



WEST VIRGINIA DEPARTMENT OF AGRICULTURE

SPECIALTY CROP BLOCK GRANT PROGRAM

FINAL REPORT

12-25-B-1705

Submitted by:

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Program Administration

A total of \$3,500.00 was reallocated from the Wine Trail project to Program Administration. The allocations for the Program Administrators Conference in Oregon was expended (\$1,097.66) and an allocation to professional development (Management Concepts \$869.00) was utilized.

Due to a resignation of the Marketing Specialist assigned to grants management, the remaining funds (\$1,533.34) were not expended.

Balance remaining: \$1,533.34

PROJECT TITLE

Kitchen Garden See to Plate Better Tasting Fruits and Vegetables

Amount Awarded: \$13,500.00

Project Summary

This project was designed to provide access to all students to the garden at New River Elementary, but especially aimed at providing access for special needs students who have limited mobility. The goal was to expose all students to the vibrant environment found in a garden. We implemented a comprehensive plan for the entire garden area at New River Elementary to include a gardening area for the exclusive use of the special needs students.

Providing an opportunity for a positive, experience based garden experience as well as activities leading to the development of self-confidence amongst special needs and at-risk students was the motivation for this project. Situated in a community facing economic and educational challenges as well as non-voluntary over-sight by the state board of education, this project targeted a student population often overlooked with discretionary funding. The need for a project that had a high degree of success as well as non-traditional learning scenarios was identified in the previous grant allocation and had full support of the administration and classroom teachers.

Project Approach

We established a kitchen garden at Oak Hill High School, renovating an ornamental courtyard and replacing those plants with produce and herbs.

Mr. Matney's special education class at Oak Hill High School helped establish the pollinator and herb garden at the school.

Students participating in the Family and Consumer Science curriculum participated in maintenance and growing activities pertaining to the grant. The benefits were learning life skills including organizing and growing a garden with a food budget, understanding a nutritional food system and learning about agricultural business opportunities. The USDA My Plate resources were implemented along with the CSO's of Family Consumer Science.

Many students were new to the class this year however some students from last year reported to have maintained improved eating habits. While 100% of our students receive Free Breakfast and Lunch, many have begun reading the nutritional labels during these times. Also, many students have decided to choose fruits instead of chips for their morning snacks. Some of the returning students have dropped by the class with much more interest and appreciation for the design elements of the garden. All student participation seemed to improve their school behavior especially approaching graduation. The courtyard garden became a retreat which contrasted with years of being chained off and excluded from the students. Overall, their

ownership of the work performed improved their behavior and gave them a sense of accomplishment. Many students were encouraged to seek out jobs or careers in gardening or farming. Most students were interested and felt that an Agriculture program was needed and that they would explore this sector if available in their school curriculum.

Students and Teachers supported gardening projects and participated with great dedication and energy in developing the best school garden in this second year. Special Education Program Directors from Charleston, visited the courtyard garden and gave praise to staff and work performed by the students. Many visiting educators are surprised that a lush garden could be created and maintained by students. Assistant Vice-Principal Mrs. Katie Hayes has praised those teachers who have contributed their class time to helping with the garden activities and allowing students to develop their creativity through design planning including various patterns of color and texture.

Our parent open house in September included families that were pleased that their children were learning functional life skills. Family members expressed appreciation that their children could learn about home gardening. Most older family members recall growing up with a garden and relying solely on this source as their main supply of food in the home. All students in Family and Consumer Science classes, Shop Class classes, and Special Education classes were encouraged to take seeds and plants home to implement their own garden.

Oak Hill Community and the Fayette Board of Education has been supportive of the courtyard therefore a second gardening plot has been created outside the school walls. This Heirloom Garden will produce more vegetables and job possibilities for students at the Fayetteville/Oak Hill Farmers Market. Working with the Farm to School coordinator, students are being educated about possible farming and agricultural job opportunities.

Sixteen male students with repetitive behavioral problems were eager to participate on gardening day. Some of these students preferred hands-on activities mainly due to their lack discipline in the classroom and boredom of the academics in the classroom. These male students led the way as peer tutors sharing gardening knowledge and becoming great helpers. Later several teachers stated that they were willing to allow these same male students to participate in the garden maintenance days. The shift in behavior from problematic to cooperative was a direct result of harnessing the student's energy to a learning experience that was project based.

For the third year of the grant we continued to provide a grow tower/demonstration garden in the school cafeteria at New River Elementary.

We provided grow lights in 12 classrooms and the starter plants were placed in the production garden at New River.

Nutrition and wellness classes were provided. Students were able to follow the entire process of plants from seedlings to decay and breakdown.

We continued to improve on the greenhouse in the garden at New River Elementary. This greenhouse is and will be the focal point of the gardening programs at Oak Hill High, New River Elementary and the vocational school. It should be noted that this greenhouse was provided through the generosity of a local business ACE Whitewater.

We established a kitchen garden at Oak Hill High School, renovating an ornamental courtyard and replacing those plants with produce and herbs. With the involvement of several special education classes this garden in the courtyard is maintained.

We continued to use the straw bale garden to make gardening wheel chair accessible.

Goals and Outcomes Achieved

We were able to coordinate the activities of the SCBGP at New River, the farming projects of the vocational students at the Fayette Institute of Technology and the gardening projects at OHHS so that they complement and support each other.

This project has been very difficult to implement due to administration and staff changes. Utilization of the school garden and its demonstrated impact on student behavior was an unexpected outcome providing life skill and alternative activity choices for students experiencing difficulty in the classroom. Students who prepared and planned for the local specialty crop “cook-off” event had to cancel the night before their second year of competition due to county regulations concerning school/weather closure and extra curricular activities. This activity was slated as a follow-up from their year one experience when they represented the school at the annual Small Farm Conference presenting their cooking and production skills in front of more than 500 participants. Eventually, the changes of administration, decline in staff and board support and a lack of commitment to the project meant that the students were not able to fully achieve project success.

Despite the challenges, students were able to participate in the establishment of a produce, heirloom and herb and pollinator garden, complete the assembly of a donated high tunnel for alternative growing, and incorporate the concepts of a growing cycle related to specialty crops in the classroom through curriculum integration and a Grow Tower. A pre-test was administered to the 4th-6th grade moderate and mild special needs classroom focusing on specialty crop identification. Both classes were able to recognize visual specialty crops and articulate their recognition at least 60% in the moderate class and above 90% in the mild classroom. An attempt to conduct a pre-test in the severe classroom yielded no significant results. When provided a written label identifying specialty crops, there was a less than 50%

correlation; however, the mild classroom correctly correlated the written and visual in more than 80% of the instances. One student, after exclaiming during the pre-test that he **did not** eat vegetables. He was delighted to know that popcorn (done as a classroom lesson) was indeed a specialty crop and that he had just eaten a vegetable after chastising the instructor in the moderate classroom for “tricking” him. Due to school condemnation, AmeriCorp staff turnover, and administration changes, post-test and consumption assessments were not conducted.

Beneficiaries

All students who participated in the program benefited, with an emphasis on the special needs students at Oak Hill High School, Collins Middle School and New River Elementary School.

Due to the relocation of several special needs classes from Collins Middle School to Oak Hill High School we were able to include them in this grant activities.

A total of 135 students were directly affected and impacted by the activities of the project. The economic impact of the project cannot be calculated. A decision by the school board in early 2016 to eliminate the high tunnel and the vocational agriculture field for athletic facility usage curtails any extended project impact. The straw garden for wheelchair access and a small raised bed area in the common area of the elementary school are the only specialty crop focused activities that remain in a school district facing the closure of seven of their 18 schools in the next 18 months due to out migration, outdated facilities and a severely depressed economy. Once the consolidation process is complete, it is the desire of several of the teachers who participated in the project to resume a school based specialty crop initiative.

Lessons Learned

The Core Curriculum changes have had an impact on our activities.

Making and keeping connections with teachers continues to be a challenge. It takes extra work to make this happen and it is difficult to find teachers consistently willing to go the extra mile.

Location of the garden is important, we still need to correct the erosion and runoff problems at the New River Garden.

The grant recipient Jackie Caudill no longer is employed at Oak Hill High School. Her loss was very disappointing; she was a strong advocate for this program with both staff and students.

We have had three different AmeriCorps members working on this project along with Ms. Caudill.

The Child Nutrition Director for Fayette County moved to a Harrison County and is replaced by a new Director, Joe Dooley.

Contact Person

Fayette County Schools

Joseph E. Dooley

Child Nutrition Director

(304) 574-1176

jdooley@k12.wv.us

Additional Information



Program Income

There was no program income realized from this project. Due to turnover, school integration due a condemned facility and a new Food Service Director, the project was unable to expend \$3,707.02 of project funds.

PROJECT TITLE

Using Experiential Learning to Promote and Increase Maple Syrup Production in West Virginia
Amount Awarded: \$22,392.00

Project Summary

The U.S. maple syrup production is largely centered in New England, New York, and from Michigan to Wisconsin. These states produced 1.91 million gallons of syrup from 9.77 million taps in 2012 (USDA NASS 2012). The U.S. is the largest market for maple syrup, but lags behind Canada in production. The U.S. imports almost 4 times as much syrup as it produces (Farrell and Chabot 2012), which highlights the opportunities to fulfill domestic demands from local sources.

While not usually included in the national statistics, West Virginia has a stable maple syrup industry. The majority of the state's production comes from the higher mountainous areas in Preston, Tucker, Randolph and Pocahontas counties. In their recent assessment of the growth potential for the syrup industry in the U.S., Farrell and Chabot ranked West Virginia sixth in the number of potential maple trees available for tapping, higher than Vermont. They note, however, that a significant challenge to boosting production in lesser known areas (e.g., WV) is overcoming cultural traditions, or lack thereof. For example, Vermont's 3% tapping rate is substantially higher than all other states. No data exist for West Virginia, but the tapping rate for the neighboring states (OH and PA) average around 0.45 and 0.15 %, respectively.

Clearly, West Virginia can increase production by getting landowners to take advantage of the resources already present throughout the state. Given the demographics and land ownership patterns that exist in the state, much of the potential production will come from smaller scale operators (e.g., hobby producers). However, a critical need for these potential producers is the knowledge base and skill set required to establish, operate and maintain a sustainable operation. Similarly, it will be necessary for any business venture to have realistic costs and income estimates associated with these smaller, hobby-sized operations.

The goals of this project are to create an outdoor learning environment that fosters youth education and entrepreneurship, and community education and outreach to showcase maple syrup opportunities for West Virginians and increase the state's market share of the U.S. syrup production. This is a new SCBG project that was not associated with previous funding. The objectives of this project are to: (1) develop a course for WVU students devoted to maple syrup production and business planning, and (2) use field days and workshops to demonstrate the establishment and production of a syrup operation for small landowners in order to encourage new producers to begin producing maple syrup. This project was not a continuation of a previous specialty crop project.

This project targets several stakeholder groups and audiences with the overall objective of increasing syrup production and sales in WV by overcoming hurdles and knowledge gaps that pertain to new hobby producers. The educational outputs will be accomplished coincident with

a youth education and entrepreneurship course provided by West Virginia University's Division of Forestry and Natural Resources.

As noted above, WV ranks 6th in the U.S. for the total number of tapable maple trees. By increasing resource awareness and reducing the unknowns presented to new producers, small changes in tapping rates (fractions of a percent) can significantly increase WV market share of maple syrup. The WVU course will likely enroll between 12-20 students each spring.

Project Approach

The goal of this project was to increase student and maple syrup producer knowledge of syrup production, natural resources, and business management through the development and implementation of a maple sugaring course. Their knowledge was measured throughout the project by a series of pre- and post-tests that measure their understanding of the industry. A benchmark will be established by the test data taken by the students at the beginning of the semester. It was expected that participants will increase their understanding of maple sugaring by 50% by the end of this new course.

Additional outputs of this project included a compiled list of commercial producers in the state that are interested in promoting their operation, and a document describing the financial considerations pertinent to small hobby producers. Several existing producers were enlisted to be partners for this project. They provided instruction and experiences to students during class trips to visit their commercial operations. These partners represented some of the smallest and largest producers in the state. Additionally, these partners were engaged during WV Maple Syrup Producers Association workshops to garner additional information.

This project represented the combined efforts of WVU students and the instructor (Jamie Schuler). The three objectives of project were to: (1) increase knowledge of operations for the producer, (2) provide a breakdown of the costs associated with a new syrup business, and (3) educate future agriculture/natural resource students through an experiential learning environment.

An experiential learning course was developed through WVU's Division of Forestry and Natural Resources that focused on establishment, operating, and book keeping for a syrup production enterprise. Supplies for a maple syrup operation were purchased with the grant funds requested. Operations were setup at the WVU farm woodlot in Morgantown, WV. Students, under supervision, will experience first-hand the various options for collecting maple sap, running evaporators, filtering and bottling, quality and safety controls, and marketing the finished product. Essentially, a small-scale syrup operation that represents the scale and size expected for new producers was established. Students were required to collect data on setup costs for equipment and supplies, labor, fuel use, sap collection, and maple syrup production. The output of this course was a business plan that can be used by new producers.

Students also had the opportunity to interact with established producers within the area during field trips.

Students were evaluated at the beginning of each course to provide a benchmark from which learning was quantified. A series of post- tests were offered during the semester to evaluate student learning and teaching effectiveness. This information was also used to improve teaching effectiveness.

On various days during the sap season, the program hosted interested landowners and members of the community at demonstration events that showcase the various components of a syrup production operation.

Goals and Outcomes Achieved

One of the main goals of the project was to characterize the state's maple syrup producers and the potential for the state to increase its production based on distribution of maple trees. A graduate student, M. Adele Fenwick, surveyed known producers in the state to better understand the sizes of WV's current operations and their needs. She also used USFS FIA data to estimate the top maple counties and regions within the state so our promotional/educational activities can be better targeted.

The maple resource in WV is concentrated in the high elevation counties extending from Monongalia and Preston Counties through Nicholas/Webster/Pocahontas Counties. Randolph Co. tops the list for having the most potential taps/ac. In total, the state has over 123 million potential taps.

