they well-prepared?

- Yes, all of them.
- Did well
- Great
- Yes to all
- Questions were well answered and elaborated on. Yes, they had well-organized presentations that kept my interest. Yes, good examples and supporting visuals. Yes :)
- Excellent presentations, very knowledgeable. Appreciate the wealth of experiential knowledge and passion for sharing that.
- Excellent info but presented very quickly--high level of info not really accessible for someone at a beginning winter growing level of knowledge
- Great presentation!
- Great!
- Good pace, sometimes too fast on screens, although they say they will supply material to us later for our review.
- Yes.
- Yes yes yes yes. Excellent
- I feel the presenters did a great job.
- All good.
- Great presentors--well prepared with real world examples
- By not allowing questions during the presentation, the thought was lost by the end of the presentation. Kept me focused on the very well prepared material, but disappointed that the missed question opportunities, could not be addressed after the presentation.
- Michael: more energy--practical information, interesting--more "word color". Paul: Sort of monotone, low energy, hard to keep interest. Sandy: interesting, good energy. Michael's information more useful overall.
- Yes X4
- The presenters did a very good job of explaining, giving examples, well prepared.
- Great presenters
- Everyone presenting was very informative and very well heard
- I would've liked to have more answering questions as they moved through the info.

- Yes
- All very good.
- The only critique I have is the volume of information was so large it did not feel like they had enough time to be detailed.
- Yes.
- Yes.
- Very informative and clearly presented.
- All did a good job. Some of the info was beyond my scope of experience/reference. Overall the program was valuable to me.
- Excellent
- Paul and Sandy Arnold--very good. Michael Kilpatrick--fair.
- Presenters were very kowledgable. Would benefit from specifics instead overviews.
- Presenters spoke with enthusiasm and knowledge. I had a good experience, learned a lot and will utilize the tips given by these knowledgeable speakers.
- Speakers were very knowledgeable and experienced. The information presented added to my knowledge. Yes!
- Absolutely!
- Excellent presentations all around.
- Well-prepared, variety of topics, engaging slides!
- The presenters did not use clear examples. Needed to give more information on some items by having more handouts or printed on paper.
- Very well done.
- Paul and Sandy are great presenters. Michael is also very good and very data oriented, which for an advanced grower is super informative/helpful.
- I came specific because I knew the speakers and wanted to see them. I have enjoyed all of the winter farming conferences. Please continue!
- Enjoyed all.

7. What will you do differently as a result of this program?

	Did Before Workshop	*Plan to Do in Next 6 Months*	*No Plans to Use this in My Operation*	*Does Not Apply in My Operation*
Start winter vegetable production	26.66667	57.77778	4.444444	11.11111
Use high tunnels in my vegetable production	44.68085	44.68085	2.12766	8.510638
Change my mix of winter vegetables	6.976744	74.4186	6.976744	11.62791

8. What else did you learn that you plan to use this year?

- Soil prep requirements. Pros/cons on tunnel types. Economic impact of tunnel choice. Labor impact of tunnel choice.
- Recommendations on packing shed construction. Row covers directly on my crops in tunnel. Soil testing and balancing soils.
- A lot of small tips gained and previous knowledge reinforced.
- plant covers. Less animal fert.

- better weed control. Disease prevention. Better ventilation. Better use of row cover.
- Possibly use a cooler. Row covers. Ground cover. Keep vents open.
- Planting dates, varieties, heating
- Possibly root cellaring. Also how to store winter crops.
- Fertilizers; organic vs. animal
- To do more
- Cover my crop inside my tunnel
- Under soil heating
- Climate battery
- Chopped straw in paths between beds.
- Calculate cost vs sales vs spaces
- Biotello
- Storage practices.
- Mustard cover crop
- We are really short on capital but we are going to implement as much as we can do as we can afford it.
- Irrigation in high tunnel.
- Direct planting. Soil warming.
- Radiant heat. Compost heat
- Economic evaluations.
- Crop spacing and better use of row covers
- Flaming
- Row cover knowledge. Modifications to high tunnel. Tools.
- Maximizing are instead of expanding plot size.
- Possibly build a small greenhouse or at least start using hoophouses/low tunnels. Will also test soil for fertilization.
- Get S23 soil tests. Install woven weed barrier on the edges of my gardens. Apply oxidate and actinovate to tunnels betwee seasons to control sclerotinia (?). Implement th euse of insect netting over susceptible crops.
- High tunnel planning and construction
- Row covers
- More winter gardening

9. What suggestions do you have for making this program more effective?

- Not sure
- Have it on a weekend and not on Valentine's Day :)
- have it before winter
- paper handouts of slides
- Handouts of all the slides shown.
- Thank you!
- Maybe a notebook for us to record things we want to refer back to.
- None
- None they did very well
- More pics
- Seasonal tours, Hands on high tunnel workshop
- Allowed questions during each presentation to further understanding of material presented.
- don't know-- perhaps more on crops other than lettuce and salad crops

- Nothing to improve
- None very well presented
- not sure
- Not direct to all organic gardening. All in all most applications can be used for either.
- Slightly more time for questions.
- NA
- None
- Classroom seating instead of round tables.
- Advanced morning session was basic information had been given in past.
- Would like to have a full year calendar that would maximize high tunnel and outside fields.
- More questions and answers. None.
- Really benefited from "Lunch with an expert". This really facilitated growers sharing knowledge and ideas. Keep doing the conference; keep it in this area. It was well attended.
- Greater understanding of personal interest of participants
- Printed handout of speaker suggested resources. ie books, articles, videos, websites, companies, people, not calling different plants 'asian greens' : be specific about cultivar names. Ie you don't say American cabbage/ American greens

10. What topics would be of interest to you in future workshops?

- Farmers markets: how to, avg cost, exp. Income, produce amts, etc.
- Farm infrastructures planning and construction. Farm planning in general. Thanks :)
- I would appreciate information for beginning/potential farmers on accessing land and resources and funds.
- record keeps. Storage
- Berries. Please keep it going!
- Aqua culture
- Solar heating
- More tomato production and heating
- Tomato and Curcubit grafting
- Don't know--
- mushroom cultivation
- Not organic layouts and gardening
- Pest control
- Possibly smaller scale. As an individual producer, I will never expand to the scale of most of the producers.
- Melons in high tunnels. Spring/summer high tunnel production. Marketing your productions other than markets. Collaborations for growers.
- Varieties for our area. What variety to plant when. 1st planting, 2nd planting, etc.
- More on vegetable timing, tips and tricks for disease and pest maintenance.
- How to use/incorporate cover crops in small systems. Tomato pruning. I would like Extension to purchase a drone that could be rented out to farmers to assist in making crop maps and other useful things.
- More brand names
- Educating public/consumer about 'uncommon produce'. Permaculture principles. Bio-regional principles of gardening--Dan Barber. Soil Health, Soil Microbiome,

Mycorhizzia. Perennial edibles. Benefits of Native perennial planting for yield and pollination. Emphasis on Diversity. Benefits of Refuge area around plots and farm edges.

WebApps impact reporting

1. **Customer Quotes - What else did you learn that you plan to use this year?**

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- Recommendations on packing shed construction. Row covers directly on my crops in tunnel. Soil testing and balancing soils.
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- Row covers
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2. **Learning (Short Term) Outcomes knowledge, skills or attitude change**

When asked to consider the program as a whole, the attendees who responded to the survey (n=53) reported an average knowledge gain of **3.321** on a 1-4 Likert scale, with 4=great deal of knowledge gain. Attendees were surveyed on knowledge of workshop topics before and after the program, and average knowledge gain on a 1-4 Likert scale, with 4=considerable knowledge gain, was the following: Using low tunnels, 0.596; Using high tunnels, 0.664; Economics of winter production, 1.192; Planting dates for winter vegetables, 0.529; and Types of vegetables for winter production, 0.660. **The overall knowledge gain was 0.863; average knowledge level improved from 2.60 to 3.33 on a 1-4 Likert Scale**. Following the program, attendees reported confidence in understanding these topics at a considerable level, 41%, and a moderate level, 52%. The attendees who responded to the survey were asked to describe behavior change as a result of the program. The following actions were planned within the next 6 months: Start winter vegetable production, 58%; Use high tunnels in my vegetable production, 45%; and Change my mix of winter vegetables, 74%.

3. **Customer satisfaction exit survey or comments about the learning experience**

The attendees who responded to the survey rated the overall program as **4.431** on a 1 to 5 Likert scale, with 5=excellent. Attendees reported that expectations were met in the program at a level of **4.471** on a 1 to 5 Likert scale, with 5=excellent. **100%** of attendees reported that they would recommend the program to others.

Please comment on the presenter's skills so that we can improve.

Did presenters encourage questions? Keep me focused and interested? Did the presenters use clear examples? Were they well-prepared?

- Yes, all of them.
- Did well
- Great
- Yes to all
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- Excellent info but presented very quickly--high level of info not really accessible for someone at a beginning winter growing level of knowledge
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Project 2: Descriptive Sensory Analysis and Chemistry of Elderberry Juice

The Curators of the University of Missouri
Dr. Michele Warmund
Final Performance Report

Project Summary

Flavor attributes of North American-grown elderberries have not been described. Thus, the objectives of this project were to quantify juice characteristics and identify and compare the flavor attributes of juice from elderberry cultivars ('Bob Gordon', 'Marge', 'Ocoee', 'Ozark', 'Wyldewood', and 'York') using descriptive analysis, as well as identify atypical off-flavors. 'Bob Gordon' and 'York' juices were browner in color than juices from other cultivars. 'Wyldewood 'and 'York' juice had the lowest soluble solids and titratable acidity. Highly trained panelist identified 24 attributes to describe sensory characteristics of elderberry cultivars. Unique descriptors for juices from North American-grown cultivars included apple, beet, caramelized, fermented, processed, and pomegranate flavors, and astringent mouth-feel. Additionally, elderberry juices produced in North America were most highly characterized by processed aroma and processed and elderberry flavors, but varied in nine sensory attributes (fruity, floral, sweet aromatics, bitter, sour, and sweet flavors, bitter and sweet aftertastes, and astringent mouth-feel). Surprisingly, juice from 'Marge', which is a European elderberry, was indistinguishable from that of 'Bob Gordon' and 'Wyldewood' (American elderberries) for all sensory attributes except bitter flavor. Relative to other cultivars in this study, 'York' may be favored by juice processors due to its relatively low astringency and bitter aftertaste.

Project Approach

Plants were pruned, fertilized, and cultivated in a replicated research plot at the University of Missouri Southwest Research Center, Mount Vernon, MO for fruit harvest in August 2015. Harvested fruit from six elderberry cultivars, including 'Marge', 'York', 'Ozark', 'Bob Gordon', 'Wyldewood', and 'Ocoee', was immediately frozen after harvest and transported to the fruit laboratory at University of Missouri.

For color measurements, a 200 g berry sample of each cultivar from all harvest dates was thawed, and pressed in a sieve for juice extraction after de-stemming fruit in October 2015. A 10 ml juice sample was then placed in a cuvette in a cell holder attached to a hand-held spectrophotometer with a 6 mm diameter aperture. For each measurement, CIE illuminant D65 with a 10° observer setting was used with specular light excluded. Two readings of juice color values (L*, chroma, and hue angle) for each sample were averaged.

For fruit compositional analyses, 50 g fruit was placed in a Waring blender cup with 50 ml double distilled water and processed for 30 seconds. The puree was then strained in a sieve to remove the seeds. A 0.3 ml aliquot of puree was used for soluble solids measurements with a digital refractometer and 10 ml were used to determine pH. Puree (10 g) was then diluted with 40 ml double distilled water and titrated to 8.2 pH with 0.1 N sodium hydroxide to determine titratable acidity (expressed as citric acid). Three replications of each sample were evaluated for each cultivar for all measurements.

Juice was also prepared for sensory analysis in October 2015. For each sample, 800 g fruit was placed in1600 ml water and was preheated to 90°C. After 5 min, the mixture was pressed through a sieve for

juice extraction. After juice was cooled to 21°C, sucrose was added to each sample to attain 10° Brix. Samples were stored at -20°C for later evaluation by a trained sensory panel.

In January 2016, a highly trained sensory panel was convened by Elmore Consulting to generate descriptive terms during four, 2-hour sessions (Table 1). After this was completed, panelists evaluated juice samples from each cultivar in triplicate over six sessions. A randomized complete block design was used to determine the serving order of the samples for the panelists. Each of the flavor attributes was evaluated using a 0 to 150 point intensity scale with references provided for some scale points. Six samples were presented to the panelists during each session to evaluate each flavor attribute for every cultivar. Distilled, deionized water and unsalted crackers were used as palate cleansers. Sensory data was submitted to Michele Warmund for statistical analyses. Analysis of variance was conducted for each sensory attribute with cultivar, replicate, and panelist, as well as all 2-way interactions of these factors using PROC GLMMIX. Panelists and replicates were treated as random effects. HSD tests were performed post-hoc for those attribute means found significantly different across the samples by ANOVA ($P \leq 0.05$). Data from chemical and sensory attributes that significantly discriminated among the samples were used in a principal components analysis (PCA). PCA was performed on the correlation matrix using JMP (version 9.3, Cary, NC). Following PCA, attributes with vectors in close proximity on the first two components were further analyzed using multiple regression.

Results from this study demonstrated that undiluted juice samples had similar L* values when evaluated for color (Table 2). However, chroma values were significantly higher for 'York' and 'Bob Gordon' juices than 'Ocoee', 'Ozark', and 'Wyldewood' samples. 'Bob Gordon' and 'York' juices had the lowest hue angle values and were visually browner than samples of other cultivars with a strong correlation found between hue angle and chroma values ($R^2 = 0.89$, $P = 0.005$). 'Wyldewood' and 'York' juices had the lowest soluble solids and titratable acidity (Table 2). Juice from 'Wyldewood' had a higher pH than that of other samples, except for 'York'.

Twenty-four sensory attributes were used to qualify and quantify the juice from the elderberry cultivars in this study, including six aroma descriptors (fruity, elderberry, sweet, processed, fermented, and green/viney), 14 flavor attributes (apple, beet, caramelized, elderberry, fruity, fermented, processed, floral, pomegranate, sweet aromatics, green, bitter, sour, and sweet), three aftertaste descriptors (bitter, sour, and sweet), and one mouth-feel attribute (astringent) (Tables 1 and 3). Elderberry juices were characterized by a processed aroma (61.9 to 67.8 mean intensity ratings), and several flavors, including processed (67.7 to 72.8 ratings), elderberry (55.0 to 62.5 ratings), fruity (38.6 to 46.4 ratings), and sweet (37.8 to 52.5 ratings). Lower impressions of fruity aroma, elderberry aroma, floral flavor, sweet aromatics, and sweet aftertaste (22.5 to 34.8 ratings) were also perceived in the juices. Lower, but detectable levels of the remaining attributes were also perceived (≤ 22.9 ratings). These results demonstrate an array of sensory attributes for juices from commonly-grown elderberry cultivars in North America.

Our study confirms that several of the attributes used for juice from *S. nigra* subsp. *nigra* cultivars grown in Europe are similar to those identified for juice from elderberries cultivated in North America, including 'Marge'. However, we identified additional elderberry juice descriptors, including apple, beet, caramelized, fermented, processed, and pomegranate flavors, bitter, sour, and sweet aftertastes, and astringent mouth-feel. The development of a formal lexicon for American elderberry with definitions for each attribute in the present study is an additional contribution to elderberry sensory research.

Results from this study also indicated that intensity ratings for each aroma attribute were similar among juice samples from all cultivars (Table 3). However, nine of the 24 sensory descriptors of elderberry juice flavors and mouth-feel varied significantly among cultivars. 'York' juice had relatively high intensity ratings for fruity, floral, sweet aromatics, and sweet flavors as compared with juice from other cultivars. Also, juice from 'York' generally rated lower for bitter aftertaste and higher for sweet aftertaste than juices from other cultivars. 'Ocoee' juice was the most dissimilar from 'York' samples, differing in nine sensory characteristics. Relative to 'York', juice from 'Ocoee' was significantly less flavorful (fruity, floral, sweet aromatics, sweet, and sweet aftertaste attributes) and more bitter, and sour in taste, bitter in aftertaste, and astringent in mouth-feel. Although sucrose was added to adjust juices to a similar soluble solids content, panelists perceived 'York' juice to have a sweeter initial flavor and aftertaste than juices from other cultivars. The reason for these perceptions is unclear, but may be related to the low titratable acidity and low intensity of bitter aftertaste of 'York' juice. Average intensity ratings for 'Ozark' juice were significantly more bitter (taste and aftertaste), sour, and astringent than those ratings for 'York' juice. Sensory attribute ratings were not significantly different among juices from 'Bob Gordon', 'Marge' and 'Wyldewood', except for the more bitter flavor of 'Marge' samples.

Results from the PCA showed that the first two principal components (C1 and C2) accounted for 79.7% of the variation (Figure 1). Component 1 explained 60.6% of the variability and was positively related to bitter and sour flavors, bitter aftertaste, and astringent mouth-feel, as well as hue angle. This component was strongly and negatively related to sweet flavor, sweet aromatics flavor, sweet aftertaste, and chroma. Component 2 explained 19.1% of the variability and was more heavily influenced by juice characteristics (pH, titratable acidity, and soluble solids). Fruity and floral flavors had relatively minor influences on Components 1 and 2. 'York' juice was separated from those of all other cultivars on C1, having the highest values for most of the taste attributes related to sweetness and among the lowest for attributes related to bitterness and sour flavors and astringency. 'York' also had the highest chroma value with 'Ozark' and 'Wyldewood' among the lowest, further defining the separation of the juice from these cultivars on C1. Juice from 'Marge', the only European elderberry cultivar included in this study, did not separate from juices of other cultivars studied on C1. However, 'Marge' juice was distinguished on C2, which was defined predominantly by pH, soluble solids, and titratable acidity. When means of several of the important attributes for C1 were analyzed individually with chroma by linear regression, a strong negative correlation was found for bitter aftertaste (R^2 = 0.73, P = 0.03), sour taste (R^2 = 0.83, P = 0.012), and astringency (R^2 = 0.78, P = 0.014). However, hue angle was strongly correlated with sour taste (R^2 = 0.82, P = 0.013).

A presentation entitled, "Descriptive Analysis of Juice from Six Elderberry Cultivars", was delivered to 150 extension specialists and researchers at the American Society for Horticultural Sciences annual meeting in Atlanta, Georgia on August 8, 2016. A presentation was delivered at the River Hills Elderberry Workshop/Tour to 130 elderberry producers held on June 17, 2016 at the University of Missouri Horticulture and Agroforestry Research Station at New Franklin, Missouri. An article, "Elderberry Juice Aromas and Flavors", was submitted on October 20, 2016 for publication in the December 2016 issue of River Hills Harvest Newsletter with 950 subscribers at: http://riverhillsharvest.com/education---support.html.

Goals and Outcomes Achieved

Before this study was conducted, little was known about the sensory characteristics of American elderberry juice. Thus, this project generated new knowledge regarding aroma, flavor and mouth-feel attributes of juice from six elderberry cultivars commonly-grown in the United States using descriptive

sensory analysis, and compared juice color and composition. Most importantly, we found that 'Ocoee' juice was generally less flavorful than that from other cultivars. Thus, it will be eliminated from recommendations for future plantings to limit poor quality fruit in the marketplace. Because 'York' juice rated highly for fruity, floral, and sweet flavors and lower for astringency and bitter aftertaste as compared with others, this cultivar will be promoted for new plantings. This study also provided key elements for future elderberry sensory research in the development of a formal lexicon for juice with defined attributes.

Research results from this study were presented to 150 extension specialists and researchers at the American Society for Horticultural Sciences annual meeting in Atlanta, Georgia on August 8, 2016. A similar presentation was delivered at the River Hills Elderberry Workshop/Tour to 130 elderberry producers held on June 17, 2016 at the University of Missouri Horticulture and Agroforestry Research Station at New Franklin, Missouri. An article, "Elderberry Juice Aromas and Flavors", was submitted on October 20, 2016 for publication in the December 2016 issue of River Hills Harvest Newsletter with 950 subscribers at: http://riverhillsharvest.com/education---support.html. In addition to these outreach activities, a journal article, "Sensory Attributes of Juice from North American-Grown Elderberry Cultivars" was submitted and accepted by HortScience to communicate the results of this study to a broader audience. This article will be posted at: http://hortsci.ashspublications.org/content/by/year.

Beneficiaries

The specialty crop groups and other stakeholders that benefit immediately from this study are members of the River Hills Elderberry Producers (100) and the Midwest Elderberry Association (50). Additionally, the 950 producers in the U.S. that subscribe to the elderberry newsletter will be beneficiaries of this work. Following publication in HortScience, results of this study will available at: http://hortsci.ashspublications.org/content/by/year. As a result of this study, Extension specialists will no longer recommend planting 'Ocoee' elderberry for fruit production, but will promote 'York' for new plantings. Processors can use the information from this study to produce different styles of uniquely-flavored, higher quality juice-based products. Also, processors will be able to reduce the amount of additives and spices used to mask bitter and/or astringent flavors of some elderberry juices when 'Ocoee' fruit is eliminated from the marketplace.

Lessons Learned

All goals of this project were achieved. A lesson learned during this study was to de-stem all fruit from the cymes before freezing to reduce the occurrence of plant debris in the juice.

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Additional Information

Refer to Tables 1-3 and Figure 1.

Table 1. Descriptive terms, definitions and references used in the sensory analysis of juices from six North American-grown elderberry juices.

Attribute and definition	References and anchors[z]
Aroma	
Fruity: a general term used to describe the sweet, floral, fruity aromatics associated with a blend of fruits.	Black elderberry syrup (Gaia Herbs, Brevard, NC), 350 g· L^{-1} solution = 25
Elderberry: aromatics associated with elderberry fruit.	Elderberry extract (Dynamic Health Laboratories, Brooklyn, NY), 50% solution = 25
Sweet: aromatic associated with sweet material.	Clover honey (Great Value, Wal-Mart, Bentonville, AR) = 35
Processed: aromatic associated with processed, canned fruits, or vegetables.	Peach juice (Minute Maid, Sugar Land TX) = 75
Fermented: aromatics associated with fermented fruits or vegetables.	Dried figs (David Lewis orchards, Garden Grove, GA) = 35
Green/viney: aromatics associated with green vegetables and newly cut vines and stems.	Stems of *Forsythia xintermedia* Zab. = 30
Flavor	
Apple: a sweet, light, fruity, somewhat floral aromatic commonly associated with processed apple juice and cooked apples.	Apple juice (Great Value, Wal-Mart, Bentonville, AR) = 70
Beet: the slightly sweet flavor commonly associated with canned/cooked beets.	Canned beets (Kroger, Cincinnati, OH) = 70
Caramelized: cooked flavor that may include the character notes identified as caramelized and associated with dates or other cooked fruit.	Elderberry jelly (Dutch Kettle, Hamptonville, NC) = 20
Elderberry: flavor associated with elderberry fruits.	Elderberry extract (Dynamic Health Laboratories, Brooklyn, NY), 50% solution = 85
Fruity: a general term used to describe the sweet, floral, fruity flavor associated with a blend of fruits.	Dates (Sunsweet, Yuba City, CA) = 45
Fermented: flavor associated with fermented fruits or vegetables.	Dried figs (David Lewis Orchards, Garden Grove, GA) = 35

Processed: flavor associated with processed, canned fruits or vegetables.	Peach juice (Minute Maid, Sugar Land TX) = 75
Floral: sweet, light, slightly perfumery impression associated with flowers.	Clover honey (Great Value, Wal-Mart, Bentonville, AR) = 50
Pomegranate: flavor associated with pomegranate fruit.	Pomegranate arils (DJ Forry, Reedley, CA) = 35
Sweet aromatics: flavor associated with sweet material.	Clover honey (Great Value, Wal-Mart, Bentonville, AR) = 35
Green: flavor associated with the green material.	Homogenized, filtered parsley (25 g fresh parsley and 300 mL water) = 40
Bitter: the amount of bitter taste left on palate after expectoration.	Caffeine (Sigma-Aldrich, St. Louis, MO), 0.8 g· L^{-1} solution = 20
Sour: the basic taste associated with citric acid.	Citric acid (Sigma-Aldrich, St. Louis, MO), 0.5 g· L^{-1} solution = 20
Sweet: the basic taste associated with a sucrose solution.	Sucrose (Kroger, Cincinnati, OH), 50 g· L^{-1} sucrose solution = 50
Bitter aftertaste: the amount of bitter taste left on the palate after expectoration.	Caffeine (Sigma-Aldrich, St. Louis, MO), 0.8 g· L^{-1} solution = 20
Sour aftertaste: the amount of sour taste left on the palate after expectoration.	Citric acid (Sigma-Aldrich, St. Louis, MO), 0.5 g· L^{-1} solution = 20
Sweet aftertaste: the amount of sweet taste left on the palate after expectoration.	Sucrose (Kroger, Cincinnati, OH), 50 g· L^{-1} sucrose solution = 50
Mouth-feel	
Astringent: the puckering or drying sensation on the mouth or tongue surface.	Alum (McCormick & Co., Hunt Valley, MD), 20 g· L^{-1} alum solution = 20

Table 2. Mean juice color (L*, chroma, hue angle) and fruit composition of six North American-grown elderberry cultivars.[z]

Cultivar	L*	Chroma	Hue angle	Soluble solids (° Brix)	pH	Titratable acidity (g·100 mL^{-1} as citric acid)
Bob Gordon	27.46	1.03 b	27.80 b	12.4 a	4.72 bc	0.28 a
Marge	27.26	1.00 bc	32.93 a	12.4 a	4.51 d	0.32 a
Ocoee	27.35	0.97 cd	32.69 a	12.1 a	4.70 c	0.30 a
Ozark	27.33	0.93 d	35.35 a	12.3 a	4.59 cd	0.31 a
Wyldewood	27.28	0.94 d	33.44 a	10.4 b	4.99 a	0.21 b
York	27.45	1.08 a	26.22 b	9.9 b	4.87 ab	0.25 b

[z]Values represent the mean of three replications. Means with different letters in a column are statistically significant at $P \leq 0.05$ by Tukey's honestly significant difference (HSD) test. L* scale ranges from 0= black to 100 =white. Chroma is the departure from white toward pure hue color and represents brightness. Hue angle quantifies color where 0° = red, 90° = yellow, 180° = green, and 270° = blue.

Table 3. Mean sensory attribute intensity ratings of juice from six North American-grown elderberry cultivars.[z]

Descriptor	Bob Gordon	Marge	Ocoee	Ozark	Wyldewood	York	*P* value
Aroma							
Fruity	27.5	26.1	24.6	28.8	29.7	27.1	0.0870
Elderberry	24.9	24.5	23.6	25.8	26.7	25.8	0.2618
Sweet	19.6	22.9	20.6	21.6	20.3	21.2	0.1580
Processed	65.8	64.2	61.9	65.4	67.8	67.5	0.5139
Fermented	13.0	13.7	10.1	13.6	14.8	12.8	0.2571
Green/viney	10.3	9.5	10.9	12.4	12.5	14.0	0.0790
Flavor							
Apple	21.2	19.7	18.2	19.7	17.1	20.6	0.7094
Beet	20.1	14.7	18.3	16.9	19.6	19.3	0.0807
Caramelized	17.2	15.5	16.3	15.2	16.9	17.5	0.4089
Elderberry	58.9	57.1	55.0	62.5	55.2	58.3	0.1454
Fruity	43.3 ab[y]	39.2 bc	38.6 c	43.8 a	43.5 ab	46.4 a	0.0064
Fermented	14.0	16.9	13.9	14.1	16.4	16.8	0.6284
Processed	72.8	71.3	69.4	71.7	67.7	72.5	0.5617
Floral	27.1 ab	27.9 ab	23.5 c	28.1 ab	25.6 bc	28.9 a	0.0124
Pomegranate	16.2	16.0	14.9	17.6	13.6	16.7	0.3530
Sweet aromatics	22.8 b	22.5 b	22.5 b	23.1 ab	22.8 b	28.0 a	0.0137
Green	13.9	14.6	14.9	16.5	15.1	16.0	0.6085
Bitter	20.8 a	17.3 bc	20.3 ab	22.3 a	20.7 a	15.1 c	0.0001
Sour	13.8 bc	14.8 bc	15.0 b	18.3 a	15.4 ab	11.9 c	0.0032
Sweet	38.1 b	40.6 b	37.8 b	44.7 b	42.5 b	52.5 a	0.0032
Aftertaste							
Bitter	18.8 ab	17.4 bc	19.7 ab	20.8 a	18.7 ab	12.9 c	0.0001

Sour	12.5	13.0	13.7	14.9	13.7	11.2	0.0687
Sweet	25.2 b	26.9 b	23.3 b	26.8 b	24.8 b	34.8 a	0.0006
Mouth-feel							
Astringent	19.4ab	17.6 bc	21.0 a	21.8 a	20.6 ab	15.8 c	0.0036

[z]Attribute intensity was evaluated using a 0 to 150 mm line scale (0 = none to 150 = extreme) with 1-mm increments.

[y]Means with different letters in a row are statistically significant at $P \leq 0.05$ by Tukey's honestly significant difference (HSD) test.

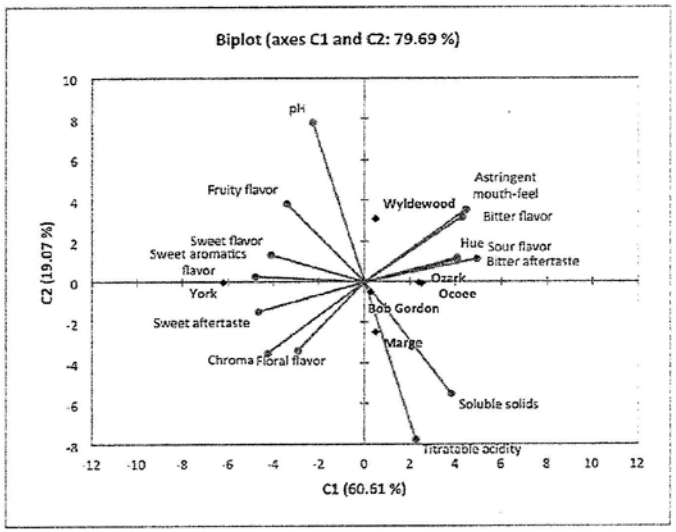

Figure 1. Principal components analysis biplot showing the relationship between descriptive sensory attributes, juice color, and fruit composition of six North American-grown elderberry cultivars. C1 and C2 represent the first and second principal components, respectively.

Project 3: Genetic Study of Rooting Ability in *Vitis aestivalis*-derived "Norton" Grape

Missouri State University
Darr School of Agriculture
Chin-Feng Hwang, Ph.D.
Final Performance Report

Project Summary

Why do hardwood cuttings from some grapevines root readily whereas cuttings from other species do not? This question has prompted much research, but despite many important advances, there remains much to learn about the molecular biology, biochemistry and physiology of rooting. There is considerable commercial interest in this topic, since vegetative propagation by dormant cuttings is an efficient method to produce large numbers of plant material, and is presently used in the grape and wine industry. The *Vitis aestivalis*-derived 'Norton' is a premium wine grapevine grown in the Midwest. A significant limiting factor of Norton propagation is how recalcitrant this cultivar is to rooting through dormant woody cuttings. Recent progress has been made in this area using bottom heat or rooting hormones either alone or in combination. However, the percent rooting of Norton dormant woody cuttings lag behind most other grapevine cultivars (e.g. *V. vinifera* 'Cabernet Sauvignon', the European grape used for most wine making worldwide) and continue to result in limited stock available to meet grower needs. In view of this, a mapping population of 184 F_1 individuals was constructed from a cross between Norton and Cabernet Sauvignon to study the genetic variation in rooting ability of dormant cuttings and their subsequent growth. The ultimate goal of this project is to study the vegetative propagation capacity of Norton grape and to determine whether it can be improved in the F_1 hybrid population.

Project Purpose

Vitis aestivalis-derived 'Norton', the official grape of the State of Missouri, is grown in many regions of U.S. where *V. vinifera* production requires extensive pesticide use for fungal disease and pest management. Norton (a.k.a. Cynthiana) grape was discovered in a location near Alexandria (formerly Potomac), Virginia, circa 1828 and is a dominant red grape variety used for winemaking in the Eastern and Midwestern U.S. Outstanding traits of Norton are its high level of resistance against a broad-spectrum of foliar and berry diseases and an abundance of anthocyanins and organic acids. Norton is highly resistant to powdery mildew, downy mildew, and harvest rot complex, the latter including black rot, bitter rot and bunch rot. Norton wine is praised for its intense flavor, rich color and full body. It represents a premium wine that is made from an American grape. The unique characteristics of Norton in disease resistance and cold hardiness have heightened its attractiveness to grape growers due to increasing concerns regarding environmental protection and pesticide avoidance. However, propagation of Norton through traditional hardwood cutting has been a major hindrance in providing enough plants to meet commercial demand. It has been noted that Norton is vegetatively vigorous and the most undesirable characteristic of Norton vines to propagators is the poor rooting of dormant woody cuttings. Thus, planting stock is limited and costly. Research in the genetics of Norton rooting ability has not yet been explored or understood. Genetic mapping of Norton x *V. vinifera* populations will increase our knowledge of the genetic determinants of this complex agronomical trait. Completion of the objectives of this project will lead to construction of the first Norton high-resolution linkage map and provide the foundation and tools to associate molecular markers with candidate genes related to its rooting ability.

Specific Objectives:

1. Develop a Norton and Cabernet Sauvignon linkage map using genetic markers
2. Conduct segregation analysis of the population for rooting ability
3. Identify genetic markers associated with the rooting for future marker-assisted selection

Vegetative propagation is required to maintain the identity and increase the number of individual plants within a specific grape cultivar or clone. The rooting ability of the cultivar or clone is key in the success of this procedure. Gaining knowledge concerning the genetics and molecular mechanisms affecting the rooting of Norton dormant hardwood cuttings may aid in achieving higher percentages of rooted cuttings in the future. Studying the quantitative inheritance of rooting ability should provide information for the development of improved cultural technologies. Such practices may enhance the potential for the success of the commercial and sustainable production of Norton grapevines. In addition, the proposed work will provide applied training in viticulture for graduate and undergraduate students to address the skilled workforce shortage for the American grape and wine industry. By using genotyping-by-sequencing (GBS) technology to remove temporal, financial and validation barriers in the development and application of molecular markers, this proposed project aims to associate molecular markers with the heritability of rooting.

Work Plan

Project Activity	Who	Performance Measures	Timeline
Construction of the Norton genetic linkage map using SSR markers	Dr. Chin-Feng Hwang, Li-Ling Chen, Brigette Williams, and Mia Mann	Complete a 19 linkage group map with 400 SSR markers	October 2014 – June 2015
Construction of a Norton linkage map based on SNP markers via GBS	Dr. Lance Cadle-Davidson (USDA-ARS/Cornell Univ.) via VitisGen Program, Dr. Chin-Feng Hwang and Li-Ling Chen	Assign ~35,000 SNPs onto 19 linkage groups	October 2014 – August 2015
Develop and integrate a dense Norton genetic map with both SSR and SNP markers	Dr. Chin-Feng Hwang, Li-Ling Chen, Surya Sapkota and Dr. Lance Cadle-Davidson	Construct a Norton linkage map with both SSR and SNP markers	August-December 2015
Phenotyping rooting ability index include root length, root number and lateral root number	Dr. Chin-Feng Hwang, Brigette Williams and Charles Butcher	Establish protocols for the measurement of rooting ability	December, 2014 – June, 2015
Map and localize the major QTL for rooting ability	Dr. Chin-Feng Hwang, Li-Ling Chen, Brigette Williams and Logan Duncan	Collect and analyze data and repeat the same experiment next year	January -May, 2016

This is a new project and has not been submitted to or funded by another Federal or other State grant program.

Project Activities

1) Develop a Norton and Cabernet Sauvignon linkage map using genetic markers

Crosses between *V. aestivalis*-derived "Norton" and *V. vinifera* "Cabernet Sauvignon" were made in Mountain Grove, MO in 2005 and resulted in 94 hybrid progenies. This F_1 population was planted in a

Missouri State Fruit Experiment Station (MSFES) vineyard in 2007. Additional crosses were made in 2011 and 2012; we have acquired additional genotypes of 134 and 51 survived the winters of 2012 and 2013, respectively. There are more than 800 simple sequence repeat (SSR) markers that have been isolated in grapevine to date. The markers are publicly available and are described in the NCBI databases dbSTS and UniSTS http:/www.ncbi.nlm.nih.gov/. We have tested this set of SSR markers with the parents and six F_1 progenies and identified 383 polymorphic markers. We have screened 182 genotypes of the Norton x Cabernet Sauvignon population, and the first Norton linkage map including 359 simple sequence repeat (SSR) markers clustered in 19 chromosomes has been constructed (Figure 1). We also have assembled 262 polymorphic markers from Cabernet Sauvignon. Genotyping-by-sequencing (GBS) has been completed for the parents and 182 progeny of the Norton x Cabernet Sauvignon population. Currently, 43,320 single nucleotide polymorphism (SNP) markers have been identified in this population. An additional 71 Norton x Cabernet Sauvignon F_1 progenies were generated and DNA from leaf samples were used for the generation of additional SNP markers by using GBS. A consensus linkage map with 2,323 SNP markers also has been constructed.

2) Conduct segregation analysis of the population for rooting ability

Three-node dormant cuttings of uniform size were taken from 128 hybrids of *Vitis aestivalis*-derived 'Norton' x *V. vinifera* 'Cabernet Sauvignon' by Logan Duncan, a graduate student, on January 17-18, 2015 from the Missouri State Fruit Experiment Station (MSFES) vineyard at Mountain Grove. Five cuttings were selected from each F_1 individual along with parents and standardized to a mass of 14-16 grams. The cuttings were treated with a low concentration (0.1%) of Indole-3 butyric acid (IBA), bundled in groups of 5 cuttings from the same vine and stuck in the rooting bed supplied with bottom heat set at 80 °F to promote root development before bud break. The rooting bed was filled with commercial growing media (Fafard growing mix, Agawam, MA) composed of 50-55% composted pine bark, Canadian Sphagnum peat moss, perlite, vermiculite and dolomitic limestone. It is located in an unheated room (around 40 °F) to keep the upper portion of cuttings cool in order to avoid early bud break. The WinRHIZO software, an image analysis system, was specifically designed for root measurement in different forms including morphology (length, area and volume), architecture and color analyses. It is made of a computer program and image acquisition components that can be combined to meet different needs. Cuttings containing roots of > 1mm were considered as rooted. Root length and total number of primary and lateral roots were scored (Figure 2).

3) Identify genetic markers associated with the rooting for future marker-assisted selection

Both parents and the 128 F_1 progenies showed various degrees of rooting ability with this population indicating that this trait is inherited genetically. The frequency distributions of phenotypic scores of F_1 hybrids were analyzed with MINITAB 14. The 43,320 SNP markers and phenotypic data were analyzed using a multiple linear regression model (MLM) in TASSEL (Trait Analysis by aSSociation, Evolution and Linkage). Figure 3 demonstrates that a major quantitative trait locus (QTL) for rooting ability was identified on linkage group 5. The plant breeding projects require multi-year trait evaluation; this preliminary data suggests the developed protocol is valid and can be used in future evaluations.

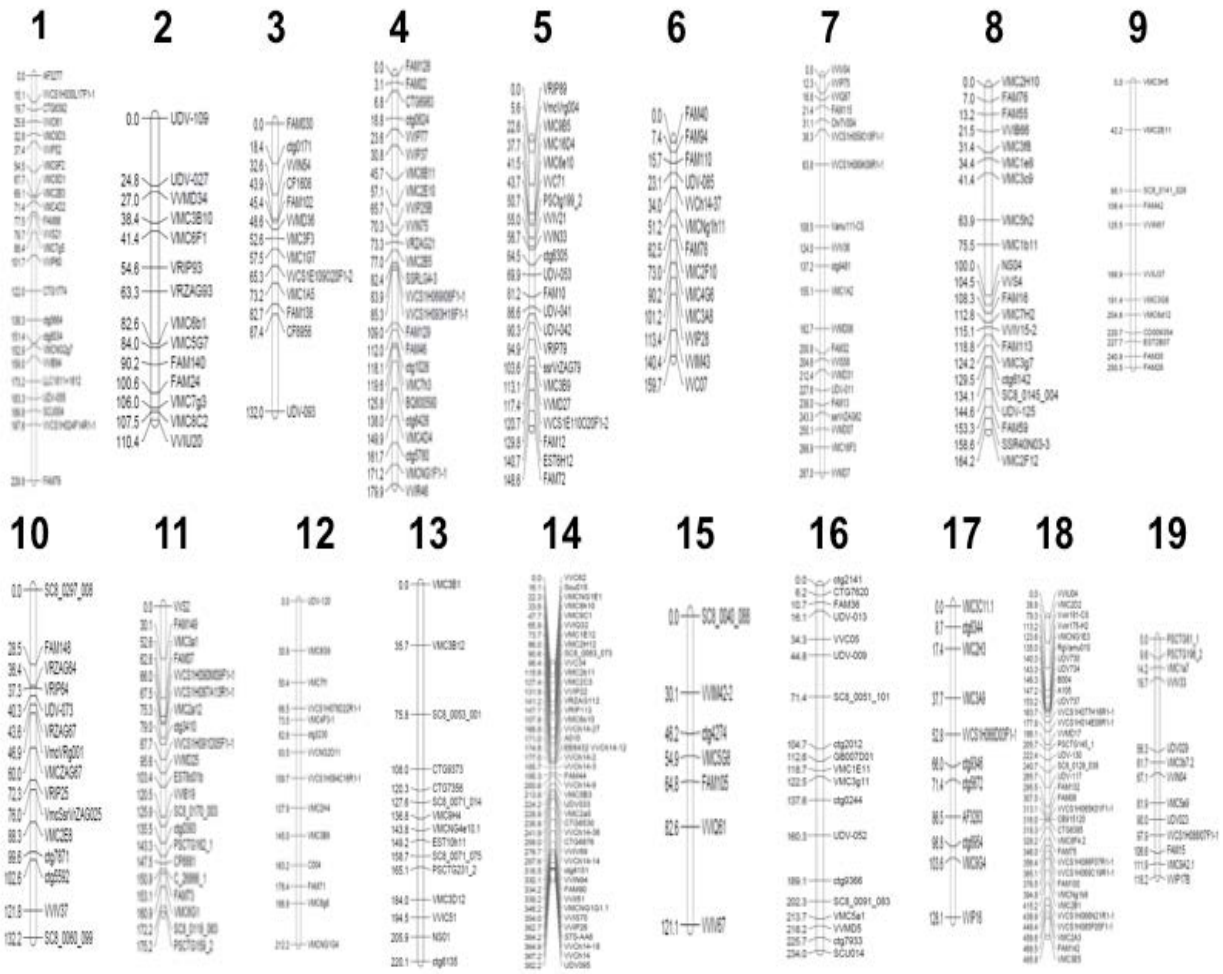

Figure 1. The haploid map of *V. aestivalis*-derived 'Norton' using SSR markers with 19 linkage groups. Distances are in cM. Linkage analysis was performed with JoinMap 4.1 with LOD threshold of 6.0.

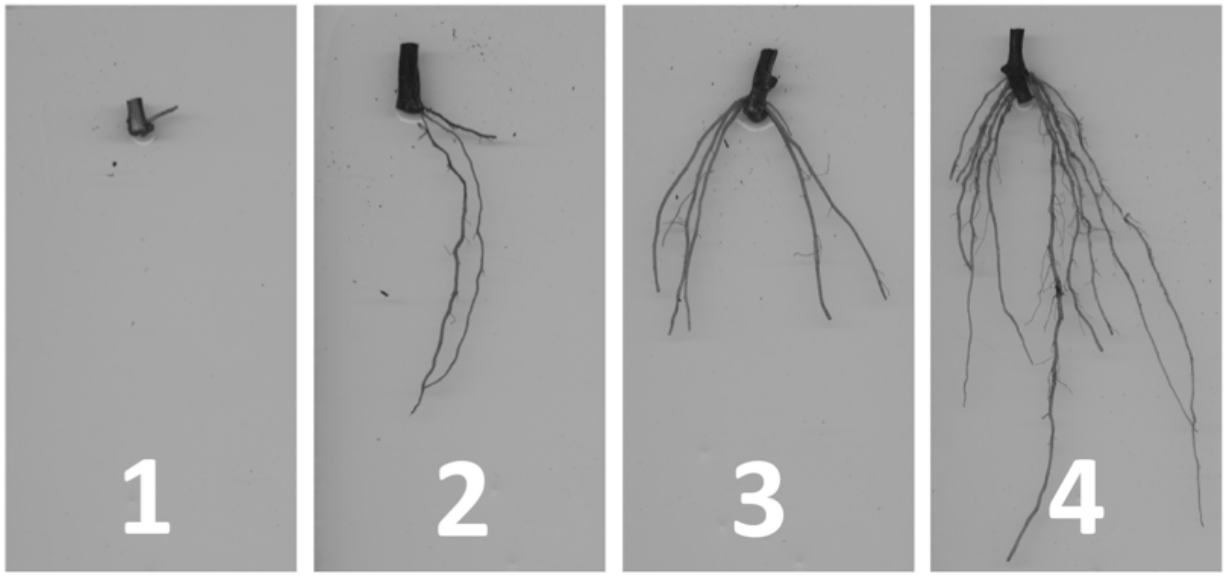

Figure 2. Confirmed F_1 hybrid progeny showing segregation in dormant rooting ability, 1 being low rooting potential (Norton) and 4 being high rooting potential (Cabernet Sauvignon).