Of the 30+ surveys sent to known producers, 19 were returned. The survey and summary of the responses to select questions are attached. Briefly, most:

- started their syrup operation within the last 5 years;
- own their timberland for reasons other than timber production;
- did not consult with a professional forester for management suggestions/planning
- used tubing for sap collection
- plan to expand their operation

For 2014, over 33,000 taps were installed by these producers, netting almost 7,750 gallons of syrup. These statistics were shared with NASS to help quantify WV's agricultural statistics related to maple syrup.

Monies from this grant were used to purchase equipment and supplies to establish a 5 ac sugarbush on a University-owned woodlot near the main campus. The major equipment included an evaporator, finishing pans, bottling equipment to produce a salable maple syrup product. Additional expenses included a substantial amount of tubing, fittings, and specialty tools for establishing a tubing system on the woodlot.

To date, the grant has supported the "Sugarbush Management and Maple Syrup Production Course" at West Virginia University since 2014. This class was taught each spring. Enrollment from 2014-2016 was 6, 11, and 12 students, respectively. The course was designed to allow

students to essentially setup their own small-scale sugaring operation. Each class effectively starts from the beginning: learning how to evaluate a woodlot for its potential as a sugarbush; learns about plant physiology and sap flow processes; installs a tubing system; converts sap into syrup using a modern evaporator; bottles and grades syrup; and makes value-added products. Students also take field trips to two producers in the state to see larger-scale operations and discuss the similarities and differences among the operations relative to ours.

Most students that taking the course have limited knowledge related to maple syrup and its production—most have never made maple syrup. The last two classes were given pre- and post-course exams to gauge student learning. The average pre-course exam grade was 28.5%. The average post-course exam grade was 80%. This reflects a 2.8-fold increase in acquired knowledge.

Another objective for this project was to begin to gather financial data to estimate the profitability of small-scale operations. This proved somewhat challenging. It was difficult accurately quantify hours, especially since much of the focus was on student learning. Group training is often a slow and repetitive process. Oftentimes, groups were assigned tasks that could be accomplished as efficiently with only 1 or 2 individuals. Our actual syrup production was relatively low, which undoubtedly affected profit margins. Our operation was one that depended on student availability. Their other classes and coursework affected availability as did holidays. For small-scale producers, this may better reflect one’s availability, especially if the operator has full-time employment away from the syrup operation.

Based on our estimates, small-scale producers will lose money if they account for their time spent sugaring and pay themselves a suitable wage. These estimates are predicated on relatively low production rates. Our production rates (0.12 gal/tap) are about 50% lower than most estimates. Again, this is due to educational constraints, and inefficiencies associated with new startup operations. Increased production to average assumed rates would probably make the accounting nearly break-even.

Cost	\$	Annualized cost*
Fuel- evaporate & finish	319	319
Supplies & Equipment	9,500	643
Building	3,000	150
Labor (\$10/hr)	1,800	1,800
Sub-total	14,619	2,912
<hr/>		
Revenue	\$	
Syrup (15 gal.)	1200	1200
<hr/>		
Total	-13419	-1712.25

* Assumes initial startup costs for tubing is annualized over 10 years, Equipment (e.g., evaporator) and buildings are annualized over 20 year period.

Beneficiaries

Apart from the students that have participated in the course over the last three years, we have engaged with a number of other groups and audiences to promote maple syrup.

During the 3 year grant period, the following groups have visited the sugarbush:

- 15 k-12 science teachers
- Troop 60 boy scout group and parents
- 40 urban forestry professionals
- 40 attendees of the Mid-Atlantic Maple Short Course
- A number of local landowners

Additionally, I have presented the experiential learning model for our sugarbush course to:

- USDA State & Private Forestry regional managers
- Several WV Maple Producers Association workshops (~30 members)
- Forest industry professionals from across the state

I have also conducted training sessions for several workshops and conferences. For example,

- Co-instructor for field training session at Dry Fork Maple Camp for about 40 participants
- Host/co-instructor for the Mid-Atlantic maple Workshop with 40 attendees. This was co-taught with faculty members from Cornell University. A substantial amount of information was provided on a CD to help new producers start their operations.
- A poster was presented at the Society of American Foresters National Convention that presents our initial assessment of “hot spots” for potential maple syrup production in the state. Over 1000 people attended this meeting.

Lessons Learned

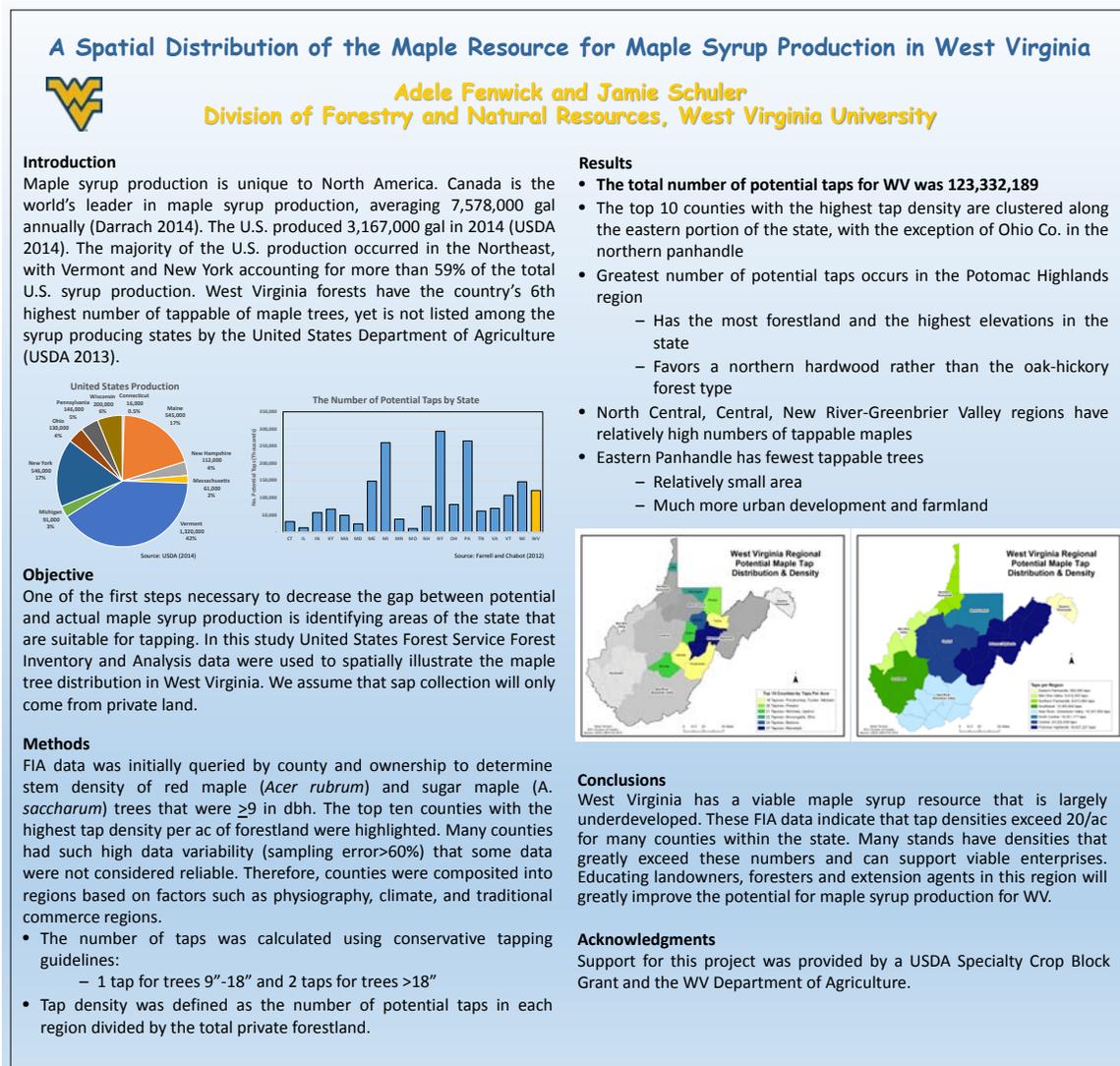
There were many lessons learned from the academic component of this project. A major challenge to operating an efficient sugarbush is reliable man-power. Due to academic obligations, several students were not available in large enough blocks of time to allow for major participation. Especially when it comes to boiling sap, a large block of continuous time is required to produce syrup. Our solution was to only boil on days in which we could boil for at least 6 hours. Normally, enough students could allocate 2-3 hour time slots that would be sufficiently long to make syrup.

Class time was scheduled on Friday afternoons for a 3 hr block. This allowed us to work in the woods and still have time for a short lecture. However, I found that the week between lectures or field instruction really didn't promote retention of the course material. This coming year I decided to add a 1 hr dedicated lecture on Monday to help promote retention and allow for an additional meeting time to more thoroughly cover various topics.

Contact Person

Jamie Schuler
322 Percival Hall
West Virginia University
Morgantown, WV 26506
304-293-3896
Jamie.schuler@mail.wvu.edu

Additional Information



West Virginia Maple Syrup Producers Survey

July 2014



Please return the completed questionnaire in the postage-paid envelope provided to:

Jamie Schuler
Division of Forestry & Natural Resources
322 Percival Hall
West Virginia University
P.O. Box 6125
Morgantown, WV 26506-6125

Please contact Jamie Schuler: jamie.schuler@mail.wvu.edu or 304-293-3896 if you have questions. Thank you.

About This Survey

The purpose of this survey is to assess the current and potential maple syrup industry in West Virginia. This project is designed to develop, maintain, and improve collaboration and partnerships between producers, West Virginia University, and the West Virginia Department of Agriculture, and to address opportunities, available resources, issues, and concerns related to sap collection and syrup production.

This survey is part of a Specialty Crop Production grant from the WV Department of Agriculture that was awarded to WVU Division of Forestry & Natural Resources to develop outreach programs associated with maple syrup production in West Virginia.

The goals of this project are intended to:

- Assess opportunities for maple syrup production of West Virginia;
- Expand awareness about sap collection and syrup production among forestland owners and their local communities;
- Promote resources available to syrup producers.

Your insights will provide helpful information to guide WVU, state and local agencies, and other private forestland owners in developing a maple syrup industry in West Virginia.

Your participation **is voluntary** and you have the right to refrain from answering any questions. Please feel free to answer only those questions that you are comfortable answering. If you choose to participate, your answers will be kept strictly confidential.

In this survey the forestland on which you tap maple trees for sap is referred to as “sugarwoods” and the syrup production facility is referred to as a “sugarhouse”.

Thank you very much and we appreciate your help!

Instructions:

- Either a pen or pencil may be used.
- When answering questions that require marking a box, please use an “X”.
- If you need to change an answer, please make sure that your old answer is either completely erased or clearly crossed out.

START HERE:

Please carefully read the following items and check the ones that apply.

I **do not** currently, or intend to in the future, collect maple sap and/or produce maple syrup (*please return blank questionnaire*).

I **currently collect, or intend to start, maple sap and/or produce maple syrup** (*please continue with the questionnaire*).

I prefer not to participate in this survey (*please return blank questionnaire*).

Forestland Property Ownership

1). With respect to your property in WV:

- How many acres is this property? _____ acres.
- Approximately how many acres of this property is forestland? _____ acres.
- Approximately how many acres of this property is sugarwoods? _____ acres.
- What is the range in elevation of your sugarwoods? From _____ to _____ feet.
- In what county is this property? _____
- In what year did you take ownership? _____
- Do you primarily reside on this property? Yes No
If **not**, _____ county _____ state

h. Is your forestland part of the West Virginia managed timberland Stewardship Program?

Yes No

i. In what year did you start maple sap collection/syrup production?

j. Do you lease additional forestland to tap? Yes No

If **yes**, _____ taps on _____ acres.

2). Which category below best describes your ownership? (*Please check only **one***)

- | | |
|--|--|
| <input type="checkbox"/> Individual | <input type="checkbox"/> Joint, such as a husband and wife |
| <input type="checkbox"/> Family | <input type="checkbox"/> Corporation or business partnership |
| <input type="checkbox"/> Trust or estate | <input type="checkbox"/> Other (please specify) |
-

3). Do you, or have you ever sold timber from this property? Yes No

4). Did you acquire this forestland in West Virginia with the intention of maple sap collection and/or maple syrup production? Yes No

5). Have you ever discussed the management of your sugarwoods with a professional forester?
 Yes No

Sap Collection and Syrup Production Activities

6). Number of taps in 2014? _____ taps

7). Amount of syrup produced in 2014? _____ gallons

8). What sap collection methods do you use? (*check **all** that apply*)

- Tubing
 Buckets/jugs/sap bags

9). If you use tubing, what percentage of taps are on vacuum?

_____ % of my taps are on vacuum.

10). Do you buy sap from someone else to produce syrup?

- Yes No

11). Do you sell sap to someone else?

- Yes No

12). If you buy or sell sap, what is your main reason for doing so?

- I do not collect enough sap to meet demand for amount of maple syrup I sell
 I collect more sap than I can/want to process into syrup
 I do not own the equipment to process syrup
 Other: _____
-

13). Does your sugarhouse have? (*check **all** that apply*)

- Electricity

Running water

14). a. Are you planning to continue sap collection and/or syrup production for the foreseeable future?

Yes No

b. If the answer is **yes**, do you plan on expanding your maple syrup production operation?

Yes No

c. If the answer is **no**, what is the main reason for discontinuing maple syrup production?

15). What are your 3 top reasons for sap collection and/or syrup production?

a.

b.

c.