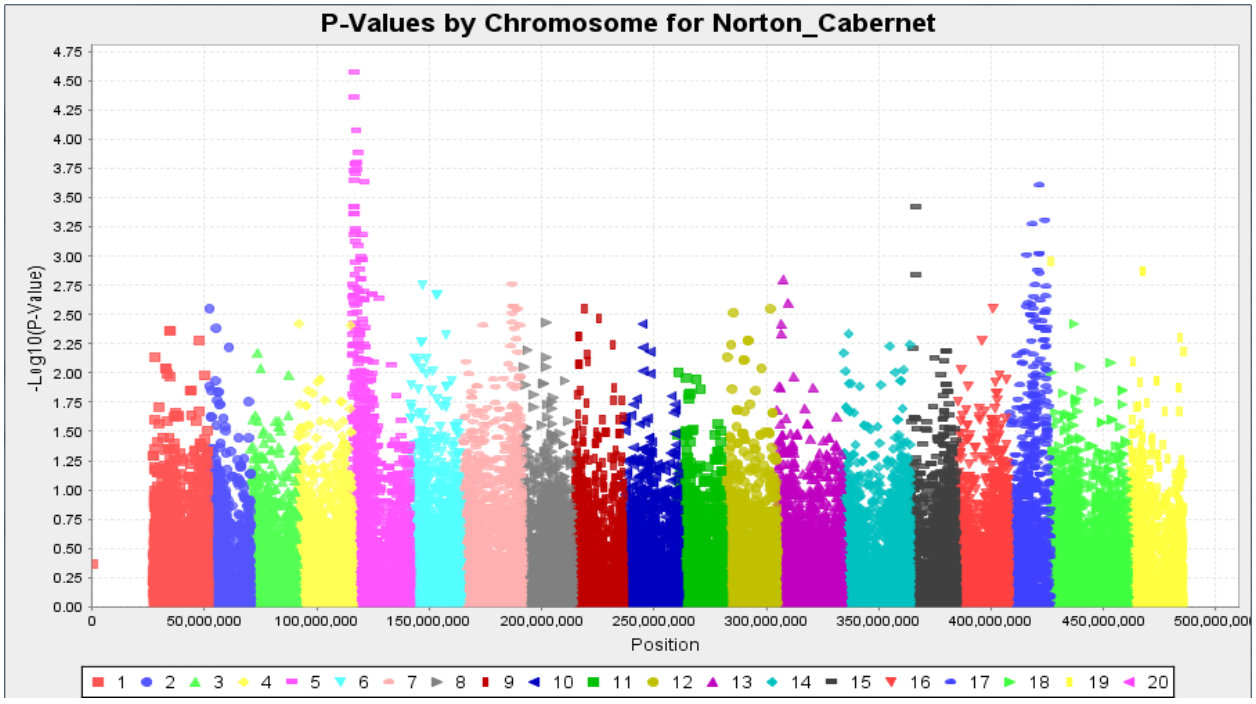

Figure 3. Manhattan plot using MLM analysis of SNPs and phenotypic data shows a possible QTL for dormant rooting ability on Cabernet Sauvignon linkage group 5.

Goals and Outcomes Achieved

1. Using 6 universal SSR markers for the screen of F_1 population to eliminate the off-types (not interspecific hybrids) and construct a mapping population with 182 genotypes
2. Tested >800 SSR markers for potential polymorphism on a small set of DNA including parents and 6 F_1 genotypes and 373 of which have been identified as polymorphic markers for Norton. A 19-chromosome Norton genetic linkage map with 359 SSR markers using JoinMap 4.1 software (Figure 1) was constructed. Two hundred and sixty-two polymorphic markers were also assembled from Cabernet Sauvignon.
3. Genotyping-by-Sequencing (GBS) has been completed for the parents and 182 progeny of this population. Currently, 43,320 single nucleotide polymorphism (SNP) markers have been identified in this population. A consensus linkage map with 2,323 SNP markers also has been constructed.
4. Protocol using dormant hardwood cuttings has been established for the evaluation of rooting ability (Figure 2).
5. Segregation analyses on potential have been conducted (Figure 2) and quantified the phenotyping data using statistic software.
6. A major QTL for rooting potential has been discovered on linkage group 5 and will be used for future marker-assisted selection (Figure 3).
7. The location of this work at the Missouri State Fruit Experiment Station at Mountain Grove, Missouri is situated in a rural region of Southern Missouri and serves Northwest Arkansas. The project has provided access for science education and training of biotechnology for high school students and teachers to strengthen their Science, Technology, Engineering and Mathematics (STEM) curriculum. Summer internships also provided to work on grape molecular breeding.

A comparison of actual accomplishments with the goals established for the project.

Proposed Activities	Accomplishments
Identification of polymorphic markers using parents and 6 F_1 genotypes (techniques include DNA isolation, polymerase chain reaction (PCR), gel electrophoresis and DNA fragment analysis via capillary electrophoresis)	Additional crosses were done in the vineyard to increase the number of genotypes in the F_1 population. Using SSR markers, interspecific hybrids have been identified, and the mapping population has been expanded from 92 to 253 genotypes. More than 800 SSR markers were tested and 383 of which were identified as polymorphic markers.
Construction of the Norton genetic linkage map using SSR markers	A 19-chromosome Norton genetic linkage map with 359 SSR markers was constructed using JoinMap 4.1 software (Figure 1).
Construction of a Norton linkage map based on SNP markers via GBS platform	43,320 SNP markers have been identified using 182 F_1 progeny from the mapping population. A consensus linkage map with 2,323 SNP markers also has been constructed.
Phenotyping rooting ability index include root length, root number and lateral root number	A segregation analysis on rooting potential was completed; root length and total number of primary and lateral roots were scored (Figure 2)

Map and localize the major QTL for rooting ability	A significant QTL was identified on linkage group 5. This information will be used for future marker-assisted selection (Figure 3).

A comparison of baseline or benchmark data with quantifiable targets

Proposed Measurable Outcomes	**Achieved Outcomes**
Develop a mapping population between Norton and Cabernet Sauvignon. An ideal mapping population size for establishing a genetic map is about 200 progeny.	A mapping population has been established with 253 genotypes and maintained by the professional field crew at Missouri State Fruit Experiment Station (MSFES), Mountain Grove, MO
Construct a SSR Norton linkage map and identify SNP markers via GBS to lay a foundation for future grape breeding	A 19-chromosome Norton genetic linkage map with 359 SSR markers was constructed as well as 43,320 SNP markers have been identified.
Phenotype the entire mapping population for dormant cutting rooting ability	A segregation analysis using 128 F1 progeny on rooting potential was completed (Figure 2). Using the newly developed Norton linkage map, a major QTL was identified on chromosome 5 (Figure 3). New protocol for rooting ability developed and tested on the parents and F_1 progenies (Figure 2).
Provide summer internships to work on grape molecular breeding program	Ten summer interns in 2015 and 2016 stayed at MSFES for 3 months to learn via hands-on experience in the laboratory and vineyard
Disseminate/publish research data at various conferences, in peer-reviewed journals and students with MS degrees	Pragya Adhikari and Logan Duncan graduated with a MS degree, December 2014 and May 2016, respectively. Please see "Additional Information" for details regarding conference attendance.

To identify the QTLs, a mapping population of 182 individuals was constructed from a cross between *V. aestivalis*-derived 'Norton' and *V. vinifera* 'Cabernet Sauvignon'. A haploid Norton genetic map has been constructed with 359 polymorphic SSR markers clustered in 19 linkage groups. In collaboration with VitisGen (www.vitisgen.org), approximately 43,000 SNP markers generated GBS were identified in this population and will be integrated with SSR markers to construct a high-resolution linkage map. A major QTL for dormant cutting rooting potential on linkage group 5 has been identified and will be used for future marker-assisted selection. Careful genetic mapping of this population provides the foundation and tools to associate molecular markers with rooting ability of Norton for future new cultivar release. The new knowledge produced from this proposed project also will be disseminated to the adult learner through the VESTA program.

Beneficiaries

The Project Director, Dr. Chin-Feng Hwang, has been invited to the following conferences to present the research results from this project: American Society of Enology and Viticulture (ASEV), North American Grape Breeders Conference (NAGBC), Missouri Grape and Wine Research Symposium (MGWRS) and the

Missouri Grape and Wine Research Symposium (MWGRB). Dr. Hwang was also invited to Ningxia Forestry Institution, Ningxia, China and provided a-week short course on molecular breeding techniques via DNA markers. A manuscript on the construction of Norton mapping population has been published; it has been distributed to the grape breeding and genetics community worldwide. In addition to the professional conferences, the results also being presented at grower meetings such as Field Days and Outreach Workshop in conjunction with viticulture/enology advisors to better educate growers on the benefits of new Norton/*Vitis vinifera* hybrids with improved pathogen resistance and fruit quality. The extension/outreach effort has provided information on traits that are being incorporated into new varieties, explain new advances in technology that accelerate the development of new and improved grape cultivars and the importance of these new traits with regard to farming practices and sustainability. Missouri State University (MSU) leads the Viticulture and Enology Science and Technology Alliance (VESTA) program, a partnership of institutions in 17 states, funded as a National Center of Excellence from the National Science Foundation's (NSF) Advanced Technology Education program. This program is focused on the development of on-line educational materials and training workshops for secondary students, teachers, farm advisors, grape growers and enologists. The new knowledge produced from this proposed project also has been disseminated to the adult learner through the VESTA program. The location of this work at the Missouri State Fruit Experiment Station at Mountain Grove is situated in a rural region of Southern Missouri and serves Northwest Arkansas. The project provides access for science education and training of biotechnology for high school students and teachers to strengthen their Science, Technology, Engineering and Mathematics (STEM) curriculum. Based on the data in Table 1, there are approximately four thousand people worldwide affected by the distribution of this new knowledge.

Table 1. The number of people affected by the distribution of this new knowledge

Dissemination Sources	ASVE (June 17-18, 2015)	VitisGen (Jan 8 & Jan 7, 2015 & 2016)	NAGBC (Aug 27-28, 2015)	MGWRS & MWGRB (2015 & 2016)	VESTA (2015 & 2016)
Number of people participated	**1,500**	**300**	**250**	**500**	**1,200**

Using the *V. aestivalis*-derived 'Norton' as a perennial woody model plant, the work presented in this proposal provides an exceptional opportunity in both research and education. It includes interdisciplinary training opportunities for students in plant breeding, genetics, genomics and plant pathology with a specific focus on viticulture. The grape and wine industry will be aided by new grape varieties. The education program has included hands-on experience both in the laboratory and vineyard, and produce highly trained professionals that will address the need for a knowledgeable and skilled workforce for the American grape and wine industry. We have recruited one graduate student and two summer interns to work on rooting ability. These focal areas target one of the most commercially significant traits in the wine and grape industry, since vegetative propagation by dormant cuttings is the preferred method to produce large quantities of plant material.

Lessons Learned

The original proposed project was designed based on our infrastructure and capacity. We completed the proposed work in a timely manner with goals and outcome measures achieved.

There is always a risk of vine loss due to cold injury during winter. To manage this risk, a total of 92 genotypes with at least six 18-inch cuttings per seedling (plus parents) were shipped to E.J. Gallo Winery, Modesto, CA to establish a backup population. We shipped the rest of the mapping population by April 2016. This backup planting is an important resource for us to reduce the possibility of loss of important genotypes. It could also provide additional phenotyping material.

Grape breeding programs require long-term investments and continuity because the time required from initial crossing to variety release usually take decades. In addition, growing grapes is an expensive and labor-intensive endeavor. However, the budget has been carefully planned in order to achieve projected results with minimum spend. Plant materials for this project are grown and maintained by a professional crew at MSFES; they are employed at MSU and provide work paid by institutional funds. MSU also will provide housing at MSFES for the graduate students without charge.

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Additional Information

Publications
Surya Sapkota, Li-Ling Chen and **Chin-Feng Hwang** (2015). Genetic study of Botrytis Bunch Rot Resistance in Grapevine. Acta Horticulturae 1082: 149-152.

Conferences
Dr. Chin-Feng Hwang; Li-Ling Chen, research specialist; and Surya Sapkota, graduate student, were invited to attend the third annual meeting of the Cornell University-based VitisGen program January 08, 2015 and January 07, 2016, respectively. The TASSEL software workshop was provided for us to learn how to construct a Norton linkage map using single nucleotide polymorphism (SNP) markers.

Dr. Chin-Feng Hwang and four students; Surya Sapkota, an Missouri State University/University of Missouri collaborative Ph.D. student; Logan Duncan, Mia Mann, Brigette Williams, all Plant Science Master's students, attended the 66th American Society of Enology and Viticulture (ASEV) National Conference June 17-18, 2015 in Portland, Oregon. Four of the students presented posters on their research and participated in the flash talk where students gave timed, three-minute presentations on their research. Dr. Hwang was invited to serve as a moderator for a "Viticulture Pests and Diseases" session.

- Sapkota presented a poster entitled "Genetic Study of Downy Mildew Resistance in *Vitis aestivalis*-derived 'Norton' Based Population"
- Duncan presented a poster entitled "Genetic Analysis of Dormant Rooting Potential in *Vitis aestivalis*-derived 'Norton' Grape"
- Mann presented a poster entitled "Interspecific Hybrid Identification and Linkage Map Construction of a Chambourcin x Cabernet Sauvignon Population"
- Williams presented a poster entitled "Investigation into the Genetic Basis of Leaf Shape in Grapes"

Dr. Chin-Feng Hwang was invited to attend the North American Grape Breeder Conference, NYS Agricultural Experiment Station, Geneva, New York, August 27, 2015. Dr. Hwang presented a talk entitled "Progress in the Norton Grape Breeding Program at the Missouri State University"

The USDA-SCBGP funds were not used for the trips listed above; however, the results from this project were presented in these conferences as opportunities to promote the USDA-SCBGP.

Dr. Chin-Feng Hwang was invited to give a seminar entitled "Optimization of *Vitis aestivalis*-derived 'Norton' Grape Breeding using Molecular Genetic and Genomic Approaches" on March 24, 2015 at the USDA Crop Diseases, Pests & Genetics Research Unit, Parlier, CA.

Dr. Chin-Feng Hwang was invited to give a seminar entitled "Optimization of *Vitis aestivalis*-derived 'Norton' Grape Breeding with Marker-Assisted Selection" on May 08, 2015 at 4th Grape and Wine Research Symposium, University of Missouri, Columbia, MO.

In general, the School of Agriculture at Missouri State University offers about 10 summer internships every year. The two graduate summer assistantships provided from this funding were awarded to two MS graduate students, Logan Duncan and Daniel Adams. Working together with Li-Ling Chen (Research Specialist), the graduate students and undergraduate summer interns were able to gain teaching experience by direction the summer interns in the laboratory to 1) isolate DNA from grape leaves, 2) determine the concentration of isolated DNA using a spectrophotometer, 3) visualize DNA via electrophoresis, 4) perform polymerase-chain reaction (PCR) and 5) run DNA fragment analysis via capillary electrophoresis. The purpose of these procedures was to verify the true hybrids at the seedling state by using DNA markers. In the vineyards, they were also able to provide the hands-on experience with traditional breeding techniques including parental selection, flower emasculation and pollination.

Project 4: Increase Beekeeping and Honey Production in Missouri

Missouri Vegetable Growers Association
Liz Graznak and Travis Harper
Final Performance Report

Project Summary

The Missouri honey industry has been negatively affected over the past several years by colony collapse disorder, varroa mites, and weather. The 2007 Census of Agriculture reported that only 55% of Missouri farms with honey bee colonies produced surplus honey for sale or personal use. These farms produced 776,184 pounds of honey which was a 27% decline from 2002. Additionally, the commercial vegetable industry in Missouri relies on honey bees for pollination. Without honey bee pollination many important food crops, especially those in the cucurbit family, could not be produced. The goals of this program were to increase the number of managed beehives in Missouri, increase the percentage of beekeepers producing surplus honey, and increase the availability of honey bee hives for pollination of commercial vegetable crops. Missouri Vegetable Growers Association conducted a series of beginning and advanced beekeeping workshops throughout the state in 2015 and 2016. More than 800 people attended these workshops and at least 1,134 new bee hives were started. Furthermore, 34% of all

attendees indicated that they would make their hives available for pollination of commercial fruit and vegetable crops.

Project Approach

The following work plan activities were accomplished:

- 6 beginning beekeeping workshops were held in 2015.
- 2 hands-on Integrated Pest Management (IPM) workshops were held in 2015 and 2016.
- 6 advanced beekeeping workshops were held in 2016.
- 2 beekeeping workshops were held in conjunction with the Great Plains Growers Conference
- Booths were hosted at the Great Plains Growers Conference to disseminate information related to beekeeping, pollination, and IPM.
- 10 scholarships were awarded for growers and beekeepers to attend IPM and beekeeping workshops at the Great Plains Growers Conference.
- A beekeeping stop was included in the 2016 Missouri Vegetable Growers Association Vegetable and Greenhouse Tour to educate commercial growers on the role of honey bees in vegetable production.

Approximately 350 people attended the beginning beekeeping workshops held in 2015. Respondents to follow-up surveys for these workshops indicated that they had started 156 new bee hives in 2015. Additionally, 48% of respondents indicated they would use their hives for the pollination of commercially-grown fruit or vegetable crops. More than 100 people attended the two hands-on integrated pest management workshops. These individuals planned on starting more than 300 hives within the next year. More than 200 individuals attended the advanced beekeeping workshops held in 2016. Respondents to follow-up surveys for these workshops indicated that they had started 116 new hives in 2016. Additionally, 27% of respondents indicated they would use their hives for the pollination of commercially-grown fruit or vegetable crops. Nationally known beekeeping Larry Connor spoke at the grant-sponsored workshop held at the 2016 Great Plains Growers Conference. At least 75 beekeepers from across Missouri attended the workshop. These attendees planned on adding 583 new hives within the next year; 45% of attendees responded that they currently use their existing hives for the pollination of commercial fruit and vegetable crops.

Significant partners included University of Missouri Extension, Morgan County Extension, and numerous local beekeeping associations and individual beekeepers. University of Missouri Extension provided assistance with the educational curriculum used at the beginning, advanced, and hands-on integrated pest management workshops. Morgan County Extension provided assistance with the logistics of holding beekeeping workshops across the state of Missouri. Individual beekeepers and local beekeeping associations provided assistance with individual beekeeping workshops held in their area. Without the assistance of these great partners, the grant activities would not have been nearly as successful as they were.

This grant provided a significant benefit to the primary specialty crop area, honey production. It also provided a significant benefit to other specialty crops by increasing the availability of bee hives for pollination throughout the state.

Goals and Outcomes Achieved

The performance goals, along with achievement towards those goals, are as follows:

1. Train new beekeepers in Missouri
    a. It is estimated that at least 300 individuals began keeping bees for the first time after attending one of the grant-sponsored workshops.
2. Increase the number of beekeepers that produce surplus honey and/or increase the amount of surplus honey being produced.
    a. This goal proved more difficult to determine within the confines of the grant. Many new hives don't begin producing surplus honey until the second or third year, outside of our window for the follow-up surveys. Furthermore, for a variety of reasons many beekeepers are hesitant to report how much honey they harvest.
3. Increase the number of beekeepers with 5 or more colonies
    a. Approximately 100 beekeepers increased their total number of colonies from a number less than 5 to 5 or more hives.
4. Increase the availability of honey bee colonies for crop pollination
    a. More than 1,100 new beehives were started as a result of the grant. Beekeepers attending grant-sponsored workshops plan to make more than 500 hives available for crop pollination.
5. Train beekeepers on insects and diseases of honey bee colonies and integrated pest management (IPM) methods for controlling these pests
    a. 100% of workshop attendees received training on insects and diseases of honey bee colonies, as well as IPM methods for controlling these pests.

The expected measureable outcomes, along with results, are as follows:

1. Increase knowledge of integrated pest management practices in beekeeping of at least 100 individuals through 6 advanced beekeeping workshops.

    a. More than 228 individuals attended an advanced beekeeping workshop.

    b. All classes (when students were grouped as a whole for each class) reported an increase in knowledge of integrated pest management practices used in beekeeping.

    c. All classes grouped together exceeded our target of a 50% increase in knowledge of IPM practices used in beekeeping.

    d. A follow-up survey was sent out to all 228 individuals. Even though only 14% of individuals responded to the survey, 100% of respondents reported to actually using at least one integrated pest management practice in their beekeeping operation.

2. Increase the number of managed bee hives in Missouri through the beginning and advanced beekeeping workshops and GPGC beekeeping workshop.

    a. Respondents (approximately 20% of beginning beekeeping workshop attendees responded to follow-up survey) to our follow-up survey after the beginning beekeeping workshops reported starting 156 new bee hives in Missouri.

    b. Respondents (approximately 14% of advanced beekeeping workshop attendees responded to follow-up survey) to our follow-up survey after the advanced beekeeping workshops reported starting 116 new bee hives in Missouri.

    c. Respondents to our survey at the Great Plains Growers Conference beekeeping workshop indicated they would start 583 new bee hives in 2016. However, we did not

conduct a follow-up survey of this group to determine how many hives they actually added in 2016.

d. Students at our summer hands-on/IPM workshops indicated that they would add 279 new hives in 2015 or 2016. However, we did not conduct a follow-up survey of this group to determine how many hives they actually added.

e. We know for sure that at least 272 new hives were started by participants in grant-sponsored workshops, well exceeding our target of 200 new hives.

f. It is possible that as many as 1,134 new hives (or more) were started by participants in grant-sponsored workshops.

Beneficiaries

The primary specialty crop group benefitting from completion of this grant's accomplishments is the honey producers in the state of Missouri. It is estimated that grant workshop attendees started at least 1,134 new bee hives in Missouri in 2015 and 2016. These new bee hives can produce as much as 62,370 pounds of honey annually. This would represent an 8% increase in pounds of honey produced in Missouri compared to what was reported in the 2007 Ag Census.

The secondary beneficiaries of the grant's accomplishments include Missouri fruit and vegetable producers. It is estimated that the 1,134 new hives started have annual indirect economic impact, in terms of pollination value, of approximately $6,804,000. These 1,134 new hives are capable of foraging in an area as large as 20 million acres. When used to specifically pollinate intensively-grown crops, these new hives are capable of adequately pollinating more than 1,000 acres of fruit and vegetable crops.
In summary, more than 800 people attended the workshops supported by MVGA'S beekeeping grant. These individuals reported starting 1,134 new bee hives in Missouri in 2015 and 2016. These 1,134 hives have an estimated direct economic impact (honey sold) of approximately $204,967 and an estimated indirect economic impact (pollination value) of approximately $6,804,000. Furthermore, 34% of all attendees plan on using their hives for pollination of commercial fruit and vegetable crops and 100% of all attendees reported using at least one IPM practice in their operation.

Lessons Learned

To our great joy, and surprise, our goals and expected outcome measures were greatly exceeded. We attribute part of this to the fact that the subject of honey bees and beekeeping has a greater level of interest in Missouri than it has for many years. Timing of our project could not have been better. This project would not have been as successful during a period of decreased interest in honey bees and beekeeping.

There's an old adage that if you ask ten beekeepers a question, you're going to get ten different answers. This turned out to be more accurate than we ever thought. There are multiple approaches to beekeeping and trying to develop curriculum that is open to all of these approaches proved to be challenging. We really did not want to encourage or discourage one method of keeping bees compared to another. Beekeepers are a very diverse group. They come from all walks of life. They live in urban, suburban, and rural areas. They could be a hobby, sideliner, or commercial beekeeper. They come from drastically different growing regions with far different pollen and nectar crops. They have different

goals in mind when keeping bees. In the end, we found it best to cover as many different beekeeping methods as possible. We also found that all beekeepers, no matter their method of keeping bees, could coalesce around the idea of using integrated pest management for the control of insects and disease pest of honey bees so we made that a focal point of all of our educational trainings.

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Additional Information

Not applicable

Project 5: Home and Community Gardening – Kansas City

Kansas City Community Gardens (KCCG)
Ben Sharda
Final Performance Report

Project Summary

As part of the Missouri Department of Agriculture - USDA Specialty Crop Block Grant program, project staff held 43 free gardening and healthy cooking workshops at Missouri locations. KCCG made more than 135,000 square feet of community garden space available for rent to Missouri growers in large-scale community gardens including the Swope Park, Prospect, Eastwood Hills, Freeway Park, Ivanhoe-Richardson, Research Medical Center, and Kauffman Community Gardens. Specialty Crop Block Grant funds allowed KCCG to extend reduced-cost garden tilling services into areas beyond the city of Kansas City, MO, such as Independence and Raytown in Eastern Jackson County, making it possible for many seniors and disabled individuals to continue gardening despite physical limitations. Project staff grew more than 80,000 specialty crop seedlings in the KCCG greenhouse, focusing on high-yield food crops such as sweet potatoes, tomatoes, and peppers. KCCG's dedicated volunteers packaged 39,206 packages of specialty crop seeds purchased in bulk to be included for free with KCCG membership, with additional packages made available to members at a very low cost. KCCG also purchased fruit trees and berry brambles and sold these at a reduced cost to KCCG's Missouri members. This project builds on lessons learned during previously funded SCBGP projects by implementing best practices learned to improve education and technical assistance given during workshops and site visits. This project enhances healthy food access and specialty crop production through urban gardening.

Project Purpose

From November 1, 2014- October 30, 2015, Kansas City Community Gardens (KCCG) partnered with the Missouri Department of Agriculture through the USDA Specialty Crop Block Grant program to continue the "Home and Community Gardening Kansas City" project for a second year. The purpose of this project was to promote specialty crops through urban gardening, providing education, supplies, and

other resources to increase the number of individuals and community garden groups that are able to successfully grow specialty vegetable and fruit crops in community and home garden spaces in the Kansas City, Missouri area.

The mission of Kansas City Community Gardens is to assist low-income households and community groups in the Kansas City metropolitan area to produce vegetables and fruit from garden plots located in backyards, vacant lots, and at community sites. KCCG began in 1979 as the Metropolitan Lutheran Ministry's "Community Garden Project," an initiative started to help low-income families save money on grocery bills. In 1985, the organization became incorporated as an independent 501(c)(3) nonprofit organization. This past year, KCCG provided technical assistance and gardening resources, including direct construction, garden tilling, and planting assistance, to 1,348 low-income households, 919 additional non-low-income households, 197 school garden projects, 69 Giving Grove micro-orchard sites, and 245 Community Partner Garden projects (including 31 youth garden projects) at nonprofit agencies, congregations, neighborhood groups, and other community-based organizations. KCCG offers free education, low-cost community garden space, and other resources to help make gardening affordable for everyone.

KCCG's work focuses on providing gardening resources, including education, supplies, and technical assistance, to help make gardening affordable for everyone. The *Home and Community Gardening Kansas City* project allowed KCCG's knowledgeable staff to improve food security for Kansas City's communities by providing free educational garden skills workshops, free and low-cost specialty crop seeds and plants grown in the KCCG greenhouse, community garden space, raised bed construction supplies, tilling services, and other support to Kansas City's low-income families and community garden groups. The Specialty Crop Block Grant Program was a natural fit with KCCG's mission, since all of our programming is intended to support underserved communities in their efforts to grow fresh fruits and vegetables to eat, share, or donate.

This project is timely and relevant due to the alarming rate of food insecurity experienced by children and families in the region. Here in Missouri, community and home gardening is providing critical nutrition for families and children experiencing food insecurity. Child food insecurity affects 21% of children living in Jackson County, where KCCG is located, while less than 13% of Jackson County adults are eating the recommended five daily servings of fruits and vegetables per day (Source: KC Health Matters Community Dashboard, Feeding America's Map the Meal Gap, and Missouri Department of Health and Senior Services). Good nutrition is a major factor in childhood growth and development, while helping to prevent obesity and related health conditions such as diabetes and heart disease for people of all ages. KCCG's free and low-cost gardening services allow more low-income people and food insecure communities to participate in gardening in order to eat, share, and donate fresh produce for hunger prevention and relief. No other Kansas City organization provides over 135,000 square feet of community garden space available for rent, the community garden construction and management expertise of our experience staff, or more free garden skills workshops each year than KCCG. Promoting community and home gardening not only improves the competitiveness of specialty crops in Missouri, but also fosters greater food security in our communities and reduces reliance on food assistance for Missouri families.

The Union of Concerned Scientists recommends expanding healthy food access to make healthy food accessible and affordable for everyone: through support for specialty crop producers and support for

local and regional food systems.[1] Fruit and vegetable production by Missouri gardeners not only promotes access to healthy food for underserved populations, as these growers produce a portion of their own food supply, while community gardening groups donate thousands of pounds of fresh garden produce to area food pantries or use their harvest to prepare meals for nonprofit clients. The Centers for Disease Control and Prevention (CDC)'s Healthy Community Design initiative recommends community gardens to promote a healthy food environment with mental and physical health benefits to gardeners ranging from eating fresh more fruits and vegetables to engaging in skill building.[2]

Project Activities

This project was a continuation of a previously funded project. In the coming year, KCCG will continue to collaborate with the Missouri Department of Agriculture for the "Youth Gardening Education and Support" project to support Missouri school and youth garden projects as they work to grow fresh fruits and vegetables for nutrition education or to share with families and communities in need.

Year Two of this project built on Year One as staff hosted a series of six free "hands-on" garden skills workshops in the Swope Park Demonstration Garden, constructed by staff in the project's first year in order to educate growers and test new varieties and growing methods. The "hands-on" workshop series focused on specific topics that were better demonstratedthan explained, in keeping with Missouri's motto, the "Show-Me State." Topics included: (1) Spring planting in the garden (3/26/15), (2) Summer planting in the garden (4/30/15), (3) Get Growing: Water in the Garden (5/28/15), (4) Insects in the Garden (6/25/15), (5) Fall Planting in the Garden (7/30/15), and (6) Harvesting from the Garden (8/27/15).

In addition, project staff incorporated lessons from the demonstration garden into the second year's workshops and greenhouse operations. For example, staff used the Swope Park Demonstration Garden to test intercropping, drip irrigation, intensive raised-bed gardening, and over-wintering and integrated pest management practices with the use of row cover. Project staff devised a support system for the row covers using tomato cages, securing at bottom with a wood frame. After covering the plants with straw, staff added row cover to four of the raised beds. Carrots, beets and kohlrabi grew well underground even as the tops died off. Spinach planted in late fall grew well under a layer of straw during the winter months. KCCG provided row cover at a low cost to members and incorporated overwintering practices into our "Extending the Garden Season," "Insects in the Garden," and other workshops.

By combining free education and low-cost gardening resources, KCCG staff work to help get more Kansas City families and community groups growing fresh fruits and vegetables in home and community garden spaces. We used the following methods to promote the growing of specialty crops by Missouri gardeners during Year 2 of the *Home and Community Gardening Kansas City* project:

- Selecting appropriate crops- During the project period, KCCG offered more than 90 varieties of vegetable, fruit, and culinary herb seeds pre-selected by KCCG's experienced staff for productivity, disease resistance, appropriateness for Missouri's climate, and other criteria. In addition, project staff grew more than 90 varieties of vegetable, fruit, and herb plants in the KCCG greenhouse.

[1] Union of Concerned Scientists Food and Agriculture Policy Recommendations, http://www.ucsusa.org/our-work/food-agriculture/solutions/expand-healthy-food-access#.VjEwM2vrTMt.
[2] CDC Healthy Places Topics, http://www.cdc.gov/healthyplaces/healthtopics/healthyfood/community.htm.

- Educating gardeners- Sessions are designed to improve basic garden skills for all gardeners with such topics as "Vegetable Garden Basics" and "Fruit Trees and Berry Bushes," while building confidence for more advanced gardeners to build on their knowledge with workshops like "Growing Under Lights," "Cooking from the Garden," and "Extending the Garden Season." KCCG's Executive Director, Ben Sharda, who holds a Bachelor of Science degree in Horticulture from the University of Missouri, led approximately half of all workshops. Mr. Sharda, KCCG's Executive Director since 1989, celebrates 30 years with KCCG in 2015 and is widely recognized by community and government partners as Kansas City's leading authority on community garden development and management. The Program Director, and Community Partner Garden Coordinators led the remaining workshops, including "Early Spring Crops," "Get Growing a Community Garden," and "Cooking with Summer Harvest."
- Producing specialty crop transplants in KCCG's on-site greenhouse- our Garden Assistant led greenhouse production efforts, from seeding and growing under lights as appropriate to managing seasonal planting schedules and assisting with plant sales.
- Providing fruit trees and berry bushes to Missouri gardeners- including apple, pear, and peach trees, bush cherry, and strawberry, blackberry, and raspberry plants. These were purchased in bulk and provided at a low cost to families and community groups.
- Providing other technical assistance to gardeners- KCCG provided other supplies and technical assistance to Missouri's low-income families enrolled in the KCCG Self-Help Gardening program, along with Missouri Community Partner Gardens maintained by nonprofits, hospitals, neighborhood associations, and other community garden groups. Resources shared with gardeners included: straw mulch, fertilizer, tomato cages, tilling services and tiller rental, raised bed garden supplies and technical assistance, rainwater harvesting supplies and technical assistance, garden tools, and other resources.
- Supporting Missouri Community Partner Gardens- with soil amendments, garden tilling, and technical assistance. SCBGP funds helped to support garden projects like: St. Michael's veterans housing; Jewish Vocational Services Global Gardens; Blue Valley Neighborhood Garden; Christian Fellowship Baptist Church; Seven Oaks Community Garden; Truman Heritage Habitat for Humanity Community Garden; low-income senior housing facilities such as Woods Chapel Lodge, Friendship Manor and St. James Place; youth gardens with Park Avenue Baptist, Metropolitan Spiritual, and Mary Kelly Center; a food pantry garden at Avondale United Methodist and community garden rental plots at Freeway Park and Prospect Community Gardens, among many others.
- Testing best practices in the Swope Park Demonstration Garden and incorporating these into greenhouse production and educational workshops.

KCCG received program income, primarily from membership fees. This income, totaling $24,620, was reinvested in the project to support KCCG's Self-Help Gardening program activities. Project revenue helps to make it possible for low-income members to receive significant discounts on membership fees through a two-tiered fee schedule ($2 per qualified family versus $12 for a higher-income household) and to cover KCCG's costs for garden tilling. Garden tilling services cost KCCG approximately $60-$100 per garden, based on garden size, while qualified low-income families pay a reduced fee of only $8-$12.

SPECIALTY CROPS GROWN:

***Fruit trees and plants**:*

Berry plants selected for bulk purchase and distribution to members included strawberry ('Cavendish,' 'Eversweet,') blackberry ('Natchez' thornless), and rasperry ('Heritage" fall-bearing). KCCG selected a variety of fruit trees, including apple ('Enterprise,' 'Liberty,' 'Pristine,' 'Winecrisp'), cherry ('Black Gold,' 'Danube,' 'Montgomerency'), Asian pear ('Chojuro,' 'Korean Giant,' 'Seuri,' 'Shinko'), pear ('Harrow Delight,' 'Potomac,' 'Sunrise'), peach ('Contender,' 'Harrow Diamond'). KCCG also provides seeds for several varieties of canteloupe, watermelon, muskmelon, and other fruit crops.

All fruit trees and berry plants were ordered bare-rooted and stored temporarily in KCCG's on-site refrigerated storage unit upon shipment until picked up by participating families and community groups. Individuals and community groups ordered fruit plants in February and picked them up in April at planting time. (For a complete listing, please see http://kccg.org/fruit-tree-berry-plant-list/).

Vegetable and Herb Seeds and Plants:

KCCG also made vegetable, herb, and selected fruit seeds available to participating gardeners both at our Swope Park location and during "satellite" seed and plant distribution days at the Independence Health Department. For a complete KCCG seed and plant listing, please visit: http://kccg.org/vegetable-seed-plant-list/). Seeds and plants available from KCCG during the project period included the following:

Cool season vegetable crops recommended by KCCG included broccoli, cabbage, cauliflower, kale, lettuce, radish, turnip, and many others. Cool season herbs included chives, cilantro, oregano, parsley, rosemary, and thyme. Warm season vegetable and herb crops offered to participating gardeners included beans, sweet corn, cucumber, peppers, sweet potatoes, squash, tomato, and others, along with basil and dill. Other special order crops available to gardeners included onions, asparagus, sweet potatoes, and garlic (hard neck and soft neck).

Goals and Outcomes Achieved

The goals originally set for this project during the second year are as follows:
Goal: The goal of this project is to increase production of specialty crops, including vegetables, fruits, and culinary herbs, by supporting community and home gardening in the Kansas City, Missouri area.

Target: KCCG will provide education, greenhouse production of specialty crop transplants, supplies, and technical assistance to support approximately 1,150 low-income Missouri families and 200 Missouri community groups in their efforts to successfully harvest produce from home and community gardens during KCCG's Fiscal Year 2015 (10/1/14-9/30/15).

Benchmark: KCCG assisted 978 low-income Missouri families and 172 Missouri community groups during KCCG's Fiscal Year 2013 (10/1/12-9/30/13).

Performance Measurement and Monitoring Plan: This project will help more Missouri families grow specialty crops by increasing the number of vegetable and herb seedlings produced in KCCG's greenhouse from approximately 80,880 in 2013 to more than 110,000 in 2015. KCCG will increase total attendance at KCCG's Missouri educational workshops by 10% in order to improve knowledge and successful production of specialty crops of among Kansas City's gardeners. In addition, 95% of gardeners surveyed will successfully harvest produce from their gardens, as measured by an annual survey of KCCG's returning low-income families and community groups.

Results:

During KCCG's Fiscal Year 2015, 1,159 low-income Missouri households and 176 Missouri Community Partner Gardens enrolled as KCCG members. Surpassing our goal for families participating and falling just short of enrolling more Missouri Community Partner Gardens. Our overall number of participating Community Partner Gardens fell (Missouri and Kansas) from 265 to 245 in 2015, which we attribute in part to unusually rainy weather circumstances during spring 2015, keeping many garden groups from being able to plant until much later in the season than usual. . Nearly 80% of Community Partner Gardens surveyed successfully harvested specialty crops from their gardens, and the vast majority reported donating produce for hunger relief.

Of low-income gardeners returning as KCCG members in 2015, 877 of 883 (99.3%) said that they successfully harvested produce from their gardens, 871 of 883 (98.6%) said that they ate more servings of fruits and vegetables due to gardening, and 873 of 883 (98.8%) said that they stayed more physically active due to gardening. The first measure indicates improved food security and greater access to healthy food in Kansas City through gardening, and the second measure demonstrates how support for local food systems for grant programs like the Specialty Crop Block Grant Program can lead to better nutrition in our communities.

Due to an expansion of the Swope Park greenhouse in 2014, KCCG was able to significantly increase our number of specialty crop transplants grown, from 80,880 in 2014 to 91,620 in 2015. More than 700 people attended KCCG workshops held at the Swope Park Community Garden, Independence Health Department, Ivanhoe Community Center, and other Missouri locations. With an average attendance of 20 per workshop, KCCG workshop attendance has increased in the past year due to increased visibility (social media, partnerships with key community leaders), and selected workshops drawing 40-50+ attendees.

Beneficiaries

Population Served

Of the 1,348 low-income Kansas City families participating in KCCG's Self-Help Gardening program (growing fresh fruits and vegetables with KCCG support) during the past year, 757 (56%) were African American, 453 (34%) were Caucasian, 43 (3%) were Asian, 93 (7%) were Hispanic, and 2 families (less than 1%) were Native American. Based on family sizes, the 1,348 families served represented 2,654 individuals of all ages, including many seniors, with 702 (52%) of gardeners over the age of 60 and including 22 gardeners over the age of 90.

Helping Families and Communities Grow Fresh Produce

The goal of the Home and Community Gardening Kansas City project was to increase production of specialty food crops, including vegetables, fruit, and cooking herbs, in the Kansas City metropolitan area through community and home gardening. This project directly supported KCCG's efforts to purchase specialty crop items (seeds, fruit trees and plants, onion sets, garlic bulbs) and related supplies, combined with relevant education and support to make the process of growing fruits and vegetables easier for hundreds of participating gardeners.

With Specialty Crop Block Grant funds, KCCG provides educational workshops that create a new generation of knowledgeable specialty crop producers, while supporting both families and community-based organizations that are focused on distributing produce for hunger prevention and relief. Although KCCG serves families and organizations with an interest in producing homegrown produce for market,

the central focus of our service to Missouri Community Partner Gardens through this project is to help neighborhood and community groups grow and donate produce that helps to feed families and raise the nutritional profile of the food available through Kansas City's food pantries.

The Community Health Impact of Gardening

In addition to the nutritional benefits of garden-fresh fruits and vegetables, some of the many health and environmental benefits of gardening include:

• Providing physical activity, enjoyment, and opportunities for horticultural therapy for youth, seniors, traumatized populations, and others served by KCCG.

• Providing a foundation for lifelong healthy eating habits for youth and adults of all ages who learn the importance of fresh fruits and vegetables to a healthy diet by participating in youth gardens and other community garden projects.

• Helping to transform the environment and local food system by incorporating organic production methods, using fewer chemical fertilizers and pesticides, greening urban spaces, and reducing the amount of fuel used to transport produce long distances to market.

• Providing opportunities for faith-based hunger relief, including providing fresh produce for faith-based food pantries and other community-based anti-hunger initiatives.

Community gardens are building community everywhere in Kansas City, bringing together people of all ethnicities and socioeconomic backgrounds as they garden side by side. KCCG's Community Partner Gardens serve refugees and other recent immigrants, homeless individuals and families, veterans, at-risk youth, survivors of domestic violence, and many other diverse populations. Some of the many community garden groups participating include: youth gardening projects like the Kansas City Police Athletic League garden; community and faith-based groups like the Pendleton Heights Neighborhood Association and Hope Faith Ministries' Paseo West Community Garden; congregations including Morningstar Missionary Baptist Church; hospitals and universities such as the Kansas City Veterans Affairs Medical Center; nonprofit organizations like Mattie Rhodes Center and Harvesters; and corporations like DST Systems and Arvest Bank.

<u>Lessons Learned</u>

Although many people have the passion and community connections to start community gardens, they often lack the practical skills. KCCG has witnessed many garden groups face frustration as they till and plant too much land and plant it in a disorganized way. With technical assistance from KCCG, community gardeners can grow more food. Although neighborhood and city leaders are often eager to turn vacant lots into productive growing space, several barriers exist. First, neighborhood buy-in is essential. Second, there are often infrastructure barriers that make gardening on vacant lots difficult, such as water access, too many trees, poor soil (including remnants of old houses), or uneven land. KCCG has taken steps to try and reduce these barriers, including networking with leaders in a large number of neighborhoods across the city, advocating for and implementing water access programs (KC Grow in partnership with the City of Kansas City, MO, which provides funding and water audits administered by KCCG staff, and H20 to Grow in partnership with the Unified Government of Wyandotte County), and providing community groups with access to compost through the Get Growing KC mini-grants program supported by the Health Care Foundation of Greater Kansas City and with other grant funding.

Contact Person

Ben Sharda, KCCG's Executive Director, oversees the *Home and Community Gardening* Specialty Crop Block Grant project. Mr. Sharda can be reached with questions at (816) 931-3877 or Ben@kccg.org.

Additional Information

KANSAS CITY COMMUNITY GARDENS

The Seeder's Digest

Annual Seed and Plant Edition

2015

6917 Kensington Kansas City, Missouri 64132 (816) 931-3877 www.kccg.org JANUARY 2015

ORDER BERRY PLANTS AND FRUIT TREES THROUGH KCCG NOW!!

Now is the time to order bare-root fruit trees and berry plants through KCCG. See ordering information on pages 10-11. **Order your fruit plants soon, as varieties sell out quickly. In order to insure equitable sales we reserve the right to limit order quantities on certain items.** Variety description info is also available on our website, kccg.org, and at our office.

KCCG OFFICE WILL BE OPEN SATURDAY MORNINGS THIS SPRING

The Kansas City Community Gardens office will be open on Saturday mornings from 9am to 12pm starting Saturday, March 28th continuing thru Saturday, May 16th. Regular office hours are Monday through Friday from 9am to 5pm.

Straw Bales for Sale

KCCG will again have straw bales available for sale starting mid-March, at the KCCG office, 6917 Kensington, for 2015 KCCG members. $5.00 per bale.

COOL SEASON VEGETABLE PLANTS ON SALE MARCH 24TH

at 6917 Kensington

Broccoli, Brussels Sprouts, Cabbage, Cauliflower, Collards, Kale, Lettuce, Onion and Leek Plants

Must have a 2015 KCCG Membership Card to purchase plants.

Organic Fertilizer for Sale

Back by popular demand!! KCCG will be selling organic fertilizer in the form of pelletized chicken manure. 2015 Members receive 10lbs with their membership and will be able to purchase additional quantities. All quantities are self-serve.

10 lb. bag - Green Card Members $2
- Yellow Card Members $4

5 gal. bucket (34lbs) - Green Card Members $5
- Yellow Card Members $10

Bring your own 5 gallon bucket or purchase a large bag for $1.50.

Home Garden Tilling Services Available for KCK and Jackson County Green Card Members

KCCG has expanded its tilling services to include KCCG Green Card members in Jackson County (including Grandview and Independence) and in Wyandotte County. KCCG will continue to offer tilling services to Green Card Members in Kansas City, MO. Tilling is done on a first-come, first-served basis, and is available at a low cost (between $8-$25). You must present proof of income to sign up for tilling. If you are interested in having your home garden tilled come in to our offices to sign-up. For more information, contact Earlene at 816-931-3877 or earlene@kccg.org.

GARDENER'S EXTRAVAGANZA

Thursday
February 12th
7am-7pm

Don't wait until tomato time to sign up for your KCCG membership. Get a jump on the gardening season and join us for food, fun, and kid's activities at our 2nd annual Sign up Extravaganza. We will have free food and giveaways throughout the day. Anyone who signs up on or before February 12th will be entered in a raffle to win: a cedar wood raised bed, KCCG t-shirt, KCCG ball cap, garden tools, and a $25 gift certificate to KCCG. Join us for this special event during our extended hours (7am-7pm) and kick start your gardening in the new year!

Call 816-931-3877 for more information.

Looking For a Place to Garden?

We have plots and raised beds available for rent at:

- Ivanhoe/Richardson Community Garden (36th and Park, KCMO)
- Eastwood Hills Community Garden (8100 Ozark Rd, KCMO– East of I-435)
- Kauffman Community Garden (48th & Troost-Next to Discovery Center)
- Prospect Community Garden (5008 Prospect, KCMO)
- Northrup Park Community Garden (10th and Grandview, KC,KS)

If you are interested in renting a plot or a bed this season, contact Earlene at 816-931-3877 or earlene@kccg.org

Want to Start a Community or Group Garden?? KCCG Can Help!!!