16). Please name a few sources you use for information on syrup production or other forestry related questions.

a. _____ b. _____ c. _____

Sales and Other Maple Products

17). How do you sell your maple products? (*Please check **all** that apply*)

	None	Some	Half	Most	All
a. At your sugarhouse/home	<input type="checkbox"/>				
b. At a farm market or fair	<input type="checkbox"/>				
c. Retail outlets	<input type="checkbox"/>				
d. Online	<input type="checkbox"/>				
e. Bulk	<input type="checkbox"/>				
f. To other local maple syrup producers	<input type="checkbox"/>				
g. Other _____	<input type="checkbox"/>				

18). Of your total syrup production volume, estimate the % of each size container in which your package your syrup for sale. (*For example, 25% of the total 100 gallons I produced is packaged in pint bottles for sale.*)

For Example:

Your Operation:

a. Gallon:

- b. Quart: 50% _____
- c. Pint: 25% _____
- d. Half-pint: 15% _____
- e. Bulk barrel: _____
- f. Other: maple leaf bottle 10% _____
- g. Other: _____
- h. Other: _____

19). What is the average price you charge for the following size containers?

- a. Gallon: \$ _____
- b. Half-pint: \$ _____
- c. Pint: \$ _____
- d. Quart: \$ _____
- e. Bulk barrel: \$ _____
- f. Other: \$ _____

20). Do you produce value-added maple products for sale? (*Please check **all** that apply*)

- Maple candies
- Maple sugar
- Other: _____
- Maple coated nuts
- Maple cream/butter
- Other: _____

21). Do you offer tours of your operation to the public? Yes No

West Virginia Maple Syrup Producers Association and Programs

22). Please indicate your level of agreement:

- a. I would be interested in cooperating with WVU in a maple syrup research/education/extension program.
- b. I would be interested in joining a Maple Syrup Producers Association. (*Remember this survey is anonymous, so your name/address will **not** be shared with any association*)

Strongly agree
Somewhat agree
Neutral
Somewhat disagree
Strongly disagree

<input type="checkbox"/>				
<input type="checkbox"/>				

23). Please indicate your level of interest:

- a. In the future, would you be interested in hiring a consultant for maple sap collection, syrup production, and/or sugarwoods forest management for your property?

Very interested
Somewhat interested
Neutral
Somewhat uninterested
Very uninterested

<input type="checkbox"/>				
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- b. In the future, would you be interested in using a shared syrup production facility/equipment/resources?
- c. In the future, would you be interested in working with other producers to jointly market your maple products?
- d. Would you be interested in attending a series of meetings or workshops on maple sap collection, syrup production, and/or sugarwoods forest management?
- e. Would you be interested in a walking tour of other producers' sugarwoods and sugarhouses?
- f. Would you be interested in hosting a walking tour of your sugarwoods and sugarhouse for other producers?
- g. Would you be interested in leasing additional forestland to tap?
- h. Would you be interested in leasing your forestland to another producer to tap?

Demographics – Remember, your answers will be kept **strictly** confidential

Please answer the following questions about the **primary** producer:

24). What is your gender? Female Male

25). What is your age?

- 18 – 29 40 – 49 60 – 69
- 30 – 39 50 – 59 70+

26). a. Are you retired? Yes No

If **not**, what is your current occupation? _____

b. Are you able to work from home? Yes No

c. Are your work hours flexible? Yes No

27). What is the highest level of education you have completed? (Please check only one)

- Some high school Associates degree
- GED Bachelor's degree
- High school graduate Master's degree
- Trade or technical school Professional degree
- Some college

28). What is your average yearly income? (Please check only one)

- Less than \$ 25,000
- \$ 25,001 - \$50,000
- \$ 50,001 - \$75,000

- \$ 75,001 - \$ 100,000
- \$100,001+

Other Comments, Questions, Suggestions:

If you would have any other questions, concerns, comments, or suggestions, if you would like to provide further detail or provide any other information, or if you would like a copy of the results of this survey please contact:

Adele Fenwick
Division of Forestry & Natural Resources
322 Percival Hall
West Virginia University
P.O. Box 6125
Morgantown, WV 26506-6125
Email: mafenwick@mix.wvu.edu
Phone: 202-285-2660

Thank you for completing this survey!

Initial Results of the Maple Producers Survey 2014

Jamie Schuler
School of Forestry and Natural Resources
Morgantown, WV 26506



Median Property Size

- Total acres = 88 ac
- Forestland = 65 ac
- Sugarbush = 30 ac

} 

- Multiple Use
- Forest Age
- Species Composition

Property/Ownership Characteristics

- Elevation of sugarbush? Median=1500-1800 ft (range 800-4500 ft)
- County: Barbour, Doddridge, Fayette, Grant, Greenbrier, Hardy, Kanawha, Mineral, Monroe, Pendleton, Pocahontas, Randolph, Richlie, Taylor, Tyler
- Year of ownership? 2002
- Residence at property? Yes=13, No=4
- Forestland in Stewardship Program? Yes=2, No=15

Property/Ownership Characteristics

- When did you start sap collection? 2010
- More than 65% started in last 5 years
- Lease land for tapping? 23%
- Have you sold timber from property? Yes=7, No=10
- Acquired land for maple syrup production? 23%
- Discussed management with a forester? 23%

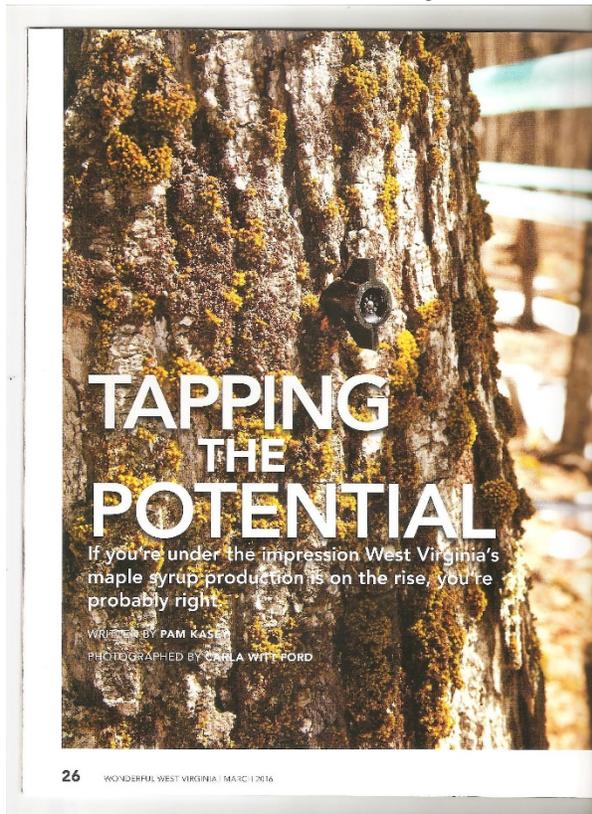
Sap Collection and Syrup Production

- Number of taps in 2014? Median=369, Total=33,171
- Amount of syrup produced in 2014? Median=110 gal, Total=7715 gal
- What sap collection methods do you use?
 - Tubing=8, almost all on vacuum
 - Buckets=6
 - Combination=3
- No one buys or sells sap

Future Plans

- Are you planning to continue sap collection and/or syrup production for the foreseeable future?
 - Everyone! 😊
- Do you plan on expanding your maple syrup production operation?
 - Yes=14, No=3

Photos and Public Press Articles Related to the Project



Excerpt from article in Wonderful West Virginia, March 2016, P. 26-30. P. 27 shows a glimpse of tubing layout established by WVU students.

Popular press article highlighting our maple syrup program and students. From AREA (Arboricultural Research and Education Academy) Newsletter, June 2014, Vol 9(2):

Student Perspective Backyard Urban Syrup Production Can Be A Sticky Affair

Ken Beezley

We have all heard of plants with sweet names, the most notable being sugarcane (*Saccharum officinarum*) and our state (West Virginia) tree, the Sugar maple (*Acer saccharum*). The Latin term saccharum, meaning sugar or sweet, literally flows just as easily from your lips when spoken as it does from maple trees during the late winter and early spring months. And with a name like that, something sweet has got to come out of it. Most likely discovered by eastern woodland Indians prior to European settlement in the U.S., the collection of sap from Sugar maple trees provided not only a sweet addition to most things eaten, but also contributed to one of the catalysts that drove the vision of American independence, reducing the demand for foreign sugar. Early settlers in many parts of the eastern U.S. sought out home sites not only for the lands agricultural potential but also for the availability and potential of "sugaring" trees. Almost every old home site or community had a sugar grove, and today remnants of the old sugar shack or some of the ancient, weathered maple trees can be found when traveling winding mountain roads. Today, in areas of the upper mid-eastern states and New England, the art and science of maple syrup production, or sugarbush management, has been mastered. This can be seen in the many brands of locally produced syrup, in tune with the miles upon miles of plastic tubing strung between maple trees for sap collection.

That is really great if you happen to have some wooded acreage and several maple trees available for syrup collection, along with the proper tools, processing facility, and know how. But suppose you only have one tree in your back yard or no trees at all. Do not fret my friend, we can still make some syrup, or molasses, or crystallized sugar to remedy your sweet fix. Urban syrup production is possible and practiced in more than one community, sometimes culminating in a boiling-down shindig for all to savor. If you prefer to shy away from the sticky crowds and keep your sap to yourself, backyard syrup production can be accomplished, says Henry Lieberman, a Forest Resources Management senior at West Virginia University (WVU). "Boiling down your own collected sap can be done with the aid of any cooking device, such as a propane type turkey fryer." However, Lieberman adds that the turkey fryer is really only applicable when trying to produce syrup from small amounts of sap. For those of you that want to give syrup production a whirl, at least a few options are available. (Of course any open fire laws within your community

should be observed, as safety is of utmost concern.) Generating interest in urban syrup production would take a little effort, and you never know who might have the equipment and facilities to host a sweet, foot-stompin' community boil-down.

As it turns out, Lieberman is part of a handful of students involved in a Sugarbush Management project at WVU, covering topics related to the history of syrup production, sugar tree management, and syrup production. Under the instruction of WVU Silviculturalist Dr. Jamie Schuler, the three year sagebrush management project provides hands-on experience for students to participate in all aspects of maple syrup production at the WVU woodlot. Schuler describes the educational grant funded program as experiential in nature, but also hopes to give students insight into small business management of non-timber forest products. "Believe it or not", Schuler exclaims, "West Virginia is number six in the nation in the amount of potentially tappable maple trees that can be used in the production of syrup". While Schuler's course is geared primarily towards traditional syrup production in a wooded area, the concepts are basically the same for urban sap collection and syrup production. Maple trees found in urban areas and the suburban interface are sometimes prime candidates to consider when selecting trees for sap collection, as tree size and location play a vital role in the amount of sap produced by a tree, according Daniel Walton, another student in Schuler's sugarbush class. "That old maple tree sprawling over your backyard or down the block may have the potential to produce quite a bit of sap, as many of the trees found in urban conditions have a relatively larger canopy compared to their forested siblings". There seems to be quite a lot of sugar maple trees growing in our state, but you say I do not live in the forest, I live in town.

Coincidentally, the US Forest Service conducted a street tree inventory for Morgantown in 2011, and inventoried, along with other tree species, 82 sugar maples, 26 red maples, and 104 silver maples that are within city limits along public streets, all of which are large enough to be considered potentially tappable trees. The street tree inventory counts only a fraction of the trees in town and does not include residential property or trees in other public



Backyard Maple sap collection.

places, like the many parks found around town. In order to prevent any sticky legal situations, consent from the tree owner must be obtained prior to any tapping. But just think of all that yummy tree water flowing throughout a maple tree as you walk past. On average, an individual maple tree can produce roughly 5 to 40 gallons of sap annually, of which 2 to 6 percent is actually sweet, equating to 32 gallons of collected sap boiling down to about 1 gallon of syrup. There are many factors that contribute to the amount of sap produced from each tree, including the time and duration of fluctuating daily temperatures, size of the tree and canopy, and tapping methods.

Now that your sap is flowing with the zeal of a woodpecker, you fly out the door, ready to start tapping trees. But which tree is best? There are so many. And this time of year no leaves are present to use as a cheat-sheet for identification. Is that a sugar maple or a silver maple? An ash tree or a poplar tree? Sap can be collected from a variety of trees, but maples tend to produce the most abundant sap with the sweetest taste. Although sugar maple trees are most preferred, other trees such as red maple (*Acer rubrum*), silver maple (*Acer saccharinum*) and black birch (*Betula lenta*) produce a sweet sap in relatively good quantities.



Ken Beezley

ISA Conducting Search for Journal Editor-in-Chief

After several years of dedicated service, Gary Watson will soon step down from his role as principal editor and facilitator of Arboriculture & Urban Forestry (AUF). Since he became the Editor-in-Chief in 2008, Dr. Watson's contributions have been significant, and the International Society of Arboriculture (ISA), the publisher of AUF (<http://auf.isa-arbor.com>), is grateful for his integrity and commitment to excellence while steering the association's 39-year-old scholarly publication. Each year, AUF prints more manuscripts on arboricultural research than any other journal worldwide and is ISA's main outlet for disseminating new and original findings centered on the care and management of trees in urban environments.

ISA would like to extend a notice to researchers and educators in arboriculture, urban forestry, and its allied fields that we are currently accepting applications and inquiries for the position of Editor-in-Chief.

The Editor-in-Chief (EIC) has the primary responsibility for overseeing solicitation of manuscripts, the double-blind peer-review process, and ensuring the scientific accuracy and high quality of the publication. The EIC ensures timely and efficient function of the editorial process, and maintains the consistency of established standards applied across the various subject matter areas during the editorial process.

Additional responsibilities include reviewing and revising the instructions to authors as necessary; soliciting feedback on journal performance; soliciting articles on current subjects, policy dependent and adherence, scientific reviews in areas of key importance to ISA members; and collaborating with Associate Editors of various disciplines during the journal's peer-review process.

The application period for the position of Editor-in-Chief is open. The EIC is a contractor position. Interested individuals should contact journal coordinators by e-mail (auf@isa-arbor.com) regarding submission instructions.

Regards,
AUF Administration
ISA Editorial & Production



Class of 2016



Class of 2015



First class! 2014

Program Income

Year 1= \$96.00

Year 2= \$436.00

Year 3=\$736.00

Total Income= \$1268

This additional program income was put back into the program. Travel to maple workshops and additional or replacement supplies such as new tubing, spouts, and stainless steel tanks were purchased with these funds. Each year, our goal is to replace about 1/3 of the existing tubing, which allow each class to experience a new setup, which of course requires a significant annual investment. The project was unable to expend \$169.09 of project allocation.