Sign up your garden as a Community Partner Garden for access to resources such as garden planning, tilling, seeds, plants, fertilizer and other garden supplies and technical assistance for a low cost. Call Andrea at 816-931-3877 or email andrea@kccg.org for more information.

Hands-on Workshops

New for 2015! This year KCCG will be hosting a series of hands-on workshops that will walk you through the gardening seasons while teaching important garden skills. From planting to watering, to identifying insects to harvesting, we will work and learn together in our Swope Park Demonstration Garden. The workshops will be held on the last Thursday of the month, March – August at 6:00pm (5:00pm on March 26 to give us enough light). See the workshop schedule and descriptions on the following pages for more information.

KCCG Satellite Seed and Plant Distribution Site Schedule

Gardeners in Kansas City, KS and Independence, MO will be able to sign up for membership and pick up their own seeds and plants through a local distribution site.

Kansas City, Kansas
Northrup Park Community Garden
939 Barnett (10th and Grandview)
Kansas City, KS 66101
Monday
March 30
4:30 PM-6:00 PM

La Placita Market- Look for the KCCG table
11th and Central Avenue
KC, KS 66102
Saturdays
May 9, May 23, August 8
11:00 AM- 1:00 PM

Independence, MO
Independence Health Department
515 S. Liberty
Independence, MO 64050
Thursdays
March 26, April 30, May 21, August 13
Contact Joanie Shover at 816-325-7767 or jshover@indepmo.org for more information.

Kansas City Community Gardens
2015 Workshop Schedule

All workshops are approximately 1.5 hours. Workshop space is limited. Please register online at www.kccg.org/register or call 816-931-3877.

Swope Park Workshops: 6917 Kensington Kansas City, MO 64132 (in Swope Park by the KC Zoo)

February	**6**	Friday	12:00 PM	Selecting, Planting and Caring for Fruit Trees
	13	Friday	12:00 PM	Selecting, Planting and Caring for Berry Plants
	20	Friday	12:00 PM	Kick-Start Your Garden: Planting Early Spring Crops
	21	Saturday	9:00 AM	Get Growing a Community Garden
	27	Friday	12:00 PM	Vegetable Garden Basics
March	**2**	Monday	6:00 PM	Selecting, Planting and Caring for Fruit Trees and Berry Plants
	6	Friday	12:00 PM	Raised Bed Gardening
	7	Saturday	10:30 AM	Planning and Planting Your Schoolyard Garden
	13	Friday	12:00PM	Planning Your Plot for Garden Success
	26	Thursday	5:00 PM	Hands-on Series #1 - Spring Planting in the Garden
	27	Friday	12:00 PM	Cooking with Spring's Greens
April	**3**	Friday	12:00 PM	Planting and Caring for Vine Crops
	10	Friday	12:00 PM	Tomatoes, Peppers and Sweet Potatoes - Oh My!
	14	Tuesday	5:00 PM	Tips and Tricks for a Successful Schoolyard Garden
	17	Friday	12:00 PM	Popular Garden Trends
	30	Thursday	6:00 PM	Hands-on Series #2 - Summer Planting in the Garden
May	**8**	Friday	12:00 PM	What's Really Bugging You? Insects in the Garden
	9	Saturday	10:00 AM	Gardening with Your Family
	15	Friday	12:00 PM	Keep Out! Best Practices for Deterring Animal Pests
	28	Thursday	6:00 PM	Hands-on Series #3 - Get Growing: Water in the Garden
June	**5**	Friday	12:00 PM	Freeze! Your Garden Produce
	25	Thursday	6:00 PM	Hands-on Series #4 - Insects in the Garden- Swope Community Garden
July	**17**	Friday	12:00 PM	The Ins and Outs of Fall Gardening
	24	Friday	12:00 PM	Growing and Cooking with Herbs
	30	Thursday	6:00 PM	Hands-on Series #5 - Fall Planting in the Garden
August	**21**	Friday	12:00 PM	Extending the Garden Season
	27	Thursday	6:00 PM	Hands-on Series #6 - Harvesting from the Garden
	28	Friday	12:00 PM	Cooking with Summer's Bounty
October	**9**	Friday	12:00 PM	Vegetable Garden Basics
	16	Friday	12:00 PM	Cooking with Autumn's Harvest
	23	Friday	12:00 PM	Starting Seedlings Under Lights
	30	Friday	12:00 PM	Selecting, Planting and Caring for Fruit Trees and Berry Plants

Independence Workshops: St. Paul's United Methodist Church, 3601 S. Sterling Independence, MO 64052

February	**23**	Monday	6:00 PM	Kick-Start Your Garden: Planting Early Spring Crops

Independence Workshops: Independence Health Department, 515 S. Liberty St. Independence, MO 64050

March	**16**	Monday	6:00 PM	Vegetable Garden Basics
April	**13**	Monday	6:00 PM	Tomatoes, Peppers and Sweet Potatoes - Oh My!
May	**18**	Monday	6:00 PM	Get Growing: Water
June	**15**	Monday	6:00 PM	What's Really Bugging You? Insects in the Garden - Hands-on at: White Oak Community Garden 136 E. White Oak Independence, MO 64050
August	**3**	Monday	6:00 PM	The Ins and Outs of Fall Gardening

Kansas City, KS Workshops: Rosedale Development Association, 1403 Southwest Blvd. Kansas City, KS 66103

February	**3**	Tuesday	6:00 PM	Planning Your Plot for Garden Success
March	**3**	Tuesday	6:00 PM	Raised Bed Gardening
April	**7**	Tuesday	6:00 PM	Tomatoes, Peppers and Sweet Potatoes - Oh My!
July	**7**	Tuesday	6:00 PM	What's Really Bugging You? Insects in the Garden - Hands-on at: Minnie St. Community Garden 4130 Minnie Street Kansas City, KS 66103
August	**4**	Tuesday	6:00 PM	Cooking with Summer's Bounty

Ivanhoe Community Center Workshops: 3700 Woodland Kansas City, MO 64109

February	**10**	Tuesday	5:30 PM	Planning Your Plot for Garden Success
March	**10**	Tuesday	5:30 PM	Kick-Start Your Garden: Planting Early Spring Crops
April	**14**	Tuesday	5:30 PM	Tomatoes, Peppers and Sweet Potatoes - Oh My!
August	**11**	Tuesday	5:30 PM	Growing and Cooking with Herbs
October	**13**	Tuesday	5:30 PM	Starting Seedlings Under Lights

2015 KCCG Workshop Descriptions

Cooking with Autumn's Harvest: 50 pounds of sweet potatoes, trash bags of greens- no problem! Learn fun and creative ideas for cooking with fall garden veggies, including sweet potatoes, collards, spinach, cabbage and root vegetables. This workshop features cooking demonstrations and recipes. Come hungry!

Cooking with Spring's Greens: Everyone is talking about super foods - kale, collards and other leafy greens - but not everyone knows how to prepare them. Come learn some easy and delicious recipes. You will also learn how to put together simple salad dressings. We will focus on whatever produce is ready to harvest. Come ready to sample some delicious foods.

Cooking with Summer's Bounty: Learn how to prepare the beautiful, fresh produce that you have harvested from your garden. Don't know what to do with Swiss chard? Have zucchini coming out of your ears? No problem. Come sample some creative and healthy veggie recipes featuring summer produce. Bring your appetite!

Extending the Garden Season: Harvest from Your garden through the fall and into the winter. This workshop will discuss season-extension techniques, such as row covers and cold frames. We will also discuss how to get your garden started earlier in the spring.

Freeze! Your Garden Produce: Freezing is one of the easiest, cheapest and safest ways to preserve many crops harvested from your garden, including beans, peppers, tomatoes, collards and corn. Find out which of your garden's crops store well in the freezer. We will demonstrate best methods for some of the most popular and abundant crops.

Gardening with Your Family: Bring your family to this hands-on workshop featuring easy gardening methods that involve every member of the family. As you visit several demonstration stations, you will learn how to make a garden in your own back yard, select seeds and plants that kids love to plant, pick and eat, test out some kid-friendly recipes made with garden produce, and make some garden art. Bring your kids! Fun for the whole family!

Get Growing a Community Garden: This workshop is essential for anyone thinking of starting a community garden or wanting to expand or improve their existing community garden. Attend one or all sessions.
9:00am-10:00am- How to Start a Community Partner Garden
10:00am-11:00am- Making Your Community Partner Garden Successful
11:00am-12:00pm- Special Enhancements for Community Partner Gardens

Get Growing: Water
Water is essential for healthy, productive crops. Learn the science behind the water needs for your plants and hear about the different ways farmers and gardeners are accessing water throughout the city. We will talk about rain water catchment systems, water meters, and water conservation.

Growing and Cooking with Herbs
Fresh herbs are a tasty and healthy way to enhance your cooking. Learn the best ways to grow and preserve the most popular varieties of herbs. We will cook with several easy-to-grow herbs. Bring your appetite!

Hands-on Series: #1 Spring Planting in the Garden, #2 Summer Planting in the Garden, #3 Get Growing: Water in the Garden, #4 Insects in the Garden, #5 Fall Planting in the Garden, #6 Harvesting the Garden

Keep Out! Best Practices for Deterring Animal Pests: How do I keep the squirrels out of my tomatoes? Voles out of my sweet potatoes? Although there are no sure-fire solutions to keep pesky pests out of your garden, this workshop will discuss best practices for deterring animal pests.

Kick-Start Your Garden: Planting Early Spring Crops: Give in to your spring gardening fever and get outside to plant a spring vegetable garden. Learn about selecting, planting and caring for vegetables that thrive in the cool spring weather.

Planning Your Plot for Garden Success: Find out how creating a planting plan for Your garden plot can help you maximize garden space, get more of the vegetables that you love and save you time and money. KCCG has developed some great new tools to help you create a garden plan and shopping list for spring, summer and fall.

Planning and Planting Your Schoolyard Garden: Designed for teachers or school staff who have or are planning to start a school garden, this workshop will cover the basic gardening knowledge needed for planning and planting Your spring and summer school garden. Plant selection, tips for planting and garden management will all be discussed. We will also highlight ideas for fun garden activities and demonstrate garden-based lessons.

Planting and Caring for Vine Crops: Gardeners are often discouraged about the amount of produce they get from vine crops planted in their gardens. This workshop will discuss methods for increased fruit production, including variety selection, ideal planting dates and disease and insect control.

Popular Garden Trends: What gardening methods are best? Should I or shouldn't I be tilling my garden? Is square foot gardening best for raised beds? With the rising popularity of vegetable gardening, comes a tide of different garden trends. In this workshop we will discuss the merits and limitations of several different gardening trends as well as many age-old gardening myths.

Raised Bed Gardening: Discover the many benefits of raised bed gardening. Learn how to construct your own raised beds and how to plant in them for maximum efficiency.

Selecting, Planting and Caring for Berry Plants: Grow your own berries right in your own backyard! Learn about the different varieties of fruit-bearing shrubs and how to care for them to produce healthy, high-yielding plants. We will focus on strawberries, blackberries and raspberries, but will discuss other fruit plants as well.

Selecting, Planting and Caring for Fruit Trees: Fruit trees are a great addition to your garden! Learn what varieties are best for this area and how to plant and care for them to get a bountiful harvest. We will focus on the major fruit trees for this area (apple, peach, cherry and pear) but will also cover exotic fruit trees.

Selecting, Planting and Caring for Fruit Trees and Berry Plants: Join us for a special combined workshop on growing fruit trees and berry plants Hour One- Selecting, Planting and Caring for Fruit Trees. Hour Two- Selecting, Planting and Caring for Berry Plants

Starting Seedlings Under Lights: Start your own vegetable plants from seed at home under lights! Learn how to use a grow light unit to successfully prepare for, plant and maintain seedlings that can be transplanted into your garden.

The Ins and Outs of Fall Gardening: Gardening doesn't end with tomatoes and zucchini. Don't miss Kansas City's bountiful third gardening season. You can plant in July and August for a delicious fall garden harvest! Learn the details of what and when to plant for best results.

Tips and Tricks for a Successful Schoolyard Garden: Your spring schoolyard garden is planted... what's next? Join us as we reveal tips and tricks for you and your students as you work at maintaining your growing garden. We'll discuss methods for thinning, watering, weeding, and mulching as we demonstrate in raised beds. Active participation will be encouraged!

Tomatoes, Peppers and Sweet Potatoes - Oh My! Are you overwhelmed by the number of tomato varieties available? Are you confused about heirloom tomatoes? Do your pepper plants not produce as many peppers as you would like? Are you disappointed when you dig up your sweet potatoes? Come learn how to select, plant and care for tomatoes, peppers and sweet potatoes.

Vegetable Garden Basics: This workshop is helpful for beginning and experienced gardeners. Learn the fundamentals of successful vegetable gardening including: site selection, soil improvement and preparation, garden planning, planting techniques, variety selection, garden maintenance and harvesting.

What's Really Bugging You? Insects in the Garden: Do you ever wonder whether the insects in your garden are helping or harming your plants? Learn about the common insects found in our area so that you can identify garden pests as well as the beneficial insects. We will also discuss how to control problem insects.

2015 SEED LISTING

BEAN, BUSH

Blue Lake: (bush) 55 days. Vigorous, branching plants produce heavy yields under adverse conditions. Pods are slow to form seeds or fiber. A classic canning and freezing bean.

Cherokee Yellow Wax: (bush) 51 days. Pale yellow pods on vigorous, hardy, 16-18" bushes.

Kentucky Wonder: (bush) 56 days. Bears a week earlier than pole variety. Long-bearing plants with stringless pods.

Provider: (bush) 50 days. The most popular early green bean. 5" long, medium green fleshy round pods. Adapted to diverse locations, soil, and climate conditions.

Royal Burgundy: (bush) 54 days. Vigorous, erect, 15–20" high bushes with high yields of 5" purple pods which turn green when cooked. Good for colder soils, resistant to bean beetle.

BEAN, LIMA

Henderson Lima: (bush) 66 days. An old favorite baby lima bean. Bears 3.5" pods till frost.

Jackson Wonder Lima Butterbean: (bush) 66 days. A good hot weather bean. 2' tall bushes have high yields of broad pods. Shell out for fresh or dry for winter use.

Soybean (Green) Butterbeans: (bush) 90 days. Sweet buttery taste. 2' stocky, well-branched high-yielding plants. Edamame type soybean

Speckled Lima Butterbean: (pole) 80 days. Large quarter-sized seeds. Light cream colored with bright red specks. Buttery flavored beans, delicious fresh and maintains flavor canned or frozen. Tremendous yield.

BEAN, POLE

Asparagus Yard Long: (pole) 80 days. Plants grow to 10' and produce an astonishing yield of slender, extremely tasty 2-3' long pods.

Blue Lake: (pole) 55 days. Famous pole bean variety with excellent freezing and canning qualities. Tender, round, meaty pods on vigorous, heavy-yielding plants.

Kentucky Wonder: (pole) 63 days. Old fashioned favorite. Vigorous 60-84" vines with high, extended yields. Rust resistant. Pods are flat when mature.

BEETS

Early Wonder Tall Top: 45 days. Earliest beets and greens. Large vigorous tops. Tall bright, glossy green, red-veined tops, slightly flattened red roots.

Detroit Dark Red: 45–70 days. 2.5–3" globe roots of blood-red color. For canning and fresh use.

CANTALOUPE (muskmelon)

Delicious 51: 81 days. Early large fruits, 4-5 lbs. Good flavor, thick orange-salmon flesh. Fusarium wilt resistant.

Hale's Best No. 36 Cantaloupe: 80 days. The fruit is highly flavored, beautiful and solidly netted, little if any suture and no ribs. Salmon colored flesh. Fruit 2.5-3 lbs, uniform in size, slight oval shape.

CARROTS

Nantes: 62-70 days. Small 10-12" tops with 6.5" x 1" bright red-orange blunt roots. Good fresh or frozen.

Royal Chantenay: 65 days. Cylindrical 6" roots for heavy or shallow soils. Tops are sturdy, 15–20." Dependable heavy yields.

COLLARDS

Georgia: 70 days. Old standard, 36" spreading plants, large, cabbage-like blue-green, slightly crumpled leaves; heat and poor soil tolerant, slow to bolt.

CORN

Argent: 85 days. 8.5 – 9" ears with 14-16 rows of fine white kernels, tender sweet creamy texture, with a superior package and husk protection. (hybrid)

Bodacious: 75 days. An extremely high quality yellow corn. Very sweet and tender. Plants are 87" tall with 8" long ears. (hybrid)

Peaches & Cream: 70 days. Matures early in the season, 8.5" long ears with petite, bi-colored kernels. (hybrid)

Robust: (popcorn) 110 days. Early maturing gourmet yellow popcorn. 7' tall plants with 1-2 ears per plant. (hybrid)

CUCUMBER

Marketmore 76: 56 days. Long, slender, dark green slicing cucumbers on short, space-saving vines. Disease resistant.

National Pickling: 57 days. Fruit slightly tapered, about 6-7" long. Medium dark green color.

GREENS (Misc.)

Astro Arugula: 38 days. Peppery flavored, cool-season, salad green. Early, heat tolerant, strap leaf variety. Mild flavor, best when picked young.

Tatsoi: 45 days. Leaves form a compact, thick rosette. Long harvest period. Mild taste for salads, stir-fries, etc.

KALE

Vates Blue Curled: 56 days. Standard blue/green curled. Plants are 14" tall.

KOHLRABI

Early White Vienna: 50 days. Uniform plant with short top and few leaves. Stems mature quickly, harvest at 2" in diameter.

LETTUCE

Allstar Gourmet Mix: 28 days. Includes varieties such as: Outrageous, Tango Dark, Lolla Rossa and others. Ruffled edges and unique leaf shapes with darker reds and green.

Buttercrunch: 60 days. Boston type or loosehead. Larger and more heat tolerant than Bibb, slower to bolt, stands at least 2 weeks longer without bolting. Leaves are thick, crisp, and tender.

KCCG 30th Anniversary Gourmet Lettuce Blend: 30 – 60 days. This custom blend of our favorite lettuces was specially chosen to celebrate the 30th Anniversary of KCCG. It includes 11 great tasting premium lettuce varieties (Cimmaron, Red Salad Bowl, Salad Bowl, Oakleaf Royal, Red Sails, Buttercrunch, Tango, Ruby Red, Canasta, Four Seasons) with great diversity of color and texture.

Ruby Red: 40 days. A red leaf lettuce that has bright red, glossy and crumbled leaves.

Salad Bowl: 45 days. A green leaf lettuce that is sweet and crisp. Ruffled leaves and slow to bolt.

MUSTARD

Curly Leaf: 55 days. Bright green leaves are crumpled and heavily curled. Upright plants are slow to bolt. Strong mustard flavor.

Florida Broadleaf: 50 days. Early, fast-growing variety for processing, market, and home gardening. Large, upright plants 10" high, deep green, oval-shaped, smooth leaves.

Red Giant Mustard: 45 days. Very attractive plant with reddish leaves. Can be harvested either as a 6" plant or allowed to grow to 17". Has a mild, mustard flavor. Sow spring through fall. Slow bolting.

Tendergreen Mustard: 40 days. Large plants, quick growing. Leaves are oblong, thick, fairly smooth, and dark green. Mustard-spinach flavor.

OKRA

Burgundy: 55 days. Bears moderate amounts of red pods on tall plants. Pods turn green when cooked.

Clemson Spineless: 55 days. The most popular okra variety available. Plants are 4-6' tall with straight, deep green, spineless pods.

Dwarf Green Long Pod: 50 days. Pods are bright green, ridged and tapered and tend to be more slender than the Clemson Spineless. Plant height is 3-4' tall.

PEAS, GREEN

Green Arrow: (English pea) 62 days. Vigorous vines (36" tall) with 8-11 bright green peas per pod. Sweet flavor. Resistant to mildew, Fusarium, and root rot.

Oregon Giant: (snow pea) 69 days. High yields of sweet, extra-large, flat pods. Tolerant to powdery mildew, common wilt and enation mosaic.

Super Sugar Snap: (snap pea) 64 days. Plump 2-3" long, round, slightly curved, fleshy green pods. Tall vines need support. Resistant to powdery mildew; tolerant to pea leaf roll virus.

PEAS, SOUTHERN (cowpea)

Blackeye: (cowpea) 60-78 days. Vigorous, high yielding 24-40" tall plants with 7-9" pods. 10-12 seeds per pod. Wilt resistant, excellent as a shell bean, or as a dry bean.

Black Crowder: (cowpea) 63 days. Long pods, prolific, and easy to shell. Seeds turn black when dry.

Brown Crowder: (cowpea) 60 days. Extra large, straw colored, red-tinged 7-9" long pods. Very productive plants. Easy to pick and shell.

Purple Hull: (cowpea) 50-78 days. Strong, vigorous vines. Excellent for cooking green or freezing. White pea with small purple eye. Two crops in a season in this region.

PUMPKIN

Connecticut Field: 110 days. Standard general purpose or large Halloween pumpkin. Hard, smooth, somewhat ribbed, deep orange pumpkin, weighing 15-25 lbs.

Small Sugar: 100 days. Averaging about 6-7 lbs. each, this is one of the standard smaller pumpkins. Good yields of deep orange pumpkins with high quality flesh.

RADISH

Cherry Belle: 20-30 days. Round, bright cherry red with white flesh. Root is about 1" in diameter, tops about 3" at harvest time. Keeps well.

White Icicle: 30 days. A uniform short top strain which forms 6" long roots very quickly. Flesh is white, crisp, and mild.

SPINACH

Bloomsdale Longstanding: 45 days. Heavy yields of crinkled, thick textured, glossy, dark green leaves. Slow to bolt.

Space: 39 days. Early and high yielding smooth leaf spinach. Big plants are upright and disease resistant. Long standing. (hybrid)

Tyee: 42 days. Upright growth habit with high bolt resistance and vigorous growth. A good choice for overwintering. (hybrid)

SQUASH, SUMMER

Bennings Green Tint: (summer squash) 49 days. Patty pan, 3x2.5" pale green, scalloped and spiny summer squash. Delicious raw and cooked.

Black Beauty Zucchini: (summer squash) 44 days. Bush type. Long, straight, slender fruit with slight ridges, black-green color. Flesh greenish white, with firm, fine delicate flavor. Pick when still tender, 6-8".

Yellow Crookneck: (summer squash) 58 days. Bears later than straightneck squash but yields consistently for the rest of the season. Bright yellow fruits are best picked when skin is still smooth and 4-6" long.

Yellow Straightneck, Early Prolific: (summer squash) 42-56 days. Fruit are uniform lemon yellow and straight. Best when picked at 4"-6".

SQUASH, WINTER

Buttercup: (winter squash) 100 days. Turban shaped squash measuring 4.5" diameter and weighing 4-5 lbs. Rind is dark green. Thick orange flesh. Excellent flavor and keeps well.

Spaghetti Squash: (winter squash) 88 days. An early-maturing type with ivory-colored skin turning pale yellow at maturity. Fork out the baked or boiled spaghetti-like flesh as a substitute for pasta.

Table Queen Acorn: (winter squash) 85 days. Acorn shaped, ribbed, thin-shelled, dark green fruits. 5.5" length, 4.5" diameter. Flesh is light yellow, bakes dry and sweet.

Waltham Butternut: (winter squash) 105 days. Uniform fruits averaging 9" long and weighing 4-5 lbs. Flowers later than other winter squashes, but fruits develop quickly and keep well long into the winter. Less attractive to squash bugs than some other winter squash.

SWISS CHARD

Fordhook Giant: 60 days. A tall, vigorous strain with broad dark leaves. Stems are thick and white. Tolerates hot weather well.

Ruby: 60 days. Similar to Fordhook but with ruby red stalks and veins.

TURNIP

Purple Top: 60 days. Produces round, purple topped 4" roots and abundant greens for early summer harvest.

Seven Top: 45-50 days. Used only for greens as roots are tough and woody.

Shogoin: 42 days. Produces white roots that should be used while still young and mild. Greens are tender and mild.

WATERMELON

Crimson Sweet: 96 days. Short, oval, light-green fruit with dark stripes, averaging 15-25 lbs. Tolerant to fusarium and anthracnose, dark red flesh, with high sugar content in a dry year. Small seeds.

Sugar Baby: 76 days. Round fruits 6-8" in diameter averaging 8-10 lbs. Ripe melons have very dark green rinds (except for a yellow belly) and sweet red flesh with small seeds.

Verona Black Diamond: 80 days. Early and productive with sweet red flesh. Large fruits average 30 lbs.

HERBS

Basil: An Italian large leaf sweet basil perfect for pesto. High yielding plant with up to 4" long dark green leaves.

Cilantro/Coriander: Aromatic, distinctively flavored annual herb. Prefers direct-seeding in a sunny location. Requires 7-10 days to germinate in cool soil. Slow to bolt, produces abundant cilantro foliage in a 14" plant. Allow seed pods to dry for use as coriander.

Curly-Leaf Parsley: Standard variety, easy to grow. Use in garnishes, salads, and cooking.

Dill: Direct-seed in sunny location and expect about 60% germination. Plant reaches about 3'.

FLOWERS

Cosmos: Old fashioned favorite, sensation mix with large single flowers, 3-4" across in shades of lavender, pink, magenta, and white. Large plants (48-54" tall) are easy to grow. Good for cut flowers.

Daisy, Gloriosa: Upright annual with large 3-5" single blooms of rich golden yellow or mahogany red. Requires full sun. Heat and drought resistant. Plant height 2-3'. Blooms from June to September.

Daisy, Shasta: Hardy perennial. White flowers with golden centers on single erect stems. Prefers full sun to partial shade in fertile soil. Plant height 2-3'. Blooms in June and July.

Dames Rocket: Hardy biennial. Lilac-purple flowers are concentrated at the end of 2-3' tall stalks. Sweet fragrances. Plant in well-drained soil in full sun or partial shade. Blooms in April and May.

Four O'Clocks: (Marvel of Peru) Grows 15-24" tall and produces 1" white, red or yellow flowers that open in late afternoon.

Giant Sunflower: Large single 8-12" blooms are produced on 7' plants. Large edible seeds.

Marigold, Crackerjack: A tall African type, better suited for cut flowers, growing about 30" tall. Large flowers are yellow, orange, and gold.

Marigold, Sparky: Dwarf French variety, good for border plantings. Mixed colors.

Nasturtium: A colorful, edible flower. Tolerant of poor soils and heat or cold. Big seeds are ideal for kids' gardens. Flower heads 2.5" across.

Sweet Alyssum: Hardy annual with dense clusters of tiny snow-white flowers. Compact plant of 8-12" height, heat and drought resistant. Grows in full sun to partial shade in almost any soil.

Zinnia: Early maturing, mildew-tolerant, 24" plants produce 4-5" multicolored flowers that are good for cutting.

GOURDS

Birdhouse: (95 days) 12" long gourds with narrow necks and a hard shell. Excellent for making birdhouses and crafts.

Small Mixed: (100 days) Produces a good yield of small size gourds of various shapes and colors. Excellent for making crafts, birdhouses, dippers, etc.

Seeds Available March 2nd

Kansas City Community Gardens Planting Calendar

These are the recommended planting dates for best results. Sometimes gardeners will have success planting a little earlier or later due to seasonal fluctuations. Grow from seed unless otherwise noted.

Arugula	3/15-4/25	Pepper (plants)	5/1-5/30
	8/1-8/20	Potato (seed potatoes)	3/15-4/10
Asparagus - perennial (plants)	4/1-4/20	Pumpkin	5/1-6/10
Bean, Bush	4/15-5/20	Radish	3/15-5/1
	7/25-8/10		8/1-8/25
Bean, Lima	5/5-5/25	Spinach	3/20-4/20
Bean, Pole	5/1-5/20		8/1-8/20
Beet	3/15-4/15	Squash, Summer	4/25-8/1
	8/1-8/10	Squash, Winter	4/25-5/30
Broccoli (plants)	3/20-4/10	Sweet Potato (plants)	5/10-6/10
	7/25-8/5	Swiss Chard	4/1-9/1
Brussels Sprouts (plants)	3/20-4/10	Tatsoi	3/15-5/1
Cabbage (plants)	3/20-4/20		8/1-8/30
	7/20-8/5	Tomatillo (seeds or plants)	5/1-5/25
Cantaloupe	5/1-5/20	Tomato (plants)	5/1-5/25
Carrot	3/15-4/5	Turnip	3/20-5/1
	7/20-8/5		7/20-8/15
Cauliflower (plants)	3/20-4/20	Watermelon	5/1-5/20
	7/20-8/5	**Herbs, Flowers and Miscellaneous**	
Collards (seeds or plants)	3/15-4/10	Basil (seeds or plants)	5/1-5/20
	7/25-8/20	Chives (seeds or plants)	3/15-5/1
Corn	4/25-7/1	Cilantro/Coriander (seeds or plants)	3/20-4/15
Cucumber	5/1-8/1		8/15-9/15
Eggplant (plants)	5/1- 5/25	Dill (seeds or plants)	4/20-5/15
Ground Cherry (seeds or plants)	5/1-5/25	French Sorrel (seeds or plants)	3/25-5/15
Garlic (bulbs)	11/15-12/15	Oregano (plants)	4/20-5/31
Kale (seeds or plants)	3/20-4/5	Parsley (seeds or plants)	3/20-4/20
	7/25-8/20	Rosemary (plants)	3/20-5/15
Kohlrabi	3/25-4/15	Sage (plants)	3/15-5/1
	7/25-8/5	Savory (plants)	4/15-5/30
Lettuce, Head (seeds or plants)	3/15-4/20	Thyme (plants)	4/20-5/31
	8/1-8/20	Cosmos	4/15-5/15
Lettuce, Leaf (seeds or plants)	3/15-5/10	Daisy (perennial)	4/1-6/15
	8/1-8/20	Dames Rocket	4/1-6/15
Mustard Greens	3/15-5/1		8/1-8/15
	8/1-8/30	Four O'Clocks	4/15-5/15
Okra	5/1-5/25	Marigold	4/15-5/15
Onion, for Bulb (sets or plants)	3/15-4/15	Nasturtium	4/15-5/15
Onion, for Green Onion (sets)	3/1-9/15	Sunflower	4/15-5/15
Peanut	4/25-5/10	Sweet Alyssum	3/15-4/15
Pea, Green - Snap, Snow, English (short vine varieties for fall planting)	3/15-4/10	Zinnia	4/15-5/15
	8/1-8/10	Gourds	5/1-5/20
Pea, Southern	4/25-5/15	Cotton	5/1-5/20

Kansas City Community Gardens – 6917 Kensington KCMO 64132 – 816-931-3877 – www.kccg.org

Book your Beanstalk tour for 2015 NOW

The Beanstalk opens June 15th and will close October 16th. Morning and afternoon tours are available from mid-June to mid-July and September until we close in October. During the heat of the summer, mid-July thru August, we will only be booking morning tours. Tour times book quickly, so email Earlene at earlene@kccg.org to book your tour today!!

MEMBERSHIP FEE INFORMATION

	*Green Card	Yellow Card	Non Member
Membership Fee	$ 2.00	$ 12.00	
Tilling (Green Card & CPG ONLY)			
Small Garden (less than 2,000 sq.ft.)	$ 8.00		
Large Garden (2,000 - 6,000 sq. ft.)	$ 15.00		
X-Large Garden (6,000 - 9,000 sq. ft.)	$ 23.00		
Tiller Rental Program	$ 8.00	$ 15.00	
Seeds (per package)	$ 0.20	$ 1.00	$ 1.50
Specialty Seeds (per package)	$ 1.00	$ 1.50	$ 2.00
Vegetable Plants	$ 1.00	$ 2.00	
Plot Rental Fees	$ 10.00	$ 25.00	
Bed Rental Fees	$ 8.00	$ 20.00	
Bed or Plot Deposits (per bed or plot)	$ 5.00	$ 5.00	

*** Green Card Members must meet income requirements.**

2015 PLANT LISTING

BROCCOLI

Arcadia (F1): 63 days. A rugged, vigorous broccoli with mid-late maturity. Big plants with heavy, very firm, dark green, domed heads with a unique "frosted" appearance. Tolerant of cold stress. Excellent side shoot production. (hybrid)

Goliath: 76 days. Huge 10-12" heads on short, 15", plants. Heads are medium green, fine beaded, crowned. Do not crowd.

Packman: 60 days. Large, semi-domed, tight beaded heads. Produces numerous side shoots after head is cut. (hybrid)

BRUSSELS SPROUTS

Diablo: 110 days. Tall plants produce heavy crops of smooth, medium-sized sprouts. Sprouts are solid and hold well in the field.

CABBAGE

Charmant: 65 days. Darker green, larger version of Stonehead. Upright plant habit and dense head forms slowly for extended cutting period. High quality fresh cabbage. Yellow tolerant.

Napa: 60 days. Light green leaves form a barrel shaped head of 4-6 lbs. Slow bolting and equally good for early spring and fall crops. (hybrid)

Red Express: 63 days. Extra early, red compact plants, solid 2-4 lb. heads with good appearance and flavor. Relatively split resistant. (hybrid)

Savoy Ace: 73 days. Deep green color wrinkled leaves, tolerant to cold, tender and sweet. (hybrid)

Stonehead: 67 days. A very popular mid-season variety. Very solid heads average 4 lbs. More resistant to splitting. Yellow tolerant. (hybrid)

CAULIFLOWER

Snow Crown: 50 days. Well rounded solid white heads average 2 lbs. apiece and measure up to 7.5" across with good depth. Plants are vigorous and very uniform in size. (hybrid)

COLLARDS

Georgia: 70 days. The old standard. Large plants spread 36", cabbage-like blue-green, slightly crumpled leaves, heat and poor soil tolerant, slow to bolt.

Top Bunch: 50 days. Earliest to harvest. Tall productive plant produces medium green slightly blistered leaves. A Georgia-type hybrid with crinkled leaves.

EGGPLANT

Clara: 65 days. Large, white, Italian type. High yielding plants with early maturity. Fruits are 6-7" long by 4-5" wide. (hybrid)

Nadia: 67 days. Uniform dark purple fruits with green calyx, glossy and blemish free. Tall sturdy plants can set under cool conditions.

Orient Express: 58 days. Attractive, slender 8-10", glossy black fruits in long Oriental style. Ready up to 2 weeks before other early varieties. Tender, delicately flavored and quick cooking. (hybrid)

Ping Tung Long: 70 days. Heirloom Asian eggplant, prolific and early-producing. Glossy purple fruits are slender, 12-18" long and 1-2" wide. Potential yield of 20 fruits per plant, vigorous, disease and stress tolerant.

HERBS (sold individually, $.50 per plant)

Basil
Chives
Cilantro
Curly Leaf Parsley
Fern Leaf Dill
Flat Leaf Parsley
French Sorrel
Garlic Chives
Oregano
Rosemary
Sage
Summer Savory
Thai Basil
Thyme

KALE

Nero Di Toscana: 50 days. Dark green 3" wide and 10" long leaves with a blistered surface. Excellent kale for fall production. Cross between cabbage and kale, more cold-hardy than other varieties. Best and sweetest flavor after a frost.

Redbor: 55 days. Similar to Winterbor but purple-red. Flavor, color, and curling are enhanced by cold weather. (hybrid)

Winterbor: 60 days. Plants grow 2-3' tall and have excellent cold hardiness. Large numbers of curled blue-green leaves. Plants regrow vigorously after harvesting. (hybrid)

LETTUCE

Buttercrunch: 60 days. Boston type or loosehead. Larger and more heat tolerant than Bibb, slower to bolt. Leaves are thick, crisp and tender.

Canasta: 58 days. Crisp, full-flavored and exceptionally bolt resistant head lettuce. Large, ruffled, yellow-green leaves, lightly tinged with red.

Coastal Star: 57 days. Large green romaine lettuce with excellent heat tolerance.

Red Cross: 48 days. A large, dark red leafed butterhead lettuce. Great for spring and fall crops.

LEEKS (bundles of 25, $2 per bundle)

Lancelot: 75 days. Great for soups, salads and roasting. Leeks are not day length sensitive as long as you keep blanching (throwing dirt on the shaft) they will continue to grow. 12-14" shafts and that have excellent flavor.

ONION (bundles of 60, $2.50 per bundle)

Candy: (yellow) 90 days. Successfully grown in any area. Unique, sweet and mild flavor, early maturity, jumbo bulb size. Stores 3 months. (hybrid)

Candy Apple: (red) 100 days. Sweet at harvest becomes more pungent during storage. Stores 4-6 months. (hybrid)

Superstar: (white) 100 days. Earlier, milder, sweeter, larger, and more widely adapted than other white onions. Easiest variety to grow for large onions. (hybrid)

Intermediate Day Sampler: 90-100 days. Assorted bundle of Candy (Yellow), Candy Apple (Red), and Superstar.

HOT PEPPERS

Anaheim: 68 days: Mildly hot, meaty, referred to as "chiles". Plants grow 30" tall and yield an abundance of 7-8" long chiles with a shiny green color or ripening to a mellow red color. An easy pepper to grow. (open pollinated)

Ancho San Martin: 75 days. Larger size, early maturity and great production. Thick-fleshed peppers, mature to 5" length and 3" width. (hybrid)

Cayenne: 75 days. Thin tapered fiery hot standard, 6" curved fruit ripen from dark green to crimson red. (open pollinated)

Habanero: 90 days. Extremely hot small fruit start out light green and ripen orange. Handle with extreme caution. (open pollinated)

Hot Hungarian Yellow Wax: 60 days. A yellow, medium hot variety. Fruit average 6-7" long and slightly tapered. (open pollinated)

Jalapeno: 70 days. Classic, medium hot pepper, small fruit can be used in almost any kind of cooking. Keeps well in a multitude of ways. (open pollinated)

Serrano Del Sol: 75 days. Strong plants that load up early with dozens of fruit that are twice the size of a regular Serrano Chile. (open pollinated)

BELL PEPPERS

Ace: 50 days. Amazing extra-early yields of small to medium sized green bell peppers. Ripens red. (hybrid)

Big Bertha: 72 days. Huge thick-walled fruits, 6-7" long, 4" across. Dark green, ripening to red, and tender. Vigorous plants bear heavily. (hybrid)

Early Sunsation: 70 days. Big blocky bell peppers, 4" long and nearly as wide, smooth and consistently well-shaped. Plants are tolerant to most pepper virus diseases and 3 races of bacterial spot. Extra sweet when fully yellow. (hybrid)

Gypsy: 50 days. Very early and prolific pepper. Fruits are wedge shaped, 2-3 lobes, 3-4" long, greenish yellow turning to orange red. Compact plants. (hybrid)

Orange Sun: 80 days. Beautiful deep orange bell pepper is 4-5" long and not quite as wide. Thick walls and very sweet flavor. (hybrid)

Red Knight: 55 days green, 75 days red. Big, blocky, thick walled, fruit and sweet. King Arthur type with better disease resistance in more compact, open plant. (hybrid)

SWEET PEPPERS

Bounty: 65 days. A larger, more-vigorous, banana type pepper. Fruits are 8-10" long, sweet and delicious. (hybrid)

Carmen: 60 days green, 80 days red. Italian frying pepper with sweet taste for salads and roasting when fully red. Tapered fruits 6" long x 2" wide. Matures early on an upright, medium plant. (hybrid)

Lipstick: 53 days. Shiny cone-shaped fruit ripen early to red. Thick and juicy fruit are extremely sweet when ripe. Delicious for eating out of hand. (open pollinated)

Sweet Banana: 72 days. Long, tapered fruits with thin walls are light green and ripen red. (open pollinated)

Sweet Pickles: 75 days. Short plants that produce an abundance of 2-3" cone shaped sweet peppers. All colors, yellow, orange, red and purple are on the plant at the same time. Makes excellent pickled peppers. (open pollinated)

TOMATOES

Beefmaster: 80 days. (VFNASt) One of the most popular hybrid beefsteak-types, with improved disease resistance. Solid, meaty, bright red tomatoes weigh up to 2 lbs. Better yields, larger fruits and good tolerance to cracking and splitting. (indeterminate) (hybrid)

Better Boy: 75 days. (VFN) Rugged vines produce large crops of bright red, 12-16 oz. smooth, flavorful fruit. Has better disease resistance than Big Boy. Firm and perfect for slicing. (indeterminate) (hybrid)

Big Beef: 73 days. (VFFNTAst) Extra-large, juicy red fruits, approximately 10-12 oz. Very heavy yield. (indeterminate) (hybrid)

Big Boy: 78 days. A classic tomato, large fruits, up to 2 lbs. with scarlet, smooth skin, thick walls, and fine flavor. Not disease resistant. (indeterminate) (hybrid)

Celebrity: 77 days. (VFNT) A good quality, very productive variety that performs well under a wide variety of conditions. Fruit average 3" in diameter and are fairly round. Fruit sets at all the same time. An excellent home garden variety. (determinate) (hybrid)

Early Girl: 55 days. (VFF) Early red slicing tomato yields heavy crops of 4-6 oz. fruit. (indeterminate) (hybrid)

Goliath: 65 days. (VFFNTAst) Smooth, bright red, deep oblate fruits averaging 10-15 oz. A sweet flavor that lives up to its virtually blemish free exterior. (indeterminate) (hybrid)

Jet Star: 72 days. (VF) Large, firm fruit. Heavy yield, delicious flavor. (indeterminate) (hybrid)

Lemon Boy: 72 days. (VFN) The first lemon yellow (not golden) tomato. Extremely vigorous plants produce large harvests of attractive fruit that weigh 8 oz. or more. Flavor is outstanding, mild and sweet, yet tangy. (indeterminate) (hybrid)

Super Marzano: 70 days. (VFNT) Large pear-shaped fruit are an average of 5" long. This improved Roma-type tomato is high in pectin, giving sauce and paste a natural thickness. Tall plants give large yields and are resistant to bacterial speck. (indeterminate) (hybrid)

Whopper: 70 days. (VFFNT) Large fruits are born early and over a long season. Good disease and crack resistance. Good flavor and texture. (indeterminate) (hybrid)

HEIRLOOM TOMATO

Arkansas Traveler: 76 days. Smooth, crack free. Rose pink 6-8oz. flattened globe tomatoes are mild and juicy. Healthy plants produce blemish-free fruit through the end of the season. (indeterminate)

Brandywine: 78 days. An old Amish variety famous for its great flavor. Large fruit with deep pink skin and red flesh. (indeterminate) (open-pollinated)

Black Trifele: 85 days. Produces a large number of pear-shaped, intensely purple-black colored fruits. The flavor is fantastic and slices are lovely on hamburgers or salad. (indeterminate)

Cherokee Purple: 72 days. Believed to be over 100 years old and originally from the Cherokee people. Juicy tomatoes with a very full flavor and plenty of tang. Medium-large, flattened globe fruits with a distinctly different color, dusky pink with darker pink/purple shoulders. (indeterminate) (open pollinated)

Rutgers VFA: 75 days. Has some disease resistance. Produces large crops of crack-free 6-8 oz. tomatoes with old-fashioned taste. Fruit sets all at the same time. (determinate)

CHERRY TOMATO

Black Cherry: 64 days. Sweet and robust, round fruits, almost black in color. Dynamic flavor, high-yielding. (indeterminate) (hybrid)

Sun Gold Cherry: 57 days. Tangerine-orange, sweet, intense fruity flavored tomatoes on high-yielding plants. (indeterminate) (hybrid)

Super Sweet 100: 70 days. (VF) Plants produce long strands of 100 or more super-sweet cherry tomatoes, measuring 1" in diameter. Extra-high in vitamin C. (indeterminate) (hybrid)

Sweet Chelsea: 67 days. (VFFNTA) Cherry tomato with large 2" super sweet fruit. Vigorous 3' plants should be staked. (indeterminate) (hybrid)

SPECIALTY PLANTS (sold individually, $.50 per plant)

Ground Cherry – Aunt Molly: 70 days. Small tomato-type fruit covered with a papery husk. Pick when the fruits fall to the ground. The flavor is intensely sweet with pineapple tones. Great in pies, sauces, and wonderful fresh.

Tomatillo – Toma Verde: 60 days. Early-maturing large, flat-round green fruits. Great for salsa and other Mexican recipes. (indeterminate)

Order Sweet Potato Plants Now!!!!

KCCG will be taking orders for Beauregard Sweet Potato Plants until Thursday, April 30. $2.00 per dozen

You can place your order when you pick up seeds, or email: contact@kccg.org. No money needed at time of order.

Funds for this project were provided through the Missouri Department of Agriculture and the USDA's Specialty Crop Block Grant Program.

KCCG also appreciates the support of the City of Kansas City, Missouri, the Unified Government of Wyandotte County, and the generosity of our many private donors for our work.

Warm Season Vegetable Plants on Sale April 28th

Tomatoes, Peppers, Eggplants, Tomatillos, Ground Cherries and Herbs

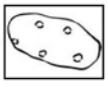
Must have a 2015 KCCG membership to purchase plants.

Seed Potatoes

Red Norland, Kennebec (White), Norkotah (Russet)
$2.50 per 5 pound bag or $.50 per pound

Onion Sets

Red, White,Yellow
$1.00 per pound



Will be available in the office starting March 9th.

2015 SPECIALTY SEEDS: "Seeds from the Beanstalk"

These specialty seeds are the same varieties of many of the special plants that we grow in the Beanstalk Children's Garden. Specialty seeds cost is $1.00 per pack for green card members, $1.50 per pack for yellow card members and $2.00 per pack for non-members. They cannot be counted in the 10 free seed packs you receive with your KCCG membership.

VEGETABLES

Bean, Bush 'Dragon's Tongue': 60-100 days. An old, dual purpose French variety snap bean (Dragon Langerie), with gorgeous pods yellow streaked with purple. Pods turn all yellow after cooking. Delicious as shell beans too.

Bean, Yardlong 'Red Noodle': 85 days. Beans grow 16-20" long and are as slender as a pencil. The burgundy color stands out on the plants. Young pods are sweet with an intense flavor. Older pods can be shelled for traditional southern peas. Plants produce heavily with up to 4 pods in a cluster.

Beet 'Red and Golden Blend': 40 - 70 days. This unique blend allows you to have dark red, bright red, golden and striped beets all from one planting.

Carrot 'Mokum': 54 days. Early Nantes type hybrid. A short, very early carrot that has a great sweet flavor. It matures quickly making it ideal for early spring or fall gardens. Tops are shorter than other varieties.