PROJECT TITLE

The West Virginia Soil Education Learning Trailer

Amount Awarded: \$10,800.00

Project Summary

The Soil Tunnel Trailer project was created to promote and assist with promotion of specialty crops in West Virginia through soil and water health education. Growing specialty crops in West Virginia soils often takes a different approach with yearly soil amendments in order to promote successful yields. Providing this information gives more growing power to producers and begins to “plant the seed” of curiosity in children throughout the state. Our goal from inception of this project was to bridge the disconnect between the community and fresh foods.

The motivation behind the project is the outreach and education programs for all West Virginia communities that our district and agency provides. Having a unit that gave not only a 3 dimensional tour of life inside of the soil, but the opportunity to educate through outdoor classroom stations in an exclusive setting. Getting the program and curriculum into the public was very important given the surge of interest in farming, both on a large and small scale, in schools and urban settings that West Virginia is experiencing at this time.

The Soil Tunnel Trailer was not an extension of another specialty crop project. Our district has, since 1938, focused solely on increasing crop production through soil health and education.

Project Approach

Although inspired by a similar education unit in Kansas, the WV Soil Tunnel Trailer was a pilot project of its own. Using materials much different for cost savings and for ecological reasons, the team that created the soil trailer had a “trial by fire” creation process.

Timeline of construction

For the majority of this SCBG timeline, the specific tasks were:

More grant writing and fund raising: More funds were needed to create the trailer than initially thought, the first sculptor gave the materials list, but was unable to be contracted due to health reasons. Finding the correct foam type was difficult, 4 types of foam were sampled and used before the correct consistency was found. Also, more funding was needed because more hand tools than initially expected were needed. We needed more hot knives, more saws, adhesives, paint guns, and a hopper for the styrospray hardener were among the larger purchases. Protective respirators and other gear was also necessary.

Finding reliable contractors: The \$1,000.00 down payment for an artist who breached his contract/agreement with our district was lost and could not be collected. A

contractor who was paid \$1500.00 also did not complete his contracted work. So \$2,500.00 of funding was lost from district matched funds.

Once the funds were in place and a new artist was found and contracted as well as a contractor. The construction work began swiftly and was completed in 90 days. Finding an artist with experience and understanding of soils and agriculture is not as easy as one would believe.

Goals and Outcomes Achieved

There are no ineligible specialty crops in this project. All crops are eligible, including the cut flowers and other pollinators for honey production.

The goals of the Soil Tunnel Trailer is to provide a hands-on based, problem solving learning opportunity. We have more than surpassed our measurable outcomes based on the education we have been able to provide to the youth of West Virginia.

The outdoor classrooms that travel with the trailer adds even more problem solving educational opportunities to the visitors of the trailer and provides preparation and excitement before the soil trailer walk-through.

The highlight of the program to date has been an early fall visit to the West Virginia Schools for the Deaf and the Blind. Students attending the residential school in Romney, WV span Pre-K through 12 grade and post graduate. The visually impaired children were delighted by the tactile learning experience. The fully ADA compliant unit provided a safe and secure space for mobility without fear of injury to the students. One student stated, "I have been blind since birth. Anything that I am taught I have to visualize in my mind. I have never seen color but feeling the walls of the soil trailer helped me to visualize what it must be like under the grass, to be a vegetable or an invertebrate. Feeling the roots, the potatoes over my head as well as the outdoor classroom activities helped me to know how soils are important to our very existence."

The visit with the WVCDB was by far the most rewarding and positive experience for the Soil Tunnel Trailer committee members. This three-day visit made the entire project and all of the difficulties completing it more than worth it.

Prior to the creation of the WV Soil Tunnel Trailer, there was no known soil, specialty crop of water education program available throughout the state to attend schools, fairs, festivals and other educational outreach opportunities. The Soil Tunnel Trailer has visited over 40,000 school aged children in West Virginia to date. The expected measurable outcomes were small in comparison to what the unit has actually achieved. The WV Soil Tunnel Trailer stays scheduled as much as the staff is available to have it out on the road. Each visit we have found that 100%

of the visitors that enter the trailer and receive the “trailer tour” leave with new knowledge. The surveys are conducted both verbally and on paper for the time being until I can get an app set up to do so. 100% of surveys have shown new knowledge of specialty crops after a soil tunnel trailer tour.

Specialty Crop knowledge gained is listed below:

- (100%) Potato growth: soil structure, seed type, how a potato is the actual seed, how to create a seed potato. The edible parts of the plants, the different products that potatoes make and the nutritional value of the potato.
- (100%) Peanuts: peanuts are a legume, they grow underground and not in a tree. Peanuts can be grown in WV but is not a large specialty crop.
- (100%) Ginseng. Where it grows in WV, how to properly harvest. Why one should NOT poach ginseng. Importance to ginseng in our state’s economy. Exporting of the plant roots and what purposes the ginseng is used; Medicinal, candy, etc. Also, we talk about how to protect the crop.
- (100%) Garlic: How to create “seed” garlic by using the clove. How to harvest seed from the flower (the garlic scape), the importance of growing garlic varieties in West Virginia as a specialty crop. The planting and harvest season. What foods we love that have garlic in them. During the trailer tour, an actual garlic clove is peeled and given to the students to plant.
- (100%) Beans: We focus on pinto beans. Talk about the large pinto bean farms in West Virginia and about how the pinto bean is the most consumed food in West Virginia. We scan over the other types of beans and begin talking about the tops n bottoms of plants. Lesson on how the bean is a magical thing. You can dry it and eat it later, or dry it and plant it. You could also can it or freeze it to eat it later too. The bean has amazing nutritional value and stores well for post-harvest handling. Students are given “magic beans” dried WV pinto bean seeds, to take out and plant in a “secret” area or their parents gardens to watch them grow.
- (100%) Carrots: The #1 learned fact about carrots is how to get seed. Visitors learn that procuring seed from carrots takes a full two years to retrieve from the carrot flower. Each visitor also learns about the variety of colors a carrot comes in. What soils are proper for good carrot growth and the nutritional value of the carrots. Also, how carrots and parsnips are used to help soil health, by adding nutrients and aerating the soil.
- (100%) Turnips, radishes and onions. Here we discuss “Tops n Bottoms” and read a book about specialty crops, which part of the plant is eaten and how they grow. We discuss the benefits of the healthy crops and which part of the plant is eaten. Turnips and Onions for instance, we can eat top and bottoms, radishes only the bottoms. We discuss the many varieties and colorful root crops that grow in radishes, shapes and sizes.

In August of 2016, when the trailer was unveiled to the public, the project was still in the process of developing a survey to measure the increased knowledge of specialty crops with

participants. Before the survey questions could be completed, since this was a pilot project - we needed the fall to create the program and make adjustments as needed. We were trying to use Contact Contact for surveys but only had a personal ipad, which did not work well to have someone hold and do a survey while another group was interacting in the trailer. There is NO down time in the trailer achieving the goal of high interaction; as soon as one group leaves, another group is walking into the back.

In Spring of 2017, the Soil Trailer will be in full swing and began making visits to schools and other events with a plan in place. Paper and verbal surveys will be used through July 2017 in the schools.

According to records, yes, 75% of participants and more have increased knowledge of specialty crops through the STT educational programs. The number of children that we have visited in the past year is higher than expected. Most schools have 250-600 students, at 3 schools per week (sometimes more). Working the trailer alone it is very difficult and yields low survey results as staff must rely on teachers to present surveys to students after the visit.

According to verbal surveys with adults/producers, (using a clip board and asking questions after the tour) the increased knowledge is higher than expected. The results showed that nearly 50% of producers do not fully understand soil testing, nutrient management or ground cover. Referrals at this point are able to provide not only education but also cost share services to improve crop management from the WV Conservation Agency.

The acquisition of two ipads with interactive features will allow survey efficiencies and better reporting as this project continues to move forward.



SAM OWENS | Gazette-Mail - Canyon Bland, a fifth-grader from the West Virginia School for the Blind, feels one of the walls of the Soil Tunnel Trailer. The trailer, which made it's first appearance at the West Virginia State Fair in August, is kept up by the Capitol Conservation District, which represents Kanawha County in the West Virginia Conservation Agency.



SAM OWENS | Gazette-Mail - Victoria Eaves, a fifth-grader at the West Virginia School for the Blind, examines a 3-D model of a bacteria found in soil inside the Soil Tunnel Trailer.



SAM OWENS | Gazette-Mail - Aimee Figgatt (front), district manager of the Capitol Conservation District, welcomes students from the West Virginia School for the Blind to come in and gently touch the walls of the Soil Tunnel Trailer, an interactive learning exhibit, in Romney, on Oct. 26. The trailer is set up to teach children of all ages about soil, water, animals and specialty crop vegetables.

The Soil Tunnel Trailer committee is still collecting data through surveys and working with educators to improve project based learning. So far, data has proven that the children benefit richly from their trip “underground”. Currently, based on the scheduling, the WV Conservation Agency is looking at the need for at least two more units within West Virginia.

The staff looks forward to spring when specialty crop planting season will begin. The STT will provide seed and school garden materials to the classrooms through district funding.

Beneficiaries

The Soil Tunnel Trailer was unveiled in August of 2016. It has since experienced tremendous interest and is currently completely booked for visits at schools and other events throughout the State of West Virginia through the end of May 2017. The feedback we have received from teachers and agriculture specialists has been positive and encouraging.

The group that has benefited the most from this project is the shareholders: the public, consumers and Pre-K through 12th grade students in the communities of West Virginia. The Soil Tunnel Trailer has been booked and has been travelling throughout the entire state, so the entire state as a whole has benefited. The knowledge that the hands on learning provides within the walls of the trailer has been tremendous!

The project continues to pursue grants and outside funding to keep the trailer operational at little to no cost to the schools. So far, the District has managed to keep the trailer **100% self-sustained** with the assistance of local private companies donating grant money that is used for scholarships for schools. The economic benefit is for one, the cost savings to the schools as well as the expansion of projects that the trailer has created. Any rental fees from the trailer is deposited into an account that is used 100% for trailer supplies, fuel, vehicle, maintenance as well as school supplies for the outdoor projects and ongoing upgrades to the unit. The WV Conservation Agency recently purchased a vehicle to be used solely by the driver and presenter of the Soil Trailer to accommodate the many trips taken throughout the state.

- Number of beneficiaries.
 - WV State Fair: 9000+ visitors
 - WV Schools Visited: 38 schools - 18,280 children.
 - Martinsburg, WV: 720
 - WV Book Festival: 210
 - WV Water Festival: 250
 - STEM Festivals visited: 1000
 - WV Small Farms Conference: 250
 - Winter Events: 250
 - Marshall University STEM Day: 980 Students
 - WV Make Conferences: 2000

- Economic Impact:
 - The #1 economic impact is that the Soil Tunnel Trailer has become a self sustained mobile education program. Not a burden nor a drain on the state government dollars.
 - Ability to INCREASE knowledge of soil health, therefor improving SC production. This would be a longer-term benefit to measure increase (1-3 years)
 - Ability to employ a part time assistant as needed.

Lessons Learned

Throughout the project, the most frustrating issue that the project coordinator faced was contractors who would not fulfill the agreement they had.

The first artist contracted kept the trailer nearly two years, giving the project coordinator many excuses as to why he could not finish the job. He would need a different foam, or a different tool, bad weather, sickness and sometimes he would have child care issues among the reasons. In March of 2016 the project coordinator demanded to inspect the trailer to see what work had been completed. The artist declined, stating that it was a mess and he wanted to make it look good first. The project coordinator went anyway and upon finding that no work had begun on the trailer, took the trailer back to the district office to and terminated the contract with the artist based on his breach of the contract. Normally a project coordinator would not have waited two years or given a contractor that long, however, due to a death in the immediate family, the project coordinator had to put the project on hold for personal reasons.

Finding a contractor for the actual construction was also difficult, given that most were uninterested in the job. Once one was found, they were paid for electrical, foam installation, lighting and spraying on the Styrospray 1000. The contractor did install the foam well, ran electric behind the foam into the circles for the micro-organisms then the trailer was delivered to the artist to sculpt. Unfortunately, at the time the sculpting was completed the contractor had decided to move to a position in New York and was unable to complete the job. That left the project coordinator to find a volunteer electrician to donate the time to complete the electric and find someone else to spray the hardener on. A contractor who is the brother of the project coordinator completed the tasks free of charge.

Contact Person

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Additional Information

In the News:

Media

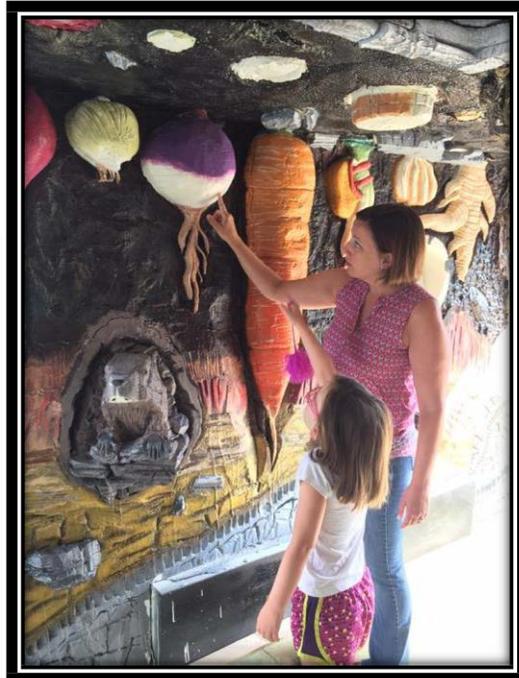
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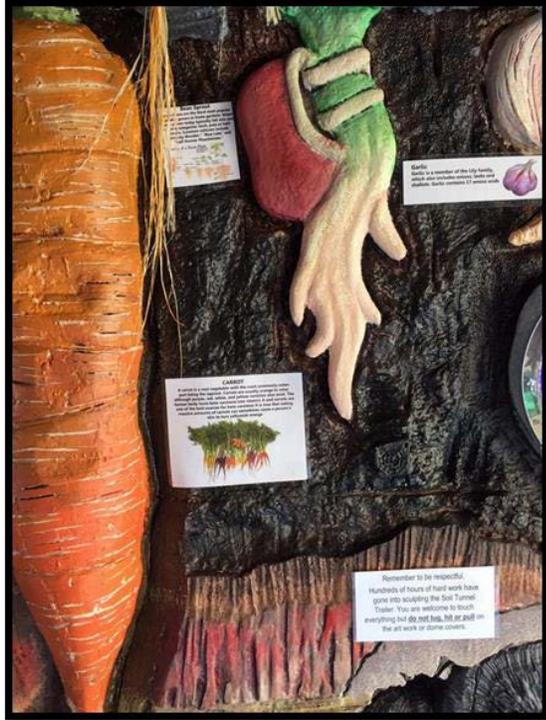
- <http://www.wvca.us/districts/ccd.cfm>
- www.wvsoiltrailer.org
- <https://www.facebook.com/The-West-Virginia-Soil-Trailer-1806437696252275/>

Program Income













PROJECT TITLE

Late Season Variety Trial

Amount Awarded: \$4,341.35

Background

In West Virginia, there is limited production information available within these counties. The producers will be more willing to raise these varieties of produce if they have hard data supporting production and marketing success in their area. With the growing interest in local food markets and the Farm to School programs, there is a high demand for producers. There has been limited information on later planting seasons to help meet later markets such as schools and the ongoing demand for the restaurant industry. This information will allow producers to feel confident in producing more fruits and vegetables for these markets. The grant was not an extension of an existing funded site.

Project Summary

As local markets grow in West Virginia, local producers are growing crops they have never grown before. With the diverse markets, many of them are looking at fruits as well as vegetables. Late season watermelon is an enticing crop for producers; most all local markets buy local melons. As my 2014 research has shown in a survey, consumers want local melons and will pay more for them out of the traditional season. I conducted a watermelon trial looking at five varieties: Crimson sweets, Bold Ruler, Fascination, 7167 super sweet, and Distinction. The top two producing melons that I would recommend producers grow in the Mid-Ohio valley would be the Crimson Sweets and the 7167. They had the highest recorded yields. The Watermelon that fell just below the top two melons in production was Fascination. The last two with the lowest yields were Distinction and Bold Ruler. I would not recommend these varieties in our area. The bold ruler flowers earlier than the rest of the melons, and a producer would also have to plant it a week later than the others. I tried to replicate this trial in 2015 as well as this year, but I have had no success in doing so due to the extreme wet weather conditions in the past two years in West Virginia.

However, I was able to conduct a late season watermelon trial in a high tunnel in 2016. The personal size watermelon research trial that was conducted by JJ Barrett and myself. This trial evaluated the yield of six varieties with a seventh pollinator variety mixed in. They were planted in a randomized pattern with three replications of three plants with a pollinator separating varieties. Plants were spaced three feet within the row and four feet between rows. The ground was covered with plastic with drip tape below. Eight foot trellising was constructed using two segments of four foot woven-wire galvanized fence, seven foot t-posts and support wire to secure it from the pearling support bracing of a high tunnel frame. The melons were trained to trellis by using tomato clips as starts. The plants were supplied additional nutrients through fertigation. I also treated for aphids and cucumber beetles twice and trialed for powdery mildew once during the growing season. After fruit set, the melons were allowed to grow to two pounds, and then additional weight support was added to the melon though mesh bags. Two different yield evaluations were taken—one three weeks before harvest and another at

harvest. The collected data included the following: number of marketable fruit, number of unmarketable fruit, outside markings, inside fruit color, weights, rind thickness, and sugar; I also conducted a taste panel for all the varieties of melon. This project was not a part of a past specialty crop grant.

Project Approach

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Goals and Outcomes Achieved

As stated in the original grant outcomes, varieties of watermelon recommendations were able to be made between cultivars by looking at the yield data and the palatability of the melons. This data will give producers information to pick the melons that will produce more marketable fruit to increase their farm income.

Cultivar	Marketable	Unmarketable	Avg. Wt	Rind color	Rind thickness	Flesh Color	Brix
3	28 Avg. of 4 per plant	0	5.50lb 5.15oz	Dark Green Stripes	6cm	Bright Red	11.4
7	Avg. of 3 per plant	0	6.3lb 4.63oz	Dark Green Stripes	12cm	Bright Red	10.3
5	25 Avg. of 4 per plant	2	6lb 1.38oz	Dark Green samll Stripes	8cm	Bright Red	11.1
6	22 Avg. of 3 per plant	4	4lb 8.50oz	Light green pin stripes	7cm	Orange Red	10.3
1	19 Avg. of 2 per plant	2	9lb 2.13oz	Dark Green Stripes	6cm	Bright Red	9.8
9	6 Avg. of 2 per plant	5	4lb .05oz	Pale Green	6cm	Orange Red	9.6

An assessment of the data rates the varieties from 3, 5, 7, 6 as melons that would be profitable to grow for a local producer, and a recommendation of producer planting varieties 1 and 9 due to low marketable yields.

Beneficiaries and other outcomes

The data collected during the research trials have been used in crop variety recommendations around the state. The data has been presented in a watermelon production lecture to producers at the West Virginias Small Farms Conference. The data has been used in several workshops around the state. The results of the trials will also go towards the publication of a WVU factsheet and a national published research posted to be exhibited at the 2017 NACAA meeting in Utah. The results have also been discussed on local broadcast station in promoting locally grown produce and production. The data has also been utilized in vegetable newsletter mailers and other functions such as the Master Gardening programs. It is hard to put an exact number of participants reached but the data has been exposed to over 45,000 individuals through all outreach programs indirect and direct. This number will only grow as the data is used in the future.

Lessons Learned

There are quite a few lessons learned in this project. In 2015 and 2016, wet weather completely flooded the project. Watermelons grow best in sandy loam soils that are well-drained. There are a few counties in WV that one may find that soil type, but in Jackson County, silty loam is the best for which you can hope. Higher elevation of land that had silty loam soils is recommended. In normal years, the project would have proceeded just fine.

Producers should be advised to not try to hit the late season market with watermelons. There are crops with shorter maturity dates that would fill those markets. Planting watermelons as a late crop is taking a greater risk than planting them early.

Contact Person

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Program Income

N/A

Additional Information



Ana



Serval



Solitaire



Red Delicious

PROJECT TITLE

Potomac State College farm to school cool season production

Amount Awarded: \$14,400.00

Project Summary

In this first time grant, PSC of WVU established a learning model for our students to experience farm-to-school production and market systems enabling them to develop their own farms upon graduation. They were exposed to the economic advantage of adding specialty vegetable crops to their farm production business plan. This provides the students with knowledge to increase their farm production and take advantage of the current interest in the farm to table initiatives that are popular in today's market place. Establishing a greenhouse hydroponic lettuce production system the first year allowed the students to produce fresh specialty lettuce. During the second year we expanded with the addition of a high tunnel to the college farm for cool season production of vegetable crops. However, due to events and commitments beyond the control of the investigator, the high tunnel production system was not enacted. The workshops for construction and installation of both systems reached students and the local school systems. This project is a stand-alone system and does not build on any previously funded project.

Project Approach

During the construction phase for each system the college offered specialty classes open to 15-20 college students and community members. In October 2014 a hydroponic workshop and a high tunnel work shop were offered as PSC classes. The hydroponic course had 23 full time PSC students enrolled and completed the workshop. The high tunnel workshop had 11 full time PSC students enrolled and 5 Mineral County Master Gardeners.

The workshop to construct the high tunnel included members of the local Master Gardeners who used the knowledge gained to establish two high tunnels one at New Creek Primary School and one for the Mineral County Development Center, an adult and handicap learning facility. The construction of high tunnels at local public schools by the mineral county master gardeners who attended the workshops has extended the concepts of food production to younger students. These applications will expose young students to food production and will possibly influence them as they enter upper level education. The students can be tracked as they advance through their education.

Goals and Outcomes Achieved

Production of hydroponic specialty lettuce measured as heads harvested per week beginning in January 2014 and then each week the college is in session. At the end of the spring 2014 semester the system will be producing at least 30-40 heads of specialty lettuce each week. By the end of the fall semester the system will be producing 60-80 heads of specialty lettuce each week. This level of production will continue each week the college is in session. To date with

student and leadership turnover we have not harvested the anticipated quantity of lettuce. The system will continue in the production enterprises of the college program.

Production of field grown, high tunnel winter vegetables measured as cartons harvested per week. The production will begin in the fall semester of 2014 when the high tunnels will be constructed on alluvial soils contained within the college farmland area. The season extending production in high tunnels will establish cold crops and root crops for the PSC food service. By the end of the spring 2015 semester the high tunnels will be producing 3-4 cases per week. In the fall semester 2015 the production will reach 6-7 cases per week. To date the high tunnel has no production as a result of the farm land sale and the relocation of the structure to another college owned farm. The extension of the high tunnel concepts to the local educational institutions has been a success.

Number of students enrolled in class to construct the hydroponic system in the greenhouse. The college will offer a special topics class in the fall semester of 2013 to the college students and community members with an enrollment of 15-20 persons. The class will also allow observers during the construction of the system. The workshop and class had 18 students enroll with 17 completing the course. They completed a pre-test and post-test which showed that most of the students started the course with a basic knowledge. On several questions the results indicated that they learned details about specifics unique to hydroponic production. The opinion questions indicated that prior to the course they were unaware of the labor involved in operating such a system. The answers indicate that for individual questions the students increased their knowledge by 20-30% and an overall increase for the exam a 25% increase in knowledge. See the attached pre-test and post-test.

Number of students enrolled in class to construct the high tunnels on the college farm. The college will offer a special topics class in the fall semester of 2014 to the college students and community members with an enrollment of 15-20 persons. The first of two high tunnels will be constructed by the class. The construction of the second high tunnel will be organized and lead by the class to educate the local high school students (10-20) in the process of high tunnel building. The class will also allow observers during the construction of the system. The workshop and course had an enrollment of 11 college students. The Mineral County Master Gardeners had five members join the class on the day of construction. The pre-test and post-test had very similar results to the hydroponics course. Students had a basic knowledge at the start of the class and learned more specific facts about high tunnel winter production. Again the opinion questions indicated the students under estimated the labor involved. The answers indicate that for the individual questions the students increased their knowledge by 25% and had an overall increase for the exam of 25%. See the attached pre-test and post-test.

Crop scheduling skills learned by the students measured through their record keeping and ability to deliver the crops in a sequential manner to the college food service. Crop scheduling will track the days to germination, days to transfer into the hydroponic system, and then the days to harvest for each lettuce variety grown. The students will obtain a food handling card from the local health department. They will harvest, pack and deliver the specialty lettuces to the PSC food service. The students will submit electronic journal entries at the end of each

week to the faculty for review and grading of their record keeping skills. Of the four students that worked on the hydroponic system only one excelled in setting up and maintaining the system. This is a problem with projects that rely on student management. We will continue production and refinement of the system.

Number of local high school students and master gardeners who attend the construction demonstrations given by the college class. The number of student enrolled in the class and the names of those who come to observe will be recorded. Certificates of participation will be provided to all students in the class at the conclusion of the semesters for each special topics class. Five Mineral County Master Gardeners attended the construction workshop. They were able to use the knowledge gained to establish two high tunnels one at New Creek Primary School and one for the Mineral County Development Center, an adult and handicap learning facility. These public school high tunnels are now being used by the students and teachers to extend crop production concepts to students at a younger age and to disadvantaged citizens of the region.

Beneficiaries

Potomac State College students (29)

Mineral county master gardeners (10)

New Creek Elementary students (25, increasing with each new class that uses the tunnel)

Adult developmental center clients (10, increasing with each new client that uses the tunnel)

Potomac State College students that attended the hydroponic construction workshop gained new skills in all aspects of hydroponic system setup. The students and Mineral County Master Gardeners that attended the high tunnel workshop gained new skills in all aspects of establishing a high tunnel structure. The Master Gardener participants then lead groups in the establishment of high tunnels at a local elementary school and local adult developmental center extending the benefits of the grant workshops to the local community.

Lessons Learned

Students willingly sign up for hands-on workshops offered for college credit. Adult learners, like master gardeners, will attend workshops to learn new skills and demonstrated sharing these new skills with others in the community. In the future, we will extend offers to the high school teachers and schedule activities that coincide with their course work. High school students were not willing to attend evening and Saturday classes.

Hydroponic production systems function well with committed workers. Of four students that worked with the system, only one was able to run the system productively.

Due to events and commitments beyond the control of the investigator, the high tunnel production system was not completed after the workshop that constructed the frame on the Black Oak Farm owned by the college. This farm was sold during the grant period and the frame was dismantled for relocation. High tunnel production system is currently being re-located to the Malone Farm Property owned by the college. Students and master gardeners were able to gain skills for constructing a high tunnel.

Due to this unforeseen complication with ownership of the farm property and high tunnel location, we did not use all the requested funding for student labor or supplies for the high tunnel.

Contact Person

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Additional Information

Workshop Pre and Post Test Results:

Potomac State College Specialty Crop Grant cool season production 18 student responses

**Pre Test
 Hydroponics**

1. What is the definition of hydroponics?

A.	A method of growing plants applying fertilizer solution through standard irrigation	1	6%
B.	A method of growing plants using mineral nutrient solutions, in water, without soil	15	83%
C.	A method of mixing fertilizer and pesticide for crop production	0	0%
D.	A method of growing food with standard greenhouse production techniques	2	11%

2. What crops can be grown in a greenhouse hydroponic system?

A.	All crops	6	33%
B.	Root crops	7	39%
C.	Crops with above ground harvest	2	11%
D.	Herbs	3	17%

3. What is NFT?

A.	Nutrient film technique	3	17%
B.	No fuel technique	1	6%
C.	Nutrient forage trough	4	22%
D.	Nutritional food technology	10	56%

4. What are the three production areas for growing salad greens?

A.	Seedling, juvenile, mature	4	22%
B.	0-2 weeks, 2-4 weeks, 4-8 weeks	3	17%
C.	Both A & B	10	56%

D.	Neither A or B	1	6%
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5. What is the limiting environmental factor for winter production of salad crops in our area?