Carrot 'Rainbow Blend': 60 days. Mix of purple, yellow, white, red and orange carrots in a beautiful blend.

Cucumber 'County Fair': 52 days. An early cucumber with a high yield of 3-4" long fruit ideal for both pickles and eating fresh. Plants have mostly female flowers and fruits will be almost seed free if grown away from other cucumbers. No pollinator is needed. Resistant to bacterial wilt carried by cucumber beetles.

Cucumber 'Diva': 58 days. This cucumber has smooth thin skin and a tender bitter-free taste. Plants produce all female flowers and do not need another variety for pollination, perfect for growing under row cover to exclude insects. Foliage is resistant to mildew and scab along with some resistance to cucumber beetles.

Cucumber 'Suyo Long': 61 days. Traditional variety from China has fruits up to 15" long that are sweet flavored and bitter free. Vines are widely adapted, grow well in hot weather and set fruit early.

Gourd 'Baby bottle': 100 days: Vining. A miniature version of the larger bottle gourd, these fruits are 3-4" long. They dry to a hard shell that can be painted or carved. Kids love to use these for crafts.

Gourd 'Luffa': 90 days. This is the plant that makes luffa sponges. Fruits can be eaten when they are 2-6" long and are called "Chinese okra". Or, grow to full size, dry the gourds, shake out the seeds and soak to clean for great bath sponges.

Ground Cherry 'Aunt Molly': 70 days. Small tomato-type fruit covered with a papery husk. Pick when the fruits fall to the ground. The flavor is intensely sweet with pineapple tones. Great in pies and sauces. Wonderful fresh.

Kale 'Redbor': 55 days. This deep red kale keeps its color all summer long and becomes more vivid in the cool fall. It makes a lovely accent plant when planted next to green kale.

Lettuce 'Canasta': 50-60 days. A favorite of KCCG members, Canasta is a Batavian type semi-heading lettuce that forms a crisp head with ruffled leaf edges. Leaves have a bronze edging. It is sweet and crisp tasting and holds well into summer heat.

Malabar Spinach (Red): 85 days. Vigorous climbing vines grow through summer into fall. Glossy, thick, savoyed leaves resemble spinach. Mild swiss chard taste. Use leaves and young stems sparingly in salads or stir fries.

Okra 'Jambalaya': 50 days. This early producing, high yielding okra has delicious tender pods on compact plants. (hybrid)

Pepper 'Gypsy': 50 days. Very early and prolific pepper. Fruits are wedge-shaped, 2-3 lobes, 3-4 inches long, greenish yellow turning to orange red. Compact plants. (hybrid)

Pumpkin 'Kakai': 100 days. Eye-catching, medium-small, avg. 5-8 lb., black-striped pumpkins. After displaying the pumpkins next fall, you can scoop out the large, dark green, completely hull-less seeds, which are absolutely delicious roasted. Semi-bush, short-vine plants. Avg. yield: 2-3 fruits per plant

Radish 'Easter Egg': 30 days. This seed packet will produce beautiful radishes in a variety of colors (red, white, pink, purple) that are fun for kids to pick and eat. The roots grow larger than standard varieties and stay crisp and mild even when large.

Radish 'Watermelon': 29 days. Large white rooted radish with green shoulder, round shape. The inside is red to pink, very sweet and crisp. Large tops for easy pulling. Pick while they are colorful and still small.

Snap Pea 'Sugar Ann': 60 days. 2—2 1/2' vines. This dwarf version of sugar snap peas has sweet, edible pods that have a juicy crunchy snap when eaten. Snap peas require cool weather and a trellis for a good harvest. Can be planted in late July for a fall harvest.

Swiss Chard 'Bright Lights': 28 days for baby chard, 55 days for larger leaves. Vibrant, rainbow colored stalks are an eye-catching addition to your garden. Plants thrive throughout spring, summer and into fall providing a steady supply of greens. Swiss chard can be eaten raw but generally is steamed or sautéed. Routine cutting of larger leaves will stimulate continuous production through frost.

Tomato 'Black Cherry': 64 days after transplant. This is the first very dark fruited cherry tomato. It has a lovely flavor that is sweet with a bit of a tangy bite. Plants are indeterminate and need to be staked. Produces a large crop of 1" fruits. Tastes like an heirloom and produces like a hybrid. Start seeds indoors 6-8 weeks before the last frost. Provide bright light to prevent leggy plants. Transplant outdoors around May 10-15.

Watermelon 'Yellow Doll': 75-80 days. Brightly colored yellow flesh is sweet, crisp and juicy. Melons are about 3-5 lbs, which makes them easier to store in the refrigerator. Plants produce heavily.

FLOWERS

Cardinal Climber: 73 days. These vines have bright red 1" blooms and deeply cut leaves. Part of the morning glory family, the flowers attract hummingbirds. Vines grow 15-20' long and require a heavy fence or trellis to support the vines.

Cypress Vine 'Maiden Feather': Vining flower. Soft lacey leaves frame star-like flowers in red, pink and white. Blooms mid-summer to frost. The flowers are a favorite of hummingbirds. Requires a structure to climb on.

Hyacinth Bean 'Ruby Moon': This vigorous-growing tropical vine has purple flowers, beans and leaves. The flowers are the best tasting part of this plant, as they have a nice crunchy, beany flavor but the pods are not especially good tasting and the dry seeds are toxic. Vines grow very long so support is needed. Flowering begins in late July or early August going until frost. This is the signature plant of The Beanstalk Children's Garden.

Marigold 'Janie' Mix: 8" plants with 1¾" blooms. Moderate size plants with numerous brightly colored flowers. Plants produce more and larger flowers than other French types. An excellent choice for mass plantings. Start indoors 6-8 weeks before last frost, around March 20-30.

Moonflower, White: 5" blooms open in the evening with a sweet fragrance. Vines grow 10-20' long.

Morning Glory 'Clark's Heavenly Blue': Vines over 12' long. Blooms late summer - frost. An improved blue morning glory with large luminous flowers. Vines climb up walls, fences and trellises. To aid germination either nick seed coat or soak for 36-48 hours before planting.

Nasturtium 'Whirlybird Mix': Dwarf plants with semi-double flowers. Large bright flowers are yellow, orange and red. Whirlybird tolerates more heat than standard varieties. Flowers and leaves are edible with a pleasant peppery flavor.

Sunflower 'Autumn Beauty': This variety is a warm blend of yellow, orange, bronze and red sunflowers that are 4-6" across. Excellent for cut flowers and bouquets. Multi-branched plants are 5-6' tall.

Sunflower 'Giant Grey Stripe': Produces huge heads up to 20" across that are filled with large, thin-shelled, very plump seeds that are high in protein. Plants are 8 to 12' tall. Use seeds for snacks, bird food or chicken feed.

Zinnia 'Benary Giants' Mixed Colors: 75-90 days from transplanting. Benary zinnias have large vibrant blooms that are fully double. Plants are up to 4' tall with 4-6" stems. The flowers hold longer in the vase than standard zinnias. They are less susceptible to powdery mildew than most other zinnias. Keep flowers picked to stimulate blooming.

HERBS

Basil 'Lemon': 60 days. Very bright green 2.5" long leaves with white blooms. Both attractive and intensely flavorful. 20 to 24" height. (annual)

Borage: 44-55 days. Large plant bears hundreds of small edible flowers in blue with some pink. Mild cucumber flavor for salads and garnishes. 18" height. (annual)

French Sorrel: 60 days. This perennial salad herb is a favorite of children. They have a sharp, sour lemony flavor making them delicious to eat right out of the garden. Young leaves are best. Can be eaten in salads or cooked gently for soups.

Purslane 'Goldberg Golden': 50 days. A cultivated variety of purslane that grows wild in gardens. It has crisp and mild succulent leaves that grow larger than its wild relative. Purslane has the highest levels of Omega 3 fatty acids of any other plant. Use it as a salad green or sauté lightly. This variety is very heat tolerant.

JUST FOR FUN

Cotton: 165-180 days. This is the same cotton used to make your t-shirts and jeans. Some varieties have naturally colored fibers instead of white. Grow some of your own cotton and amaze your friends. Pull fiber off seeds and plant indoors in a 4" pot by April 1st. Transplant outdoors around May 12-15. Bolls ripen and burst open in late fall. Plants grow 5-6' tall and may need staking to prevent tipping over.

Mouse Melon: Annual vine that reaches 8-10' long. Also called Mexican gherkins, mouse melons look like tiny watermelons but taste like miniature cucumbers. Fruits are ripe when 3/4" long. Just pop one in your mouth and enjoy a crispy crunch. Can be eaten raw or used to make pickles.

Peanuts 'Tennessee Red': 110 days. An early-maturing peanut that is a good choice for shorter growing seasons. Mature peanuts are delicious freshly dug. Roast them for a delicious snack this winter. Peanuts are mature around Sept. 15 in our climate.

Sensitive Plant: An ornamental plant that is a favorite with kids. Touch the leaves and watch them go to sleep. Leaves are very sensitive to any touch. Watering, wind and rain will also make them droop. In mid-summer there are soft pink flower puffs. Reseeds and volunteers freely for the next year. Start indoors if desired.

Sweet Sorghum 'Rox Orange': 110 days. 8' tall. Sweet sorghum is grown to make sorghum syrup. Seeds can be popped like popcorn. In the fall cut canes and suck out the sweet sap.

Kansas City Community Gardens and The Giving Grove 2015 Fruit Plant Order Form

Ordering Information:
Fruit plants should arrive at our office early April. We will contact you upon plant arrival. All plants are bare-rooted and should be picked up and planted quickly for good success. Trees come 4-6' tall unless otherwise noted. We recommend having your planting bed prepared and tree holes dug ahead of time in case of rainy weather.

Warranty: If your trees or berries do not break dormancy or dies shortly after breaking dormancy (prior to July 1st), through no fault of your own* we will replace it free of charge, but you should notify us prior to July 1st. ***Does not include over-watering, under-watering, mechanical damage, animal damage, or herbicide damage.***

Order your fruit plants soon as varieties sell out quickly. In order to insure equitable sales we reserve the right to limit order quantities on certain items.

Berries

'Cavendish' Strawberry - June bearer
10 plants for $2.50 – Member Price
High yielding with large high quality berries. Plants are disease resistant and hardy.

'Eversweet' Strawberry - Day Neutral
10 plants for $4.00 – Member Price
Large, intensely delicious berries. Heavy spring crop with intermittent berries through the season. This is the most heat resistant day neutral variety.

'Natchez' Thornless Blackberry
$3.50 per plant – Member Price
Large berries have excellent flavor. Plants are upright, vigorous and hardy. The earliest blackberry! Needs well-drained soil.

'Heritage' Fall bearing Red Raspberry
$2.50 per plant – Member Price
Starts bearing in August and continues until frost. Very productive and hardy with good flavor and berry size. Easy to grow and easy to prune. Needs well-drained soil.

Fruit Trees

Apple

'Pristine' Apple (needs a pollenizer mid-late season flowering) M7 Semi-dwarf rootstock 12-15'
This PRI (Purdue, Rutgers, and Illinois Universities) selection ripens in late July, producing large crops of beautiful yellow apples that are crisp and tasty. They are mildly tart and excellent for fresh eating, baking or in applesauce. The trees are healthy, highly resistant to apple scab, cedar apple rust and somewhat resistant to powdery mildew and fireblight.

'Liberty' Apple (needs pollenizer early-mid season flowering) M7 Semi-dwarf rootstock 12-15'
Liberty is very similar to appearance to McIntosh, but its flavor is a bit more tart and its flesh is crisper. It has a wonderful flavor all its own. It is a good dependable choice because it is highly productive, an excellent pollinizer, keeps well and is resistant to all the major apple diseases. It ripens in early September.

'Enterprise' Apple (needs a pollenizer mid-late season flowering) M7 Semi-dwarf rootstock 12-15'
A glossy red apple with an excellent spritely flavor that improves with storage. The tree is productive, vigorous and spreading. Fruit ripens mid-October. It is an excellent keeper and is immune to scab and resistant to fire blight, cedar apple rust and mildew.

'Sundance' Apple (needs a pollenizer mid season flowering) G.41 Dwarf Rootstock 8-10'
A pale yellow apple with sweet sub-acid flavor and very juicy. Fruit ripens in mid-October. Immune to apple scab and highly resistant to fire-blight and cedar apple rust with moderate resistance to powdery mildew. Offered on a dwarf rootstock ideal for smaller areas.

'Winecrisp' Apple (needs a pollenizer mid season flowering) Semi-dwarf M7 rootstock 12-15'
A PRI (Purdue, Rutgers, and Illinois Universities) selection that features excellent disease resistance to scab and fire blight. Ripens to a deep red in mid-October. Flavor is sweet, juicy and crisp. An excellent keeper, storing up to 8 months.

'Goldrush' Apple (needs a pollenizer late season flowering) G.202 Semi-dwarf rootstock 10-12'
A late October ripening apple with great frost tolerance for the occasional early hard freeze. Apple ripens to a harvest yellow with a slight blush. Flavor is tart and texture is crisp. Immune to apple scab and highly resistant to powdery mildew with moderate resistance to fireblight.

Cherry

'Carmine Jewel' Bush Cherry (self-fertile) 6-7' tall and wide
Perfect for food production and the edible landscape! This is the same shrub that is in the Beanstalk Garden. The tart fruit starts ripening in early June and will sweeten (a bit) as it continues to ripen throughout the month. The fruits are set under the foliage so the birds don't even know they are there! Expect 10-15 lbs of fruit once this shrub matures. (comes bare-root 2-3' tall) NEEDS WELL DRAINED SOIL!

Asian Pear

'Chojuro' Asian Pear (needs a pollenizer) OHxF 97 rootstock 15-18'
Round shape fruits, ripening to a russet orange in September. Flavor once fully ripe is incredibly sweet like butterscotch with a wonderful crisp texture. Medium storage life to 4 months.

'Korean Giant' Asian Pear (needs a pollenizer) Betulifolia rootstock 15-18'
One of the largest Asian pears sometimes weighing 1lb per pear or more. Ripens to russet orange in mid-October. Long storage life to 6 months.

'Yoinashi' Asian Pear (needs a pollenizer) Betulifolia rootstock 15-18'
This round brown skinned fruit is crisp and juicy with an outstanding butterscotch flavor. It sets a heavy crop of medium to large size crisp sweet fruit on a vigorous, fireblight resistant tree.

Pear

'Blake's Pride' Pear (needs a pollenizer) OHxF 87 rootstock12-15'
Aromatic, juicy fruit that melts in your mouth. Yellow to golden skin. Resistant to fireblight. Ripens in early September. Excellent keeping variety.

'Honey Sweet' Pear (partially self-fertile) OHxF 87 Rootstock 12-15'
Fire blight resistant. Self-pollinating (though we recommend a pollenizer) tree produces firm fruit with smooth, creamy flesh. Ripens in early September.

'Potomac' Pear (needs a pollenizer) OHxF 97 rootstock 15-18'
A crisp sweet pear ripening to a light green in early September. Excellent fire blight resistance. Two month storage.

Peach

'Contender' Peach (self-pollinating) Redleaf rootstock 15-20'
This hardy, late-blooming peach escapes late spring frosts. Beautiful, large freestone fruit is firm, sweet and delicious. Good for fresh use, freezing or for pies. Ripens in early to mid-August.

'Harrow Diamond' Peach (self-pollinating) Seedling rootstock 15-20'
This selection is the first peach to ripen in our area. Blooms are late enough to avoid frosts and are very cold tolerant. Skin blushes red, flesh is yellow and free-stone. Resistant to bacterial spot. Ripens in early July.

'Redhaven' Peach (self-pollinating) Redleaf rootstock 15-20'
This is the standard for Missouri peaches. The fruits ripen around mid to late July and are yellow fleshed and freestone.

Other

Asparagus 'Jersey Knight' This all male hybrid variety produces thick, tender, tasty spears. Highly tolerant to Fusarium, Crown and Root Rot. More tolerant of heavy clay soils than standard varieties.

Berry Plant and Fruit Tree Order Form - 2015

Order your fruit plants soon as varieties sell out quickly. In order to insure equitable sales we reserve the right to limit order quantities on certain items.

Name:_____ **Organization (if applicable):**_____

Address: _____

Phone Number:_____ **E-mail:**_____

DEADLINE TO PLACE YOUR ORDER: March 13, 2015, 5:00pm.

Item	Green Card Member	Yellow Card Member	Non-Member	Quantity	Total
Berry Plants					
'Cavendish' June-Bearing strawberry	$2.50 per bundle of 10	$2.50 per bundle of 10	$4.00 per bundle of 10		
'Eversweet' Ever-Bearing strawberry	$4.00 per bundle of 10	$4.00 per bundle of 10	$5.00 per bundle of 10		
'Natchez' thornless blackberry	$3.50 each	$4.00 each	$5.00 each		
'Heritage' fall-bearing raspberry	$2.50 each	$3.00 each	$4.00 each		
Fruit Trees					
'Enterprise' apple	$20.00 each	$30.00 each	$40.00 each		
'Liberty' apple	$20.00 each	$30.00 each	$40.00 each		
'Pristine' apple	$20.00 each	$30.00 each	$40.00 each		
'Goldrush' apple	$20.00 each	$30.00 each	$40.00 each		
'Sundance' apple	$20.00 each	$30.00 each	$40.00 each		
'Winecrisp' apple	$20.00 each	$30.00 each	$40.00 each		
'Carmine Jewel' Bush cherry	$20.00 each	$30.00 each	$40.00 each		
'Chojuro' Asian pear	$20.00 each	$30.00 each	$40.00 each		
'Korean Giant' Asian pear	$20.00 each	$30.00 each	$40.00 each		
'Yoinashi' Asian pear	$20.00 each	$30.00 each	$40.00 each		
'Honey Sweet' pear	$20.00 each	$30.00 each	$40.00 each		
'Blake's Pride' pear	$20.00 each	$30.00 each	$40.00 each		
'Potomac' pear	$20.00 each	$30.00 each	$40.00 each		
'Harrow Diamond' peach	$20.00 each	$30.00 each	$40.00 each		
'Contender' peach	$20.00 each	$30.00 each	$40.00 each		
'Redhaven' peach	$20.00 each	$30.00 each	$40.00 each		
Other					
'Jersey Knight' Asparagus	$1.00 each	$1.00 each	$2.00 each		
GRAND TOTAL					

All orders must be accompanied by cash, check or money order.

☐ **In the future, KCCG plans to map the location of fruit trees. Check here if you prefer your trees NOT be included in this map.**

For KCCG Use Only:_____**SYG** _____**CPG** _____**GG** _____**YG**
_____**Paid In Advance** _____**To Be Invoiced (Group Gardens Only)**
Picked Up By: _____ **Date:** _____

Kansas City Community Gardens 6917 Kensington Kansas City, MO 64132 816-931-3877 www.kccg.org

Please Support the 22nd Annual "Adopt-A-Garden" Campaign

Kansas City Community Gardens announces the 22nd annual "Adopt-A-Garden" campaign to help raise financial support for gardens in the metropolitan area. The Adopt-A-Garden program provides essential donor support for community, school, and home gardens throughout the Kansas City metropolitan area.

Your gift helps to fund KCCG's core mission and programs, including essential operating costs, and helps to purchase vegetable seeds, plants, and fertilizer to enable low-income families and others in Kansas City to produce food from garden plots. Each contributor of $25 or more will receive background information and a photo of his or her adopted garden.

Please fill out the attached form and mail it with your contribution to: KCCG, 6917 Kensington, Kansas City, MO, 64132.

To make a secure online donation by credit card:

1) Visit www.kccg.org
2) Click on "Donate"
3) Click on "Adopt-A-Garden" and follow the instructions.

For information on how you can adopt a garden, call 816-931-3877.

YES, I want to help grow a Kansas City Community Garden

Name _____

Address_____

City _____State_____

Zip _____Phone _____

E-mail address: _____

Adopt-A-Garden Levels

___$25 - "Seed
___$50 - "Sprout"
___$100 - "Seedling"
___$250 - "Vine
___$500 - "Community Trellis"
___$1000 - "Cornucopia"
___Other Amount $_____

KANSAS CITY COMMUNITY GARDENS

6917 Kensington
Kansas City, MO 64132
816-931-3877

Non-Profit Organization
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Kansas City Community Gardens is a not-for-profit corporation that assists low-income households and other residents of the Kansas City metropolitan area grow vegetables and fruit from garden plots located in backyards, vacant lots, schoolyards and community sites.

For information call 816-931-3877 or visit our offices at 6917 Kensington, Kansas City, MO 64132

KCCG is a registered 501(c)(3) non-profit organization, and donations are tax-deductible in accordance with IRS regulations.

www.kccg.org

LIVE UNITED United Way

Project 6: Evaluating Production and Value-Added Potential of Wild Leek and Other Native Greens.

Lincoln University
Nadia Navarrete-Tindall
Final Performance Report

Project Summary

Wild Leeks are one of the first plants to come up in the spring, often found in mixed wood forests. Because they are widely considered a delicacy, over-harvesting is a serious problem and over the years they have suffered significant habitat loss. The main goal of this study was to increase awareness about wild leeks and other native edible plants and their uses with emphasis being placed on sustainable production and protection of natural populations via outreach. Project objectives were (1) to increase knowledge about growing wild leeks and other native edible plants as specialty crops and to develop products to increase their value-added potential, (2) to increase awareness about native plants and their potential for human consumption and to generate income, and (3) to increase on-farm diversity with new 'old' specialty crops on small farms. Implementation of this educational project resulted in demonstrations in 10 small farms and also at three Lincoln University locations. Tours were offered on campus and in the Bootheel region of Missouri. Project results were disseminated among more than 100 small farmers in workshops, conferences, classes, field tours, field days, at the Lincoln University Farmers Market and via social media. Overall, the project reached more than 4,490 Missourians.

This is an initial funded project with the SCBGP.

Project Approach

Below we provide a synthesis of the outreach activities that were accomplished during the grant period. Most activities proposed in the approved project proposal were accomplished and in most cases the expectations were surpassed.

Objective 1. Increase knowledge about wild leeks and other native edible plants with potential as specialty crops.

This objective was accomplished through workshops, conferences, classes, field tours, field days, at the Lincoln University Farmers Market, exhibits, and via social media. An advisory committee was set up and provided input and guided most of the activities conducted. Table below lists the output indicators of the project.

TABLE 1. Output indicators from outreach / Extension activities that were conducted from 2015 to 2017.

Educational activity	Number of activities	Number of people reached
Exhibits (Lincoln University Farmers' Market, 1890 NIFA meeting, conferences, etc.)	29	935
Workshops and other trainings / classes	22	694
Conferences and symposia (oral/poster presentations)	10	1,300
Field days, farm tours, Lincoln Univ. campus tours	10	480
Food-tasting sessions	14	280
Newspaper articles*, Facebook[1], Radio & TV interviews*	15	501 ([1]followers)
** Number of people reached cannot be quantified*		
Annual '*Dining Wild*' event	2	300
Total	**102**	**4,490**

A representative sample list of the aforementioned activities is presented below:

Abstracts, oral presentations and posters at conferences and symposia:

1. Navarrete-Tindall, N., P. Weber, S. Bartelette, and I. Jacome-Alvarez. 2016. Wild Leeks: A Potential Native Specialty Crop for Agroforestry in Missouri. 2016. Center for Agroforestry Symposium. January 28, 2016. University of Missouri, Columbia. *Poster and abstract.*
2. Navarrete-Tindall, N. and S. Bartelette. 2016. Native Plant Outdoor Laboratories Lincoln University in Missouri. Missouri Natural Resources Conference. Missouri Department of Conservation. February 3-5, 2016. Lake of the Ozarks, Missouri. ***Abstract and poster.***
3. Navarrete-Tindall, N., P. Weber, S. Bartelette, and I. Jacome-Alvarez. May 2016. Protecting and Growing Wild Leeks. **Oral presentation and Abstract** to be published in Proceedings of Missouri Academy of Science 2016. Lincoln University, Jefferson City.
4. Navarrete-Tindall, N., P. Weber, S. Bartelette, and I. Jacome-Alvarez. 2016 Protecting and Growing *Allium tricoccum* (wild leeks) as a Specialty Crop in Missouri. Society of Economic Botany Conference. June 4-6. Kentucky. ***Abstract and Oral presentation.***
5. Navarrete-Tindall, N. September 19-20. **Abstract and Oral Presentation**: The FINCA model: Families, Integrating Nature, Conservation and Agriculture. NIFA. Capacity Building Grant Project Directors Meeting. Virginia Beach. This meeting is attended by Principal Investigators of projects.
6. Navarrete-Tindall, N. and S. Bartelette. 2016. September 20-22. **Abstract and Exhibit.** The FINCA model: Families, Integrating Nature, Conservation and Agriculture promoting native edible plants as Specialty Crops. 7th National Small Farm Conference. Virginia Beach.
7. Navarrete-Tindall, N. and S. Bartelette. 2016. November 28-December. Promoting native edible plants as specialty crops. Networking with small farmers and extension specialists. Women in Sustainable Agriculture Conference. Portland, Oregon.
8. Mid-America Organic Association Conference, Kansas City, Missouri, January 25-28, 2017.

Objective 2. Develop protocols to grow wild leeks and wild greens as crops in Missouri based on existing research.

In Missouri, there are two species of wild leeks, *Allium tricoccum* and *A. burdickii*. Both species are edible and are consumed across the range of distribution in the United States and in southern Canada mainly gathered from wild populations. Results of potted studies that quantified number of bulbs per plant and bulb diameter showed no differences among plant species.

Additional results: Survival was 100%, indicating excellent plant resilience to Missouri's conditions. Animal disturbance and diseases were not observed. Seed requires a warm-moist period followed by a cold-moist and another warm-period to germinate so germination may take 6 to 18 months.

Planting protocol. Selecting the right site to grow wild leeks is very important. Key considerations include slope, soil qualities, and understory vegetation (if grown under shade). Common advice on where to find wild leeks is a north facing slope, which is typically cooler and moister. But north slopes are not necessary if there is sufficient soil moisture retention throughout the year. Soil moisture is key to a healthy stand of wild leeks.

Wild leeks can also be grown in raised beds, preferably under a tree canopy. Again, enough soil moisture is a key aspect to producing healthy leeks. Planting wild leeks in raised beds provides several advantages, but it also costs more. Raised beds are advantageous when the soil lacks organic matter, is stony, excessively dry, or there are lots of weeds. Raised beds are easy to plant as the soils are loose and friable. Once the beds are constructed, they are lined with weed cloth. The space is then filled with good quality planting soil. Raised beds do not need to be very deep; one tier of landscape ties (about 4-5 inches) is usually sufficient. Once the beds are constructed, the landowner can plant seeds or bulbs directly into the new soil. The best time to purchase wild leeks for planting is in February and March. If the bulbs cannot be planted immediately upon receiving them, they can be placed into a soil mixture (potting soil or organic rich top soil) so that they will stay fresh, or put them into a refrigerator where they will stay fresh for a couple of weeks.

Harvest: In terms of harvest, avoid harvesting plants that have a flower scape (stalk) as they are producing seed to ensure the population will grow.

As part of this project, it was determined that expected outcome 6 ('10 to sell it as produce and 5 to sell the seed') was unrealistic due to the fact that wild leeks take 7 years to produce seed after establishment. We also underestimated the time that would take a person to establish plots and have product ready to be commercialized because wild leeks grow very slowly and have a very short window of opportunity for harvest.

View of experimental area used to grow wild leeks showing plants growing in pots and in raised beds, and view of weather station at Lincoln University campus.

Objective 3. Develop value-added products using wild leeks and other wild greens.

A series of recipes involving use of native plants including wild leeks were developed as part of this project. Fourteen food-tasting sessions were offered at Lincoln University campus. Three chefs were contracted to develop and cook the 30 recipes. The best recipes were selected to be served during Dining Wild. Examples of value-added products that were prepared and promoted include Focaccia bread with wild leeks or ramps, pesto with chickweed and nettles on humus and sugar cookies with violet flowers, jellies and jams using native persimmon and other native edibles.

In addition, 12 articles were published in the **JC News Tribune** in the column '***Dining Wild'***. The goal of these articles was to promote native plants as specialty crops. All are available online.

1. Native edible plants can create natural markets in Missouri. Published on January 6, 2016.
2. Ramping Up Flavor with Wild Leeks (*Allium* tricoccum) in Missouri. February, 2016.
3. Goldenglow (*Rubdeckia laciniata*) Dining Wild. March, 2016.

4. Nutritious and Delightful nettles. Published in newspaper hard copy and available on line. It can be retrieved at: http://www.newstribune.com/news/story/story/2016/Apr/06/dining-wild-give-delightful-nutritious-nettles-try/553829/. Article about nettle plants (*Laportea canadensis* and *Urtica dioica*) as potential specialty crops. April, 2016.
5. Cup plant (*Silphium perfoliatum*). May, 2016.
6. Dittany, June, 2016.
7. The wild plums of Missouri. Cherished native fruits. Newspaper article available online: http://www.newstribune.com/news/story/story/2016/Jul/13/wild-plums-missouri-cherished-native-fruits/631272/. July, 2016.
8. Elderberry (*Sambucus Canadensis*). August, 2016.
9. Persimmon, September, 2016.
10. Spicebush. October, 2016.
11. Jerusalem artichoke. November, 2016.
12. Looking Back at a Year of Native Edible Plants. December 14, 2016.
13. Missouri pecans are sweet, healthy and more common than you think. January 11th, 2017.
14. No shrinking violets here: They are beautiful and edible. February 8th, 2017
15. Sassafras tree: aromatic, edible and beautiful. March 8th, 2017.

Example of valued-added products made with wild leeks and other native edibles. Focaccia bread with wild leeks, pesto with chickweed and nettles on humus and sugar cookies with violet flowers were the first recipes of the year 2017 that people had the opportunity to taste. '*It was better than ever*', according to supporter Mr. Hugh Flowers. Recipes were prepared by Taylor Cleveland, owner of '*Taylor Made*'.

Project partners: This project benefited from the participation of numerous faculties and staff from Lincoln University, University of Missouri Extension, growers, and staff from local and state organizations. They are listed in the table below:

Mr. John Blackmon	Small Farmer, Bootheel region	Established production plots and helped evaluate growth and development.
Mr. Hugh Flowers	Landowner and LU-Market Food Vendor, Callaway Co.	Established production plots and developed new recipes. He sells at LU-Farmers Market.
Mary and Bill Glasper	LU Cooperative Extension, FINCA project. Outreach Educators, landowners, Bootheel region	Organized training events. Establish production plots, data collection.
Dan Kuebler	Farmer and Producer, Boone Co.	Established production plots and developed value-added products
Kristin Tipton	Callaway Co. Landowner and potential producer	Established production plots to evaluate growth and development

Pam Schmutzler	Cole Co. Small Farmer and LU-Farmers Market Vendor	Established production plots and develop value-added products
Mervin Wallace	MO Wildflowers Nursery. Seed and plant producer.	Advised on seed and seedling production of wild leeks
Carol Davit	Missouri Prairie Foundation	Advised and promoted project to find natural wild leek populations
Charlie Hopper	Missouri Department of Agriculture AgriMissouri Coordinator	Offered advice about marketing and helped promote workshops and other events
Sue Bartelette and Amy Hempen	LUCE-Native Plants Program	Established demonstration plots. Collected and processed data. Helped organize training events.
Maggie Hopper	LU Commercial Kitchen and Farmers Market	Contacted chefs, helped develop recipes, organized cooking classes and demonstrations in Jeff City
Jaime Pinero	LUCE-Integrated Pest Management	Helped with monitoring of insects on native edible plants
Mersha Zelalem	LUCE-Plant Disease Program	Helped with monitoring of diseases affecting native edible plants

Funds allocated to this project were used to solely enhance the competitiveness of specialty crops.

Goals and Outcomes Achieved

Expected outcome: Four to six farmers and producers, in Central Missouri and in the Bootheel, will establish wild leeks for production and offer tours to local communities.

Accomplishments: This outcome has been accomplished by having 10 small farmers and 3 Lincoln University locations for demonstrations. Tours have been offered on campus and in the Bootheel. See activities for more information.

Expected outcome: One-hundred small farmers including urban farmers will attend workshops about uses of native plants during conferences and field days.

Accomplishments: This has been accomplished by reaching many more than 100 small farmers in workshops, conferences, classes, field tours and field days. See activities for more information.

Expected outcome: Two-hundred farmers' market costumers will be introduced or reminded of uses of native edible plants.

Accomplishments: The Lincoln University Farmers Market is visited by an average of 200 people per market. Twenty to 30 people get direct information from our educational and food tasting exhibit staffed by Lincoln University students. See activities for more information.

Expected outcome: One-hundred individuals, children and adults, will learn and taste native edible foods in Central Missouri and the Bootheel region.

Accomplishments: This has been accomplished. In results, numbers of people reaches are presented. See activities for more information.

Expected outcome: At least 50 hits in a blog, Facebook page or webpage each month are anticipated after updates are created.

Accomplishments: The Facebook page posts have 501 followers.

Expected outcome: After project completion, possibly during the next 2-years, at least 30 more individuals will grow wild leeks and other native greens, 15 for their own consumption, 10 to sell it as produce and 5 to sell the seed.

Accomplishments: We estimate that 30 or more people are growing wild leeks and other native edible plants as a result of our outreach and 15 or more are growing them for their own consumption. Some vendors are selling edible native greens at the Lincoln University Farmers' Market with great demand by customers. Due to the nature of this project, at this moment it is not possible to determine how many more people are growing lees and other native greens for market purposes. The Lincoln University Native Plants Program has been closed (June 30th, 2017) due to financial adversities faced by this university.

Additional outcomes: Short-term outcomes are knowledge gains by people who attended the workshops and food-tasting sessions. Short-term outcomes were documented with pre- and post-workshop surveys.

Beneficiaries

Home-owners: The nutritional content of leeks is high, in particular vitamins A, C, K, selenium, chromium, lutein and zeaxanthin, among others. This means that people growing wild leeks at home will have more access to healthy food.

Vegetable growers: Growing leeks can provide additional income to producers. Small farmers and producers could increase their income by selling fresh leeks at $10 to $17 a pound. Kimchi and other fermented products prepared with wild greens can be sold in farmers markets and possibly in specialty stores where such products are usually imported from other countries or distant locations in the United States. The price of kimchi, for example, varies from $6 to $20/lb. depending on the greens used. Wild greens and leeks could be preserved, dried or frozen for later use, which could be another way to sell these plants to extend their availability throughout the year.

Additional beneficiaries are people who attended the conferences, workshops, field days, exhibits, and other educational activities:

- Small sustainable and organic farmers.
- Native Edible Plants Wild Leeks Advisory Board formed by collaborating farmers and Native Plants Program staff.
- Minority, limited resource, public at large.
- Farmers, producers, extension educators, conservationists and potential farmers.
- General public: Jefferson City, Columbia, Fulton, California, Sedalia and Lake of the Ozarks.
- 150 extension specialists and educators from seventeen 1890 institutions (event hosted by NIFA).

Lessons Learned

One of the expected outcomes ('10 to sell it as produce and 5 to sell the seed') could not be fulfilled entirely because wild leeks take 7 years to produce seed after establishment. We also underestimated the time that would take a person to establish plots and have product ready to be commercialized because wild leeks grow very slowly and have a very short window of opportunity for harvest. However, other native edible greens such as cup plant, golden glow, and stinging nettles have been produced and marketed by some vendors.

The Lincoln University Native Plants Program was understaffed and therefore additional salary funds had to be provided to some staff from other sources.

Contact Person

Ms. Yvonne Matthews, Associate Administrator, Lincoln University Cooperative Extension Phone: 573) 681-5375 900
Email: MatthewY@lincolnu.edu

The Lincoln University Native Plants program was closed on June 30, 2017. Therefore, the contact information of the Cooperative Extension Associate Administrator is provided.

Additional Information

Cover page of article published in the Jefferson City News Tribune Newspaper, January 6th, 2016

Nadia Navarrete-Tindall, an associate professor and native plant specialist for the Lincoln University Cooperative Extension, leads the extension's Native Plants Program, which works to increase appreciation of native edible plants in Missouri. Look for her monthly column, Dining Wild, in future News Tribune Flavor pages.

DINING WILD

Native edible plants can create natural markets in Missouri

By Nadia Navarrete-Tindall
For the News Tribune

If something was tasty, good for you and, best of all, free for the taking, would that get your attention?

Well, you're in luck. In Missouri, one can find a variety of native plants that can be consumed as greens, teas, in stews or for flavoring, the way American Indians did before the arrival of the Europeans. Settlers adopted many of them in their diet, and these foods continued to be used commonly until recently in our history.

Many of these plants are mentioned in native edibles books, but in reality only a few of them are consumed regularly, such as gooseberries, black raspberries, paw paws, persimmon, elderberry, wild plum, wild leeks and a few more. A very few domesticated popular native species include sunflower, pecans and black walnut and northern species like cranberries and wild rice. In Missouri and across the country, there is little awareness about native perennial greens that are available in abundance, including nettles, cup plant and goldenglow, among others.

Many of these plants are still being consumed, but general knowledge about them is limited to older generations and a few interested individuals, organizations and institutions. There have been recent efforts to revive knowledge of native edibles, and one such effort is being undertaken by the Native Plants Program at Lincoln University in Central Missouri and beyond.

See Plants, p. 2

Plants

Continued from p.1

There are many reasons to grow and consume native edible plants. Because of their diversity, some grow better in dry conditions and some prefer wet habitats. Some tolerate shade, and others grow better under full sun. Most of them have a wide range of adaptation, and in these times of unpredictable weather native plants are very resilient. According to retired State Park Naturalist Bruce Schuette, the number of Missouri native plants surpasses 2,000 and the Missouri Department of Conservation recommends many of them in gardens and farms because of their importance for the survival of native pollinators like native bees and other wildlife.

The Native Plants Program is helping to increase appreciation of readily available native edible plants in Missouri by offering classes, field days and special events through outreach and education. It puts special emphasis on plants good for human consumption, those that provide food and cover for pollinators, and those that can beautify and improve the well-being of communities.

Many native species good for food, other value-added products and conservation have been established at the Native Plant Outdoor Laboratory and other demonstration gardens and can be seen at the Lincoln University campus throughout the year.

To get you started, consider these eight native edible plants in Missouri. They are all perennial and are easy to grow:

- Elderberry is a woody shrub that forms thickets. The white flowers are used to prepare tea or cordials, and the berries are used for juice, jellies, wine and pies. Also, the unripe fruit can be pickled and replaced for capers in recipes.
- Smooth sumac and winged sumac are two shrubs that form thickets. The bright red berries should be harvested immediately after ripening in the fall and can be used to prepare "sumacade," a refreshing drink; syrups or jams.
- Wild plum is a thicket-forming shrub or small tree. The bright red fruits mature in late summer and are used to make jellies and marmalades. The flavor is excellent!
- Mountain mints, either slender mountain mint or fussy mountain mint, are two aromatic herbs. At Lincoln University, we have developed a recipe for ice cream and a cheesecake that, according to evaluators, are to die for!
- Blue sage, another aromatic herb member of the mint family, has been used at Lincoln to flavor scones and shortbreads.
- Cup plant, also called carpenter square for its square stems, is a member of the sunflower family. In the spring, the first leaves are gathered and used in recipes that call for greens like spinach.

Before you start consuming these plants, know how to identify them. You can have your own little supermarket by planting some of these natives right in your own backyard. Remember these plants are just to get you started! There are many more, and we will discuss some of them in future columns.

Nadia Navarrete-Tindall has been an associate professor and native plant specialist for the Lincoln University Cooperative Extension since 2008. The Native Plants Program provides educational tools to students and the public on how to identify, grow and market native edible plants and those that are important to pollinators.

Cover page of article published in the Jefferson City News Tribune Newspaper, March 2016

Dining Wild: Goldenglow offers fresh spring greens

March 2nd, 2016 | by Nadia Navarrete-Tindall, For the News Tribune | in Life & Entertainment | Read Time: 4 mins.

Goldenglow leaves have a nice, sweet and mild taste that can be used in recipes to replace spinach or other mild-flavored greens.

Wild Leeks: A Potential Native Specialty Crop for Agroforestry in Missouri

Nadia Navarrete-Tindall, Email: Navarrete-TindallN@LincolnU.edu , Paul Weber, WeberP@LincolnU.edu, Sue Bartelette, BarteletteW@LincolnU.edu and Isabel Jacome, JacomeI@LincolnU.edu. Institution for all: Lincoln University of Missouri, Native Plants Program.

Missouri Department of Agriculture

NativePlants program

USDA National Institute of Food and Agriculture

ABSTRACT

Wild leek or 'ramps' (*Allium tricoccum*), is a native edible plant rarely grown as a crop in Missouri and across its range in the United States. In Eastern states this plant is a delicacy but it is usually collected from wild populations subject to overharvest. Studies at NC State University suggest that wild leek can be grown under forest canopy or in the field under artificial shade. Based on preliminary observations at Lincoln University and personal communication with growers in Missouri, wild leek could be grown as a perennial vegetable. The purpose of this study is to increase awareness about wild leeks and other native edible plants and their uses, protect natural populations, develop value-added products, examine nutrient content and do outreach and education to promote their production and consumption. The weather has become a little unpredictable in the past few years. Native plants are usually adapted to extreme weather conditions and by developing these perennial crops, farmers can reduce costs of crop establishment and production. Some of these plants are readily available on farms so initial cost of value-added products will be less than growing annual crops. Successful farmers or producers could sell one pound of ramps for $10-$17 and 30-40 seeds for around $4. Plots have been established at LU campus and farms in Central Missouri and the Bootheel region.

OBJECTIVES

1. Increase knowledge about wild leeks and other native plants potential as specialty crops.
2. Develop propagation protocols for wild leeks in Missouri
3. Develop value added products of wild leeks and other natives.

Allium tricoccum distribution in the US.

http://bonap.net/MapGallery/County/Allium_tricoccum.png

Plant Communities where Wild Leeks Grow

Wild leeks grow naturally in woodlands where spring ephemerals like sweet williams, Solomon's seal, and wild ginger grow. Other natives like riparian wild rye, native impatiens, nettles, paw paw and blackberry grow in similar habitat. Deep shade, rich soils, moist but with good drainage.

SPECIES DESCRIPTION

In Missouri, there are two species of wild leeks, *Allium tricoccum* and *A. burdickii* (Yatskievych 1999); however, *A. burdickii* is considered a variety of *A. tricoccum* by other botanists. For the purposes of the studies at Lincoln University, we recognize Yatskievych's two species and focus on *A. tricoccum*, which we consider to have more potential as a new crop due to the fact that *A. tricoccum* is more abundant and has much broader leaves. Both species are edible and are consumed across the range of distribution in the United States and in southern Canada mainly gathered from wild populations (Davis and Greenfield 2002). Other edible Missouri members of the onion family (Liliaceae) include wild onion (*A. canadense*), nodding wild onion (*A. cernuum*) and prairie onion (*Allium stellatum*). Common garlic, chives and onion are introduced species.

Allium burdickii with narrow leaves inside the circle and *A. tricoccum* with much broader leaves growing in a raised bed under oak trees at LU campus

Left: wild leeks bulbs ready for planting in the spring. Right: root system of bulbs in the fall. Below: foliage develops fully in April.

Flowers open in mid-June, seed and fruit develops in July and August and matures in September and October.

POTENTIAL IMPACT

Who are the specialty crop beneficiaries of the project?
Urban and rural small farmers, seed and plant producers, farmers market vendors, communities in southeast Missouri and Central Missouri. Minority and underserved populations.

How many specialty crop beneficiaries will the project impact?
Six small farmers are collaborating directly with the project. More farmers are being informed about this project during field days and farmers conferences. Local chefs are developing recipes and offering cooking demonstrations. Locally owned restaurants or farmers market food vendors in Central Missouri and the Bootheel region will use these plants as ingredients in their menus. Fifty workshop participants and 50 to 100 farmers' market customers will taste foods prepared with native edibles. Five-hundred to 2000 general public individuals will be reached through articles submitted to newspapers, newsletters, social media, interviews and radio shows. -Plants that have been considered of no value will provide income for those growing them. Bottomlands harboring wild greens such as nettles will be protected and instead of being a nuisance, will become a source of income. By protecting bottomlands we will protect habitat for pollinators and other beneficial wildlife.

OUTCOMES

Increase identification skills of farmers and producers (rural and urban) about wild leeks, wild greens and other native edible plant species

Increase knowledge about growing leeks as crops and establish demonstration plantings using different organic soils that support beneficial soil microflora present in Six farmers, 5 in the Bootheel and 5 in the Central region will grow wild leeks in their farms to sell for propagation or for natural plantings.

Wild leek seed and bulb producers will be identified in Missouri and surrounding states.

- ✓ **Short-term:** About 300 individuals, including farmers, will learn to identify and grow native edible plants in two regions in Missouri at the end of this two and a half-year study.
- ✓ **Medium term**: Native greens will be available in local markets at the end of this study.
- ✓ **Long-term**: Ten farmers will establish or recognize wild leeks and other wild greens as specialty crops and Five nurseries and seed producers will offer seed or seedlings to the public in the next two-years after this study ends.

METHODOLOGY

Evaluating plant growth and development.
Two sources of bulbs were identified. The Ramp Farm in West Virginia and local producer Becky Erickson. Preliminary data on plant growth was done in 2015. Bulbs were obtained in March 2014 and established in 1 gallon pots filled with three types of soil media, free of peat moss, obtained from the St. Louis Compost: wildflower mix, tree and shrub mix and the raised bed mix (http://stlcompost.com/real/). Ten replications of each media were established in seven locations, including 6 farms in 4 counties. Before planting, bulb was weighed and diameter at the widest part of the bulb was measured. Bulbs were planted in pots and established 50% shade. Three bulbs were planted per pot and fertilized twice with 1 tablespoon of 7-4-5 Organic Happy Frog mix with active soil microbes. Irrigation was done as needed to keep them moderately moist. We made observations of the growing cycle, starting with leaf development and senescence and inflorescence and fruit development. In late fall 2015, we selected 5 pots of each soil mix from two locations and measured diameter, root and bulb length. The rest of the bulbs will be measured and weighed in spring 2016. After data collection, bulbs will be transplanted into raised beds with the Raised Bed mix from the St. Louis Compost company. In 2016, the effect on growth and development will be measured of two kinds of shade (30 and 50%) provided by shade cloth. Shade material will be installed on the raised bed immediately after planting.

METHODOLOGY

Germination studies. They were initiated in 2014 and continued in 2015. The source of seeds is from two local producers and Prairie Nursery in Wisconsin. Seed treatment includes exposure to warm and moist weather followed by a 4 to 6 week period of cold and moist conditions. Seed germination will be evaluated in Spring 2016.

Outreach and Education. Workshops are being offered across Missouri to help farmers, producers and others to learn about the importance of native edible plants and their potential as specialty crops. We organized 9 sessions to evaluate more than 40 recipes prepared with wild leeks and other edible plants.

Right photo: 3 and 5 year old wild leek bulbs. Down left: wild leeks were established in pots and in raised beds for preliminary observation in year 1 of this study. Down right: pots with wild leeks pots covered with oak leaves for protection and to provide additional nutrients.

OUTCOMES

Preliminary results on numbers of bulbs per plant and bulb diameter showed no differences. Survival was 100%. Animal disturbance and diseases were not observed in fall 2015. Evaluations and germination results will be evaluated in spring 2016. Seed requires a warm-moist period followed by a cold-moist and another warm-period to germinate so germination may take 6 to 18 months.

Outreach and Education: we had greater participation in events where wild leeks and other native edible plants were featured. At Dining Wild, we had 125 and 175 guests in 2014 and 2015, respectively. Nine sessions featuring 30 recipes prepared with natives brought an average of 15 evaluators. Of five recipes containing wild leeks, average rates for flavor, texture, aroma, presentation and overall acceptability was 4.2 to 4.5, with 5.0 being excellent. This project is timely because of recent changing weather patterns. Native plants are usually adapted to extreme weather conditions and wild leeks and other perennial crops may be more resilient than domestic crops. Some native edibles are readily available on farms and could help to diversify farms. This study receives funding from MDA and NIFA.

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Contact information

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- Ms. Sue Bartelette, LUCE Native Plants Landscape Designer. Email: BarteletteW@LincolnU.edu
- Paul Weber and Isabel Jacome are Native Plants Program Assistants.

Poster presenting project results, presented at various workshops and conferences.

Draft of Guide Sheet describing wild leek production and consumption

Ramping Up Flavor with Wild Leeks in Missouri

By Dr. Nadia Navarrete-Tindall
Native Plant Extension Specialist, Lincoln University Native Plants Program

Although not well-known here in Missouri, wild leek is a champion at adding an extra boost to many dishes normally cooked with garlic or onions, especially since it tastes a little like both, with the bulbs and leaves having a pleasant taste of mild onion combined with garlic aroma. Leaves are not only extremely tasty, but add color to your meals. It is very popular with chefs in more easterly states where it is more common and goes by the name "ramps". According to G. Yatskievych (1999), in Missouri, there are two species, *Allium tricoccum* and *A. burdickii* (Photo 1); however, *A. burdickii* is considered a variety of *A. tricoccum* by other botanists. *A. tricoccum* is more abundant and is the largest. Both species are edible and are consumed here and in southern Canada (Davis and Greenfield 2002), mainly gathered from wild populations. For the purposes of the studies at Lincoln University, we recognize Yatskievych's two species and focus on *A. tricoccum*, which we consider to have more potential as a new crop. Other Missouri members of the onion family (Liliaceae) include wild garlic or wild onion (*A. canadense*), nodding wild onion (*A. cernuun*) and prairie onion (*Allium stellatum*). Common garlic, chives and onion are introduced species.

In Missouri, *wild leeks* are reported in 12 counties, including Boone, Howard, and Osage in the central region. Both species are naturally found in rich soil and moist woodlands under the canopy of trees like sugar maple, hickory, and oaks. In central Missouri, the wide leaves develop in early March through April (Photo 2). After the leaves die back, onion-like flowering stalks with white flowers emerge in June and seeds mature in late summer to early fall (Photo 3).

Studies by North Carolina State University Extension showed that the best time to establish leeks from seed is in late summer to fall under shady conditions. Wild leeks can be grown from seed and from bulbs. It will take 6 to 7 years for a plant propagated from seed to fully mature. For that reason we recommend buying the 2 to 3 year-old bulbs from local nurseries in Missouri or surrounding states to establish your own patch.

Lincoln University's Native Plants Program is making it more familiar by helping Missourians grow it for themselves on their own property. Because these plants are mainly obtained from wild populations, digging has put this plant in the species of concern list. In 1994 in Canada, gathering in the wild was prohibited in the province of Quebec. There are legitimate concerns by botanists and conservationists in Missouri that these plants could be under threat of overharvest. To discourage any digging from natural populations in Missouri, the Native Plants Program is conducting a study with funding from the Missouri Department of Agriculture through a Specialty Crop Grant and the Institute of Food and Agriculture -NIFA. The main goal is to increase knowledge about growing wild leeks and other native edible plants as specialty crops and develop products to increase their value-added potential. Five Missouri farmers are collaborating with this project in Central and Southeast Missouri. Funding is being used to evaluate growth and development of wild leeks and other native edible plants, and workshops and cooking demonstrations are offered to familiarize Missourians with them.

Leaves and bulbs are edible, but to sustainably maintain large, well established wild populations or plantings, only part of the leaves and few, if any, bulbs should be harvested in the spring. If the bulbs are left, the plants will reseed themselves and produce more bulbs the following spring. In Missouri, wild leeks can be found in early spring in Farmers Markets in St. Louis and Kansas City. We hope to be able to offer it in 2017 at LU Farmers Market.

If you are interested in learning more about wild leeks, Lincoln University is offering a free workshop on February 17 at LU campus, limited to 15 people. Make your reservation at Navarrete-TindallN@LincolnU.edu or call Natalie Benjamin at 573-681-5581. Food samples will be served and wild leek bulbs will be available for participants.

Wild leeks leaves can be eaten cooked or raw. Add uncooked minced leaves to create a special salad dressing or add them on top a fresh salad. If you prefer to eat them cooked, we are offering this wild leek recipe developed by the Native Plants Program.

Example of flier used for a Field Day in the Bootheel

FINCA Field Day in the Bootheel

Saturday, May 20, 2017 • 1:00 p.m. to 3:00 p.m.

Where: FINCA at the Glaspers'. Meet under the big oak tree.
Address: Walnut Street and Highway U, Haywood City.

FINCA is the acronym of the project in Missouri:
Families Integrating Nature, Conservation and Agriculture.
In tropical America FINCA is a small-scale farm cultivated mainly with native edible plants.
Vegetables, flowers, fruits and brambles are grown as specialty crops for consumption or to develop value-added products.

During this tour you will:
Learn how to identify and grow more than 20 species of Missouri native plants.
Taste food prepared with native edibles.
Find out which plants are important for native pollinators, butterflies and more.

USDA
United States Department of Agriculture
National Institute of Food and Agriculture

HORTICULTURE
Commercial Vegetable Program
Lincoln University Cooperative Extension

UNIVERSITY OF MISSOURI Extension

NativePlants program

MISSOURI PRAIRIE FOUNDATION

LINCOLN UNIVERSITY
MISSOURI
COOPERATIVE EXTENSION

To register, contact Ms. Tiara Riggs-Butler at (573) 471-3059 or Riggs-ButlerT@LincolnU.edu
or Ms. Mary Glasper at 573-481-1186 or send email to maryeglasper@yahoo.com
The event is free and open to the public due to funding from our collaborators.

Lincoln University Cooperative Extension is an equal opportunity provider and employer

Article published in the Kansas City Gardener (Nov. 17, 2016)
https://issuu.com/thekansascitygardener/docs/kcg_dec16_issue

Evaluation form used for the food-tasting sessions, offered at Lincoln University campus.

NativePlants program
Integrating Nature and Agriculture
Lincoln University Cooperative Extension

Recipes flavored or prepared with native plants.
Evaluation Form 2017

DATE: _____

1. Have you attended a Lincoln University Native Plants Workshop or event before? Yes No
   If you said yes- what kind of event (s)?

2. Would you like to volunteer? yes no. If yes, add your name, location, phone # and email in the signed up sheet.
3. Are you interested in growing the native plants used in these recipes? Yes No
4. Do you want to learn more about native edible plants? Yes No
5. Would you buy the native plants used in these recipes if it was available in the market? Yes No
6. Are you on limited income? yes ___ no __
7. Gender: F_____M_____
8. Ethnicity: African/American ___Hispanic/Latino____White____Asian____Other ____Explain _____
9. Age: younger than 19 ____, 20-30_____, 30-40 _____, 40-50 ____, 50-60____, 60-70+____

Satisfaction
Please circle the appropriate number for your level of response.

How satisfied are you with:	Not Satisfied	Somewhat Satisfied	Satisfied	Very Satisfied	Extremely satisfied
The information presented about native plants tested today	1	2	3	4	5
Location of the event	1	2	3	4	5
The overall quality of the training workshop	1	2	3	4	5

Knowledge: Please circle the appropriate number to indicate your level of knowledge about the following topics **before** and **after** completing the program. Please use the following key for rating:

1. Very Low = Don't know anything about this topic.
2. Low = Know very little about this topic
3. Moderate = Know about this topic but there are more things to learn
4. High = Have good knowledge but there are things to learn
5. Very High = Know almost everything about this topic

Plants tested	BEFORE THIS WORKSHOP					AFTER THIS WORKSHOP				
	Very Low	Low	Moderate	High	Very High	Very Low	Low	Moderate	High	Very High
Nettles										
Chickweed										
Goldenglow										
Wild leeks										
violets										

Evaluation form used for the food-tasting sessions, offered at Lincoln University campus [*cont*.]

Mark what you feel best describes recipe _____

	5	4	3	2	1	Comments
Flavor/Taste Rating	Tasted great	Flavorful	Acceptable	Off flavor	Flavor did not appeal to me	
Texture Rating	Wonderful texture	Good texture	Acceptable texture	Off texture	Unacceptable	
Aroma/Smell Rating	Wonderful aroma	Appealing aroma	Acceptable aroma	Aroma is not appealing	Unappetizing	
Presentation/ Appearance	Extremely attractive	Moderately attractive	Attractive	Unappetizing	Unattractive	
Overall acceptability	Extremely acceptable	Moderately acceptable	Acceptable	Moderately unacceptable	Unacceptable	

Reference: http://healthymeals.nal.usda.gov/hsmrs/Taste_Testing/Sensory_Evaluation_Form.pdf

Mark what you feel best describes recipe _____

	5	4	3	2	1	Comments
Flavor/Taste Rating	Tasted great	Flavorful	Acceptable	Off flavor	Flavor did not appeal to me	
Texture Rating	Wonderful texture	Good texture	Acceptable texture	Off texture	Unacceptable	
Aroma/Smell Rating	Wonderful aroma	Appealing aroma	Acceptable aroma	Aroma is not appealing	Unappetizing	
Presentation/ Appearance	Extremely attractive	Moderately attractive	Attractive	Unappetizing	Unattractive	
Overall acceptability	Extremely acceptable	Moderately acceptable	Acceptable	Moderately unacceptable	Unacceptable	

Reference: http://healthymeals.nal.usda.gov/hsmrs/Taste_Testing/Sensory_Evaluation_Form.pdf

Project 7: **Evaluating Plant Volatile Organic Compounds as Potential Species-Specific Attractants in Spotted Wing Drosophila Monitoring Traps**

Lincoln University
Dr. Jaime Piñero
Final Performance Report

Project Summary

Missouri experienced in 2013 a statewide infestation of Spotted Wing Drosophila (SWD), *Drosophila suzukii*, a devastating pest of many small fruit crops. In the absence of monitoring and suppression tools for SWD, farmers continue to be at risk of losing a portion (small or large) of their crops. For small-scale farmers who suddenly lose 50% or more of their crop, economic losses are significant. This project aimed at reducing risks caused by this pest by improving current monitoring systems for SWD and educating small and medium-scale farmers (including limited-resource, and other underserved audiences) in MO on effective management options for this pest. Project objective 1 aimed at evaluating the response of adult SWD to certain host plant volatiles. Laboratory and greenhouse evaluations of individual plant-based volatiles, followed by evaluations of binary, tertiary and more complex mixtures revealed that the level of response of adult SWD is highest when mixtures are complex. B-cyclocitral and/or isoamyl acetate were two compounds that showed high potential. These two compounds were then evaluated in combination with grape and cherry juice. It was determined that female SWD responded in significantly greater numbers when either plant volatile is presented in combination with fruit juice. Objective 2 evaluated the most promising VOCs in field trials towards the development of an optimal SWD-specific monitoring lure. Evaluation of commercial lures revealed less attraction of male and female SWD toward these lures compared to the home-made bait consisting of sugar, yeast, and water. However, commercial lures proven to be more attractive than the mixtures of synthetic volatiles that were identified in this project. Objective 3 sought to quantify the response of male and female SWD to combinations of visual and chemical stimuli. Field evaluations that involved color-painted bait stations revealed that the strongest visual response of male and female SWD is towards red, and that color / odor may interact in such a way that both types of stimuli need to be present for adequate SWD response to traps. Objective 4 aimed at disseminating, through extension and outreach, the findings of our research with berry producers and extension educators at the local and regional levels. Over the course of ca. 3 years, over 1,660 farmers were reached directly. More farmers were reached indirectly through media, online information etc., but numbers cannot be quantified. About 150 farmers received ca. 500 free monitoring traps and yeast, as well as identification kits that included fact sheets and slides or vials with real SWD specimens.

This project (14-SCBGP-MO-0029) was built upon a previously funded project with the SCBGP (12-25-B-1471). One of the goals of the previous project #13 was to start, for the first time in Missouri, a monitoring system for two invasive insects: Spotted Wing Drosophila (*Drosophila suzukii*) (SWD) and the Brown Marmorated Stink Bug (*Halyomorpha halys*) (BMSB). Monitoring of SWD and BMSB was accomplished with the best traps and lures that were available based on research done throughout the USA. At that moment (2012-2014) it was determined that there was a need to improve the attractiveness and selectivity of baits and lures used to monitor SWD. The present project was submitted with the goal of evaluating individual plant-based compounds and compound mixtures that could be attractive to adult SWD. Research results generated from this project are expected to improve monitoring and management of SWD, thereby complementing the previously funded project.

Project Approach

Below we provide a synthesis of the research and outreach activities that were accomplished during the grant period. All activities proposed in the approved project proposal were accomplished and for at least one objective the expectations were surpassed. The heavy work load associated with our research and outreach were leveraged with supplementary funding provided by other sources. For example, this project was heavy on student labor / casual worker; even though only $ 5,000 was allowed for salaries. Any additional salaries, including the stipend of Ph.D. student Grant Bolton (University of Missouri) were covered by University of Missouri, by Lincoln University, or by supplementary sources. This exemplifies efficient use of resources by both Lincoln University and the University of Missouri. The PI states that funds were used to solely enhance the competitiveness of specialty crops e.g., (berries and other soft-skin fruits).

Objective 1: Evaluate the degree of attractiveness adult SWD have towards certain host plant Volatile Organic (naturally occurring) Compounds (VOC's) in laboratory behavioral bioassays.

***1.1 Laboratory research**:* This research was conducted by Mr. Grant Bolton, a Ph.D. student at the University of Missouri. He is supervised by Dr. Bruce Barrett (University of Missouri) and co-supervised by Dr. Jaime Piñero (Lincoln University). *Funds to support this student (tuition and stipend) were provided by other sources.*

Laboratory evaluations aimed at identifying individual plant-based compounds and compound mixtures that could be attractive to adult Spotted Wing Drosophila (SWD) started in 2015. Research was conducted using two main approaches. The first one involved physiological (neuronal) responses by male and female SWD using electroantennography to determine a dose response sensitivity curve for 9 chemicals derived from suitable SWD plant hosts. Doses evaluated ranged from 10^{-8} to 10^{-2} concentrations. Both male and female SWD were tested for any sensitivity differences between the sexes. The second approach involved behavioral responses to the same compounds that were evaluated in the first series of tests.

SWD olfactory behavioral attraction (via flight) to a dose series of host plant volatile organic compounds (VOCs) was evaluated in screened cages, 33 x 33 x 33 cm (BugDorm-43030F). In each cage two 5 ml plastic cups were placed in opposing corners. One of the cups contained 200µl of mineral oil (control) and the other cup contained 200µl of VOCs (treatment odorant) at one of the three doses. Approximately 20 adult female SWD, 3-6 days old, were then released into the cage. The cages were placed in an environmental chamber set for a 16 h light: 8 h darkness photoperiod and constant temperature of 23°C. After 24 hours, the cages were removed and the number of flies captured in the control and treatment cups counted and recorded.

Data were evaluated using an Attraction Index (AI), calculated as AI=(O-C)/T, where O is the number of flies in the VOC cups, C the number of flies in the control cups, and T the total number of flies released in the cage. Each tested VOC had six replicate cages per dose.

Main Findings:

I. Electroantennography. Neurophysiological data, obtained through electroantennograms (EAG), showed that SWD and *D. melanogaster* are both sensitive to all doses of each chemical tested. 2-Heptanone and butyl acetate were the most sensitive to both species. Acetic acid and ethanol were the least sensitive for both species.

Figure 1 shows that for 6 of the chemicals, there was no significant difference between SWD male and female responses. However, ethyl hexanoate (EH) and B-cyclocitral (BC) elicited a greater response by males at lower doses. Ethyl acetate was detected by the female at a lower dose than the male at a lower dose.

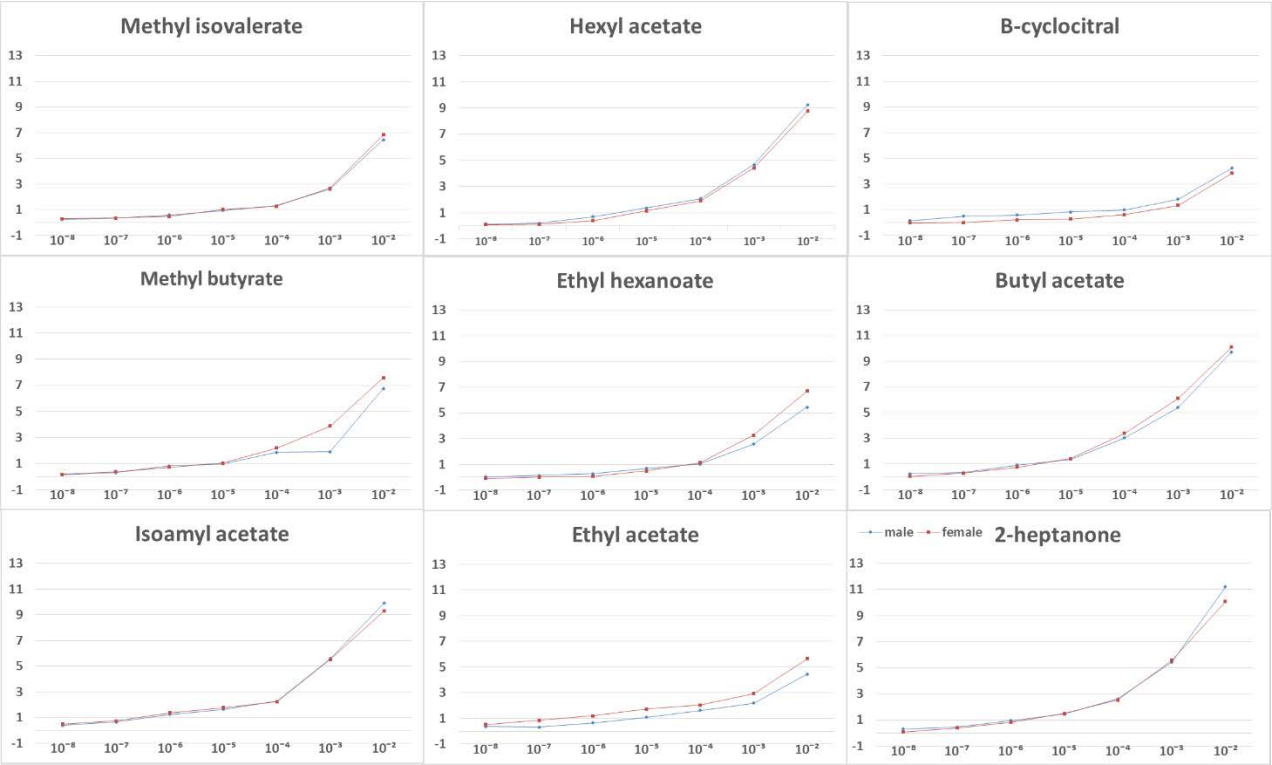

Figure 1. Electrophysiological responses of male and female *Drosophila suzukii* to nine plant-derived compounds tested singly at 7 different concentrations. Numbers denote amplitude of response in millivolts (mV).

II. Behavioral bioassays.

From the single compound behavioral assays completed earlier in 2016, we chose B-cyclocitral and isoamyl acetate as a base for our compound mixtures. We combined each of the remaining non-fermentation chemicals with the base pair of B-cyclocitral (BC) and isoamyl acetate (IA).

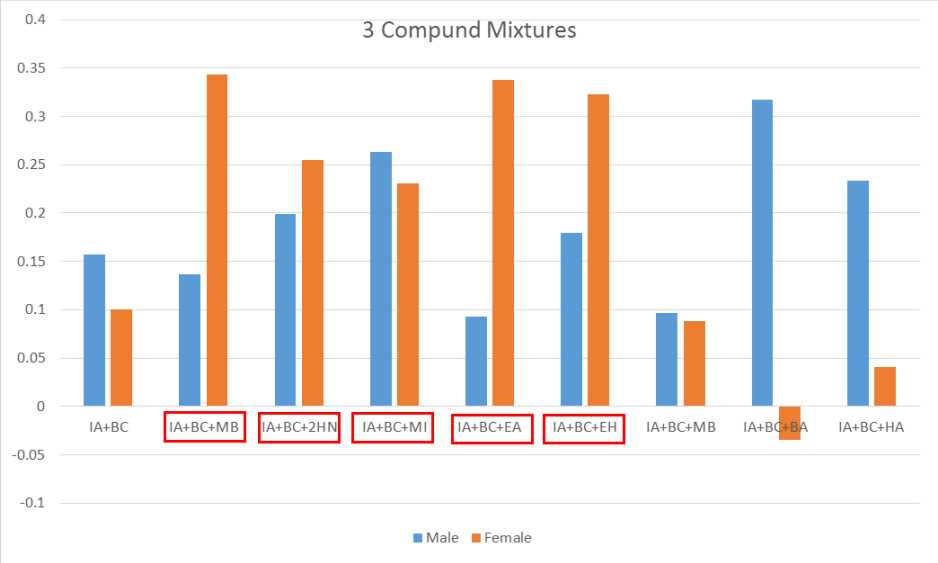

Figure 2. Behavioral responses of male and female *Drosophila suzukii* to binary and tertiary mixtures of plant-derived compounds tested singly at a single concentration. Numbers denote Attraction Index values calculated from the raw data.

Additional research evaluated methyl butyrate (MB), 2-hepatanone (2HN), methyl isovalerate (MI), ethyl acetate (EA), ethyl hexanoate (EH)] tested in 4, 5, 6, and 7 compound combination attractants. These combinations were also tested with a closely related non-target species, *Drosophila melanogaster*, to determine level of selectivity when compared to SWD.

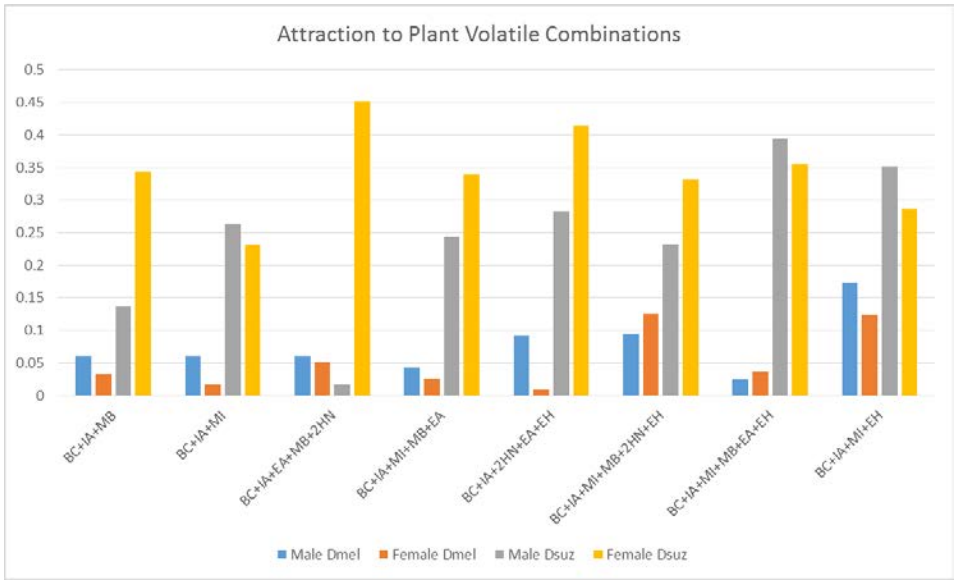

Figure 3. Behavioral responses of male and female *Drosophila suzukii* and *D. melanogaster* to complex mixtures of nine plant-derived compounds tested singly at four different concentrations. Numbers denote Attraction Index values calculated from the raw data.

Eight combination compounds were selected based on high attraction to SWD and low attraction to *D. melanogaster*. These compounds were then further tested in field trapping trials (2017).

1.2 Greenhouse research: This objective was undertaken by Dr. Jaime Pinero and his team. Four main studies were conducted with the goal of determining whether selected fruit juices (grape and cherry) are attractive to male and female SWD, and whether plant volatiles would enhance the attractiveness of the juices.

As shown in Figure 4, when B-cyclocitral and isoamyl acetate were tested singly, males did not show a preference for either compound over the controls. Both chemical compounds showed to be attractive to females. When B-cyclocitral and isoamyl acetate were tested singly, males did not show a preference for either compound over the controls. Both chemical compounds showed to be attractive to females.

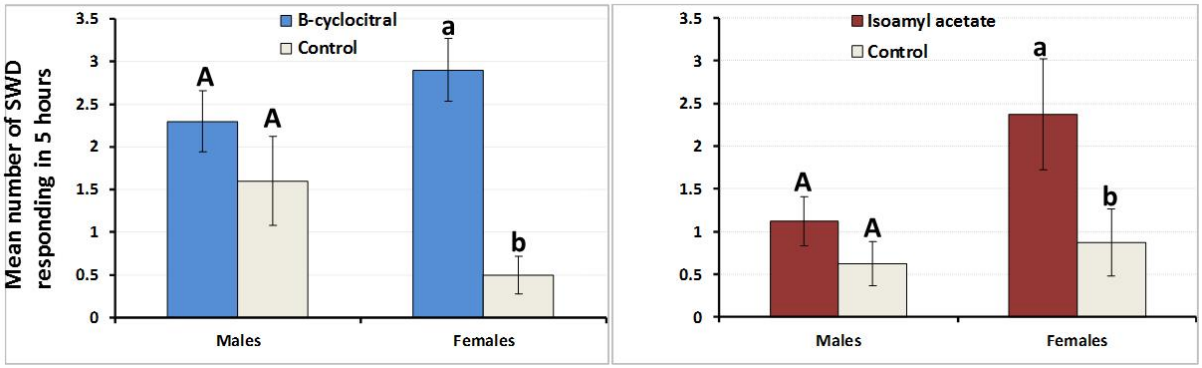

Figure 4. Behavioral responses of male and female *Drosophila suzukii* to B-cyclocitral or isoamyl acetate. All compounds were evaluated singly. Numbers denote individuals that responded positively in cages in the greenhouse.

In the next series of tests that involved fruit juice, grape juice alone was attractive to males and this level of response was not significantly enhanced by the addition of B-cyclocitral. In contrast, the addition of B-cyclocitral to grape juice significantly increased the response of females compared to grape juice alone. B-cyclocitral did not show to be attractive to males and females when compared against the control (Figure 5A).

No significant preference for cherry juice either, alone or in combination with B-cyclocitral, or for B-cyclocitral alone was recorded for males. For females, the combination of cherry juice and B-cyclocitral resulted in 4X increased attraction compared to cherry juice alone. When alone, B-cyclocitral showed not to be attractive when compared to the control (Figure 5B).

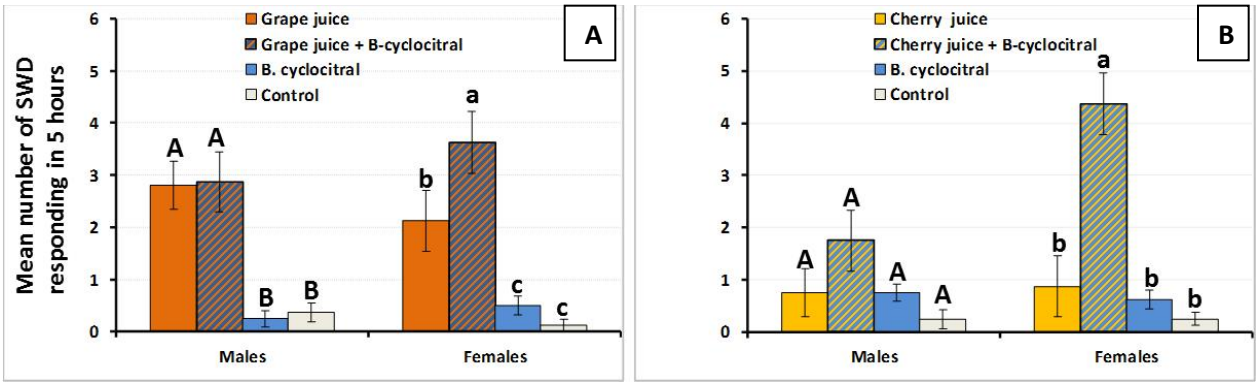

Figure 5. Behavioral responses of male and female *Drosophila suzukii* to (A) grape, and (B) cherry juice, either, alone or in combination with B-cyclocitral. Numbers denote individuals that responded positively and were captured by small devices placed at the corners of cages, in the greenhouse.

Grape juice alone was attractive both to males and females, and the addition of isoamyl acetate did not increase the level of response to grape juice. Isoamyl acetate was not attractive to males and females in this 4-choice setup (Figure 6A). Cherry juice and isoamyl acetate either, alone or in combination, were not attractive to males. SWD females showed a significant preference for cherry juice and for cherry juice + isoamyl acetate when compared to isoamyl acetate alone and the control (Figure 6B).

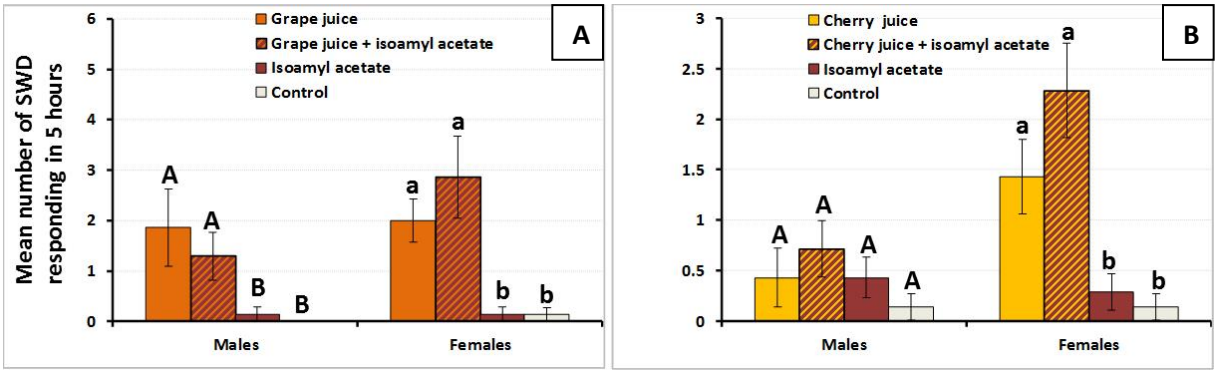

Figure 6. Behavioral responses of male and female *Drosophila suzukii* to (A) juice and (B) cherry juice, either, alone or in combination with the plant volatile isoamyl acetate. Numbers denote individuals that responded positively and were captured by small devices placed at the corners of cages, in the greenhouse.

Grape juice and cherry juice did not differ in attractiveness to males and females (Figure 7A). For males, B-cyclocitral and isoamyl acetate were similarly attractive. For females, isoamyl acetate was significantly more attractive than B-cyclocitral (Figure 7B).

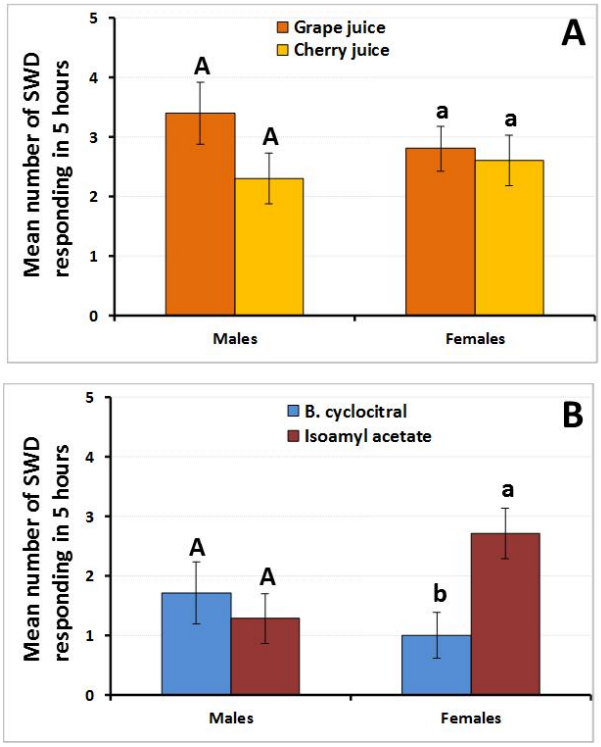

Figure 7. Behavioral responses of male and female *Drosophila suzukii* to (A) grape and cherry juice tested against each other, and (B) B-cyclocitral and isoamyl acetate, tested individually against each other. Numbers denote individuals that were captured by small devices placed at the corners of cages, in the greenhouse.

Objective 2: Evaluate the most promising VOCs in field trials towards the development of an optimal SWD-specific monitoring lure.

We previously reported on the effectiveness of commercial lures that are currently available for SWD. In 2016, one field study was conducted at the Lincoln University George Washington Carver farm to assess the level of fruit susceptibility to SWD attack based on questions from producers about which elderberry (*Sambucus canadensis*; *Sambucus nigra* ssp. c*anadensis*) cultivars would be more or less attacked by SWD. We deemed this information to be valuable as recently, elderberry has received more attention as an emerging fruit crop of commercial interest for small-scale producers in Missouri and other states of the Midwest. Results (see Figure below) show that, while most cultivars seem to be similarly infested by SWD, the cultivars York, Ocoee, Dallas, and Deer seem to be less attractive to SWD. This information would be of interest to elderberry producers as they may be able to select cultivars that are less prone to SWD attack.

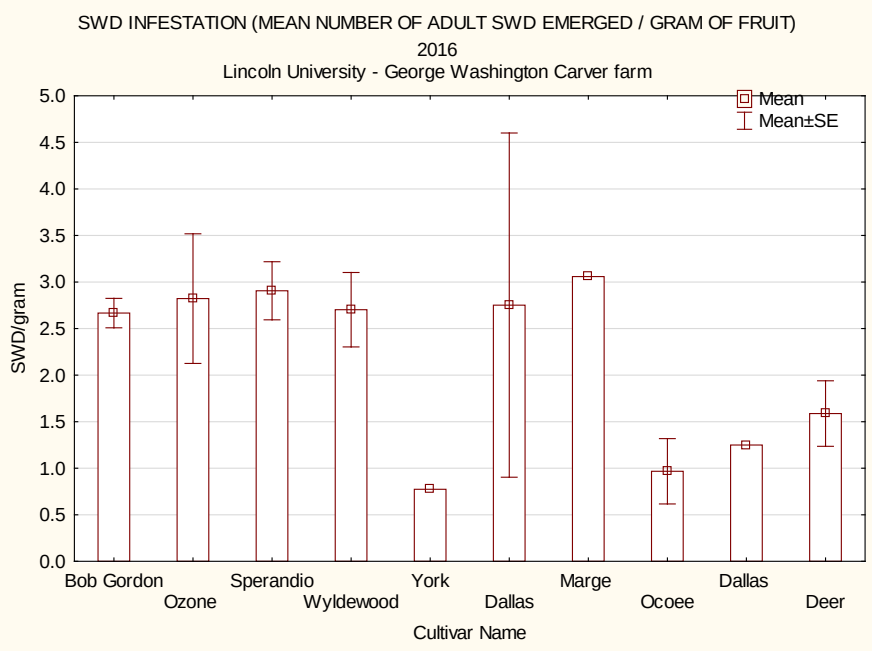

Figure 8. Mean number of adult *Drosophila suzukii* emerging from sampled fruits from nine different elderberry cultivars in 2016. Elderberry orchard is located at the Lincoln University George Washington Carver farm.

The 2017 evaluations of 8 different combinations of volatiles identified in the laboratory did not perform well in a blueberry orchard compared to the commercial lures. Data collected over the summer are being summarized and analyzed. Additional research (not part of this project) is needed to improve the attractiveness of the various blends of plant volatiles that were evaluated.

Research Objective 3: Quantify the response of male and female SWD to combinations of visual and chemical stimuli.

One study that aimed at quantifying SWD preference for particular colors using bait stations was conducted in a commercial blackberry orchard located in Columbia, MO. Bait stations are being evaluated as a potential attract-and-kill system for SWD. Bait stations were constructed following the design developed previously by Piñero et al. (2009)[1] and collaborators in Hawaii. In short, bait stations were constructed using plant pot saucers (36 cm outer diameter, 5 cm height of the lip). A metallic shelf bracket was attached to the interior side of the saucer using screws and Gorilla glue. This simple design allowed for easy deployment to vertical structures such as fence posts or tree trunks. Four colors were evaluated: red, white, yellow and sap green. Four bait stations were painted of each color using spray paint. One 25 ml vial containing 10 ml of the sugar / dry yeast bait was attached to the inner area of the bait station so as to attract the insects. The interior side of each bait station was coated with Tangletrap glue (Great Lakes IPM, Vestaburg, Michigan, USA) to capture all responding flies. For each observation day, each of the four bait stations was attached to a 3 ft. fence post of perimeter-row blackberry plants waist height. Bait stations 2 m apart and the initial position of each color treatment was assigned randomly. Observations typically started by 09:00 and ended by 11:00 hours.

[1]**Reference: Piñero, J.C.,** Mau, R.F.L., McQuate, G.T., and Vargas, R.I. 2009. Novel bait stations for attract-and-kill of pestiferous fruit flies. Entomologia Experimentalis et Applicata 133: 208-216

Bait stations evaluated to determine SWD response to color (yellow, sap green, red, and white). All. Bait stations had a vial containing 10 ml of sugar / dry active yeast bait. Tangletrap (sticky material) was applied to the inner side of each bait station to collect responding insects.

Figure 9 shows that that red is the preferred color by SWD as indicated by SWD captures in red bait stations compared to any other color. This means that any attract-and-kill system that is developed needs to include red as visual stimulus to increase trap captures.

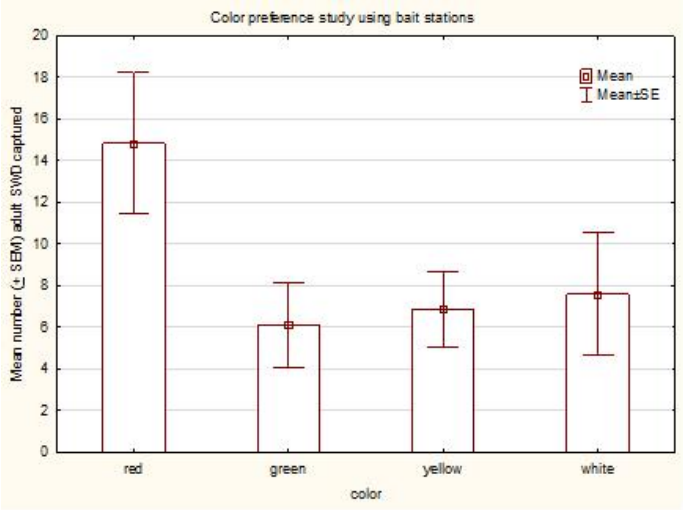

Figure 9. Captures of adult *Drosophila suzukii* in red, green, yellow, and white-painted bait stations baited with 10 ml of the home-made bait made of sugar, active dry yeast, and water.

In the project narrative, Drs. Piñero and Barrett indicated that through the educational programming that would be implemented, at least 300 farmers would be reached directly (i.e., those farmers that will attend the workshops and the field days) and at least 400 more farmers would be reached through presentations at the Annual Meeting of the MO Organic Association and at the Great Plains Growers Conference, and through articles published in Newsletters and the Fact Sheet that will be developed as part of this project. Our Extension efforts exceeded those outcomes. From November 1, 2014, to August 31, 2017 over 1,660 farmers were reached (direct contacts) at the numerous outreach activities that were conducted. The following table summarizes the main Extension activities involving SWD that were conducted in three years, and the number of direct contacts:

ACTIVITY	2015	2016	2017	
Annual presentations at the Great Plains Growers Conference	29	55	67	
Hands-on clinic at the Great Plains Growers Conference	N/A	N/A	95	
Comprehensive elderberry workshop	140	N/A	22	
Lincoln university George Washington Carver Farm Field Day	80	66	N/A	
Lincoln University Alan T. Busby Farm Field Day	97	134	137	
Lincoln University In-Service Education - Organic Pest Management	48	N/A	N/A	
Farmers reached by Extension staff based on ISE workshop	N/A	188	N/A	
Insect Chemical Ecology Short Course (PA)	N/A	N/A	96	
Growing Blackberry Workshop (Univ. Missouri St. Joseph, MO)	N/A	N/A	16	
Lee Farms (Truxton, MO) Spotted Wing Drosophila Trapping	N/A	N/A	25	
Blackberry Workshop (Univ. Missouri Southwest Research Center, Mt. Vernon, MO)	N/A	N/A	70	
Missouri Blueberry School Conference (Springfield, MO)	78	55	165	
TOTAL PER YEAR / GRAND TOTAL	**472**	**498**	**693**	**1663**

Additional contacts (i.e., indirect), which are those that accessed and read online articles, Fact Sheets, etc. cannot be quantified.

About 150 farmers received ca. 500 free monitoring traps and yeast, as well as identification kits that included fact sheets and slides or vials with real SWD specimens.

Goals and Outcome Achieved

***OUTCOMES AND IMPACTS FROM OUR RESEARCH*:** Research results generated from this project are expected to improve monitoring and management of SWD. Research aimed at developing a mass trapping system that integrates plant volatiles and fruit juices will be conducted as part of a new project. At least 2 research manuscripts are being written and they will be submitted to entomological journals with international readership.

OUTCOMES AND IMPACTS FROM OUR EXTENSION (OUTREACH): Over a 3-year period at least 1,660 people (direct contacts) received information generated by this project. There were many more indirect contacts that read posters regional, national, and international conferences, and also Newsletters articles online. Many farmers learned (short-term outcome – *increase in knowledge*) about the need to monitor for SWD, about effective control options, and about the research that was conducted as part of this project to improve IPM for SWD. Some farmers (<20) have implemented SWD monitoring at their farms (mid-term outcome – *change in behavior*).

All activities described were conducted ensuring that grant funds were used to solely enhance the competitiveness of specialty crops.

Some of the output indicators were:

- Number of workshops: 9
- Number of field days: 4
- Number of farmers visited the research sites in Jefferson City
    - Carver Farm: 146 (combining 2015 and 2016)
    - Busby farm: 368 (combining 2015, 2016, and 2017)
- Number of publications (fact sheets): 0
- Website (blog) on SWD (http://www.lu-ipm.net): 1
- Number of presentations (oral / poster) (2015-2017): 5
    - Great Plains Growers Conference (2015-2017): 3
    - ICE 17 - International Short Course in Insect Chemical Ecology (2017): 1

Measurable outcomes to growers included:

- Number of farmers that were reached (direct contacts): 1,660
- Knowledge gain by farmers on SWD identification and management: documented with pre- and post-workshop surveys
- Implementation of monitoring systems for SWD: At least 20 farmers
- Adoption of at least one IPM strategies to manage SWD: At least 5 farmers

Beneficiaries

We do not have access to information on the number of people that grow berries or other crops that are susceptible to SWD in Missouri either, commercially or in home gardens. However, assuming that people who attended our workshops and field days (who were very interested in learning about SWD and made the effort to drive to the workshop / field day locations) produced fruits susceptible to SWD,

then a conservative estimate is 1,6600. This number does not include readership of our Newsletter articles, online Fact Sheets, or press releases.

Lessons Learned

Monitoring for invasive insects needs to be implemented using as many means as possible in order to have early warning systems in place. Improving current or developing new monitoring systems requires considerable time and resources. Research conducted as part of this project revealed that some fruit juices (e.g., grape) could be combined with selected synthetic plant volatiles (e.g., isoamyl acetate) resulting in a mixture that is more attractive than the individual components. From an Extension perspective, this project was successful in part because, with support from the SCBGP, we conducted extensive outreach that focused on a segment of the specialty crop industry that comprises small- and mid-scale growers (including limited-resource, and other underserved audiences) in Missouri on effective management options for SWD. Whenever possible, traps were provided along with fact sheets and other educational materials that were developed. This increased the likelihood that producers would implement monitoring systems for SWD.