A.	Outside temperature	12	67%
B.	Daylength	1	6%
C.	Precipitation	2	11%
D.	Light quality/levels	3	17%

6. What are micro-greens?

A.	Special varieties of lettuce	3	17%
B.	Herbs	3	17%
C.	Genetically modified lettuce	6	33%
D.	Harvest of very young plants	6	33%

7. What pH is the goal for NFT nutrient solution?

A.	5.5	1	6%
B.	6.0	2	11%
C.	6.5	11	61%
D.	7.0	4	22%

8. For winter salad greens what is the target daytime temperature range?

A.	45-50°F	3	17%
B.	50-55°F	4	22%
C.	55-60°F	6	33%
D.	60-65°F	4	22%

9. For winter salad greens what is the target nighttime temperature range?

A.	40-45°F	10	56%
B.	45-50°F	4	22%
C.	50-55°F	3	17%
D.	55-60°F	1	6%

10. What herb works best with the temperature ranges used for hydroponic salad greens production areas?

A.	Basil	4	22%
B.	Oregano	4	22%

C.	Mint	6	33%
D.	Parsley	4	22%

11. What would be the limiting factors for you to establish your own hydroponic production system? (choose all that apply)

A.	Cost of materials and greenhouse	17	94%
B.	Marketing of products	6	33%
C.	Time and labor	7	39%
D.	Just not interested	1	6%

12. How likely are you to develop a hydroponic production system of your own?

A.	Unlikely	2	11%
B.	Possibly	13	72%
C.	Likely	0	0%
D.	Highly likely	3	17%

13. What substrates are used for hydroponic salad green production?

A.	Perlite	1	6%
B.	Rockwool	2	11%
C.	Greenhouse medium	4	22%
D.	All of the above	11	61%

14. Besides the major and minor nutrients needed for plant growth, what element is added to hydroponic fertilizers?

A.	Fluoride	6	33%
B.	Chlorine	0	0%
C.	Sodium	5	28%
D.	Hydrogen	7	39%

15. What system is used for hydroponic tomato/pepper production most often?

A.	NFT	6	33%
B.	Flow through	5	28%
C.	DFT	2	11%
D.	Aquaponics	5	28%

Post Test
Hydroponics

1. What is the definition of hydroponics?

A.	A method of growing plants applying fertilizer solution through standard irrigation	0	0%
B.	A method of growing plants using mineral nutrient solutions, in water, without soil	13	76%
C.	A method of mixing fertilizer and pesticide for crop production	0	0%
D.	A method of growing food with standard greenhouse production techniques	4	24%

2. What crops can be grown in a greenhouse hydroponic system?

A.	All crops	9	53%
B.	Root crops	2	12%
C.	Crops with above ground harvest	6	35%
D.	Herbs	0	0%

3. What is NFT?

A.	Nutrient film technique	14	82%
B.	No fuel technique	0	0%
C.	Nutrient forage trough	0	0%
D.	Nutritional food technology	3	18%

4. What are the three production areas for growing salad greens?

A.	Seedling, juvenile, mature	4	24%
B.	0-2 weeks, 2-4 weeks, 4-8 weeks	1	6%
C.	Both A & B	6	35%
D.	Neither A or B	4	24%

5. What is the limiting environmental factor for winter production of salad crops in our area?

A.	Outside temperature	3	18%
B.	Daylength	12	71%
C.	Precipitation	0	0%
D.	Light quality/levels	2	12%

6. What are micro-greens?

A.	Special varieties of lettuce	4	24%
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B.	Herbs	2	12%
C.	Genetically modified lettuce	2	12%
D.	Harvest of very young plants	9	53%

7. What pH is the goal for NFT nutrient solution?

A.	5.5	5	29%
B.	6.0	5	29%
C.	6.5	3	18%
D.	7.0	4	24%

8. For winter salad greens what is the target daytime temperature range?

A.	45-50°F	2	12%
B.	50-55°F	5	29%
C.	55-60°F	7	41%
D.	60-65°F	3	18%

9. For winter salad greens what is the target nighttime temperature range?

A.	40-45°F	3	18%
B.	45-50°F	4	24%
C.	50-55°F	4	24%
D.	55-60°F	6	35%

10. What herb works best with the temperature ranges used for hydroponic salad greens production areas?

A.	Basil	11	65%
B.	Oregano	1	6%
C.	Mint	1	6%
D.	Parsley	4	24%

11. What would be the limiting factors for you to establish your own hydroponic production system? (choose all that apply)

A.	Cost of materials and greenhouse	14	82%
B.	Marketing of products	7	41%
C.	Time and labor	10	59%
D.	Just not interested	2	12%

12. How likely are you to develop a hydroponic production system of your own?

A.	Unlikely	3	18%
B.	Possibly	8	47%
C.	Likely	3	18%
D.	Highly likely	3	18%

13. What substrates are used for hydroponic salad green production?

A.	Perlite	0	0%
B.	Rockwool	2	18%
C.	Greenhouse medium	4	24%
D.	All of the above	11	65%

14. Besides the major and minor nutrients needed for plant growth, what element is added to hydroponic fertilizers?

A.	Fluoride	4	24%
B.	Chlorine	2	18%
C.	Sodium	5	29%
D.	Hydrogen	6	35%

15. What system is used for hydroponic tomato/pepper production most often?

A.	NFT	5	29%
B.	Flow through	10	59%
C.	DFT	2	18%
D.	Aquaponics	0	0

Pre Test
High tunnels

1. What is the definition of a high tunnel?

A.	A method of growing plants under fabric covers places over rows	0	0%
B.	A method of growing plants in the field with light weight plastic covers	1	10%
C.	A method of growing plants in un-heated greenhouse like structures	6	60%
D.	A method of growing food with standard greenhouse production techniques	3	30%

2. What crops can be grown in a high tunnel system for extended winter harvest?

A.	All crops	5	50%
B.	Root crops	2	20%
C.	Beans and corn	0	0%
D.	Herbs	2	20%

3. What crops can be grown in a high tunnel system for extended winter harvest?

A.	Cole crops	8	80%
B.	Summer squash	1	10%
C.	Tomatoes	0	0%
D.	Melons	1	10%

4. What were the original season extension containers?

A.	Greenhouse	2	20%
B.	Cloche or Bell jars	3	30%
C.	Cold frame	5	50%
D.	Hot bed	0	0%

5. What is the limiting environmental factor for winter production of salad crops in our area?

A.	Outside temperature	3	30%
B.	Day-length	6	60%
C.	Precipitation	0	0%
D.	Light quality/levels	1	10%

6. What are cole crops?

A.	Special varieties of lettuce	0	0%
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B.	Herbs	0	0%
C.	Cabbage, broccoli, kale, etc.	8	80%
D.	Zucchini, pumpkins, squashes	2	20%

7. What pH is the goal for crop production soils?

A.	5.5-6.0	4	40%
B.	6.0-6.5	3	30%
C.	6.5-7.0	2	20%
D.	7.0-7.5	1	10%

8. Under on layer of plastic cover, the micro-climate can be modified so that the growing conditions are equal to how many USDA hardiness zones warmer?

A.	1-1 ½	2	20%
B.	2-2 ½	6	60%
C.	3-3 ½	1	10%
D.	4-4 ½	1	10%

9. If we have two layers of protection, the micro-climate can be modified so that the growing conditions are equal to how many USDA hardiness zones warmer?

A.	1-1 ½	2	20%
B.	2-2 ½	3	30%
C.	3-3 ½	3	30%
D.	4-4 ½	2	20%

10. What herb works best with the temperature ranges in high tunnels for our area?
(choose all that apply)

A.	Basil	6	60%
B.	Oregano	3	30%
C.	Rosemary	4	40%
D.	Parsley	7	70%

11. What would be the limiting factors for you to establish your own high tunnel production system? (choose all that apply)

A.	Cost of materials and greenhouse	7	70%
B.	Marketing of products	6	60%
C.	Time and labor	5	50%
D.	Just not interested	3	30%

12. How likely are you to develop a high tunnel production system of your own?

A.	Unlikely	2	20%
B.	Possibly	6	60%
C.	Likely	0	0%
D.	Highly likely	2	20%

13. What month is best for seeding directly into the ground in a high tunnel for production of cole crops?

A.	September	6	60%
B.	October	1	10%
C.	November	3	30%
D.	December	0	0%

14. How long does it take to reach harvest for winter production of broccoli in a high tunnel with interior row covers?

A.	One month	2	20%
B.	4-6 weeks	3	30%
C.	6-8 weeks	3	30%
D.	8-10 weeks	2	20%

15. How long does it take to reach harvest for winter production of carrots in a high tunnel with interior row covers?

A.	One month	2	20%
B.	4-6 weeks	4	40%
C.	6-8 weeks	2	20%
D.	8-10 weeks	2	20%

Post Test
High tunnels

1. What is the definition of a high tunnel?

A.	A method of growing plants under fabric covers placed over rows	3	38%
B.	A method of growing plants in the field with light weight plastic covers	1	12%
C.	A method of growing plants in un-heated greenhouse like structures	4	50%
D.	A method of growing food with standard greenhouse production techniques	0	0%

2. What crops can be grown in a high tunnel system for extended winter harvest?

A.	All crops	5	63%
B.	Root crops	2	25%
C.	Beans and corn	0	0%
D.	Herbs	1	12%

3. What crops can be grown in a high tunnel system for extended winter harvest?

A.	Cole crops	8	100%
B.	Summer squash	0	0%
C.	Tomatoes	0	0%
D.	Melons	0	0%

4. What were the original season extension containers?

A.	Greenhouse	0	0%
B.	Cloche or Bell jars	7	88%
C.	Cold frame	0	0%
D.	Hot bed	1	12%

5. What is the limiting environmental factor for winter production of salad crops in our area?

A.	Outside temperature	4	50%
B.	Day-length	4	50%
C.	Precipitation	0	0%
D.	Light quality/levels	0	0%

6. What are cole crops?

A.	Special varieties of lettuce	0	0%
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B.	Herbs	0	0%
C.	Cabbage, broccoli, kale, etc.	8	100%
D.	Zucchini, pumpkins, squashes	0	0%

7. What pH is the goal for crop production soils?

A.	5.5-6.0	4	50%
B.	6.0-6.5	4	50%
C.	6.5-7.0	0	0%
D.	7.0-7.5	0	0%

8. Under on layer of plastic cover, the micro-climate can be modified so that the growing conditions are equal to how many USDA hardiness zones warmer?

A.	1-1 ½	4	50%
B.	2-2 ½	2	25%
C.	3-3 ½	2	25%
D.	4-4 ½	0	0%

9. If we have two layers of protection, the micro-climate can be modified so that the growing conditions are equal to how many USDA hardiness zones warmer?

A.	1-1 ½	0	0%
B.	2-2 ½	2	25%
C.	3-3 ½	5	63%
D.	4-4 ½	1	12%

10. What herb works best with the temperature ranges in high tunnels for our area?
(choose all that apply)

A.	Basil	5	64%
B.	Oregano	1	12%
C.	Rosemary	1	12%
D.	Parsley	1	12%

11. What would be the limiting factors for you to establish your own high tunnel production system? (choose all that apply)

A.	Cost of materials and greenhouse	6	75%
B.	Marketing of products	5	63%
C.	Time and labor	6	75%
D.	Just not interested	0	0%

12. How likely are you to develop a high tunnel production system of your own?

A.	Unlikely	1	12%
B.	Possibly	5	63%
C.	Likely	1	12%
D.	Highly likely	1	12%

13. What month is best for seeding directly into the ground in a high tunnel for production of cole crops?

A.	September	7	88%
B.	October	0	0%
C.	November	0	0%
D.	December	1	12%

14. How long does it take to reach harvest for winter production of broccoli in a high tunnel with interior row covers?

A.	One month	0	0%
B.	4-6 weeks	4	50%
C.	6-8 weeks	3	38%
D.	8-10 weeks	1	12%

15. How long does it take to reach harvest for winter production of carrots in a high tunnel with interior row covers?

A.	One month	3	38%
B.	4-6 weeks	0	0%
C.	6-8 weeks	4	50%
D.	8-10 weeks	1	12%

Program Income

No income was received.

PROJECT TITLE

Specialty Hops in West Virginia

Amount Awarded: \$22,478.40 + reallocation of \$4,969.16 = \$27,447.56

Project Summary

As the craft beer industry continues to grow, both in West Virginia and across the country, this project was designed to better determine if hops were a crop that West Virginia farmers could grow for a profit that would take advantage of the growing needs for hops for these small, up-and-coming craft breweries. Most of the hops grown in the United States are grown in the Pacific Northwest states of Washington and Oregon, however these large hopyards contract their hops with the larger macro-breweries like Miller-Coors, Anheuser-Busch and others. As smaller craft breweries enter the market they require less hops than the larger operations, but find it difficult to purchase hops due to these contract obligations. It is for this reason that WVSU Extension Service implemented this project to assist these new microbreweries in have fresh, locally grown hops available for their brewing operations. During the course of this project, the number of craft breweries in West Virginia has grown from 7 breweries in 2013 to 20 that are projected to be licensed and open for business by the end of 2016, a nearly 3-fold increase in breweries in just 3 short years. This project was the first of its kind by WVSU Extension Service, but additional funding opportunities will be pursued going forward based upon the results of the initial project.