Contact Information

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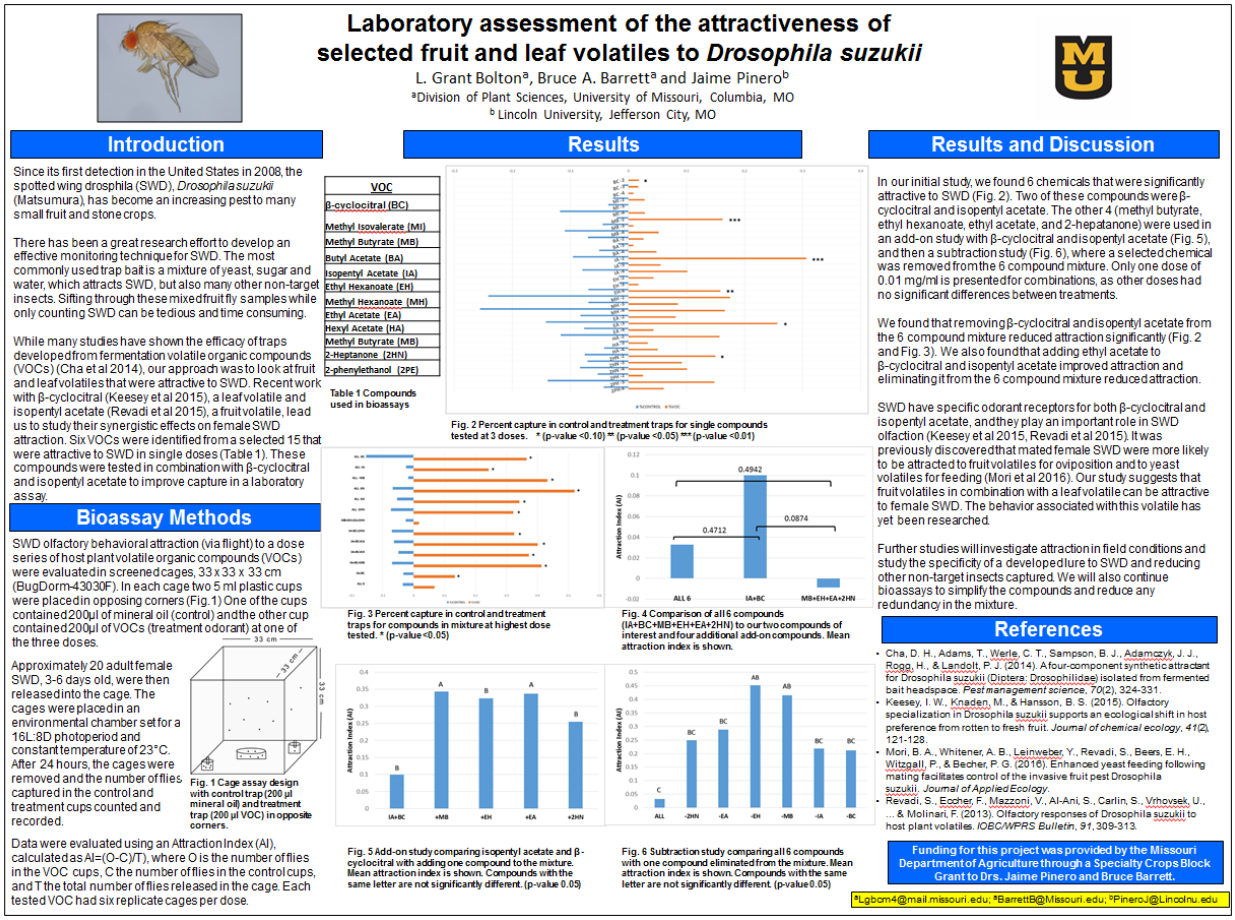
Additional Information

APPENDIX I

Selected examples of poster presentations at national and international conferences, field days, workshops, etc. For additional evidence of outreach, please contact Dr. Jaime Pinero at pineroj@lincolnu.edu

Poster presented at the International Congress of Entomology (Orlando, FL, September 25-30, 2016)



Laboratory assessment of the attractiveness of selected fruit and leaf volatiles to *Drosophila suzukii*

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Introduction

Since its first detection in the United States in 2008, the spotted wing drosphila (SWD), *Drosophila suzukii* (Matsumura), has become an increasing pest to many small fruit and stone crops.

There has been a great research effort to develop an effective monitoring technique for SWD. The most commonly used trap bait is a mixture of yeast, sugar and water, which attracts SWD, but also many other non-target insects. Sifting through these mixed fruit fly samples while only counting SWD can be tedious and time consuming.

While many studies have shown the efficacy of traps developed from fermentation volatile organic compounds (VOCs) (Cha et al 2014), our approach was to look at fruit and leaf volatiles that were attractive to SWD. Recent work with β-cyclocitral (Keesey et al 2015), a leaf volatile and isopentyl acetate (Revadi et al 2015), a fruit volatile, lead us to study their synergistic effects on female SWD attraction. Six VOCs were identified from a selected 15 that were attractive to SWD in single doses (Table 1). These compounds were tested in combination with β-cyclocitral and isopentyl acetate to improve capture in a laboratory assay.

Bioassay Methods

SWD olfactory behavioral attraction (via flight) to a dose series of host plant volatile organic compounds (VOCs) were evaluated in screened cages, 33 x 33 x 33 cm (BugDorm-43030F). In each cage two 5 ml plastic cups were placed in opposing corners (Fig. 1) One of the cups contained 200µl of mineral oil (control) and the other cup contained 200µl of VOCs (treatment odorant) at one of the three doses.

Approximately 20 adult female SWD, 3-6 days old, were then released into the cage. The cages were placed in an environmental chamber set for a 16L:8D photoperiod and constant temperature of 23°C. After 24 hours, the cages were removed and the number of flies captured in the control and treatment cups counted and recorded.

Fig. 1 Cage assay design with control trap (200 µl mineral oil) and treatment trap (200 µl VOC) in opposite corners.

Data were evaluated using an Attraction Index (AI), calculated as AI=(O-C)/T), where O is the number of flies in the VOC cups, C the number of flies in the control cups, and T the total number of flies released in the cage. Each tested VOC had six replicate cages per dose.

Results

VOC
β-cyclocitral (BC)
Methyl Isovalerate (MI)
Methyl Butyrate (MB)
Butyl Acetate (BA)
Isopentyl Acetate (IA)
Ethyl Hexanoate (EH)
Methyl Hexanoate (MH)
Ethyl Acetate (EA)
Hexyl Acetate (HA)
Methyl Butyrate (MB)
2-Heptanone (2HN)
2-phenylethanol (2PE)

Table 1 Compounds used in bioassays

Fig. 2 Percent capture in control and treatment traps for single compounds tested at 3 doses. * (p-value <0.10) ** (p-value <0.05) *** (p-value <0.01)

Fig. 3 Percent capture in control and treatment traps for compounds in mixture at highest dose tested. * (p-value<0.05)

Fig. 4 Comparison of all 6 compounds (IA+BC+MB+EH+EA+2HN) to our two compounds of interest and four additional add-on compounds. Mean attraction index is shown.

Fig. 5 Add-on study comparing isopentyl acetate and β-cyclocitral with adding one compound to the mixture. Mean attraction index is shown. Compounds with the same letter are not significantly different. (p-value 0.05)

Fig. 6 Subtraction study comparing all 6 compounds with one compound eliminated from the mixture. Mean attraction index is shown. Compounds with the same letter are not significantly different. (p-value 0.05)

Results and Discussion

In our initial study, we found 6 chemicals that were significantly attractive to SWD (Fig. 2). Two of these compounds were β-cyclocitral and isopentyl acetate. The other 4 (methyl butyrate, ethyl hexanoate, ethyl acetate, and 2-hepatanone) were used in an add-on study with β-cyclocitral and isopentyl acetate (Fig. 5), and then a subtraction study (Fig. 6), where a selected chemical was removed from the 6 compound mixture. Only one dose of 0.01 mg/ml is presented for combinations, as other doses had no significant differences between treatments.

We found that removing β-cyclocitral and isopentyl acetate from the 6 compound mixture reduced attraction significantly (Fig. 2 and Fig. 3). We also found that adding ethyl acetate to β-cyclocitral and isopentyl acetate improved attraction and eliminating it from the 6 compound mixture reduced attraction.

SWD have specific odorant receptors for both β-cyclocitral and isopentyl acetate, and they play an important role in SWD olfaction (Keesey et al 2015, Revadi et al 2015). It was previously discovered that mated female SWD were more likely to be attracted to fruit volatiles for oviposition and to yeast volatiles for feeding (Mori et al 2016). Our study suggests that fruit volatiles in combination with a leaf volatile can be attractive to female SWD. The behavior associated with this volatile has yet been researched.

Further studies will investigate attraction in field conditions and study the specificity of a developed lure to SWD and reducing other non-target insects captured. We will also continue bioassays to simplify the compounds and reduce any redundancy in the mixture.

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Funding for this project was provided by the Missouri Department of Agriculture through a Specialty Crops Block Grant to Drs. Jaime Pinero and Bruce Barrett.

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Field Day hosted by the Lincoln University Alan T. Busby farm (June 9th, 2016) – one SWD workshop was offered (morning hours) and one SWD station was set up for the field day (afternoon).

Alan T. Busby Farm Field Day
and Producer Workshops

Thursday, June 9, 2016 *(rain date June 10, 2016)*

Alan T. Busby Farm — 5124 Goller Road • Jefferson City, Missouri

1866 - 2016 150 YEARS LINCOLN UNIVERSITY
COOPERATIVE EXTENSION AND RESEARCH

Promoting Sustainable and Organic Agriculture for Small Farms

Limited to 25 people per workshop • Registration fee: $15 per person • Workshop registration begins at 8:00 a.m

9:00 a.m. - 12:00 p.m. Workshops:

- Internal Parasites of Goats, Sheep and Cattle
- Organic Berry Production
- Organic Management of Spotted Wing Drosophila (SWD)
- Predator Control for Small Ruminants
- Creating and Protecting Habitat for Native Pollinators
- Agroforestry and Mushroom Production
- Disease Management in Organic Fruit and Vegetable Production

1:00 p.m. - 2:00 p.m. Keynote Speaker:
Dr. John Ikerd
Professor Emeritus, University of Missouri

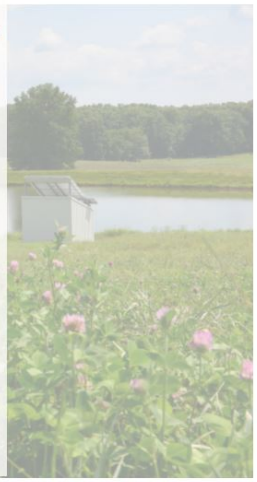
Organic Farming: The Roots of Sustainable Communities

The local food movement is putting down the organic roots needed for development of sustainable communities. The local food movement reflects growing public concerns about alarming trends in public health and the lack of social and ecological integrity of the industrial food system – including the loss of integrity as organic foods move into mainstream markets. As people come together around their common interest in good food, they are rediscovering the importance of their interconnectedness with each other and with the earth. The quest for authentic organics through local connections is creating the roots for sustainable by restoring social, ecological, and economic integrity to communities.

2:00 p.m. - 6:00 p.m. Farm Tours

DEMONSTRATIONS:

- Multispecies Grazing
- Organic Blueberries
- Organic Vertical Garden
- FINCA Garden with Native Plants
- Silvopasture
- Plant Disease Management with OMRI products
- Small Ruminant Parasite Management
- Composting/Green Roof and Walls
- Cucurbit Pollination
- Trap Cropping
- Insectary Plants
- Invasive Insects
- NRCS Pollinator Habitat for the Environmental Quality Incentive Program (EQIP)
- Biochar



For more information email Chris Boeckmann: BoeckmannC@LincolnU.edu or Cindy DeOrnellis DeOrnellisC@LincolnU.edu; or call (573) 635-2063

USDA United States Department of Agriculture | National Institute of Food and Agriculture | NORTH CENTRAL SARE Sustainable Agriculture Research & Education | THE CERES TRUST

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Workshop Descriptions

Workshop 1. Internal Parasites of Goats, Sheep and Cattle:
Dr. Bruce Shanks, Associate Professor of Animal Science, Lincoln University
Luke Wilbers, Research Technician, Lincoln University
Learn more about internal parasites in small ruminants and how managed grazing can help control parasites. Get hands-on training on doing body condition scores, fecal egg counts and FAMACHA.©

Workshop 2. Organic Berry Production:
Dr. Touria Eaton, State Extension Specialist - Horticulture, Lincoln University
The workshop will consist of three presentations. Presentation #1 will focus on blueberries. Presentation #2 will focus on Blackberries and Raspberries, and presentation #3 will focus on strawberries and specialty berries such as elderberries and gooseberries. All presentations will focus on production and economic importance. This includes site selection and preparation, soil fertility and stewardship, and the different marketing channels and their advantages and disadvantages.

Workshop 3. Organic Management of Spotted Wing Drosophila (SWD):
Dr. Jaime Piñero, State Extension Specialist - Integrated Pest Management Program, Lincoln University
Don Johnson, Department of Entomology, University of Arkansas Extension
Anastasia Becker, Missouri Department of Agriculture
The warm winter can potentially lead to high overwintering survival of SWD, resulting in a challenging year for managing this invasive pest. Learn about the biology, habits and organic management options for SWD.

Workshop 4. Predator Control for Small Ruminants:
Jim Braithwait, Wildlife Damage Biologist, Missouri Department of Conservation (MDC)
Overview of MDC's regulations and landowner rights. Learn about management and trapping techniques for nuisance wildlife. Demonstration of various trapping methods and the advantages/disadvantages of each.

Workshop 5. Creating and Protecting Habitat for Native Pollinators:
Dr. Nadia Navarrete-Tindall, State Extension Specialist - Native Plants, Lincoln University
Learn the habitat requirements for native pollinators' survival in urban and rural areas. Native plants, from wildflowers to woody species, are important for pollinators. How conservation practices benefit pollinators.

Workshop 6. Agroforestry and Mushroom Production:
Greg Ormsby Mori, Center for Agroforestry, University of Missouri
Introduction and overview of agroforestry in Missouri. Discussion and demonstration of mushroom production, including shiitake, oyster and *Stropharia* varieties.

Workshop 7. Disease Management in Organic Fruit and Vegetable Production:
Dr. Zelalem Mersha, State Extension Specialist - Plant Pathology, Lincoln University
Patrick Byers, University of Missouri Extension
Martha O'Connor, Plant Pathology Technician, Plant Pathology Program, Lincoln University Cooperative Extension
Learn to recognize and identify common diseases of vegetables and small fruits. Speakers will discuss where and how to find organically approved products. Hands-on activities will include dissections of fungal and bacterial infected plants and using Immunostrip® based tests to diagnose disease.

Lincoln University George Washington Carver farm field day (September 8, 2016)

There is no charge to attend and this event is open to the public! Small- and mid-scale farmers and gardeners will receive research-based information and hands-on skills on disease identification.
Lincoln University Cooperative Extension and Research educators will have displays and presentations on:

- Hydroponic Vegetable Production and Gravel Aquaponics Design
- Field Blueberry Variety Trial for Missouri
- Cover Crop Grazing by Goats and Sheep
- Tomato Production in High Tunnels
- Mobile Biobed System for Pesticide Remediation
- Composting and Biochar
- Sweet and Chili Pepper Production
- Organic Kale Production
- Organic and Conventional Cucurbit Disease Management
- George Washington Carver and Peanut Production
- Tomato Disease Management and Solarization
- Native Plants for Native Pollinators and as Specialty Crops
- Missouri Seafood and Eat it!
- Bioenergy Crops on Marginal Lands
- Soybean, Sorghum and Quinoa
- Monitoring and Management of Invasive Insects– free bait and traps will be available for Spotted Wing Drosophila
- Food Safety

Registration is not required but encouraged. To register, or for more information, contact Ms. Erin Brindisi by email at: BrindisiE@lincolnu.edu or call (573) 681-5312. Be sure to let us know if you need special accommodations.

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This event is made possible from funding provided by the USDA-NIFA.

Project 8: **Evaluation of Seven Grape Varieties from the Cross of Norton and Cabernet Sauvignon for Selecting New Wine Grapes for the MO Grape and Wine Industry**

Missouri State University
Dr. Wenping Qiu
Final Performance Report

Project Summary

Only a limited number of grape varieties are grown in Missouri and produce quality wines because of harsh climate and high disease pressure. New wine grape varieties are needed for the Missouri grape and wine industry, and will make the industry viable and sustainable. New varietal wines boost marketing, increase competitiveness, and broaden spectrum of Missouri vintage wines. Breeding and selection of new grape varieties is the strategic goal and plan for the industry. A cross of Norton and Cabernet Sauvignon was made in 2005. Seven new grape varieties, four white and three red grape, were selected based on a preliminary assessment, and were planted with two parents in an experimental vineyard in 2011. A total of 12 vines for each variety with 4 vines per replicate in three biological replicates has reached a stage for field evaluation of their traits.

The goal of this project was to conduct an assessment of the seven new grape varieties for their viticultural characteristics in 2015 and 2016. This project was continued from a previously funded project. The traits were continuously monitored for verifying the previously recorded ones under slightly different climate conditions. The viticultural traits of the seven new grape varieties have been recorded and reported. These recorded traits have been considered in selecting the promising new varieties for further evaluation of enological characteristics after consulting with wine makers and the industry. Graduate student Steven Beach and two summer interns were trained in this project.

Project Approach

Specific activities and tasks accomplished

In this project, we evaluated the disease resistance of seven varieties and two parents “Norton” and “Cabernet Sauvignon”. We measured the pruning weights of each variety. We recorded dates of bud break, bloom, veraison and harvest. We measured crop yield per vine. We performed assays of Brix, TA and pH. These recorded traits are the most significant accomplishments by this project. The results have helped make critical decisions of selecting the best varieties for the Missouri Grape and Wine Industry.

Significant conclusions: From evaluation, we recommended that new variety NC43 may not be the variety for further evaluation, and the new variety NC6 may be the variety for further evaluation. Cabernet Sauvignon is not a suitable cultivar to the Midwest region. The selection of NC6 as a potential new cultivar for the Midwest region is the most valuable recommendation from this project.

Susan Howard recorded all the traits, she compiled all the data and made significant contributions to the successful implementation of the project. Wenping Qiu supervised and managed the project closely and made critical decisions in each phase of the project and in selecting the most potential cultivars.

Goals and Outcomes Achieved

Goals: The goal of this project is to have a comprehensive report of viticultural traits of the seven new grape varieties by conducting an assessment of their characteristics. We recorded and reported the traits of the seven new grape varieties together with two parental cultivars in 2015 and 2016 (Table 1 and 2). The two year's data are one set of traits which we used for further evaluation. The accomplishment of this project laid the foundation for the continuous evaluation of these varieties in the future and allowed us to manage the vineyard, greenhouse and laboratory experiments very well.

Table 1. Traits evaluated for the seven varieties and two parents "Norton" and "Cabernet Sauvignon"-2015

New Variety	Downy Mildew	Pruning Weight	Bud Break	Bloom	Verasion	Harvest Date	Yield/Vine lb.	Brix	TA	pH
NC6	2.81	1.88	4/14/2015	6/7/2015	8/10/2015	9/1/2015	2.19	19.5	1.29	3.24
NC28	3.97	0.66	4/14/2015	6/7/2015	8/12/2015	"	1.13	15.3	1.94	3.15
NC43	2.5	1.23	4/13/2015	6/2/2015	8/12/2015	"	0.68	14	2.21	3.01
CN21	4.06	1.67	4/13/2015	6/7/2015	8/14/2015	"	0.0 (rot)	19.4	1.4	3.1
NC17	2.25	0.63	4/18/2015	6/7/2015	8/23/2015	9/28/2015	1.75	20.5	0.85	3.52
NC60	3.06	0.93	4/13/2015	6/9/2015	8/13/2015	"	2.34	21.7	0.79	3.43
NC65	2.58	1	4/18/2015	6/8/2015	8/16/2015	"	2.14	17.8	1.2	3.55
Parent 'Norton'	0.31	1.56	4/13/2015	6/1/2015	8/15/2015	"	13.25	22.7	1.05	3.46
Parent 'Cab'	3.62	1.06	4/20/2015	6/3/2015	8/16/2015	"	0	0	0	0

Disease index: 5-the highest infected, 1-the lowest infected.

Table 2. Traits evaluated for the seven selections and two parents "Norton" and "Cabernet Sauvignon"-2016

New Variety	Botrytis Index (wounded)	Botrytis Index (unwounded)	Pruning Weight (lbs)	Bud Break	Bloom	Harvest Date	Yield/ Vine (lbs)	berry weight (g)	Brix	TA	pH
NC6	2.03	0.76	1.64	4/11/2016	6/6/2016	9/21/2016	12.77	1.28	21.70	0.59	3.21
NC28	1.7	0.33	1.17	4/8/2016	5/29/2016	9/27/2016	5.83	1.32	23.90	0.57	3.30
NC43	1.3	0.83	1.51	4/11/2016	6/2/2016	10/18/2016	5.11	1.58	21.00	0.65	3.19
CN21	2.7	0.47	1.68	4/12/2016	6/3/2016	9/27/2016	8.1	1.09	24.40	0.67	3.21
NC17	1.2	0.77	0.56	4/11/2016	6/4/2016	10/4/2016	4.17	1.29	23.80	0.75	3.39
NC60	1.76	0.53	0.82	4/9/2016	6/2/2016	10/11/2016	1.71	1.34	22.50	0.73	3.35
NC65	1.97	0.833	0.81	4/13/2016	6/3/2016	10/11/2016	N/A	1.20	20.20	0.99	3.25
Parent 'Norton'	0.57	0.47	1.19	4/13/2016	6/3/2016	10/4/2016	14.09	1.23	24.10	0.64	3.37
Parent 'Cab'	3.06	1.37	0.70	4/14/2016	6/4/2016	10/4/2016	N/A	0.81	19.40	0.76	3.15

Beneficiaries

The outcome of this project benefit Missouri Grape and Wine Industry greatly. Breeding and selection of new grape varieties has fundamental and significant impact on the strategic planning and sustainable economic viability of the Missouri grape and wine industry. Selection and growing of new Norton-based grape varieties will benefit the Missouri grape and wine industry in a long term. If new wines are made of the selected grapes, they will add freshness to the marketing and recognition of Missouri wines and

increase Missouri wines' competitiveness in an increasingly competitive global market. The potential new cultivar 'NC6' is a Norton-based, disease-tolerant white grape variety. It adds a new variety and a new style of wine to the Missouri Grape and Wine Industry. The new variety will be adopted by more than 100 grape growers in the Midwest region.

Lessons Learned

The planting of these varieties is part of a larger vineyard block. This block had been evaluated as a complete no-spray vineyard for three years. During those years, long periods of leaf wetness during the spring in three consecutive years had increased pathogen inoculum. The severe defoliation caused by grape pathogens followed by two deep cold winters caused varying degrees of damage to the plants, especially to "Cabernet Sauvignon" that is not a suitable cultivar to the Midwest region. The plants were sprayed according to the best pest management guidelines starting in spring of 2015, but the high pathogen inoculums built up during previous years and long periods of leaf wetness in 2015 led to less than complete disease control. This resulted in widespread, multi-disease, berry rots on all varieties except for "Norton". Because of these berry rots, the values of pH, Brix and TA could not be obtained at full harvest ripeness, and it was also not possible to collect data on yield for the partial crop of this year on all varieties. Several plants of "Cabernet Sauvignon" will need to be replaced. Some of the expected data (pruning weight, yield) can no longer be collected for "Cabernet Sauvignon".

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Additional Information

None

Project 9: Missouri GAP & GHP Cost Share Program

MDA - Ag Business Development Division
Alan Freeman
Final Performance Report

Project Summary

The Missouri Department of Agriculture Ag Business Development Division received $44,135 through the Specialty Crop Block Grant Program to increase the number of specialty crop operations with GAP and GHP certification in Missouri.

The main purpose of this project was to continue funding the GAP and GHP cost-share program to make certification more affordable and enable producers to access more commercial markets. During 2012 and 2013, the Missouri Department of Agriculture (MDA) took part in food safety workshops with the

University of Missouri Extension, Lincoln University Extension, trade associations and farmers' markets. More than 300 participated, however, at the time Missouri only had 8 farms and 2 processing and distribution centers GAP/GHP certified. Also, at the time the Food Safety Modernization Act gave FDA the authority to require farms to be GAP certified to sell whole and raw produce to wholesale markets or to sell to a GHP-certified facility within 5 years. In addition, Missouri's 2 largest commercial buyers handled over 60% of the produce sold to Missouri consumers and already require their suppliers to be GAP certified.

During the grant period 20 individual producers were provided cost-share assistance for Good Agricultural Practices (GAP)/Good Handling Practices (GHP) Certification in Missouri for a project total of $8,974.32.

This project did not build on a previous SCBGP award.

Project Approach

The project had an online presence through a cost share application webpage hosted on the Missouri Department of Agriculture's Financial Assistance website. Staff developed a comprehensive list of producers that completed GAP/GHP certification through USDA over the last three years and distributed letters to them notifying them of the available funding. Staff also developed a comprehensive list of growers who participated in the departments Organic Cost Share program over the last three years.

Staff developed a GAP/GHP informational flyer that was emailed out to over 200 farmers' market managers and taken to multiple Department events and distributed. Information flyers were also sent out to all seven produce auctions in the state of Missouri.

Detailed emails were sent to both C&C Produce and Associated Wholesale Grocers about our availability of GAP/GHP funding and requested that it be sent to their vendors. Staff from the Missouri Department of Agriculture's Plant Industries Division, played a vital role in providing GAP/GHP cost share information to producers during certification site visits.

Staff attempted to work with Primus, a third party GAP/GHP certification organization, to determine corresponding criteria for PRIMUS certification to USDA GAP/GHP Certification to improve the pool of potential cost-share applicants based on the past three years of PRIMUS Certification. Unfortunately the organizations were unable to sync strategies for collaboration.

Goals and Outcomes Achieved

The goals for the program included increasing the number of operations with GAP and GHP certification in Missouri, improve overall food safety, increase the overall amount of Missouri produce grown, handled and processed by Missouri owned and located operations and increase the total amount of produce specialty crops. The program achieved a number of its goals identified in the work plan and project plans. However, the outcomes were less than desired. We were able to award out $8,974.32 for the GAP/GHP grant. Staff sent out grant information to 47 organic cost share recipients.

Detailed Progress with Expected Measurable Outcomes:

1) Increase the number of operations with GHP and GAP certification.

	2015	2017	Change
Number of Operations GAP/GHP Certifications	12	38	217%

2) Increase the overall amount of produce grown in the state and handled by Missouri facilities.

MDA set a minimum target of 60 cost-share certifications from July 1, 2015 through August 30, 2017. That target was not met. During the grant period, we were able to provide cost-share assistance to 20 individual producers and 25 certifications.

3) Increase consumer access to Missouri grown produce while increasing food safety.

USDA GAP/GHP records for 2017 show that 40 producers and distribution centers were certified. This is more than a 300% increase from the data included in the original grant request proposal, therefore this measurable outcome was achieved.

Beneficiaries

Beneficiaries include:

- 20 individual producers were provided cost-share assistance for Good Agricultural Practices (GAP)/Good Handling Practices (GHP) Certification in Missouri for a project total of $8,974.32.
- 250 Farmers' Market organizations were provided information about available financial resources for members through mailed flyers, email notifications or Facebook posts.
- Over 2,200 AgriMissouri members were aware of the program through various outlets including; social media, email and website accessibility.
- 3,900 plus social media followers were provided information about the available financial resources.

Lessons Learned

We encountered a few obstacles when administering this grant. One obstacle that we faced was staff turnover at the beginning of the grant period. This put a significant delay on announcing the grant and effective strategies for implementation.

Another obstacle faced was a lack of response from wholesalers and other certifiers. Staff reached out to two major wholesalers in the state of Missouri as well as PRIMUS, another certifying agency, and there was no response from these companies.

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Project 10: Improving Youth Education and Consumer Awareness of Specialty Crops Columbia Farmers Market

Columbia Farmers Market
Corrina Smith
Final Performance Report

Project Summary

The Columbia Farmers Market (CFM) developed a two-part educational program through the Specialty Crops (SC) Block Grant Program. Before this project, feedback and surveys from vendors claimed that the main problem they saw needing to be addressed, was the lack of sales and number of customers. Customer feedback through similar methods had shown that nearly 100% visit the market to purchase SCs. Through others' research, customers spend more money, the longer they have been coming to the market and the more they visit each month. As well, in many ways children are just as important to include as they drive their parents to shop; if they don't want it than parents are much less likely to buy it. With no designated educational space or youth programming, it was essential to design the following programs. Firstly, the creation of The Greenhouse, a booth for CFM and community organizations to provide educational SC related children's activities, took place. By establishing The Greenhouse, a centralized location was established for children to learn about local agriculture and healthy eating. Every week, an activity or cooking demonstration is offered engaging children. The second part of the project created the Good Food Detectives club, where a take-home activity booklet was designed, awarding children with 'Munch Money' for completed activities. The Good Food Detectives booklet contains ten activities with the goal of improving youth's education and awareness of SCs. Activities focus on helping youth explore and learn about SCs at market, home, the store or a farm.

The timeliness of this project initially was longer than expected, specifically during collaboration on the design of the booklet, resulting in an extension on the project with MDA. After completion of the booklet, the project was quickly up and running. Despite this setback, we now have a graphic template for the future booklets, which will make them much easier and quicker to create.

The importance of this project is that it improved youths' attitudes towards fresh fruit and vegetables leading both them and their parents to purchase more SCs and adopt healthier eating practices. In turn, customers are more capable of preparing, cooking and buying SCs, which influences their purchasing habits, and improves SC vendors' overall sales.

Project Approach

To begin this two-part project initial brainstorming meetings with local graphic design company, Sonshine Graphics took place. The first part of this project was the creation of an educational children's booth, The Greenhouse. To create an inviting and eye-catching booth, marketing materials, signage, and logo for The Greenhouse were all needed. Upon print of these materials, CFM staff began setting up this booth every week. To eliminate some of the pressure from the limited CFM staff, community organizations were invited to come to market and provide SC related activities at The Greenhouse. Below the growth in attendance and activities at The Greenhouse is shown:

Year	Nov-Dec 2014	Jan-Dec 2015	Jan-Oct 2016
Number of Activities at The Greenhouse	3	42	38
Total Annual Participants	31	1060	1891
Average Number of Participants	7	25	71
Number of SC Cooking Demos	0	1	6

Weekly, CFM saw repeat children participate at The Greenhouse, which in turn, generated excitement in other children at market. As shown, over this projects time period, there has been a steady growth in attendance.

To help guide community organizations on what types of activities are encouraged at The Greenhouse, CFM staff put together an activity guidebook, 23 different activities, plus a Field Trip Guide for groups touring the market. Activities vary from "Specialty Crop Close-Ups" to "What Part of the Plant Do We Eat?"

CFM realized that there are benefits to sampling and tasting exposures, specifically for children, though due to strict sampling regulations from the Boone County Health Department CFM staff was unable to offer cooking demos and taste testings. Compliance with regulations placed too much strain for the small market staff to conduct sampling demonstrations at market. Instead, CFM began working with volunteer chefs who have certified kitchen access to do live demonstrations at the market. Logistically it was feasible for CFM to set up The Greenhouse tent at market for individuals or entities that already have certified kitchen space to deliver SC tastings at the market. Additionally, due to the popularity of The Greenhouse and space restrictions, CFM can only schedule one cooking demonstration per month.

For the second part of the project, the Good Food Detectives (GFD) club, the market spent January-September 2015 working with Sonshine Graphics to design the layout for the booklet and program materials. The final materials include the Good Food Detective activity booklet with ten different activities, an informative flyer, "Munch Money", punch-cards to track completed activities and recipe cards. The booklet contains activities such as "Using Your Senses" and "Sketch Your Favorite Vegetables or Fruits." The first asks detectives to use their five senses to describe a fruit or vegetable while the second asks detectives to draw the suspects – in this case two favorite fruits or vegetables. Each week, participants can turn in one completed activity at The Greenhouse. The GFD club officially started on September 12, 2015, seeing 258 children sign up for the club over this project's life. Upon signing up, the children receive the GFD activity booklet, the punch-card and $2 in 'Munch Money' (CFM currency that children can spend on SCs). Each week activities can be turned in at The Greenhouse booth, which are then rewarded with 'Munch Money'. Total amount of $2 'Munch Money' dispensed was $1205, which children then used to purchase SCs from farmers at CFM. On the market's bookkeeping end, a membership card is kept on file to record 'Munch Money" transactions, age, parent's authority to participate in program and an email address. These email addresses are kept in a database that market staff uses to email parents about weekly Greenhouse activities and GFD information.

To ensure this project solely enhanced SCs, activities at The Greenhouse were limited to SC related activities, the GFD booklet's activities were limited to SCs education and 'Munch Money' purchases were limited to SCs.

To fund the reimbursement of 'Munch Money' to CFM vendors, CFM holds an annual Farm to Table fundraiser dinner. No SCBGP funds were used towards these dinners.

To help in the research and design of the GFD program, CFM staff visited three Missouri farmers' markets that offer some type of children's programming. In 2015, CFM Market Manager, Corrina Smith visited the City Market in Kansas City, and CFM AmeriCorps VISTA, Ellis Cole, travelled with Corrina Smith to the Webster Groves Farmers Market in St. Louis. The Webster Groves Farmers Market operates a children's program similar the GFD program. Many of the accounting, operational, structure, rules, guidelines, etc. observed helped CFM finalize the details of their program. The Kansas City market operates a program in which at-risk youth assist customers to taxi their large purchases to their cars. CFM was able to observe how City Market manages adult volunteers who oversee children's program. In 2016, Corrina Smith visited the Webb City Farmers Market, seeing how their winter market operates, along with how they manage volunteers.

Due to the success of the GFD club, CFM realized there was a need for additional staffing to smoothly operate the program. After seeing the Webb City's volunteer system CFM decided what and how they needed for staffing volunteers at The Greenhouse. CFM now seeks assistance from volunteer community organizations to provide weekly educational activities at The Greenhouse, plus one individual volunteer. In addition, CFM hired a part-time employee to assist the Market Manager in overseeing the programming. CFM is using its own funds to pay that employee.

CFM has seen and heard the excitement children have experienced being GFDs. One mother reported to CFM Market Manager that before this program, her daughter would never eat apples. After completing a GFD activity in her activity booklet, the daughter took her 'Munch Money' and purchased an apple. The mother was ecstatic that this program was effective in providing a platform for her daughter to feel empowered to open her horizons and try new SCs. Children are very proud to come up to market staff at The Greenhouse and turn in their completed activities to receive their "Munch Money". Another parent stated, "This program is so awesome- the kids love to have their special 'Munch Money' and we got to talk to them about the importance of eating healthy and knowing where your food comes from and how it is grown and being good stewards of the environment. We love this program and recommend it all the time!"

Over the course of this project CFM staff presented market educational programming to 8 different community organizations. Market Manager, Corrina Smith, presented to three different organizations. On January 23rd, 2015, she visited the Missouri Farmers Market Association Conference in Webb City, where she participated in a class given on children's farmers' market clubs. During this class she gave a brief introduction to the attendees on CFM's GFD program. On February 3rd, 2016, Corrina Smith visited The Children's School at Stephens College and gave a presentation to 29 students on the GFD club. On February 25, 2016, she presented at the "Serving Up Healthy Food" meeting, where she informed 8 representatives from community health, poverty, education organizations on the details of the GFD program and the market's educational activities. Market Assistant, Caitlin Ruth presented the details on how the GFD program works to local community groups; September 30, 2016 to City Garden School – 23 children, 11 parents and 2 teachers, October 1, 2016 to a Boy Scout Troop – 8 children, 6 parents, 15 Columbia College students, October 3, 2016 to Windsor Montessori School - 23 kids, 4 adults, October 5, 2016 to Benton-Stephens School - 11 kids, 2 adults and October 12, 2016 to Willow Tree Waldorf – 8 children, 2 teachers.

Goals and Outcomes Achieved

To monitor success of this project data was collected every Saturday, recording how many children participated in the activity at The Greenhouse, how many children signed up for the GFDs club, which activities were completed and how much 'Munch Money' was dispensed.

At the beginning and the end of this project, surveys were conducted with customers, children and CFM SC vendors.

While we saw growth and positive numbers for all our goals, in some cases we did not quite reach our targeted outcomes. We expect this program to continue to grow and be an essential hub of educationally programming at CFM. Through recently awarded new SCBGP funding CFM will be able to design two new GFD booklets to further educate children on SCs, as well as continue SC programming at The Greenhouse.

Goal 1 (completed)	Implement a youth education program promoting and teaching the benefits of SCs in turn improving the healthy habits of children.
Target: • 100% growth of youth program from previous year's participation (from 50 to 100) • 75% of the children that completed the learning booklet to sign up for our program • 50% of kids participating will report increased eating habits of SCs at the program's end • $3500 of token spending will be tracked to determine how much they spent on SCs • After the outreach phase, we expect 30% of the participants that sign up to reference our visits as how they heard of the program.	**Outcomes Achieved:** • attendance of participants in program o 258 children signed up in the GFD program • completion of learning booklet o 71% of GFD signups completed 1-3 activities o 20% of GFD signups completed 4-6 activities o 9% of GFD signups completed 7-10 activities • Children were asked the following questions: • How often do you eat fruit and vegetables? o Results gathered in 2014 and then again in 2016 showed a 12% increase in eating fruits and vegetables once a day. • Do you ever eat fruits and vegetables from the market? o 2014 Answers: 100% yes. o 2016 answer: 100% yes. • Do you ever help cook meals at home? o Results gathered in 2014 and then again in 2016 showed a 5% increase children helping cook meals at home. • Track transactions of 'Munch Money' o $1205 in "Munch Money' dispensed • sign-up database for membership and outreach o 116 emails parent's email addresses gathered to promote CFM SC market activities

<table>
<tr><td>Notes:</td><td>While we did not quite reach our targeted goal of children completing all 10 activities of the GFD booklet, we surpassed the anticipated number of children signing up. Once children signed up for GFD club, they are likely to participate in activities at The Greenhouse. As a result, we did not dispense the anticipated amount of ‘Munch Money’. We expect the program to continue to grow, and see more children redeem activities and purchase items with ‘Munch Money’. We additionally expect that through this programming more children will eat SCs, which in turn will be encourage parents to purchase locally grown SCs from CFM vendors.</td></tr>
<tr><td>Goal 2:
(completed)</td><td>Raise consumer awareness and improve knowledge of SCs through offering a series of educational programs.</td></tr>
<tr><td colspan="2">
Target:
• 45% of customers will report improved purchasing habits of SCs from before grant
• 25% of customers will participate in the educational events

Outcomes Achieved:
• Track attendance and participation at workshops at The Greenhouse
<table>
<tr><th>Year</th><th>Nov-Dec 2014</th><th>Jan-Dec 2015</th><th>Jan-Oct 2016</th></tr>
<tr><td>Number of Activities at The Greenhouse</td><td>3</td><td>42</td><td>38</td></tr>
<tr><td>Total Annual Participants</td><td>31</td><td>1060</td><td>1891</td></tr>
<tr><td>Average Number of Participants</td><td>7</td><td>25</td><td>71</td></tr>
<tr><td>Number of SC Cooking Demos</td><td>0</td><td>1</td><td>6</td></tr>
</table>
• Surveyed Purchasing Habits of Market Customers:
1. How often do you buy SCs at CFM?
a. 2014 Answers: 59% weekly, 14% every other week, 14% monthly, 9% first time, 4% other.
b. 2016 Answers: 74% weekly, 22% every other week, 2% monthly, 2% other/rare.
2. How much on average do you spend weekly on SCs?
a. 2014 Answers: average $29
b. 2016 Answers: average $35
</td></tr>
<tr><td>Notes:</td><td>As you can see in the chart above, activities offered and participation at The Greenhouse grew significantly over this project.

Through surveying of CFM customers, we saw a 25% increase in customers purchasing SCs on a weekly basis and a 57% increase in customers purchasing SCs every other week. Additionally, we saw a 28% monetary increase in weekly SC purchases.</td></tr>
</table>

Goal 3: **(completed)**	Promote the market as a routine and reliable source of SCs, effectively increasing SC vendors' sales

Target: • 100% of participating vendors will be interviewed and surveyed and will report increased sales due to grant program • SC vendors' sales will increase 25-30%	**Outcomes Achieved:** • track sales of SC vendors by surveying o 2014 average sales: $26,050 o 2016 average sales: $27,666
Notes:	Through surveying of CFM SC vendors, they reported a 62% increase in SC sales. The overall average annual SC vendor sales also increased by $1616 over the project.

Beneficiaries

Approximately 50 of CFM's 80 members are focused solely on SCs and many of the remaining 30 have some SC offerings. These vendors benefited from this project by not only seeing an increase in their SC sales, but also with the addition of 'Munch Money' income. Children signed up for the GFD and those that participate in the activities at The Greenhouse benefited greatly from this project. The 258 children signed up as GFDs not only increased their SC knowledge, but also learned valuable shopping skills through the awarded 'Munch Money'. The now 71 average children that participate in the weekly SC activities at The Greenhouse also benefit by increasing their SC knowledge. The community as a whole gained knowledge about their food and where it comes from. This improved awareness strengthens the ties between producer and consumer, contributing towards a thriving local economy. The farmers market is an organization made up of 80 members, all in support of the long-term effort to increase awareness of local food through the promotion and education of SCs. This project further develops the educational programs of the farmers market as part of a larger effort to build a community-based food system founded on healthy living and knowing your food and farmer. The success and progress we have made so far is due to the support we have received from the community at large and our customers.

Other farmers' markets have the opportunity to benefit from this project. Any that are interested in creating a program similar to this one, the GFD booklet is downloadable on CFM's website, as well as an invitation to contact CFM's Market Manager for assistance.

Lessons Learned

This project brought a few challenges and taught us important lessons. First, we didn't expect collaboration on the design of the booklet to take as much energy and time for Corrina Smith as it did. Despite this setback, we now have a graphic template for the future booklets which will make them much easier and quicker to create. Second, once the activity booklet was available to the public, the response that we received from parents and children was overwhelmingly positive. We learned quickly that the number of kids signing up for the program on a weekly basis placed more pressure on staff time than we were initially expecting.

Volunteers and additional staff have been allocated to assist in enrolling and delivering the program. We also didn't expect the level to which kids would be excited about the program. Many kids are completing their activity booklets in as little as 10 weeks. Through future SCBGP funding, CFM plans on creating two

more activity booklets. Strict sampling regulations from the Boone County Health Department also challenged program implementation. Compliance with regulations placed too much strain for the small market staff to conduct sampling demonstrations at market. Currently we are working with volunteer chefs who have certified kitchen access to do live demonstrations at the market. We have realized that although there are benefits to sampling and tasting exposures, specifically for children, logistically it is feasible for CFM to set up the demonstration tent at market and to contract with individuals or entities that already have certified kitchen space to deliver SC tastings at the market. Despite initial challenges in planning and delivery of the program, we have learned lessons to overcome them allowing us a strong platform and experience from which we can continue offering SC-based educational programming for kids at the market.

Contact Person

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manager@columbiafarmersmarket.org

Additional Information

You find a downloadable version of the Good Food Detectives booklet on the CFM website at http://columbiafarmersmarket.org/events/good-food-detectives/.

Project 11: Missouri River Valley Specialty Crop Assessment and Marketing Program

Missouri River Communities Network
Steve Johnson
Final Performance Report

Project Summary

The market for specialty crops in Missouri is in the billions of dollars, but local producers generally do not collaborate to market their produce to capture much of this potential market. This project was designed to teach producers techniques on how to organize activities and marketing to increase sales and income.

The initial purposes of this award was to:

- increase the number of local specialty crop producers who are producing locally grown food;
- survey a sample of these producers to capture the attitudes, future plans and attitudes about collaborative marketing of their locally grown products;
- raise the awareness of consumers in the Missouri River Valley about where they can purchase fresh, healthy locally grown specialty crops in their area;
- support and increase producer participation in the “regional non-profit organizations”.

We were generally successful in the first three goals.

There are certainly more specialty crop producers that are growing and selling specialty crops in the Missouri River Valley in Missouri. We captured the attitudes of 60 specialty crops producers in this area and some of their ideas about methods of collaborative marketing. And through the workshops, support of community festivals and the printed "Food and Farm Guide", we were successful in expanding the awareness of consumers about where they can find and buy locally grown specialty crops in their area. Unfortunately, we were not so successful in increasing membership in the "regional organizations". Soon after our proposal was approved, these three regional organizations experienced challenging issues regarding volunteer staffing and membership. Only one of the three organizations is still regularly functioning. However, this grant helped build relationships between producers that are selling through local Farmers' Market in the Missouri River Valley.

The importance of this project was the potential markets for locally produced specialty crops in the target areas significance and if successfully developed, would produce millions of dollars in local economic development and increase jobs and income for these producers. Statistics indicate that the total food market for Boone County alone (the county where Columbia is located in the center part of the State), spends close to $600 million per year purchasing food for consumption. That is almost $2 million each day. A significant percentage of that figure is spent on specialty crops and much of it could be grown right here in Boone County. But instead most is being grown in California, Texas, Mexico or Central America. These food expenditures could be building the economy of our river communities.

MRCN completed the following:

- Inventoried 240 Specialty Crops Producers, and contacted 120 Producers about production and marketing activities.
- Surveyed 60 producers about marketing successes and held three focus groups.
- Created a database of 120 specialty crop producers and verified through direct contact.
- Published and distributed 15,000 local food maps with contact information of all interested SC producers and Farmers' Markets operating in the 18 county Missouri River valley area.
- Conducted three training workshops demonstrating "How to Organize a Specialty Crops Festival in Your Community", in Fulton, New Haven and Lexington.
- Provided four communities with funds to support marketing of specialty crops at five local "festival events" in Osage County (two events), Lexington, Fulton, and New Haven.
- Produced a Resource Booklet for all workshop participants.
- Conducted two specialty crop workshops: *"How to Organize a Community Food Circle"* (15 attendees) and *"Planning a Food Hub"* (30 attendees).

This project was built from a previously funded SCBGP project. In 2011-2012, MRCN collaborated with the Missouri River Bluffs Association (one of the three regional non-profit organizations) to utilize SCBG Funds to organize, sponsor and implement six "Taste of Local Missouri Food Festivals" in Callaway, Osage, Cole, Moniteau, Cooper and Boone Counties in central Missouri. We invited specialty crop producers to come to the festivals (at no cost to their business) to introduce customers to their specialty crop produce, provide tastings and sell their products. The goal was also to encourage local specialty crop producers to think about every local community "festival" as an opportunity to include local food producers as a part of that festival. Two of those county festivals are still organizing and including locally grown food each year.

Project Approach

Activity #1:

Develop and implement a Local Specialty Crop Food Assessment Inventory for specialty crop producers in the Missouri River Valley:

1. MRCN will coordinate the implementation of a Specialty Crops Producer attitude survey. MRCN sub-contracted with private contractors to coordinate and complete the inventory of Specialty Crops Producers in the three regions along the Missouri River. The Project Team started with a database of about 240 local food producers in the 18 county area along the Missouri River, between St. Louis and Kansas City, MO. After going through this database and following up to find out which of the producers on this list were "specialty crops producers" and then if the producers were still in business, we narrowed the list down to about 120 producers. The Project Team initiated a 10 question survey asking producers' about their current specialty crop growing activities and what their desires are for future expansion of growing and distributing. We contracted with an online survey company that allows people to click on a website address and complete the 10 question producer survey. This online survey tool is called *Survey Monkey* and was contracted to give producers time to complete the survey at their convenience. We had difficulty getting participation from specialty crops producers to complete the online survey and we had to follow up several times with producers to remind them to "please complete the survey". This also included sometimes printing out surveys and taking them to various Farmers Markets and asking producers to complete the survey while we waited for them to complete the survey in person. Small specialty crops producers are very often reluctant to take the time to complete such a survey or to divulge their opinions on various subjects.

2. The surveys will be summarized into a written document with some analysis. We received a total of 60 completed surveys. Survey responses from 60 Specialty Crops producers throughout the Missouri River Valley Region were collected. A copy of the analysis of the survey results from participating producers is attached to this report and is titled: "**Missouri River Valley Specialty Crops Producers Survey Results:** Spring 2017". The analysis demonstrates that many producers are currently engaged in collaborative marketing organizations such as farmers markets in their local communities and the Kansas City and Saint Louis metropolitan areas, as well as Community Supported Agriculture (CSA) programs. Many respondents are interested in increasing production of specialty crops but cited barriers such as the need for larger farmers' markets, a shortage of labor to work on the growing and harvesting, the need for more specialized equipment, and the availability of cold storage. Respondents cited farmers markets' as being their primary engagement with collaborative marketing, and mentioned that social media (specifically Facebook) and word of mouth (including direct relationships with retail and wholesale customers) as their most effective marketing techniques.

3. Conduct three "focus group" discussions with specialty crop producers. A focus group was held with 5 producers from the Missouri River Bluffs region on Wednesday, October 7, 2015 discussing the survey and opportunities for addressing the need for a "food hub" that could assist with cold storage, shared distribution, and cooperative marketing. Two focus groups were held in the Missouri Rhine Valley region in McKittrick, Missouri (near Hermann, MO) with one on Wednesday, March 16, 2016 with about 25 producers discussing methods of improving the Hermann Farmers Market. A second focus group was held on June 16, 2017, with thirty local food producers and consumers meeting at the McKittrick Farmers Mercantile in McKittrick, MO for a local food circle pot luck supper. The group meets periodically to share a meal of locally raised foods they have produced themselves and share information about food production and marketing. This evening's topic was growing and processing

herbs for health and healing. The presenter, Joey Los, made a short presentation to the group about growing, processing and selling value added herbs products and then opened the discussion up to all producers. Members of the group were enthusiastic to learn about a new value added product. Other uses and ways of using and marketing herbs were discussed as well.

Activity #2

1. Create a database of all information collected. From the original database of about 240 producers gathered from the three regions along the Missouri River we added and deleted entries based on three criteria: (1.) Whether the producer was still in business; (2.) Whether they were still growing specialty crops, and (3.) Whether they were currently selling at a retail location or if they wanted customers to get in touch with them for direct sales. We reduced the number of specialty crop producers to 120 then we verified their contact information through direct contact so we had accurate current information to include them on the Local Food Map. The number of producers decreased from the original database of 240 because we took out entries of businesses that focus on regional tourism activities or agricultural production that does not include specialty crops, or because the producer decided that they did NOT want to be included as a business location on the Local Food Map.

We used a variety of different methods to gain data for the specialty crop producer database including web searches, direct communication with farmers' market managers and vendors, and data collected from survey respondents. The database that we created for the local food map includes specialty crop producers in the 18 county region who stated that they want to be included on the map, are interested in having visitors to their farm or business, offer on-farm sales, responded to the survey, or we have been able to verify that the information we have about them as a "specialty crop producer" is accurate.

2. Build a database with the contact and product information for every producer in the 18 county area along the Missouri River. The database has 168 data entries and was updated with current information as of May 2017.

3. Publish a map of the producers for each of the three areas 10,500 maps total. Instead of three different maps, we designed and published a single Local Food Map that includes all three regions along the Missouri River Valley. We printed a total of 15,000 maps and distributed them to many of the Farmers Markets, road-side markets, Community Tourism Offices, regional planning offices, and local non-profit organizations that promote locally grown food. MRCN worked with a graphic designer, (with whom we have sub-contracted with in previous SCBG funded activities) to undertake, coordinate and complete the process of designing the Local Food Map of the Missouri River Valley region. They design the graphics, layout the map with the database of participating Specialty Crops Producers, and coordinate negotiations with a printer to receive the best quality product for maximum utilization of funds. We reached out to the Convention and Visitors Bureaus in several Missouri River communities, to invite them to collaborate with us to print additional maps and make them available to visitors in their region.

The tourism offices in five communities collaborated with us to print and distribute "The Missouri River Valley Food and Farm Guide 2017". This included the Columbia Convention and Visitors Bureau, the Boonville Office of Tourism, the Fulton-Callaway County Visitors Bureau, the Jefferson City Visitors Bureau, and the Boonslick Regional Planning Commission which works with the non-profit "Missouri River Country". A digital copy of this publication is included in this report.

Activity # 3

1. *Conduct three training workshops demonstrating "How to Organize a Specialty Crops Local Food Festival in Your Community".* All three workshops were completed in the following manner:
    a. The first workshop was sponsored by a non-profit called The Art House located in The Brick District located in downtown Fulton, Missouri, on Friday, August 27, 2015 with 26 people attending the workshop.
    b. The second workshop took place on Friday, October 23, 2015 in New Haven, Missouri with 14 people attending.
    c. The third workshop took place in Lexington, MO for the Old Trails Region on Friday, November 13, 2015 in Lexington, MO with 16 people attending.

2. *Work with people from local communities who are organizing local festivals to submit a proposal to utilize Specialty Crops Funds to support marketing of specialty crops at a local "festival event".* MRCN utilized specialty crops grant funds to provide five communities who are organizing "local food festivals" with a small amount of Specialty Crops Funds to promote specialty crops as a part of that local festival event. In all cases staff members of the MRCN Specialty Crops Grant submitted copies of the proposed documents to be funded with SCBG funds and were approved by MDA staff before we expended the funds.

    We provided financial support to the following events:

    a. In Osage County we provided $445.20 in Specialty Crops Funds to the "Taste of Osage County" group to help them purchase a full color advertisement in the Jefferson City News Tribune for three days prior to the event, to promote the specialty crops producers in the Taste of Osage County Festival which occurred on Saturday, June 27, 2015 in Linn, Missouri. The event was sponsored by the non-profit organization called Visit Osage County.
    b. In Lexington, Missouri we provided $500 in funding to the Old Trails Regional Tourism Partnership to help promote the apple producers as a part of the "Lexington Apples, Art and Antiques Festival" which was held on Saturday and Sunday, September 26th & 27th, 2015 in downtown Lexington and was sponsored by the Lexington Chamber of Commerce. The Old Trails Regional Tourism Partnership sponsored cooking demonstrations during the two day event and the SCBG funds were used to print apple recipe cards to hand out to people attending the cooking demonstrations and to print a poster promoting the apple, grape and fruit vendors who were participating in the two-day festival.
    c. The Autumn On The Bricks Festival took place on Saturday, October 10, 2015 in the Brick District in downtown Fulton, MO sponsored by the non-profit organization The Art House Gallery. This was the second year of this event and the sponsors wanted to expand the festival to include a greater role for the specialty crop producers from the Fulton Farmers' Market. We utilized $286.88 in SCBG funds to purchase a full color ad in the Fulton Sun Newspaper promoting the Fulton Farmers Market which held a special Farmers' Market as a part of the Autumn on the Bricks event.
    d. In New Haven, Missouri we supported a "Local Food Tasting" sponsored by the New Haven Public Library on Thursday, April 14, 2016. We utilized $157.99 in SCBG funds to place an ad in the Hermann Newspaper and the New Haven Newspaper promoting the event.

e. For the second year in a row we provided SCBG funds of $399.00 to purchase a full color advertisement in the Jefferson City News Tribune for two days prior to the event, to promote the specialty crops producers in the Taste of Osage County Festival which occurred on Saturday, June 25, 2016 in Linn, Missouri. The event was sponsored by the non-profit organization called Visit Osage County and was the second year of the festival being supported with Specialty Crops Grant funds.

3. *MRCN will produce and publish a small 15-20 page booklet on resources for organizing a food event emphasizing specialty crops.* This Resource Booklet was produced and handed out to participants' at all five workshop events. These resource booklets included a variety of resources for participants including:
   - a definition of specialty crops;
   - past local food and regional tourism maps;
   - examples of marketing materials from past local food festivals;
   - examples of recipes utilizing specialty crops that could be used in a live cooking demonstration at a festival;
   - "how to guide" for hosting a local food festival;
   - variety of online resources to connect with specialty crop producers in a specific area.

Activity # 4

Develop and conduct two additional workshops,

1. *Organize and conduct a workshop on "How to Organize a Community Food Circle to Maximize Specialty Crops Marketing in Your Community".* This workshop took place on Saturday, April 2, 2016 at the Cooper County Health Department in Boonville, MO with 10 people attending. The focus of this workshop was specifically geared toward helping local specialty crops producers gather information to help them understand how to create a "food circle" to increase specialty crop production and distribution in Cooper County. A food circle is essentially a less formal group of producers who come together to help each other create a vehicle to share ideas, marketing efforts, and sales opportunities. Sometimes a food circle can evolve into a farmer's market that meets regularly and might have rules with a legal structure, staff and participation fees. A copy of the flier promoting this workshop is included in this report.
2. *Organize and conduct a workshop on "Planning a Food Hub to Enhance and Grow the Market for Specialty Crops in Your Area".* MRCN contacted Patty Cantrell who is a "local food consultant" from Springfield, MO who specializes in writing about and organizing regional food systems. This workshop gathered producers and buyers from the Missouri River Valley Region with participants attending from as far as Kansas City, Missouri. In this workshop, Patty facilitated a group process that helped each attendee to identify the various assets and gaps in their local food system. Participants walked away with increased connections with other major players in the "local food system" in Missouri, as well as a better understanding of both the producer and buyers' perspective. Further, participants gained a better understanding of the framework and process required to increase the share of locally produced food in our schools and other institutions.

Problems and Challenges

Our biggest challenge with this grant has been getting the participation of specialty crops producers to participate in our survey activity. First, small local food producers are very independent minded people. (That is why they are growing food for a living rather than working at a regular 9-5 job!) Therefore, they are often very reluctant to spend the time to fill out a survey, and especially hesitant when asked to know any details about their small business. Second is that during growing season they don't want to take the time to complete a survey and during the off season they are very difficult to get ahold of because they very often don't answer their phone in the off season.

Goals and Outcomes Achieved

Describe the achievement of the performance goals and measurable outcomes identified in the approved project proposal and subsequent amendments.

Expected Measurable Outcomes

Measurable outcomes for this proposal included the following:

- Number of specialty crop producers who complete a survey and participate in the database of producers. **Goal: 60** **Actual Number: 60**
- Number of people and communities that participated in the workshops.
  Goal: # of people: 150: **Actual Number: 98**
  Communities Represented: 10 **Actual Number: 11**

- Communities that requested to organize a local food event: **Goal 6** **Actual: 6**
- The number of communities who organized a local food event: **Goal: 6** **Actual: 4**
- The number of community partnerships that are created with different organizations collaborating to build the local food movement in their community. **Goal: 15** **Actual: 13**
- Increased memberships in the three regional cuisine associations, local farmers markets and the Missouri Farmers Market Association. **Goal:** Five new members in each of the three regional associations, farmers markets or farmers market association, total of **15. Actual: Undetermined.** Two of the three regional organizations (Missouri Rhine Valley Association and Missouri River Bluffs Association) went defunct during the period of this grant, and the third organization (Old Trails Regional Tourism Partnership) is struggling to continue. However, a fourth non-profit organizing in the eastern Missouri River Valley area (Missouri River Country) has started and participated in supporting the Missouri River Valley Food and Farm Guide. The Missouri Farmers Market Association continues to have strong support statewide. In the last few years, the Columbia Farmers' Market has experienced tremendous growth. The weekend customer counts (in the spring, summer and fall) regularly surpass 3,000, and vendor membership has expanded to 80 local farmers, producers, and artisans.
- Number of Local Food Maps distributed to members of each of the three regional associations, to specialty crop producers and to the businesses who buy and utilize specialty crops in the Missouri River Valley from St. Louis to Kansas City.
  Goal: 4,500 maps distributed. **Actual: 11,250 distributed**

Beneficiaries

Through the Missouri River Valley Food and Farm Guide, 160 Specialty Crops Producers in the Missouri River Valley benefited from increased exposure to the general public about how customers can access their locally produced crops through farmers markets, roadside stands, direct sales to customers, on farm sales, and special local food events in small communities.

About 11,000 residents of Missouri benefited by learning about where they can access locally grown specialty crops in the Missouri River Valley between St. Louis and Kansas City when they picked up a Food and Farm Guide. Hundreds of specialty crop producers benefited from having their crops featured at five community festivals that focused on promoting locally grown food items. Almost 100 specialty crops producers benefited by attending workshops organized and presented by this project teaching producers about how to increase product sales through cooperative marketing and encouraging organizers of local events in their communities to include locally grown specialty crops as a part of any community wide events (fairs, rodeos, art shows, scout events, service organization fund raisers, etc).

All these people have benefited by raising the awareness of the economic development role that locally grown food plays in the economy of small rural communities. Increase awareness means more people will start buying food produced by their friends and neighbors so the money they spend is helping support local families rather than being shipped out to California, Mexico or South America.

According to USDA statistics, Boone County residents (just one county in the 18 counties in the Missouri River Valley) spend between $600 to $700 million each year buying food, and 99.9% of that food travels an average of 1,500 miles (from California, Mexico, Texas or wherever) to reach our grocery sacks. This means that a significant percentage of the dollars we spend on food immediately leaves our local economy. This is at a time when the Missouri River Valley has some of the most fertile soil in the world AND we have one critical ingredient that many locations do not have…….. WATER. There is a tremendous opportunity for local specialty crops producers to be producing and selling more fruits and vegetables that are grown right here in central Missouri and more of the money we spend on this food ($2 million per day) will stay here in our local economy. The goal of this project was not to calculate the dollar value of our food dollars being spent on buying locally grown food. Our goal was to help local specialty crops producers understand that they can increase their production and sales of locally grown specialty crops by collaborating with their fellow producers on marketing, and by building their sales networks with organizing a “local food component” at the vast network of small community festivals that already take place every year in small and medium sized communities in Missouri.

Lessons Learned

One limiting factor in our project was working with the three “regional associations” that were organizing to promote tourism and regional food identity in the Missouri River Valley. As mentioned earlier, two of the three associations have dissolved since we started this project. The eastern Rhine Valley Association succumbed to the efforts of another non-profit organization (Missouri River Country) with a broader more comprehensive agenda (and a bigger budget!) that is organizing in the same geographical area. The Missouri River Bluffs Association board of directors was unable to keep the organization going with such a large regional area without regular funding. The death of one of our primary executive board members was a serious blow to our efforts to continue. The third organization, the Old Trails Regional Tourism Partnership has been able to continue with the help of the Lexington and Higginsville Tourism Offices and the efforts of a single volunteer staff person, Marsha Corbin who tirelessly keeps the broad group of community volunteers meeting and working on regional marketing efforts from Booneville, MO to Independence, MO. The take away from this effort is that it takes either

a salaried staff person (or almost a fulltime volunteer) to keep a regional organization like these moving forward and promoting food and tourism on a broad geographical scale.

The most unexpected outcome from this project was the realization that "local food producers" are much more focused on the activity that they like the most……. Growing food! In many cases they understand the value of marketing, but do not see how they can undertake the efforts to collaborate with other producers to build efforts on a regional basis. The idea with this project was to help them understand that they don't need to do marketing all on their own. But rather, join with other organization events in their local community to add local food to events that are already happening….. tastings at the local library; an art festival with local artists; food booth at the county fair; etc.

Although the increase in the number of Farmers Markets has stabilized, the demand for locally grown food is still increasing. People are demanding healthy locally grown food that they can buy from food producers that they can talk to in person. Customers want to know how the food was grown, what the producer used on the crops, and who benefits from their purchase of the food they are buying. And customers understand that the best way to discover this information is not to read a label stuck on a package, but to talk to the person who planted, grew, harvested and is selling them the food and ask the grower these questions directly.

Contact Person

Steve H. Johnson, Missouri River Communities Network
Telephone: 573 999 2165
Email Address: manitoubluffs@centurytel.net

Additional Information

MISSOURI RIVER COMMUNITIES NETWORK

200 Old 63 South Suite # 203
Columbia, MO 65201
573-256-2602

Specialty Crops Mini Grant Application

Funded by the Missouri Department of Agriculture Specialty Crops Program

Application Information (Please print or type)

Name of Organization	
Contact Name	
Email Address	
Mailing Address	
Phone Number	
Amount Requested	

Grant Details

Grant Size: Up to $500 will be reimbursed per approved project.

Application Deadline: Ongoing

Purpose: To increase the integration of Missouri-grown specialty crops at local festivals.

Eligibility: CVB's, non-profit organizations, community groups, individuals

Examples of previously funded mini-grant projects:

- Newspaper ad highlighting specialty crops
- Recipe cards to accompany specialty crops tasting events

Description of Project:

***Note:**

- All expenditures including language, graphics, and photographs **MUST BE** pre-approved by MRCN.
- Provided proper receipt documentation, MRCN will dispense reimbursement funds directly to service provider or grant recipient.
- Fundable activities may only support specialty crops. Specialty crops include fruit, vegetables, honey, cut flowers, nuts and plants.

Please submit applications to:

Steve Johnson
manitoubluffs@centurytel.net
573-256-2602

Please call or email with any questions or concerns.

Missouri River Valley Specialty Crops Assessment and Marketing Program

Missouri Specialty Crops Grant; USDA-AMS Agreement: 14-SCBGP-MO-0029
Missouri River Communities Network
Missouri River Valley Specialty Crops Producers Survey Results
Spring 2017

Abstract:
The Missouri River Communities Network recruited a team of individuals who are involved with regional organizations along the Missouri River corridor that organize and support the efforts of Specialty Crops producers.
Methods: In late 2015, the team developed the survey instrument that was utilized to explore the practices and perspectives of Specialty Crops producers in this area. Specifically, the survey explored what producers grow, how they market their products, what challenges they experience in growing and selling products, their most effective marketing practices, experiences with collaborative marketing, and participation in regional organizations that support specialty crops production and sales. Qualitative coding was utilized to analyze the data. Themes were developed from the respondents' experiences.
Data Collection: Data was collected from January through November of 2016. Specialty Crops producers in the 19 counties contiguous to the Missouri River were recruited through regional food organizations, farmers' market managers, and through a regional agricultural listserv. The majority of our 15 question survey was qualitative, with a few questions offering pre-determined categories to respondents.
Results: Farmers markets were mentioned by many producers as being their primary method of marketing specialty crops. The majority of respondents mentioned both a desire and plans to increase production of specialty crops. The specific needs experienced to increase production were labor and more market opportunities. While weather was mentioned as the most challenging factor to production, time to harvest, pack, and deliver was mentioned as the most challenging factor to selling. Marketing practices were split between respondents with many valuing word of mouth, while others mentioned farmers' markets and online marketing as being effective. Collaborative marketing and sales were utilized by some in the form of farmers' markets, food hubs, and combined CSA's. Many respondents reported that they do their own marketing and sales, not engaging in collaborative efforts with other farmers. Finally, there was a split between those who engage in groups that advocate for local food systems and those who do not.
Summary: Overall, many similar themes were present in the experience of specialty crops producers in the Missouri River Corridor. While many respondents expressed that they are able to sell what they grow, further increases to production are limited by farmer time and therefore their ability to tap into and expand market opportunities. While intermediaries such as Food Hubs and Combined CSA's seem effective in helping some producers increase product sales, many of the respondents were not engaged in this type of commerce. Further, while many expressed the benefit in being involved in local food advocacy groups or organizations, continued participation was limited by time to volunteer. Overall, sales through farmers markets and creating one-on-one personal connections seemed to be the most valuable sales outlet to producers with calls to restaurants and institutions also being valued.

Data Collection Period: Data was collected from January 2016 through November 2016.
Data Collection Method: The survey instrument was made available to producers online via Survey Monkey or in-person utilizing a paper copy. Because of the geographic distance of the area we were sampling and the lack of technology access or understanding by some respondents, it was essential to have both online and paper versions available. The majority of questions on the survey instrument are qualitative – they asked for open-ended responses, with a few questions offering closed-option responses.

Respondents: Sixty respondents were recruited through collaboration with regional food organizations. Specifically, we worked with the Old Trails Regional Tourism Partnership, the Missouri River Bluffs Association, and the Missouri Rhine Valley Regional Association. We also recruited producers through regional farmers markets, regional growers associations, and at the Clark Produce Auction to gain the specific perspective of Amish growers in the mid-Missouri region.

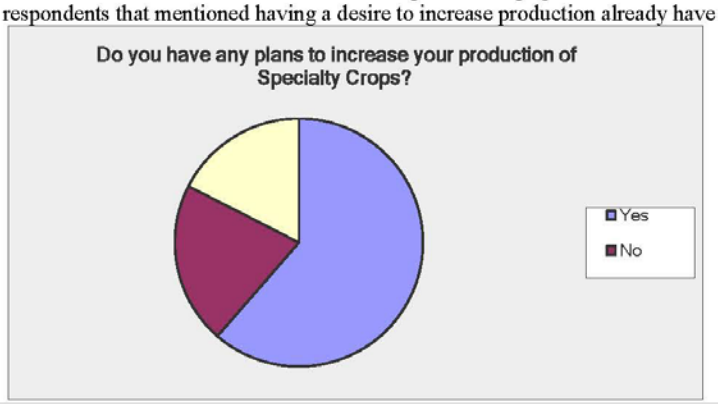
Survey Results:

What Specialty Crops Producers Grow: Many respondents mentioned growing a variety of different specialty crops products. While a few focused on more specific specialty products such as Elderberries, Honey, Grapes for wine, Nuts or Nursery plants, the majority listed out diversified Specialty Crop product offerings. Specifically, 43 grow vegetables, 28 grow fruit (with 6 growing Elderberries), 10 grow cut flowers, 5 produce honey, 2 grow nursery plants, and 1 grows pecans only.

How Specialty Crops Producers Market their Products: Our respondents expressed a variety of different marketing tactics that they utilize for their products. While the highest mentioned marketing method was through the farmers market platform (28 responses), 21 mentioned marketing direct to retailers or institutions, followed by 7 marketing direct to consumers, and 7 marketing through a Community Supported Agriculture (CSA) share system or a combined-CSA. Other responses mentioned the value of Word of Mouth (6), marketing through a local produce auction (5), Online Advertising (4), Advertising with a Roadside Stand (4), at a store that sells local products (3), or on the radio (1). Three respondents stated that they do not market at all.

Desire to Increase Production: Respondents were asked if they are interested in increasing their production. While 43 answered yes, 11 answered no. Two responded with Maybe. One cited time limitations to expand, and the other stated that they needed to overcome labor issues to be able to expand production. Of those that answered yes, many stated the need to develop more market outlets to coincide with their increased production. For those selling honey or Elderberries, they stated that the demand was generally greater than their supply demonstrating the need from the market for increased production of their product.

Plans to Increase Production: The following chart and graph demonstrate that the majority of respondents that mentioned having a desire to increase production already have plans to achieve this goal.

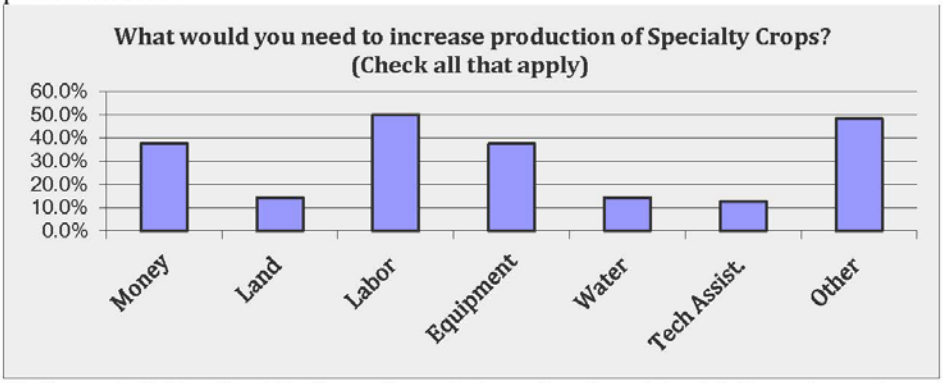


Do you have any plans to increase your production of Specialty Crops?

Answer Options	Response Percent	Response Count
Yes	61.4%	35
No	21.1%	12
I'm not sure	17.5%	10
	answered question	57

	skipped question	3

Specialty Crops Producer Needs to Increase Production: Producers listed a variety of different needs that they have in order to increase production. While labor was listed as the highest need, the other category was close behind with producers mentioning: time, customers / market, processing and storage, marketing assistance, and good weather. Money and land were also stated as primary needs for increased production to occur.



Challenges in Raising Specialty Crops: Respondents mentioned a variety of challenges in growing Specialty Crops. When respondents were asked what their biggest challenge is, many listed more than one challenge (which helped us to understand their experience). Weather was listed by 14 respondents as their biggest challenge. While some mentioned not enough rain, others mentioned too much, with one respondent commenting on rebuilding a high tunnel due to strong wind. Labor challenges were mentioned by 13 respondents. They described the lack of good or qualified labor, lack of enough labor at harvest time, with some commenting that they were not interested in hiring people outside of the family to work on their land. Further, lack of time and pests were mentioned by 10 respondents, respectively. Weed control, post-harvest storage and handling, and lack of financial resources were mentioned by 4 respondents each. Finally, ageing of key staff, soil health, land needs, equipment needs, yield, and collaboration with other farmers were each listed by 3 or less respondents as a challenge that they face.

Challenges in Selling Specialty Crops: While one survey respondent mentioned that they have no problem selling the Specialty Crops that they produce, the other respondents mentioned a number of different challenges that they experience. Time to sell and deliver product was mentioned by 10 respondents closely followed by nine stating that they lack a large enough market, with another eight respondents stating that they feel challenged by connecting with enough interested consumers. Cost of marketing/distribution, not having enough product to sell, and too many vendors with the same product at farmers markets were mentioned by four respondents, respectively as being their primary challenge. Harvest and preparation of product for market and blemished produce that is unable to be sold was mentioned by three respondents. Other responses we received were: high farmers' market fees, age of farmer, transportation, competition with stores that claim to be selling local, having product available during the school year for institutional sales, and the ability to differentiate by selling a unique product.

Most Effective Marketing Practices for Specialty Crops: Survey responses demonstrated that farmers take a diverse approach to marketing their Specialty Crops Products. Word of mouth marketing ranked highest, with 19 respondents stating this as their most effective marketing method. Twelve (12) producers stated that farmers' markets and 11 mentioned online marketing as being effective for marketing their products. For the purpose of this analysis, online encompasses Facebook marketing, website, and online marketplaces. Creating relationships with customers ranked with nine responses followed closely by direct sales to retailers (in-person and phone calls) with eight. Further, six

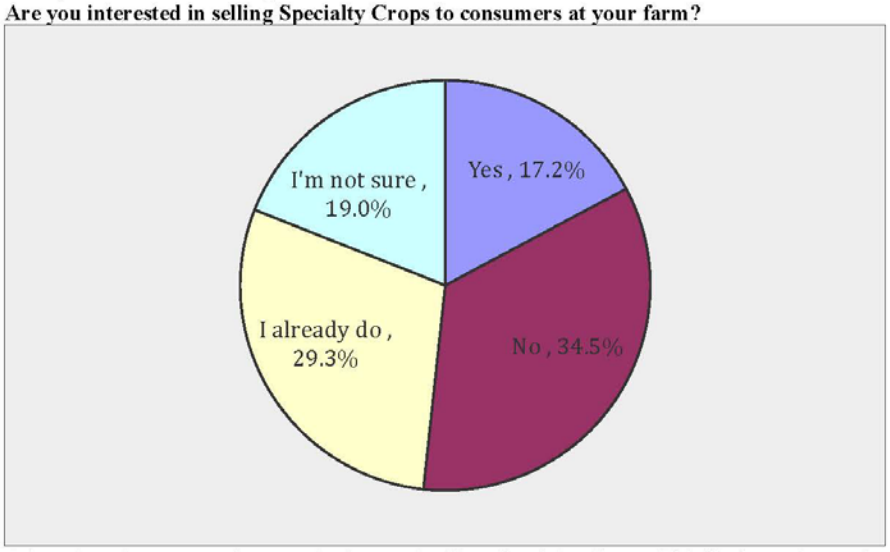
respondents mentioned having a quality product as being their most effective marketing practice. In essence, demonstrating that if their product was quality it would sell itself. Sampling product, either whole or in bite-sized samples at farmers markets was mentioned by four as being effective marketing for products. This was especially true for the experience of producers selling value-added products made from Specialty Crops. Other responses that ranked with one or two responses mentioned farm visits, produce auctions, radio, having an engaging farmers market display, and running a CSA share program as being effective methods to market their product.

Collaborative Marketing Practices: We were particularly interested in what types of collaborative marketing these Specialty Crops producers engage in currently or in the past. Although we gave a few examples in the survey of what collaborative marketing means (Farmers' Markets, Food Hubs, Combined CSAs), we were also interested in what other types of collaboration producers have experienced. While 21 respondents mentioned that they do not engage in collaborative marketing, 23 participate in farmers markets, four stated either a combined-CSA or a food hub, an additional four mentioned a grower's association, followed by three who mentioned participation in local festivals as a collaborative marketing practice. Finally, two mentioned participation in a local produce auction.

Membership in organizations that collaborate for the promotion of or sales of Specialty Crops: While almost half of the respondents said no (29), others mentioned a wide variety of local, statewide, or regional organizations that promote specialty crops in some form or another. While farmers' markets were mentioned by some (14), others mentioned organizations such as the Missouri Department of Agriculture, the Farmers Alliance of Missouri, the Root Cellar, Callaway Food Circle (now defunct), Downtown Food Circle – JC, Local Bee Club, Wine Board, Ozark Growers Association, and the Old Trails Association.

Participation in groups that advocate for local food systems: To this question, 21 respondents answered yes, and 22 answered no. Specific organizations that Specialty Crops producers mentioned participating in were: Sustainable Farms and Communities, KC Food Circle, Missouri Young Farmers Coalition, Capital Regional Medical Center, Schools, Missouri Rural Crisis Center, McKittrick Food Circle, and the Old Trails Regional Tourism Association.

Are you interested in selling Specialty Crops to consumers at your farm?



Other thoughts on growing, marketing, and selling Specialty Crops: This final question to the survey brought responses that ranged from discussions of challenges with the location of the farm and the not-so-

easy access for consumers. Others commented on the challenges that they experience competing with large companies such as Sysco and US Foods who, because of their scale and resources, make is easy for restaurants to order from them and receive one single delivery. Others mentioned financial challenges ranging from high start-up costs to the need for enhanced processing equipment, and low prices expected by consumers. In sum, although producers mentioned many challenges to what they do, they expressed encouragement and optimism for the growth of the local food system as a whole, their individual efforts and the farmers and organizations around them.

Other information gained: The survey was utilized not only to gain qualitative data to enable us to explore the growing, marketing, and selling experience of Specialty Crops producers, but also to engage them on whether or not they would be interested in having visitors travel to their farm; be included on the **2017 Food and Farm Guide** and/or receive information about workshop offerings that were taking place. For those that wanted to be included on the map, we utilized the survey instrument to gain contact information for those producers.

Survey and Results prepared for Missouri River Communities Network by:
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Project 12: Protecting Small Fruit Crops from Invasive Fruit Fly, Spotted Wing Drosophila – Cost Share

MDA – Plant Industries Division
Anastasia Becker
Final Performance Report

Project Summary

Spotted Wing Drosophila (SWD) is an invasive, non-native fruit fly first detected in California in 2008 and in Missouri in 2013. Unlike other fruit flies, SWD attacks healthy, ripening thin-skinned fruits causing rapid decay, fruit drop or the presence of fly maggots making the fresh fruit unmarketable. Berry crops ripening later in the growing season are at greatest risk for SWD infestation because harvest coincides with a rapid seasonal increase in the population. Traditionally, berry crops needed minimal insecticide protection; however, protection from SWD means higher production costs and more careful management, especially since insecticides are applied very close to harvest. Commercial growers in other states report up to 80% crop loss without insecticide protection.

An insecticide cost-share program was established to reimburse 50% of the insecticide price for appropriate products targeting SWD. The program was offered for two years to provide assistance to commercial berry growers while they incorporated additional management practices and adapted to increased input costs for this new pest. Insecticides will be a necessary tool on susceptible crops until researchers establish best management practices that can reduce this expense. The cost-share program complemented ongoing Extension education programming about identifying, monitoring and managing SWD.

Project Approach

A two-year insecticide cost-share program was put into place that reimbursed 50% of the cost of insecticides that were labeled for use on the berry crops grown for sale. Growers selling blueberry, blackberry, raspberry, elderberry or late-season strawberry fruit were able to participate. A table listing insecticides, rates, pre-harvest interval and mode of action for each crop was developed based on university research trial results from other states and was offered to growers and Extension educators. On the cost-share application growers listed their production berry crops, acreage, the insecticides and quantities purchased; products were verified by the project manager as being labeled for use on the specific crops. Proof of purchase price was required for reimbursement. Non-bearing berry acreage was not eligible for the program since these acres are not at risk for SWD infestation.

Promotion of the cost-share program was done through displays or presentations at 15 major grower conferences, trade shows and workshops in Missouri. In addition, flyers about the program were included in 6 blueberry and elderberry grower association newsletter issues and also were distributed at appropriate meetings. In addition, the project manager worked with Extension Horticulture Specialists to publicize the cost-share opportunity through their regional channels and field days.

A database of Missouri berry growers selling at farmers' markets or through U-Pick operations was developed from online resources. Emails were sent to them along with a flyer and link to the electronic cost-share application posted on the Missouri Department of Agriculture website. Due to low

participation in year one and a low response to emails, in the second year letters were mailed to berry growers that were in the database to try to increase participation in the program. Several new growers participated in the second year of the program.

A one-page survey was sent to all 2015 (n=13) cost-share participants to gather production information and assess crop losses, increased costs, and management practices they used before and after SWD became established in Missouri. Surveys were anonymous and response rate was 46%. Site visits to three berry operations verified the crops being grown and the producers were interviewed.

Survey and interview responses indicated that growers are adding some management practices compared to prior to SWD becoming established in Missouri. Responses also indicated some uncertainty about rotating insecticide classes to avoid resistance to a mode of action. While sanitation to deal with cull or overripe fruit incorporates various practices to reduce the population of SWD, these strategies are not used very often. Since SWD is a new pest and berry growers have not had to apply many insecticides in the past, additional training in calibrating spray equipment and practices to improve coverage and effectiveness (canopy management and spray timing for example) could be useful. Many insecticides are labeled to be used very close to harvest so safety for growers, pickers, and consumers is of concern, especially if using insecticides is a new practice for the grower. In general, growers indicated awareness of protecting pollinators while using insecticides.

Goals and Outcomes Achieved

Outcome 1: Offer a two-year insecticide cost-share program to commercial berry growers. Results: Program was established and all applicants met the requirements for reimbursement. Performance measure was the number of applicants using the program. The number of participants (total of 19) and the amount of cost-share reimbursements fell far short of anticipated participation for unknown reasons. Participants were monitoring and protecting their susceptible crops and about 23% of year one participants had on-site visits and interviews conducted; target was 25%. Blueberry and elderberry were the primary crops grown by the cost-share participants.

Outcome 2: Collect information about pre- and post-SWD production practices. This was done with a combination of the survey questions and on-site interviews. There was a 46% response rate (target was 50%) and there was an increase in the practices that were being used to reduce the impact of SWD on their crops. Information from the surveys and interviews was sent to key University Extension Horticulture Specialists offering educational activities on SWD for potential use in their events and newsletters.

Beneficiaries

Missouri elderberry, blueberry, blackberry, raspberry and late-season strawberry growers with commercial sales of berries were the beneficiaries of the cost-share program. Sixteen growers participated in the program and benefitted from reduced insecticide input costs; three growers participated both years. Insecticide purchases were reimbursed at a 50% rate for insecticides targeting SWD up to a maximum of $750 per grower per year. Multiple products were allowed for reimbursement because of the necessity of rotating modes of action to minimize SWD developing resistance to one. Barrier netting could be reimbursed which provided a non-chemical option, however, no growers requested payment for this option.

Lessons Learned

Over the two years there was low participation in the cost-share program. Interest was high at meetings and trade shows which primarily occurred during the winter season. It is unclear why the cost-share program had such a low rate of participation or how to remedy this for future efforts; reminders were sent to those who requested one. During interviews one grower noted only starting to spray in 2015, the first year of the cost-share program. It is possible that SWD is such a new pest in Missouri that growers have only now started to become aware of its presence and the potential economic impact on their production decisions.

A manager from an earlier cost-share program for drought assistance advised developing a self-explanatory single-page form to reduce questions. A one-page fillable PDF simplified completion of the cost-share application and reduced potential errors. Once formatted the form was easily updated for the second year. Growers could complete the form and print it off or send it electronically along with the copies of their insecticide purchase receipts.

Extension educators and growers liked the option of a crop-specific list of insecticides and the additional information about each product. Although not every product labeled for the targeted crops was listed, the tables included all of the SWD insecticides reported through key university research trials and registered for sale in Missouri. Growers were encouraged to contact the project manager if they wanted to verify whether an insecticide could be used. Elderberry growers were especially interested in the insecticide listing because fewer products are labeled for this crop, a growing industry in Missouri. Some confusion may arise when labels don't specify "elderberry" as a crop site but instead list "bush fruit" which is a broader category that includes elderberry along with other bush fruits like blueberry.

Why berry growers now need to use insecticide when they haven't needed to in the past comment is yet another opportunity for consumer education coming from a survey by a long time blueberry producer.

Contact Person

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Additional Information

Findings from the survey and interviews were:

- Sources of information for SWD identification: attending educational events (field days, conference, workshop) was the top way they learned to identify SWD with several growers utilizing multiple resources. Websites were also used as identification resources and several were listed on the informational flyer.
- Percentage of crop infested with SWD in 2015: average 37.2% (range: 0 to 90%)
- Estimated increase in annual expenditures to manage SWD: average 32.6% (range: 0 to 100%)
- Number of insecticide applications targeting SWD: average 3.6 sprays (range: 1 to 8)
- Rotation of insecticide classes to minimize resistance buildup: Just over half rotated classes.
- Comparison of production practices before and after SWD became established:
    - All growers use insecticides now

    - Cooling fruits soon after harvest increased
    - More growers managed crop canopy to improve spray coverage
    - Variety selection decisions increased (for example, not choosing fall-bearing raspberries or removing raspberries, a very susceptible crop)
- Pollinator protection practices: Responses included spraying early in morning or in evening, reducing use of insecticides, adding beehives and bee-friendly aromatics, and using organic practices. One grower reported no pollinator protection was needed since no flowering plants were near berries at this time of year.
- Insecticide application equipment: High-pressure sprayers and ATV/UTV sprayers were most common.
- Disposal of cull or overripe fruits:
    - Three growers left culls to decompose in field
    - Drying or solarizing is done by three growers
    - Other methods used were to spray insecticide on the ground at the end of the berry season and composting culls
- Sales: Direct sales to customers were main outlet followed by wholesale outlets. One grower sold to a processor.
- Respondents were asked to describe any method they developed to protect their crop from SWD:
    - "Use a good sprayer that has enough pressure to maintain uniform coverage. Handgun sprayers just will not do it" reported a blueberry grower with 32 years of experience
    - "Harvested only summer (June) crop of raspberry and pruned out almost 100% of the floricanes with blossoms or fruit clusters before berries ripened from July to October. In future I will plant only raspberry varieties that do not fall crop."
    - Removed small raspberry planting to concentrate on blueberry production which is their main market crop.
    - To keep spray off of fruit for sale they sprayed after the main harvest since no longer picking for sale.
- Suggestions for resources or training events that would help them have better success managing SWD:
    - "Send SWD info to news media. We all need to inform the public why, after 30 years, we as growers are now using insecticides. We are not organic but have never had to spray insecticides until 2015 after 32 years of production."
    - "Better developed trapping as a predictor of fruit infestation."
    - "Develop a degree day model to predict presence of adult SWD." (Note: this resource is already available online.)

Missouri Blueberry, Blackberry, Raspberry, Late-Season Strawberry or Elderberry Growers

Missouri Dept. of Agriculture's

Insecticide Cost-Share Program for Spotted Wing Drosophila

Unlike other vinegar (fruit) flies, **Spotted Wing Drosophila** (SWD) **attacks healthy thin-skinned fruits close to harvest** causing infested fruits to decay or drop. Specialty crops at greatest risk of SWD infestation are the small fruit crops: blackberries, raspberries (especially fall crops in high-tunnels), blueberries (late-season varieties are at greater risk), elderberries and late season strawberries. Monitoring and insecticides are now important production tools. This serious, new invasive fly has been found in many counties since first detected in Missouri in 2013.

The Missouri Dept. of Agriculture has an insecticide cost-share program for the 2016 season through a USDA Specialty Crop Block Grant. **Funding is available to reimburse 50% of the purchase price of SWD insecticides or netting to participants up to a maximum of $750 per grower.** The insecticide cost-share program will benefit Missouri's small-fruit industry by helping farmers to transition to additional management strategies to reduce populations of SWD, reduce damage and retain market share.

Requirements to participate for the 2016 season are:

- Grow fruits for sale that are susceptible to SWD infestation (non-bearing plants aren't at risk)
- Provide proof-of-purchase price for labeled insecticide products or insect-barrier netting
- Be knowledgeable in SWD identification and how to manage crops to minimize impact
    - Proper identification of SWD is important to avoid unnecessary insecticide applications
    - Training can be through workshops, on-line, etc.
- Have a pesticide applicator's license if using restricted use pesticides
- Submit completed form by September 15, 2016 for this season.

SWD Resources

Cornell University: www.fruit.cornell.edu/spottedwing has crops of concern including wild hosts, monitoring, identification, look-a-likes, management, etc. Site has links to other university resources.
Lincoln University: www.lu-ipm.net has a section on SWD and insecticides.
University of Missouri Extension: 2016 Midwest Small Fruit and Grape Spray Guide (MX 377) lists insecticides for SWD on these crops. Guide is available free on-line or for sale through Extension Publications.

For an information packet with details about the insecticide cost-share, contact Missouri Dept. of Agriculture, 573.751.5505. The 2016 form is available at agriculture.mo.gov, search for "spotted wing."

Spotted Wing Drosophila Survey

As a participant in the 2015 Spotted Wing Drosophila insecticide cost-share grant we would like to get some feedback about how this new pest is affecting your production practices and management decisions. Please complete this short survey and return it in the enclosed envelope. Answers are anonymous and will be used to improve programming efforts for berry growers. Thank you for providing your input.

1. How many acres of these berry crops do you grow? ___Blue. ___ Black. ___ Rasp. ___ Elder.
2. How did you learn to identify SWD? (please identify all that apply) __ Website __ Workshop __ Field day ___ Newsletter ___ Books ____ Other growers Other (please specify) _____
3. What percentage of your berry crops would you estimate was infested by SWD in 2015? _____%
4. Please estimate your annual percentage increase in expenditures due to managing SWD. _____%
5. How many insecticide applications targeting SWD did you make in 2015 to your berry crops? _____
6. Do you rotate insecticide classes to minimize resistance building up to a class?
   ____ Yes ___ No ____ Not sure what insecticide classes are
7. Production practices you used **before SWD** became established (mark all that apply):
   __ Insecticides __ Netting or row covers __ Canopy management to improve spray coverage
   __ Variety selection __ Irrigation methods to prevent fruit splits __ Traps __ Reduce other host crops
   __ Remove culls __ Pick frequently __ Cool fruits soon after harvest __ Other _____
8. Production practices you use **after SWD** became established (mark all that apply):
   __ Insecticides __ Netting or row covers __ Canopy management to improve spray coverage
   __ Variety selection __ Irrigation methods to prevent fruit splits __ Traps __ Reduce other host crops
   __ Remove culls __ Pick frequently __ Cool fruits soon after harvest __ Other _____
9. Do you try to reduce wild host plants for SWD near your production area? ____ Yes ___ No
10. What steps do you take to protect pollinators or beneficial insects?

11. How do you apply insecticides to your crops? _____ Backpack sprayer _____ Air blast sprayer
    ___ATV/UTV Sprayer Other method _____
12. How do you dispose of cull and over ripe fruit?
    __ Bury them __ Let them decompose in the field __ Bag and leave in sun to kill __ Spray insecticide
    Other _____
13. What percentage of your crop do you sell to the following markets?
    ____% Direct-to-customer sales ____% Wholesale ____% Processing ____% Others_____
14. Please describe any method that you developed to protect your crop from SWD that you would like to share with other growers:

15. Please suggest useful resources, workshop topics or training events that would prepare you or other famers to have better success managing SWD:

Project 13: Establishing the Pawpaw as a Viable Missouri Specialty Crop

EarthDance
Rachel Levi
Final Performance Report

Project Summary

EarthDance set out to plant a pawpaw orchard as part of our Organic Farm School campus, in order to promote cultivation of this unique native fruit as a Missouri specialty crop. As this project progressed, EarthDance received funding from the USDA's SARE Program (Sustainable Agriculture Research and Education) to plant pears at the farm as well. As planning for the orchards progressed, Farm Managers concluded that it would be optimal to plant a mixed orchard amidst our vegetable production areas. The result is a permaculture orchard composed of pears, apples, peaches, tart cherries, and at least 60 pawpaws, as well as other native fruit species. The trees are planted in a sequence designed to accommodate the pollination needs of the trees that are not self-fertile, but keeps trees of the same variety at a distance from one another, to minimize the spread of disease. EarthDance promoted the pawpaw to farmers and consumers by means of educational opportunities for growers; social and traditional media; farm tours for the public; and a market sampling day. Over 1100 individuals received face-to-face education about pawpaws, and 6000+ had the opportunity to learn about the project through EarthDance's social media.