Project Approach

During the project, there were three main goals and objectives. First, a survey of West Virginia breweries and homebrewers to help determine the direction of the project, particularly from a variety selection to trial with the growers. Second, growers would be selected from a statewide call for growers. WVSU Extension Service had originally planned for 3 growers, but instead chose a total of 35 to participate in the project. Finally, a hops roundtable event would be held to educate growers and potential growers of the potential that hops have for the West Virginia agricultural economy. This roundtable took place during the 2016 West Virginia Urban Agriculture Conference with great results. This program came with many significant outcomes, many of which were not expected going into the project. First, there was a great deal of interest in the crop that was found out during the call for growers with over 70 applications coming in for review. From these 70, a good percentage were already growing hops, or had done so at a prior time. Next, the breweries in West Virginia were very receptive and excited both in the beginning of the project and still remain that way at this time. At least two breweries have begun utilizing West Virginia hops in their brewing operations. These are Big Timber Brewing in Elkins and Bridge Brew Works in Fayetteville. Additionally, during this time one of the project growers Michael Heston started through the process of opening a brewery on the same site as his winery and distillery, making this one of the few locations with brewing, distilling and winemaking all in the same place. The brewery is scheduled to open in 2016, with another project participant as the head brewer for Pinchgut Hollow Brewery.

For this project, and in general the hops industry, there are no non-eligible specialty crops that are enhanced. This project did not begin with a list of program partners, because they had yet to be discovered. However, by the end of the project we have several partners in the craft beer industry who are supporting the project. Greenbrier Valley Brewing Company, Bridge Brew Works and Big Timber Brewing have been extremely supportive of the project and have purchased hops from program growers over the course of the last three years. For the hops production industry to continue to grow it will be important to have the buy-in and support from the craft brewers in West Virginia as well as the WV Craft Brewers Guild.

The tasks that took place during the project included crop planting, training, maintenance, etc. data tabulation, biennial site visits, crop monitoring and a small first harvest. The plants were initially planted in the first year, however there was nearly a total loss due to receipt of a poor shipment of plant material. The planting was done again in year 2 with much better plant establishment rates at approximately 80% across the board from all growers. The training, maintenance and plant care was completed by the 35 growers participating in the program, with technical support provided by WVSU Extension Service as needed. During each growing season, the participating farmers would keep a running list of data, mostly through observation, as the young plants were getting established during years 2 and 3 of the project. Some of the data collected was plant vigor, approximate size, etc. Growers that had older plants, or the plants that survived from the first year of this project, reported approximate green weights of harvested cones at around 2lbs per plant. The project PI tried to visit each farm participating at least once every two years to monitor the progress and to hear feedback from the participants. Due to the losses in year 1, a full hop harvest was not possible, however the average of the few plants that survived was approximately 2lbs per plant, with the trajectory of mature plants pointing towards around 3lbs per plant by 5 years of age.

Goals and Outcomes Achieved

During the course of the project, WVSU Extension Service completed the following activities related to the project. First, a brewer survey was compiled and set out to breweries and homebrewing clubs throughout West Virginia. A total of 13 responses were received answering questions related to hop usage, prices paid for hops, varieties needed, etc. as a way to help guide the project from the beginning. From these results it was concluded that the three varieties to trial would be Cascade, Columbus and Centennial. Second, a call for growers was sent out into the media. This call was followed up by over 70 applications coming into the office for review. From these applications a total of 35 growers were selected for the project. The top 3 growers were provided with 90 plants, trellising supplies and soil amendments. The remaining growers received between 15 and 45 plants based on the size of their farm, but did not receive trellising or soil amendments. These growers recorded growth and production information on a monthly basis, as well as general comments related to growth habits, insect/disease pressure, etc. to give a well-rounded report on how hops grow in West Virginia. Finally, a hops production roundtable discussion was hosted as part of the West Virginia Urban Agriculture Conference in April which was held at West Virginia State University. In addition to this roundtable discussion, the project PI Brad Cochran had the opportunity to host a hops production workshop in Fayetteville, WV which included a field trip to visit one of the project participant's hopyard to

see the hops in production. He was also invited to speak at the Appalachian Food Summit in Berea, KY in September 2016 to discuss hops production and craft beer industry in Appalachia.

Some of the production data will be completed in the coming years and the plants purchased as part of this project grow into full maturity. This will give WVSU Extension Service a more concrete idea of the production potential of the chosen varieties that can be shared with farmers. In total, over 1500 hops plants have been planted as part of the project and production numbers will be tracked going forward on these plants as well. For this project, it was anticipated that 20 brewers would participate in the survey, however only 13 brewers responded. This still gave enough variety to guide the project in the correct direction, however if the survey were completed again a total of 20 could probably be completed. It was anticipated that 20 growers would apply for the project, but WVSU Extension Service received over 70 applications from growers across the entire state. Finally, it was anticipated that 50 people would attend the hops roundtable. For the official hops roundtable the attendance was 40, however Brad Cochran hosted a workshop in Fayetteville that was attended by 10 participants and the Appalachian Food Summit in Berea, KY which was attended by approximately 80 participants. This totals 130 participants that increase their knowledge of hops and/or learned about the Specialty Crop Block Grant funded hops project from WVSU Extension Service.

The successful outcomes of this project include the number of growers participating in the project, the number of participants that have attended workshops and/or conferences with hops as a major topic, and finally the ability of this project to begin networking opportunities with surrounding states and Extension Services working on hops research and application as well. For a project that was anticipating only 20 applications, to receive over 70 and to continue to receive calls with interest indicates a huge opportunity that needs to be pursued further in West Virginia with larger research and demonstration opportunities going forward. By reaching an additional 80 people that anticipated with workshops and roundtables this also indicates the huge amount of interest in hops production in the state and region. From a networking and industry level perspective this project has done wonders for West Virginia and for WVSU Extension Service. Other universities in the area looking at hops production from a research and demonstration perspective are: North Carolina State, Virginia Tech, Virginia State, Penn State and Ohio State, among others. To be mentioned in the same breath as these institutions is incredible, particularly as it relates to the information exchange that is available to assist hop growers.

Performance Measure- Brewer Survey

During year 1 of the project, a survey was developed and sent to each of the commercial breweries in West Virginia at the time, as well as several local homebrewing clubs in the area. From this, a total of 13 brewers responded missing the benchmark of 20 that was anticipated. From these responses, the varieties were selected for the production trials, as well as the use of the other information garnered to begin discussions with other states and regions on how to increase local hops production for use in microbreweries and how this has worked in other states surrounding West Virginia. It was anticipated that 50% of the brewers that participated

in the survey would attend an informational meeting. This was not met, however the informational session did have other homebrewing enthusiasts in attendance, as well as commercial brewers that were not in operation at the time of the original survey. The survey participants have always been open to further discussions, informal surveys, etc. that have opened up opportunities for hop growers in West Virginia to sell their products into the local microbreweries located throughout the state.

Performance Measure- Hops Informational Meeting

The Hops Informational Meeting was held as part of the West Virginia Urban Agriculture Conference in April 2016 and was attended by approximately 40 people (no official sign-in sheets were used as this was a breakout session of the conference). The meeting was set up in a roundtable style and included Charles Bockway (BrilliantStream.com), Josh Clarke (Project Participant and Brewer) and Brad Cochran (WVSU Extension Service), and was also to include Ken Linch (Bridge Brew Works in Fayetteville, WV). The roundtable included short presentations from all panelists, followed by a lengthy Q&A session from participants in regards to hops production, hops usage, the status of the craft beer industry, etc. From the participants of the meeting, there have been two Extension workshops resulting directly from these conversations, as well as at least 3 new growers at a very small production level in the Kanawha Valley. Many of the meeting participants have followed up with additional questions and continue to be interested in the program and the direction in which it is going. The exact number is hard to quantify based upon this meeting, but it is a certainty that the 20% of participants being involved in follow-up questions/surveys and 25% participating in future hops workshops has been met and/or exceeded.

Beneficiaries

The biggest beneficiaries of this project are the hop growers, both beginning and existing, and also the craft breweries in the state and region. From the hop grower's perspective, having applied research based around different varieties can help make decisions from a variety standpoint and having an idea of the production capabilities. For the breweries, having an available, locally-grown crop of hops that can be utilized in their facility can be invaluable, both from a production standpoint and also marketing. If breweries can market their beers as including locally-grown hops it can take advantage of the farm to table movement. The entire number of beneficiaries of the project is unknown, however each of the 35 growers in the project, the numerous potential growers that have called, emailed or generally asked questions about the project, and finally each of the 20 breweries that are open, or will open, by the end of 2016. From an economic standpoint, hops can be very impactful as a crop, but then also from a trickle-down perspective as the hops go into local breweries for sales in the local, state or regional market. Depending on varieties of hops available and other factors, fresh hops can sell for anywhere from \$10-15/lb and pelleted hops go for a high price than that in most instances.

Lessons Learned

There were many lessons learned as a result of this project. First, it is imperative to purchase plant material from a reputable supplier. Unfortunately, the budget, and project, had to be modified after year 1 due to a nearly 100% loss of plant material. The budget was able to be modified to allow for additional purchases, but otherwise this initial mistake could have been detrimental to the project from the very beginning. Additionally, if the grower selection were to happen once more, WVSU Extension Service would probably lower the number of successful applicants to approximately 20 with more plants for each grower. The tracking that is required to get production data from 35 growers is very difficult considering the statewide approach this project took.

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Additional Information





Program Income

WVSU Extension Service had no income as a result of the project. Any growers with saleable production during this project timeline were able to sell their product and reinvest into their hop production.

PROJECT TITLE

Specialty Mushroom Production in West Virginia

Amount Awarded: \$13,500.00

Project Summary

The purpose of this project was to develop demonstration sites for cultivated mushroom production as a way to show potential mushroom growers the process and also the production potential for these crops in West Virginia. Mushrooms provide a huge opportunity for woodland owners interested in diversifying their production to include food crops in these areas. In West Virginia alone, there is an approximately 8 million pound gap between mushrooms being demanded and what is produced. Given the prices that are available for these mushrooms, this would allow for, at a minimum, a \$16 million boost to the agricultural economy of West Virginia. This project took place at the perfect time, as West Virginia agriculture continued to focus on local production being utilized by local restaurants, schools, and other establishments utilizing the Farm to Table movement. By educating landowners on the possibilities of mushroom production, this is yet another opportunity to engage additional growers in producing a crop for local consumption. This project was the first that was funded for mushroom production demonstration and education for West Virginia State University Extension Service.

Project Approach

During the course of the project, there were a total of 9 workshops that took place at various locations around the state and impacted 133 total workshop participants, as well as several indirect contacts from members of the WV National Guard and other visitors to the Welch, WV Urban demonstration location. Additional demonstration sites were located at Fruits of Labor in Rainelle, WV where a total of 17 pounds of mushrooms were produced during the final two reporting periods that were used in the Fruits of Labor Café for both education of drug offenders in the culinary training program and also used for consumption in the café. Other locations had production, but were not able to report on the total production. The site with Fruits of Labor was an extremely small site by commercial production standards, with only 30 logs being inoculated.

During the project, it was realized that a part of the mushroom industry that could have a major economic impact that didn't fall under the specialty crop umbrella, is in the logs that would be inoculated for the cultivated mushroom production. A fair price for these logs is at a minimum \$2 each, but requires a specific species, dimensions, etc. This could be a great opportunity for landowners with forest land to help with cleanup of fallen trees, or in particular, an additional saleable item for loggers in West Virginia which would be additional revenues from wood they would otherwise leave in the forest (i.e. tree tops, smaller trees that fell as a result of large tree felling, etc.) because they are not traditionally a marketable product. For mushroom logs, an adequate sized log is anywhere from 3-6" in diameter and about 3' long, creating a use for tree tops that are too small for even firewood. However, for the purposes of this project these logs

were simply a need for the project and we did not focus on this additional economic opportunity.

Project partners were essential to the completion of the project and also to its sustainability moving forward. Partners such as Fruits of Labor, Inc. in Rainelle, WV, the West Virginia National Guard, WVU Extension Service and others provided opportunities for workshops and education, demonstration sites and general support of the project. The traditional demonstration site with Fruits of Labor was a great way for their group to trial some mushroom production before jumping in to their own commercial production opportunities, while providing additional education for their culinary and agricultural training program. The West Virginia National Guard have been tremendous partners over the course of the last two years of the program. The high tunnel location and “urban” demonstration site is located at the National Guard armory in Welch, WV which was designated as the first agricultural incubator for the Patriot Gardens initiative. The WVU Extension Service partnership included workshop opportunities at both the WV Urban Agriculture Conference, as well as recommendations from the Mountain State Arts and Crafts Fair committee for educational opportunities at the fair.

Goals and Outcomes Achieved

During the course of the project, educational workshops were taught and demonstration sites were developed to increase the awareness and knowledge of mushroom production in West Virginia and the economic opportunities that are associated with these crops. A total of 9 educational workshops took place as part of the project and 5 different demonstration sites, of varying sizes, were developed. The workshops were very hands-on in nature and would allow participants to inoculate their own log and take it home with them to begin their own mushroom production. In general, mushroom production is at a minimum a 1-year project to get your first harvest. Due to this, there is not much to report in the way to commercial production being implemented at this point. Most of the workshop participants were trialing the production process on the 1-2 logs from the workshops before jumping into a commercial production operation. There have been at least 5 growers that have contacted WVSU Extension Service for more information on mushroom production on a commercial scale as a result of the project, but to date there has been no additional commercial production. With that in mind, the project has shown the production potential of traditional, in-the-woods locations to produce a decent amount of mushrooms and with a larger operation could be very lucrative for the producer.

The project originally targeted 125 workshop participants and then at least two demonstration sites (1 urban and 1 traditional site), along with 30 participants beginning commercial production. The project reached a total of 133 total workshop participants, a total of five demonstration sites, and approximately 5 new growers looking at production on varying levels or with plans to expand an existing operation. The demonstration sites were located at Fruits of Labor in Rainelle, WV, KISRA in Dunbar, WV, Agsten Manor Community Garden in Charleston, WV, WV National Guard Armory in Welch, WV and then approximately half of the logs from Welch will soon be placed in the Memorial Tunnel just off the Paint Creek exit off I-77 as an additional trial. Unfortunately for the majority of the educational workshops completion of pre-

and post-workshop surveys were unable to be completed due to the nature of the workshop taking place outdoors in the elements. Moving forward, WVSU Extension will work to develop a better evaluation system to measure knowledge gain even for workshops that are located outdoors and are hands-on based. During one workshop in Welch we were able to capture knowledge gain information. That workshop was attended by 17 people and 91% of the participants indicated an increase in knowledge of mushroom production. The majority of the workshop participants from other workshops indicated that they learned a great deal about mushroom production and looked forward to implementing their inoculated log and also would consider additional logs being inoculated for production.