This project did not build on a previously funded project with the SCBGP or SCBGP-FB.

Project Purpose

The purpose of this project is to support farmers in Missouri as they seek to diversify their production and find market niches that will allow them to compete with non-local commodity produce growers. Through this project EarthDance sought to increase consumer interest in pawpaws, and increase interest among local growers in pawpaws as a source of farm income, and to educate local growers about how to begin growing pawpaws. The long-term goal of this project is to establish the pawpaw as a viable production crop for Missouri orchardists. This project addressed the Missouri Department of agriculture's priority foci of increasing public awareness of the nutritional value of this specialty crop, and increasing the adoption of organic and sustainable production practices.

Project Objectives:

- 5000+ individuals learning about the value of this native crop through EarthDance's online communication
- At least 500 individuals touring EarthDance farm and viewing the pawpaw orchard
- At least 25 growers receiving pawpaw production training
- At least 25 growers receiving education about organic fruit production
- At least 50 market shoppers tasting pawpaws and completing surveys about their interest in purchasing this crop in the future

Project Approach

Activities:

- Planted and cared for 60 pawpaw trees at EarthDance Organic Farm School
- Conducted two classes to train growers about pawpaw and organic fruit production in the Midwest; 73 growers reached.
- Hosted a hands-on permaculture orchard planting workshop attended by 32 members of the public.
- Educated the public about the project to increase consumer interest in purchasing pawpaws
    - Conducted tours of the orchard for 978 visitors in 2015
    - Publicized the project on Facebook, in EarthDance's newsletter, and through a press release.
- Conducted market research: sampled pawpaws at the Ferguson Farmers Market; 59 shoppers sampled the fruit and completed surveys about their interest in purchasing pawpaws in the future. Based on the sample, 54 shoppers had medium or significant interest in purchasing pawpaws.

Program Income: When EarthDance proposed this project, we anticipated hosting the workshop as a sole entity. We were offered the opportunity to make the presentation at the Missouri Organic Association Conference instead. This change enabled us to reach a larger audience of commercial growers. We did not receive any workshop fees. Thus, the projected income was not earned.

Goals and Outcomes Achieved

Progress towards expected measurable outcomes:

Goal #1: At the conclusion of this project, at least 25 growers that receive education about pawpaws will increase their understanding of the market potential and cultivation strategies of pawpaws, and at least 10 growers that receive training about pawpaw production will indicate some interest in cultivating pawpaws for commercial production, and at least 3 will indicate strong interest. **Actual:** 43 growers received education about pawpaws. After the workshop, 32 stated that they plan to plant pawpaws in the next six months.

- Benchmark: 10% of attendees at the pawpaw production class would describe their pre-workshop knowledge of the market potential and cultivation strategies of pawpaws as high or very high. We project that 20% of the attendees of the workshop will have a moderate or strong interest in cultivating pawpaws before the class. **Actual:** No workshop attendees described their pre-workshop knowledge of pawpaw market potential as high or very high. No workshop attendees described their knowledge of pawpaw cultivation as high or very high. Only 4 individuals (about 10%) stated a strong interest in growing pawpaws before the workshop.

- Performance measure: 100% of growers that receive training about pawpaw production will increase their understanding of the market potential and cultivation strategies of pawpaws, and at least 40% of growers that receive education about pawpaw production will express moderate to strong interest in cultivating pawpaws commercially. **Actual:** 38 workshop attendees (88%) expressed increased knowledge of pawpaw production and marketing strategies at the conclusion of the workshop. 75% of the growers stated strong interest in growing pawpaw for commercial purposes at the conclusion of the workshop.
- Target: Our target level of improvement is for 90% of workshop attendees to increase their knowledge of pawpaw market potential and cultivation strategies, and to see a 20% increase in growers reporting a moderate or strong interest in pawpaw production. **Actual:** 88% of

workshop participants increased their knowledge of pawpaw production and marketing strategies. We saw a 65% increase in growers reporting a strong interest in undertaking pawpaw production.

Outcomes of the Organic Fruit Production and Orcharding class, presented by Guy Ames of ATTRA, surpassed our goal of 25 growers receiving education about organic fruit production.

- ❖ 30 Farm & Garden Apprentices received education on organic fruit tree production and pawpaws
- ❖ 27 Apprentices said that due to the class, they will incorporate what they learned into their future agricultural endeavors

Goal #2: At least 50 consumers at a farmers market will sample pawpaws (pending availability), and at least 40 will express interest in purchasing the fruit in the future. **Actual:** 59 consumers at the Ferguson Farmers Market sampled pawpaws. 54 consumers expressed medium or high interest in purchasing pawpaws.

Benchmark: We project that 90% of the shoppers will be unfamiliar with the pawpaw until sampling, and thereby previously uninterested in purchasing pawpaws. **Actual:** 60% were previously unfamiliar with pawpaws.

Performance measure: We project that 80% of the shoppers will express interest in purchasing pawpaws in the future. **Actual:** 91% of shoppers expressed interest in purchasing pawpaws in the future.

Target: There will be a 90% increase in awareness of pawpaws among samplers, and a 75% increase in interest in purchasing pawpaws in the future. **Actual:** 60% increase in awareness of pawpaws. Hard to gauge percent increase in interest with purchasing, given the higher than expected previous awareness.

On September 12th, 2015, EarthDance sampled pawpaws at the Ferguson Farmers Market. A total of 59 market attendees sampled the fruit, surpassing our projection for consumers reached at the sampling. Of this group, 60% were previously unfamiliar with pawpaws (though existing familiarity with pawpaws was actually higher than we projected). Thirty individuals were "very interested" in purchasing pawpaw fruit in the future, and an additional 24 tasters described their interest level in purchasing pawpaws as "medium." Thus, a total of 54 of the samplers had some interest in purchasing pawpaws, indicating that with proper consumer education, the pawpaw has an excellent potential to increase in popularity with local food shoppers at Missouri markets.

Some comments about the pawpaw, by the samplers:

- fantastic
- yum
- delicious—very sweet
- soft, like a mango
- very tasty
- loved it
- interesting

Beneficiaries

- **978** members of the general public that toured EarthDance farm between March-December 2015, who learned about the pawpaw project at EarthDance.
- **43** growers that attended a class on pawpaw production; fifteen of these attendees stated that they will begin planting pawpaws in 2015.
- **32** members of the public that attended a permaculture planting workshop; 20 attendees said that they were "very likely" to plant native fruit trees based on what they learned during the workshop.
- **30** EarthDance apprentices that attended a class on organic fruit production in the Midwest led by Guy Ames of ATTRA and Ames Orchard & Nursery.
- **10** EarthDance apprentices that participated in hands-on practice grafting and budding fruit trees with Guy Ames
- **59** market goers that sampled pawpaws.

Lessons Learned

The vigor of the pawpaw trees was lower than anticipated. We have identified several possible reasons for the slow growth. Pawpaws were mulched with black landscape fabric which was likely to heat up soil in the root zone. It is reasonable to presume the pawpaws roots were stressed due to excess heat. Woodchip mulch was applied around the trees in the fall in hopes of reducing stress in 2016. Pawpaws were also planted into berms where watering came from rain watering infiltrating the berm from the exposed uphill side. Therefore, water was being wicked into the root zone as opposed to traditional overhead rain or drip irrigation. The pawpaws may have been water stressed and consequently slow-growing. In 2016 we plan to increase the frequency with which we use drip irrigation. Lastly, slow growth of trees may have been due to the small 4'' pots they were transplanted from. Trees had underdeveloped root systems when planted and that may have been cause for trees' inability to take up the water that was being wicked into the berms. **Also, unlike most tree seedlings which are best transplanted when dormant, pawpaws are best transplanted when they have started budding out. During our transplanting day, seedlings varied in how much they had budded out.** In the future we would pot-up pawpaws to one gallon pots and transplant out into the permanent locations once roots have filled out the one gallon pot **and when we could clearly see that the tree was not dormant.**

EarthDance's expectations, in terms of farmer interest in growing, and consumer interest in tasting this remarkable crop were fulfilled. As we were at the start of this project, we remain strong advocates on behalf of the pawpaw as a new Missouri specialty crop.

Contact Persons

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Matt Lebon, Farm Manager
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Phone: 314.521-1006

Additional Information

Evaluation: MOA Pawpaw – Springfield – February 7, 2015

The information you provide will not be used to identify any program participants. You may refuse to answer any questions. Your answers to the following questions will help University of Missouri Extension make sure that we are presenting valuable programs to a wide range of participants and will aid in future planning and training improvements. We appreciate your time and input. Please circle or mark appropriate answer.

		Poor	**Fair**	**Average**	**Good**	**Excellent**
		1	2	3	4	5
1.	How would you rate the overall program?	0	0	0	20%	80%
Average rating (1-5 Likert Scale)		**4.800**				

		Poor	Fair	Average	Good	Excellent
		1	2	3	4	5
2.	How well were your expectations met in this program?	0	0	0	6%	94%
Average rating (1-5 Likert Scale)		**4.933**				

3. I would recommend this program to others.

YES 100%

NO 0%

4. Overall, after completing this workshop, do you think your knowledge gained of pest management and safe production practices has increased:

a great deal	a moderate amount	a little	not at all
4	3	2	1
87%	13%	0	0
Average knowledge gain (1-4 Likert scale)		**3.867**	

Listed below are the topics presented during this workshop. On the left, circle your knowledge of each topic BEFORE the workshop. On the right, circle your knowledge of each topic AFTER the workshop.

How confident you are in using these practices or researching information after the workshop:

5.	Question:	Non-existent	minimal	moderate	considerable
		1	**2**	**3**	**4**
1	Pawpaw native habits	0	6.666667	33.33333	60
2	improved pawpaw cultivars	0	6.666667	46.66667	46.66667
3	pawpaw propagation	0	13.33333	40	46.66667

4	growing pawpaw	0	13.33333	20	66.66667
5	pawpaw marketing	0	26.66667	40	33.33333

Knowledge gain

	Question:	Pre Evaluation score	Post Evaluation score	Knowledge gain (1-4 Likert Scale)
1	Pawpaw native habits	2.133333	3.533333	1.4
2	improved pawpaw cultivars	1.533333	3.4	1.866667
3	pawpaw propagation	1.533333	3.333333	1.8
4	growing pawpaw	1.666667	3.533333	1.866667
5	pawpaw marketing	1.2	3.066667	1.866667
	Average knowledge gain			**1.760**

6. Please comment on the presenter's skills so that we can improve.

Did presenters encourage questions? Keep me focused and interested? Did the presenters use clear examples? Were they well-prepared?

- very informative, good use of visuals, appreciate the handout
- very interesting and engaging, very well prepared
- great job!
- encouraged questions
- Patrick had one of the best presentations
- A great deal of knowledge in all areas
- had copies of presentation - excellent; it is hard to retain all information when you do not have copies
- A very professional person and presentation
- answered all questions, yet controlled the presentation
- questions were encouraged and answered clearly and with knowledge
- It may sound like overkill but I was pretty much riveted by both presentations
- Mr. Byers did a wonderful job
- Patrick is always an excellent, patient presenter; knowledgeable and interesting
- good presentation

7. What will you do differently as a result of this program?

	Did Before Workshop	*Plan to Do in Next 6 Months*	*No Plans to Use this in My Operation*	*Does Not Apply in My Operation*
Plant pawpaws	8%	75%	17%	0
Grow pawpaws from seed	0	31%	62%	8%

8. What else did you learn that you plan to use this year?

- pawpaw ice cream
- because I'm growing elderberries I may plant pawpaws and cause myself issues with SWD
- will use seedling pawpaws for deer sustainable food plots, cultivars for farm
- Keyline berms and swales
- search for wild pawpaw trees

9. What suggestions do you have for making this program more effective?

Tomato school

- have fruit available for tasting, but it's probably not cost feasible
- demonstrations
- marketing options
- allow evals to be turned in after conference so more thought can go into responses
- additional information on grafting
- info in disease treatment
- wish we would have had time to watch you chip bud

10. What topics would be of interest to you in future workshops?

- marketing examples
- taste comparisons between cultivars
- hands-on workshops
- costs to start a specific project
- selling price of products grown
- grapes
- raspberries
- blackberries
- elderberries
- tree nut production
- blackberry production

WebApps impact reporting

1. **Customer Quotes - What did you learn that you plan to use this year?**

- pawpaw ice cream
- because I'm growing elderberries I may plant pawpaws and cause myself issues with SWD
- will use seedling pawpaws for deer sustainable food plots, cultivars for farm
- Keyline berms and swales
- search for wild pawpaw trees

2. **Learning (Short Term) Outcomes knowledge, skills or attitude change**

When asked to consider the program as a whole, the attendees who responded to the survey (n=15) reported an average knowledge gain of **3.867** on a 1-4 Likert scale, with 4=great deal of knowledge gain. Attendees were surveyed on knowledge of workshop topics before and after the program, and average knowledge gain on a 1-4 Likert scale, with 4=considerable knowledge gain, was the following: Pawpaw native habits, 1.4; improved pawpaw cultivars, 1.9; pawpaw propagation, 1.8; growing pawpaw, 1.9; and pawpaw marketing, 1.9. The overall knowledge gain was **1.760**. Following the program, attendees reported confidence in understanding these topics at a considerable level, 51%, moderate level, 36%, or minimal level, 13%. The attendees who responded to the survey were asked to describe behavior change as a result of the program. The following actions were planned within the next 6 months: plant pawpaw, 75%; and grow pawpaw from seed, 31%.

3. **Customer satisfaction exit survey or comments about the learning experience**

The attendees who responded to the survey rated the overall program as **4.800** on a 1 to 5 Likert scale, with 5=excellent. Attendees reported that expectations were met in the program at a level of **4.933** on a 1 to 5 Likert scale, with 5=excellent. **100%** of attendees reported that they would recommend the program to others.

Please comment on the presenter's skills so that we can improve.

Did presenters encourage questions? Keep me focused and interested? Did the presenters use clear examples? Were they well-prepared?

- very informative, good use of visuals, appreciate the handout
- very interesting and engaging, very well prepared
- great job!
- encouraged questions
- Patrick had one of the best presentations
- A great deal of knowledge in all areas
- had copies of presentation - excellent; it is hard to retain all information when you do not have copies
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What suggestions do you have for making this program more effective?

- have fruit available for tasting, but it's probably not cost feasible
- demonstrations
- marketing options
- allow evals to be turned in after conference so more thought can go into responses
- additional information on grafting
- info in disease treatment
- wish we would have had time to watch you chip bud

EarthDance Permaculture Fruit Tree Planting Participant Evaluation Form

1. How did you learn about this event?

❑ EarthDance email newsletter - IIIIII
❑ Personal email from EarthDance staff member - IIIII
❑ EarthDance social media - IIIIII II
❑ Other - IIIIIIIIII
-other attendee or contact - IIIII
-apprentice meeting
-Meetup - I
-ED website

2. Which best describes you?

❑ Professional/ commercial farmer - I
❑ Aspiring commercial farmer - II
❑ Home gardener - IIIIIIIII
❑ Agricultural educator - II
❑ Other - IIIIIII
-local food advocate
-new gardener
-plant enthusiast
-garden coordinator for at-risk youth
-college student

GENERAL ASSESSMENT	Poor	Fair	Average	Good	Excellent
3. How would you rate the event overall?	❑	❑	❑	III (3)	IIIIIIIIIIIIII I (17)
4. How well were your expectations met by the event?	❑	❑	❑	I (1)	IIIIIIIIIIIIII III (19)

5. After participating in this event, do you think your knowledge of establishing a permaculture orchard has increased:

❑ Significantly - 16 respondents ❑ Moderately - 6 respondents ❑ Little 0 ❑ Not at all 0

6. How likely are you to plant native fruit trees after attending this event?

❑ Very likely - IIIII II (7) ❑ Moderately likely - IIIII III(8) ❑ Unsure - IIIII (5) ❑ Not likely at all - I (1)

7. What did you find most helpful or enjoyable about this event?

-meeting others, interacting - III
-informative instruction from Matt & Monica, learned a lot - IIIIIII
-well organized - I
-"Matt just blows my mind!"
-hands on - IIIIIII
-a lot of thought before planting
-Lupe was very informative - II
-everything and every topic was enjoyable
-discussions about how you choose what to plant
-approachable and friendly staff
-picked up new ideas
-demonstrating tree planting info
-explaining the design and the principles behind it; how the system is supposed to work
-design of farm, swales and berm system
-seeing large-scale planting
-permaculture orchard movie

8. What, if anything, would you do to improve this event?

-more info on irrigation strategies (how much, sizing drip irrigation, $, quantity of water needed per plant)
-more events!
-better organization (assigning specific areas / species / tasks to teams to improve efficiency), but everyone getting a chance to do everything is nice
-closer restroom facility / porta-potty
-more physical labor!
-have all the plants ready to go
-split into groups and each group takes a lot of land led by a leader as they plant
-team building activity / game at the beginning
-publicize more in local area to involve local youth

9. What level of interest would you have in a workshop on farm scale composting?

❑ Very interested - IIIIIIIIIII ❑ Moderately interested - IIIIIIIII ❑ Unsure ❑ Not interested

-"I dig composting! I want my body composted when I die"

9. What level of interest would you have in a workshop on machine-free farming?

❑ Very interested - IIIIIIIIIIIII ❑ Moderately interested - IIIIII ❑ Unsure - I ❑ Not interested

11. What other workshop topics interest you?

-fruit tree grafting, fermentation and food storage
-organic methods in general
-pest control
-companion planting
-composting using worms

-nursery management
-chicken management / livestock - II
-mushrooms! - I
-tree pruning
-natural building
-annual vegetables
-keyline agriculture
-bees
-harvesting / drying herbs
-farm-scale pollination
-breeding / selling crop varieties
-hydroponics
-home gardening/sustainability - I
-soil enrichment

12. If you would like to be added to our volunteer database or mailing list (circle one or both), please provide your name and email address.

(Responses removed for PII purposes)


PAWPAW
MISSOURI'S
TROPICAL FRUIT
Learn about the challenges and opportunities of organic fruit production in Missouri, with a focus on Pawpaws as a viable new specialty crop.
SATURDAY, FEBRUARY 7TH AT 1PM
MO ORGANIC CONFERENCE
presented by:
Patrick Byers, University of MO Horticultural Extension Specialist
& Matt Lebon, Earth Dance Farms

Project 14: Market Development Options for Missouri Wine and Grape Producers

University of Missouri
Dr. Randall Westgren and Dr. Peter Hofherr
Final Performance Report

Project Summary

The purpose of this project was to advance the collective marketing options used by wineries in the State of Missouri by examining innovative strategies used in other developing wine regions. Specifically, we were looking to enhance industry-wide marketing programs by identifying best practices in localized markets: wine trails and appellations. Find out to what extent do these localized strategies enhance prices and markets earned, market development outside the production region, and have synergy with state-wide programs.

The Missouri wine and grape industry is growing rapidly; new wineries enter annually. Since the vast majorities are very small and have limited resources for marketing, there is a need to find ways for the growers to work together in what we term collective entrepreneurship – innovative joint strategies to build market presence. There are nine wine trails in Missouri, with a majority less than 5 years old. They exist in different geographical and production regions in the State. We wondered how we can make these regional/local differences into marketable identities to enhance prices received by wine tourists and by the retail trade. Appellations, with specified wine styles, are an option. Developing strong identity-based reputations is another.

The project was delayed in Nova Scotia. A change in the scope of work was approved to accommodate the problems and delays. The project struggled to move forward and it was decided to forfeit the funds to MDA so a new project could be funded.

This project was not built on a previously funded project.

Project Approach

Initial work was completed on developing target winery lists for scheduling interviews in Nova Scotia and Ohio during the second quarter of 2015 (Partial of Project Goal # 1 with completion date of June 2016).

Training was undertaken with one undergraduate journalism student for doing video capture and editing of interviews. The student prepared electronic files from four test interviews.

Interview protocols were developed with the assistance of a professor from Illinois State University, who worked with wine and grape producers in regions outside the scope of this project, specifically in two wine trails in the Finger Lakes of New York. He was able to test the protocols there, so that the potential target winery lists would not be “used up” in protocol development. Furthermore, because these activities were outside the regional scope of this grant, the expenses associated with protocol development and testing (salary, travel, transcription) were paid from other funds.

Goals:

1. Collect data on the strategies and collective entrepreneurial activities by winery owners, including wine trail and appellation development, in three areas that have developing wine industries; Winery Association of Nova Scotia (CANADA), Wine Growers of the Grand River Valley (Ohio), and Texas Hill Country Wineries. We will collect data using semi-structured survey instruments, augmented with interviews of state government agency and state association staff familiar with the regional development. We will also collect published accounts and data where available.
2. Describe the processes used by growers to develop their collective entrepreneurial strategies, including participation by state government, consultants, and other parties. We will distill best practices from these experiences.
3. Define the successful strategies for regional/local industry development, including the identity-based reputations of successful wine trails and the specifications used to define the wine styles and production practices adopted in new appellations.

Support materials were to be created and strategy design for groups within the Missouri wine industry to develop new initiatives for linking wine trail activities and state-wide (i.e. MWGB and MDA) market development programs to the development of distinctive appellations and wine trail marketing strategies that reflect Missouri regionality. That is, by enhancing the marketing strategies of smaller areas (trails and appellations), each can create distinct value propositions that can lead to greater margins. The distinctiveness means that groups will not be following a common strategy that will lead to destructive direct competition, and hence, lower profitability. The beneficiaries will be current and new winery owners, grape growers, and the wine tourism sector. The economic impact will be to add profit margin to Missouri wines and to provide a marketing strategy platform for enhancing sales revenues within the State and in out-of-state markets.

Goals and Outcomes Achieved

The project was delayed in Nova Scotia. Personnel turnover in the Winery Association of Nova Scotia hindered the collection of secondary data (scheduled for second quarter 2015) and the execution of interviews there (proposed for summer 2015 and 2016). The project team proposed a change in the scope of work to accommodate these problems and delays. The significant change was to move the location of the overlapping study of wine trails and appellations from Nova Scotia to a three-state region along Lake Erie. (Note that the NE Ohio region is one of the original regions included in this project). We have discovered that the common appellation – Lake Erie AVA – overlaps three different jurisdictions – New York, Pennsylvania, and Ohio. The relationships between the States and the wine trails differ greatly along this AVA and we can gain exceptionally useful data on how the trails cope with different regulatory and institutional environments, despite having common agronomic and climatic conditions.

This project was not completed and had no significant goals and outcomes achieved.

Beneficiaries

None

Lessons Learned

The delays from lack of access to the Nova Scotia target region and time spent creating a new strategy prolonged the project to a point where the Principal Investigators had other commitments and were

unable to dedicate the necessary time to move forward with the approved replacement strategies and provide success toward any of the goals.

All monies that were initially spent and reimbursed ($1,299.40) were returned saving the SCBGP funds for another project.

Contact Person

Susan Bennett, MDA SCBGP Program Coordinator
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Additional Information

All paid funds from this project were returned to Missouri Department of Agriculture and redirected to a new project to begin March 1, 2017 with USDA's approval: Project 15, Comprehensive Assessment and Economic Contribution of the Missouri Specialty Crop Industry.

Project 15: Comprehensive Assessment/Economic Contribution of the Missouri Specialty Crop Industry

University of Missouri
Joe Horner
Final Performance Report

Project Summary

The purpose of this project was to improve communications, connectedness and future outreach programs with the Missouri specialty crop industry. USDA-NASS currently conducts surveys to the Missouri specialty crop industry, but there are beliefs in the industry that NASS is missing a significant portion of Missouri specialty crop businesses and producers. Additionally, there was no single report that showcases the collective Missouri specialty crop industry data and its evolution over time. There was also a need to further understand more about the Missouri specialty crop industry to provide information to extension educators that will be used to target future educational programs. The objectives of this grant project were to: 1) investigate and develop a comprehensive historical report of the Missouri specialty crop industry, 2) develop a directory of Missouri specialty crop businesses, and 3) survey Missouri specialty crop producers about their farms, sales, marketing outlets, and crops they grow. These resources were used to create awareness and understanding about the Missouri specialty crop industry and to communicate its value to consumers, policy makers and other stakeholders. This effort was also timely and was utilized to assist USDA-NASS improve its survey reach to Missouri specialty crop producers with the Census of Agriculture in 2017.

This project did not build on a previously funded project with the SCBGP.

Project Approach

The project had a team-based approach for accomplishing the project objectives.

Objective 1: Historical report of the Missouri specialty crop industry
This work involved conducting an extensive research and literature review of all data sources for the Missouri specialty crop industry. Data was obtained from the USDA National Agricultural Statistics Service (NASS), USDA Economic Research Service (ERS), university and other relevant sources pertinent to explaining the Missouri specialty crop industry. Project team members Alice Roach and Ryan Milhollin led this task and other project team members conducted reviews and provided supporting information for this deliverable. The final report contained 377 pages of analysis, including a broad overview of the Missouri industry and detailed crop-specific information about various fruits, vegetables, tree nuts, herbs/spices, nursery/flowering plants and other horticultural goods.

Objective 2: Directory of Missouri specialty crop businesses
This objective was focused on collecting producer information necessary for completing objective 3 (survey). Associations, state agencies, private organizations, extension producer lists and public domain resources were targeted for obtaining producer contact information. A total of 2,543 mail addresses and 1,086 e-mail addresses were collected from these groups. Additionally, several organizations stated they were not willing to share their list, but would forward our survey to their membership. MU Extension horticulture specialists James Quinn, Sarah Denkler, Patrick Byers, Debi Kelly and Patricia Miller were the key investigators that helped developed this resource.

Objective 3: Survey of Missouri specialty crop producers
MU Extension collaborated with the MU Assessment Resource Center (ARC) to complete the survey. The survey asked producers growing specialty crops to provide information on their farm, their specialty crop sales, their distribution outlets, and the types of specialty crops they grow. Survey was distributed in July 2017 and closed on September 1, 2017. ARC received a total of 519 returned surveys. Efforts for developing and conducting the survey were led by Joe Horner.

Goals and Outcomes Achieved

Project Goal #1: Increase awareness and knowledge of the Missouri specialty crop industry
Performance Measure: Number of historical report downloads from website
Benchmark: None
Target: 1,000 in the six months after report completion.
Accomplishment: 261 page views in two months of tracking after report completion. Further tracking will be completed and reported at a later date.

Project Goal #2: Increase representation of the Missouri specialty crop industry
Performance Measure: Number of producers listed in project directory
Benchmark: 2012 Census of Ag. estimate for Missouri specialty crop producers (3,258 farms)
Target: 10 percent increase in number of farms and agribusinesses listed in directory
Accomplishment: A total of 2,794 unique contacts were listed in the final directory that we used to disseminate our survey. We also included the survey in the Missouri Produce Growers Bulletin which reached another 500 farms. Additionally, several organizations stated they were not willing to share

their list, but would forward our survey to their membership so total dissemination in this manner was not estimated.

An additional accomplishment was helping USDA-NASS to improve their Missouri specialty crop producer directory for the next Census of Agriculture. We worked with Bob Garino (USDA-NASS state statistician in Missouri) and provided assistance in enhancing their directory. Based on their feedback, Bob estimated that 500 new Missouri specialty crop producers were added to their lists and set to be surveyed in the 2017 census.

Project Goal #3: Enhance industry understanding of scope/scale of Missouri specialty crop growers
Performance Measure: Survey response
Benchmark: None
Target: 30 percent response rate
Accomplishment: Survey was distributed in July 2017 and closed on September 1, 2017. The survey achieved an 18.6% response rate and received a total of 519 returned surveys. Given the project timelines, we feel that an improved response rate could have been achieved if we performed during the winter season or kept the survey open for a longer time span.

Beneficiaries

This project had multiple beneficiaries. Missouri specialty crop producers benefited as these resources will be used to highlight the importance of the Missouri specialty crop industry. Many associations such as the Missouri Blueberry Council, Missouri Vegetable Growers Association, Riverhills Elderberry Growers, Missouri Nut Growers Association, etc. will benefit from both showcasing their respective industries, but showing the collective strength and economic importance of the Missouri specialty crop industry. Many farmers that we contacted were excited that we working in this area and eager to support our efforts. The detailed information that was collected can also be used to showcase the evolution of the industry and key demographic and agronomic changes that have been occurring. State agencies such as the Missouri Department of Agriculture have benefited from this knowledge exchange and helped them as they work with the Missouri specialty crop industry. Further impact from this project will be assessed in the next 2017 Census of Agriculture. Our hope is that more Missouri specialty crop producers will be reached and an increase in industry value and jobs supported will be assessed.

Lessons Learned

One area we hoped for was a better response rate from our survey. Getting producers motivated to complete a survey is not an easy task. Timing of year or how long the survey was left open could have impacted responses. We also feel that including a few more University of Missouri Extension horticulture specialists that were located in strategic regions of Missouri might have improved response rates. We had five horticulture specialists on this project and adding 2-3 more would have helped with more local presence in various areas of getting producers to complete surveys.

Contact Person

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Additional Information

Roach, Alice, Joe Horner, Ryan Milhollin, Hannah McClure, Rachel Groves, Patrick Byers, Sarah Denkler, Debi Kelly, Patricia Miller and James Quinn. 2017. "Historical Perspective on the Missouri Specialty Crop Industry." Commercial Agriculture Program, University of Missouri Extension. Accessible at http://crops.missouri.edu/horticulture/MissouriSpecialtyCropsFull.pdf .

Assessment Resource Center, University of Missouri. 2017. "Missouri Specialty Crop Survey – Summary of Findings." Accessible at http://crops.missouri.edu/horticulture/CropSurvey.pdf .

Project 16: 2017 Missouri Tomato School

Webb City Farmers Market
Eileen Nichols
Final Performance Report

Project Summary

The 2017 Missouri Tomato School was a collaborative outreach effort to address production issues associated with growing tomatoes both in the field and under protection in Missouri.

Tomatoes are the top specialty crop grown in Missouri and offer important potential profits to small and medium farmers. However, it is a challenging crop to grow successfully. Our goal was to teach these farmers to be more successful tomato growers, as well as extension specialists from across the state to extend the benefits of the conference to farmers unable to attend.

This project was built on experience gained from four successful regional winter production conferences that were funded by Specialty crops, as well as a Local Foods Matching Grant.

Project Approach

Despite the short time frame available for planning, our team which included representatives from University of Missouri Extension, Lincoln University Co-Operative Extension and the Webb City Farmers Market, secured top experts in the field, as well as exceptional regional presenters and farmers presenters. Host farms demonstrating a variety of field and protected tomato growing operations were secured. Publicity was focused on reaching Missouri farmers.

One of the significant results from the school was providing 13 extension specialists who serve all parts of the state with top caliber first-hand information on tomato production and providing them with excellent resource materials to take into the field when advising farmers. These specialists will use the information to assist and educate tomato farmers throughout the state.

There will, of course, also be ripple effects from the more than 60 farmers who attended the school, particularly those attendees who were part of communities which tend to teach and support each other such as immigrant farmers, Amish farmers, and Mennonite farmers. The information will also be used for many years as most the attendees were young or middle-aged farmers.

Another opportunity for sharing the information will be through Fue Yang, manager of the market's Year Round Education Center which includes a heated high tunnel for growing tomatoes. A critical goal of the center is training Fue to teach the Hmong community in their own language and culture. The School offered an opportunity to take advantage of Fue's new expertise and practice his role as teacher. Fue was one of our table expert speakers during lunch. His table included one other Hmong grower who was fluent in English which allowed Fue to also share his experience with the five English-speaking farmers who chose to sit at his table. Not being a clan leader, Fue was not raised to take a leadership role. He was raised to be a follower which is well demonstrated by the Hmong saying "The nail that sticks up gets hammered." This school gave him practice in taking a leadership role and he demonstrated significant skill. The information that he gleaned from the school will be important to the Hmong community for whom growing tomatoes is probably, along with winter production, their biggest challenge.

The three farms included in the farm tour provided myriad examples of problems, solutions and opportunities for the experts to focus on. Many attendees said it was the most valuable part of the conference. That being the case, the organizational committee will examine ways to increase attendance of the farm tour which was held the morning of day two. Only approximately 50% of the attendees stayed for day 2.

The attendees felt fortunate in learning from some of the most knowledgeable and skilled teachers on tomato topics in the country. Interest in additional schools has been strong and the organizational committee is in the process of seeking funding and scheduling the school in a different part of the state each year. The 2018 school is tentatively set for June in Cape Girardeau in the Bootheel of Missouri.

Primary partners in this project were:

- Patrick Byers, University of Missouri Extension
- Robert Balek, University of Missouri Extension
- Shon Bishop, Lincoln University Co-Operative Extension
- David Middleton, Lincoln University Co-Operative Extension

Patrick played the largest role, proposing the school and identifying and securing the presenters. He also served as MC and handled the surveys and analysis. All served on the organizational committee and assisted with publicity. All served as experts at the Lunch with an Expert segment of the program. Shon provide on-site technical assistance. David and Robert visited farms to select the ones to be included on the farm tour.

Owen Detweiler of E & O Produce, Greg and Wendy Braker of Braker Berry Farm and Misty Philips of Misty Morning Farm served as hosts on the farm tour, putting in hours of preparation and hosting (and hearing some pretty hard critiques) in August when demands on a farmer's time are high.

In addition, staff from NRCS attended and served as lunch experts for attendees interested in the EQIP program.

Goals and Outcomes Achieved

Goal - attendance of 50 farmers.

Outcome - 75 farmers attended, plus 13 Extension specialists.

Goal - Farmers who attend the Tomato School will report an increase of knowledge of the presentation topics of 3.5 on a 1-4 Likert scale, where 4 equaled great increase in knowledge.

Outcome – Since most attendees reported a pre-conference score of approximately 2.50, an increase of knowledge of 3.5 was unattainable, the maximum score being 4. However, post-conference scores averaged a .848 increase in knowledge with an average ending score of close to 3.5. Complete survey results are attached.

Goal - 60% of farmers who attend the Tomato School will report a planned change in their production and marketing practices because of attendance.

Outcome – 73% reported a planned change in their production and marketing practices because of attendance.

Beneficiaries

The 75 farmers who attended, plus the farmers who will work with the better equipped extension specialists throughout the state.

The 13 Extension specialists who are better informed and have reference materials for further research.

The consumers of Missouri who will have better quality, more plentiful tomatoes available.

Lessons Learned

The survey results clearly indicate an on-going interest for training on the topic of growing tomatoes. Excellent resource people are available to present on this topic. Our team can move quickly and effectively to organize, publicize and present a successful conference beneficial to specialty crops growers from throughout the region. Several attendees expressed that the farm visits were when they learned the most. Should we repeat the conference, we will look at holding the farm visits during the first day because only about 70% of attendees stayed for the second day, mid-August being a very busy time for tomato growers.

Contact Person

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Additional Information

Dr. Rick Snyder – above during first day of presentation, below during the second day farm visits. Participants indicated that the farm visits were especially helpful.

Left – attendees included a range of farmers, including both young, old and in between, farmers using the latest technology and those who abstain from modern conveniences.

Evaluation: Missouri Tomato Conference – Joplin, MO – August 14, 2017

The information you provide will not be used to identify any program participants. You may refuse to answer any questions. Your answers to the following questions will help University of Missouri Extension make sure that we are presenting valuable programs to a wide range of participants and will aid in future planning and training improvements. We appreciate your time and input. Please circle or mark appropriate answer.

		Poor	Fair	Average	Good	Excellent
		1	2	3	4	5
1.	How would you rate the overall program?	0	0	0	26.98413	73.01587
Average rating (1-5 Likert Scale)	**4.730**					

		Poor	Fair	Average	Good	Excellent
		1	2	3	4	5
2.	How well were your expectations met in this program?	0	0	3.174603	39.68254	57.14286
Average rating (1-5 Likert Scale)	**4.540**					

5. I would recommend this program to others.
YES 100%
NO 0%

6. Overall, after completing this workshop, do you think your knowledge gained of pest management and safe production practices has increased:

a great deal	a moderate amount	a little	not at all
4	3	2	1
50.79365079	41.26984127	7.936507937	0
Average knowledge gain (1-4 Likert scale)		**3.429**	

Listed below are the topics presented during this workshop. On the left, circle your knowledge of each topic BEFORE the workshop. On the right, circle your knowledge of each topic AFTER the workshop.

How confident you are in using these practices or researching information after the workshop:

5.	Question:	Non-existent	Minimal	moderate	considerable
		1	**2**	**3**	**4**
1	Tomato production practices	0	1.639344	34.42623	63.93443
2	Tomato insect IPM	0	3.278689	63.93443	32.78689
3	Tomato diseases	0	3.278689	52.45902	44.2623
4	Field tomato production	0	10.71429	51.78571	37.5
5	Greenhouse/Tunnel tomato production	1.694915	10.16949	40.67797	47.45763
6	Tomato fertility management	0	1.785714	51.78571	46.42857
7	Tomato fruit quality issues	0	1.785714	55.35714	42.85714
8	Tomato grafting	0	16.66667	59.25926	24.07407

Knowledge gain

	Question:	Pre Evaluation score	Post Evaluation score	Knowledge gain (1-4 Likert Scale)

1	Tomato production practices	2.916667	3.622951	0.706284
2	Tomato insect IPM	2.516667	3.295082	0.778415
3	Tomato diseases	2.45	3.409836	0.959836
4	Field tomato production	2.672727	3.267857	0.59513
5	Greenhouse/Tunnel tomato production	2.372881	3.338983	0.966102
6	Tomato fertility management	2.542373	3.446429	0.904056
7	Tomato fruit quality issues	2.571429	3.410714	0.839286
8	Tomato grafting	2.037037	3.074074	1.037037
	Average knowledge gain			**0.848**

7. What will you do differently as a result of this program?

	Did Before Workshop	*Plan to Do in Next 6 Months*	*No Plans to Use this in My Operation*	*Does Not Apply in My Operation*
Change a production practice on my farm	1.851852	62.96296	9.259259	25.92593
Use a high tunnel or greenhouse for tomato production	28.07018	28.07018	8.77193	35.08772
Learn more about tomato pests	12.5	73.21429	0	14.28571

7. Please list two things that you learned during the conference that will make a difference in how you grow tomatoes.

- More insect options. More on disease options.
- I will be able to share this information with farmers in Missouri, tomato production practices, insect/pest management and tomato diseases.
- High tunnel construction. Determinate vs indeterminate in high tunnels.
- Controlling insects. Identify and manage diseases.
- How to get chemical license, chemical suggestions on various critters. Pick tomatoes when turning. Leave alone for 5 to 7 days.
- Picking before watering to enhance flavor. Not much yield difference suckers/non-suckers. Disease and insect control – wat too much info to list here. All excellent! Mulching both in the row & between the rows helps to prevent diseases.
- I learned more about using insecticides using drip systems.
- Insect protection.
- Not monitoring water application well enough.
- No specific changes, but it is always valuable for me to receive reminders through these workshops to have important practices emphasized. Intent on scouting more & paying more attention to tomato varieties with regard to resistance to disease etc.
- IPM. Plant (I couldn't make out the next word. Sorry)
- Advantages of grafting. Insect management in GH.
- Grafting.
- ID plant diseases & how to treat. ID pests & how to treat.
- Fertigation. How to plant.
- More consistently checking pH. Consider tissue samples to access nutrition.
- Fertility, pest management.
- Disease resistance. Grafting.
- Lower pH improves tomato flavor. Snapping leaves for pruning instead of cutting. Grafting – all of it.
- Monitor for pests before spraying. Pick varieties more carefully.
- Pest spray. Rotation.
- Variety selection. Pruning.
- Covering between rows.
- Pest Control. Tomato Production.

- Able to solve some questions we had. To check the importance of fertilizer.
- Pollen dies @ temps over 95 degrees. Learned what a tomato pinworm moth looks like. Effects of fertility on fruit quality to plant development.
- Double Cropping. Growing in perlite.
- Temperature control. Disease control.
- Fertilize more. Space wider.
- Florida weave. Fertigation.
- Small backyard gardens & small greenhouse, 20x15. Yellowing on bottom leafs – cause. I need to place screen over GH exhaust & entry fans. Work on plant rotation.
- Controlling temp in tunnel within ranges. Horizontal fans. High/low thermometer. Experiment w/grafting.
- Disease characteristics. Other tomato deformities.
- Bacterial diseases tend to drop down, more noticeable on leaf tips. Possibility of raising up hoop houses to 8' – 10'.
- Learned where to grow & what to grow.
- Provide more spacing for each tomato plant. Soil testing!
- Better @ dealing w/fertilization & pests. Closer attention to night & day temps & water control.
- High tunnel use. Pest control.
- Fertilize all through year. Keep soil off plants.
- The husband will do the bugs' thing. Many things to consider.
- Varieties for greenhouses, disease control.
- Crop rotation. Plant deep.
- Pests. Modifications high tunnels.
- Suckering differences between determinate & indeterminate. The importance of controlling weeds & traffic in & out of tunnel & handling of tobacco.
- Rotate crops for disease/pest prevention. Get bumblebees.
- Found resources I did not previously have. Pruning for high tunnel tomato.

8. What suggestions do you have for making this program more effective?

- Have this program yearly and maybe move it to other parts of the state.
- Might include short breaks.
- No recommendations.
- Round table discussions/mostly growers for practical use. Less professors, more growers.
- None, well done! Liked that information applied to both large & small-scale growers.
- More use of live examples.
- Have similar in Central MO.
- More hands on.
- None.
- Larger room, could not see all of the screen due to projection height. Website info was very difficult to access/share. Consider media management or hashtag for social media (#MOTomato17), need organic tract. Get more industry rep sponsors (seed comp.)
- Move around the state if possible.
- Better table seating.
- Would have liked a farmer panel representing different growing methods/pest experiences/growing structures.
- Handouts for all presentations.
- N/A
- More info on region specific pests.
- For me more on heirloom.
- Goes on for a bit too long.
- None.
- Great as is.
- Breaks built in.
- Overall good, no suggestions.
- Great job thank you.
- Please have speakers put pictures higher on slides so people in back can see. Black/white pictures on print offs don't show good pictures, which are important in identification.
- Larger facility could move around the state.
- None.

- For the amount of planning time you all had (8wks) I think you did a fantastic job!
- Moving around between sessions, standing up! Everyone have handouts & if they have them, enough for everyone, especially since we had to pre-enroll. All handouts be in color. I'll be spending some hours printing pictures & placing in my file.
- PDF of subjects available beforehand.
- Small printed presentations are too small to read.
- Continue the same things.
- Look like you had it covered.
- NA
- I liked the off the cuff group problem-solving scenario (Southern blight). More interactive moments like this facilitated by instructors would be great!

9. Should we continue the Missouri Tomato Conference?

- Yes (39 responses)
- Definitely.
- Absolutely.
- Yes. Try fruit production.
- Yes! Amazing that you were able to get such excellent presenters in such a short period of time! Well done as always. Thanks!
- Yes! Thanks, folks!
- Yes. Good lineup of speakers.
- Yes, consider the past. Look at what Dr. Lambeth accomplished.
- Yes. Would also be interested in focuses on other crops.
- Yes! Loved it. Thanks.
- Yes! The speakers were outstanding. Knowledgeable, entertaining. Appreciate learning from industry experts. It will make a difference in my bottom line!
- Very much so.
- Absolutely yes!
- Yes for beginners/intermediates.
- Yes. This is great.
- Of course.
- Yes, good program.
- Yes please.
- Yes, very needed.

<u>WebApps impact reporting</u>

4. Customer Quotes - What else did you learn that you plan to use this year?

- More insect options. More on disease options.
- I will be able to share this information with farmers in Missouri, tomato production practices, insect/pest management and tomato diseases.
- High tunnel construction. Determinate vs indeterminate in high tunnels.
- Controlling insects. Identify and manage diseases.
- How to get chemical license, chemical suggestions on various critters. Pick tomatoes when turning. Leave alone for 5 to 7 days.
- Picking before watering to enhance flavor. Not much yield difference suckers/non-suckers. Disease and insect control – wat too much info to list here. All excellent! Mulching both in the row & between the rows helps to prevent diseases.
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5. Learning (Short Term) Outcomes knowledge, skills or attitude change

The evaluation results for this audience revealed that there was a high level of previous experience related to tomato production (as expected), but even so a considerable amount of learning was reported. When asked to consider the program as a whole, the attendees who responded to the survey (n=60) reported an average knowledge gain of **3.429** on a 1-4 Likert scale, with 4=great deal of knowledge gain. Attendees were surveyed on knowledge of workshop topics before and after the program, and average knowledge gain on a 1-4 Likert scale, with 4=considerable knowledge gain, was the following: Tomato production practices, 0.706; Tomato insect IPM, 0.778; Tomato diseases, 0.960; Field tomato production, 0.595; Greenhouse/Tunnel tomato production, 0.966; Tomato fertility management, 0.904; Tomato fruit quality issues, 0.839; and Tomato grafting, 1.037. **The overall knowledge gain was 0.848; average knowledge level improved from 2.510 to 3.360 on a 1-4 Likert Scale**. Following the program, attendees reported confidence in understanding these topics at a considerable level, 43%, and a moderate level, 51%. The attendees who responded to the survey were asked to describe behavior change as a result of the program. The following actions were planned within the next 6 months: Change a production practice on my farm, 63%; Use a high tunnel or greenhouse for tomato production, 28%; and Learn more about tomato pests, 73%.

6. Customer satisfaction exit survey or comments about the learning experience

The attendees who responded to the survey rated the overall program as **4.730** on a 1 to 5 Likert scale, with 5=excellent. Attendees reported that expectations were met in the program at a level of **4.540** on a 1 to 5 Likert scale, with 5=excellent. **100%** of attendees reported that they would recommend the program to others.