This project included several successes. First, educating over 130 individuals on the topic of mushroom production is a success in and of itself. This topic is very foreign and “out there” for many individuals in West Virginia. To have over 130 individuals participate in these workshops, many of which were able to inoculate logs to take home to begin production, was an eye opening experience to see the interest. Secondly, the demonstration site with Fruits of Labor, which was the first demonstration site implemented, has produced nearly 17 pounds of mushrooms over the course of the last two growing seasons on only 30 logs which were inoculated. In the retail market this would be worth approximately \$200 in potential sales, with the cost of inoculation for that project being just under \$40 total. This would indicate an impressive profit margin potential to woodland owners interested in cultivated mushroom production. Finally, at least two growers are in the process of implementing, or have already done so, a commercial size mushroom production operation. These are located in Greenbrier and McDowell County which are areas of needed agricultural expansion into a crop like mushrooms.

Beneficiaries

In addition to the program partners that are listed above, program beneficiaries would include woodland owners in West Virginia who will look to implement mushroom production in the coming years due to the workshops that were provided or the workshops that will take place moving forward exterior to this grant project. Additional beneficiaries of the program, particularly as these commercial operations get up and running, would be local restaurants, farmers markets, and other retail and/or wholesale outlets for the mushrooms that are produced. It is unknown what the number of beneficiaries for this project would be above and beyond the 133 participants that were served directly. Given that the state of West Virginia is over 70% forested additional beneficiaries could be in the thousands of West Virginians. The potential economic impact of this project and in cultivated mushroom production is enormous. Over 300 logs were inoculated as part of this project. Keeping with the conservative production numbers found at Fruits of Labor where approximately 17lbs of production took place on 30 logs over 20 years, the production totals of just these 300 logs would be 171 pounds, worth approximately \$2,000 in retail sales. The total economic opportunity for mushroom production in West Virginia is well over \$15 million in potential sales.

Lessons Learned

The project offered several lessons for project staff members, particularly from an administrative perspective on projects such as these. Rather than trying to hire students from WVSU on these projects we are better served writing in AmeriCorps VISTAs who have the ability to assist with community support, additional supportive funding, and generally the administrative and behind the scenes items that take place in these projects. During the timeline of this project there have been several things taking place from a staffing perspective which often times left this project on the back burner due to staff commitments in other places, particularly as the PI was required to focus on many other projects at the same time. Otherwise, this project went as expected from an outcome perspective and all of the goals and objectives of the project were achieved with the exception of the increased number of commercial growers. This is simply due to the nature of our growers and wanting to feel comfortable with the growing practices of the mushrooms before jumping in with the investment of a commercial operation.

Contact Person

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Additional Information





Program Income

The project did not have any program income as a result of the demonstration projects. The mushrooms produced in the Fruits of Labor demonstration site were used for additional culinary training and then utilized for consumption in soups and other dishes.

PROJECT TITLE

Framework for Food Security and Economic Development in the Mid-Ohio Valley through a Locally Grown Food System

Amount Awarded: \$14,629.50

Project Summary

The project addressed the lack of locally grown foods in the Mid-Ohio Valley region of West Virginia's schools, restaurants, institutions, and retail outlets by developing infrastructure and nurturing local fruit and vegetable producers through education and shared learning to provide marketing opportunities primarily in the Mid-Ohio Valley region of West Virginia.

It also developed a framework for food security and economic development in rural Appalachian communities, demonstrating a way to be less dependent on imported produce and economic opportunities. This project enabled fruit and vegetable producers to create economies of scale to capture more food dollars in the region. Specifically, this project provided a website with administrative support that organized the purchasing of local food, portable storage units to distribute local specialty crops, and built on a previous branding campaign, known as "MOVE" (Mid-Ohio Valley Edibles), with branded packaging materials and vehicle logos for the Mid-Ohio Valley Growers Association to promote their specialty crop offerings to customers.

This project was a continuation of a previous specialty crop grant that helped to establish the growers association and create awareness of the importance of eating local among rural and urban residents throughout the Mid-Ohio Valley Region of West Virginia.

Project Approach

A website name and domain was purchased for the Mid-Ohio Valley Edibles brand and regional specialty crop growers. A laptop computer to track sales from MOVE producers was acquired. The Mid-Ohio Valley Growers Association (MOVGA) developed a job description and hired a part-time coordinator. Specialty crop producers were recruited and trained to list products on the www.movedibles.com website for marketing. The coordinator of the growers association coordinated the sale of produce to regional schools, institutions, restaurants and individuals. Vehicle magnets were purchased for the delivery vehicle. Training was provided to new growers on an as needed basis. Weekly emails were sent throughout the growing season to assess consumer demand and provide for customer needs. Invoicing and producer payments were processed by the part-time coordinator and volunteer board members. Pick tickets were also sent weekly for institutional sales and deliveries for producers to deliver product to established aggregation points. Producer product labels and packaging were purchased and distributed to growers to maintain food safety and traceability standards. Annual producers meetings and production planning meetings were conducted in 2015 and 2016 by MOVGA's board of directors. Distribution schedules for aggregated specialty crops were developed and executed

and the website has been maintained and updated by producers throughout the growing season.

Non-eligible specialty crops items such as meats and eggs that were marketed in conjunction with this project were funded with membership fees and a percentage of their sales were used to pay for their associated marketing expenses separately. Each non-specialty crop item marketed was assessed an additional 10% charge and producers of these items were charged a differentiated membership fee.

The paid part-time coordinator worked to develop new customers, recruit new producers, and coordinate producer aggregation and distribution of specialty crops. The West Virginia University Extension Service (WVU-ES) in Roane County contributed to this project by providing office space and equipment use for the part-time coordinator, training for production planning, pricing, and scaling up production, as well as the recruitment of new growers. The WVU-ES also provided printing for invoicing and product labels and associated product tracking materials. The MOVGA volunteer board of directors assisted the coordinator in aggregating the specialty crops and delivery of the produce to customers and provided administrative support for the website, package purchasing, and invoicing and producer payments.

Goals and Outcomes Achieved

The goal of this project was to increase the profitability of specialty crop producers in the Mid-Ohio Valley of West Virginia utilizing the Mid Ohio Valley Edibles website by 25% over 20 months in this project. The existing benchmark was determined through web-based software at \$24,354. Internet sales of locally grown specialty crops increased by \$40,000 as a result of this project. The goal of a 25% increase in sales was exceeded, as the project yielded an increase of 37.8% increase in specialty crop sales for the project's duration. Sales commission and additional funding partnerships have allowed MOVGA to continue to employ a part-time coordinator and acquire additional office space. MOVGA continues to attract new memberships of specialty crop growers and customers seeking to purchase quality locally grown products.

Beneficiaries

There are 30 farm families in the Mid Ohio Valley Region of West Virginia who have benefited from this project by increasing their sales of specialty crops. Five county school systems serving over 7,000 students have benefited from this project by having a regional source for locally grown specialty crops to purchase and serve their clients. Three senior centers and one local food pantry have benefitted from this project by having a regional source for locally grown specialty crops to purchase and serve their students and staff. Twelve retail stores and restaurants have benefited from this project by having a regional source for locally grown specialty crops to purchase and serve their customers. Five rural communities have benefited from the recirculation of dollars spent locally within those communities to support local farmers and other local businesses. MOVGA has benefited from this project by strengthen its membership's production knowledge, training materials, and marketing outreach. West

Virginia University Extension in Roane County has benefitted from this project by establishing continual relationships with 18 existing clients and 12 new contacts.

Lessons Learned

This project was a huge undertaking for a volunteer organization and a part-time paid coordinator. The partnership with the West Virginia University Extension Service in Roane County was invaluable. As the project developed, MOVGA was able to establish partnerships with other organization like the Value Chain Cluster that allowed us to utilize consultants to provide business structure and marketing guidance and support to our efforts. Local foods work requires passionate people and attracts passionate people, but we learned to identify specific needs to address and recruit people to meet those needs. It was imperative that as an organization, MOVGA found ways to compensate our board members for their extra efforts to ensure completion of the project, as there was not enough funds budgeted to pay a coordinator for the time needed to met our project goal. We had three different part-time coordinators throughout the duration of this project for various reasons, without our board members and project partners; we could not have accomplished our goals. It is vital that the producers support the work that coordinator does to assist them in marketing their products. Detailed timesheets and delivery logs allowed us ensure that specialty crop grant funds were used solely to increase the competitiveness of specialty crops and other funds were utilize to support marketing of non-specialty crop products. We set up deliver fees for our customers, used technical support funds, and sales commissions to offset our expenses. A continual review of procedures, funding streams, and value-based partnerships is needed to maintain and continue a project like this.

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Program Income

All sales commission, association membership fees, and delivery fees generated during this project was used to compensate the part-time coordinator, pay delivery expenses, and pay for website support, and accounting services associated with marketing specialty crops for this project.

PROJECT TITLE

Black's Brainy Botanist

Amount Awarded: \$8,100.00

Project Summary

Putnam County Master Gardener's presented a win-win collaborative project to schools in the county that would spark student's interest in agriculture and science. Science is a weakness throughout the state (determined by test scores) and while we were interested, we did not immediately jump on-board. When we saw the results of the success of GW Elementary's program, we began to set in motion how we would proceed with ours. The Specialty Crop Block Grant Program opportunity was the answer to our adventure. We received \$8100.00 from the grant which allowed us to get started and provided funding that stretched over the almost 3 year period.

Unfortunately, the State of West Virginia is the leading state whose population has been deemed 'obese'. West Teays wants to change that mentality for our school and community by developing and stimulating student interest in growing and eating healthy, fresh vegetables. We have 'taste' tests during lunch for students to try samples of food prepared with produce from the garden. This has inspired the children to try foods they have never tasted before!

Our grant was not a continuation of an existing crop project, but the funding we received resulted in the initial stages of the project. We were able to build a high tunnel with 12 beds, purchase soil, and begin the adventure of planting and harvesting with help from our local Master Gardener's organization.

Project Approach

Our initial step was to meet with our local Master Gardeners. They were the ones that would help guide our mission. Upon meeting with them and securing their support, we investigated the type of high tunnel we wanted to purchase and met with their salesperson. The land where we hoped to build the high tunnel was examined and adjusted to accommodate the lay of the land. One of the Master Gardener's husband donated the equipment and labor we needed to level the land. We then met with a high tunnel contractor to discuss the time elements of erecting the building. He suggested finding several parents to donate their time for this project. Parents, students and other community members helped build the beds inside the tunnel and fill them with soil. The tunnel was ready for planting in late February.

Unfortunately, due to the large number of students at our school, only ½ of the students can use the high tunnel during the spring and the other ½ in the fall. This is the biggest obstacle we have is continuity of the program. While we have discussed at length the need for installation of an additional beds, the county Extension Agent has advised against it at this time. Classrooms across the county are able to use the tunnel for both growing seasons and it makes a difference in student's interest level. We are still trying to find the balance between too much

or not enough of vegetables. If we are demonstrating taste between fresh and cooked vegetables, we need quite a bit of the vegetable to feed 540 students.

We have donated a large quantity of food grown in the high tunnel. Community food banks and nursing homes have appreciated the fresh produce they can provide to their patrons. Of course, having school grown vegetables on our salad bar is quite a treat as students will more likely try things they have planted and nurtured to ripeness. We have held 'tasting' samples for students to try different foods such as bok choy salad, butternut squash soup and kale chips.

Our project consisted only of eligible specialty crops.

The local Master Gardeners have played a major role in implementing the garden project at West Teays. Without their support, we honestly couldn't have continued with our plans. They have partnered with PC Schools, parents, staff and students to create a garden at WTE. While some of us 'knew' about gardening, no one felt comfortable enough to take on this large task. Also, time is a huge variable as well.

Chuck Talbot, WVU Extension agent, has been the brains behind the whole movement of high tunnels in Putnam County. He has led several professional development courses training the teachers on a variety of subjects including proper sanitary conditions in the tunnel, documentation of harvest, and lesson plans that go with the growing/harvesting of plants.

Goals and Outcomes Achieved

Land for the high tunnel was leveled and a fence was built to surround it. Soon after our high tunnel was built. The school held a night for raised beds to be built by students and parents. These were filled with soil and coconut fiber donated by Gritts' Farms. Master Gardener's and teachers taught lessons to the students before they began the planting season. Fourth and fifth graders used math to string grids to the beds. Students planted seeds and watered the vegetables on a rotating cycle. Students harvested crops when they were full grown. The crops were washed and 'tasted tested' by students, taken to the kitchen for salad bar, or donated to a non-profit organization.

While each seasonal harvest is short term, the long term goal is to allow students the opportunity to experience the planting cycle as well as the benefits of eating fresh vegetables grown by their own hands. Building the high tunnel, completion of raised beds, collaboration between Master Gardeners, Putnam County Schools, parents, staff and students is our long term goal.

The inclusion of STEAM activities was one our primary goals for our students. Our math scores on the annual state assessment have risen steadily since the implementation of the garden. In fact, West Teays scored 21st out of all the elementary schools in the state.

This school year we have harvested 68 lbs of produce that includes: tomatoes, kale, carrots, bok choy, radishes, pie pumpkins and butternut squash. These numbers are just since August! While we do like to sell large quantities to the kitchen, we also like our students to taste test the vegetables during lunchtime.

The State of West Virginia underwent a significant change during the 2015 academic year relating to standardized student assessments. The WEST TEST is no longer administered in WV schools and an alternative testing protocol is in place. Fortunately, this allowed for baseline data in 2015 and additional comparison numbers in 2016.

In math, students at West Teays Elementary scored 65% proficiency on the Smarter Balance Assessment (compared to a 36% statewide mastery) and improved to an average of 66.54% (compared to a statewide average of 41% mastery) in grades 3, 4 and 5. In 2016, baseline data in the Science curriculum was established with the school (grade 4 only) scoring 51.94% compared to a state baseline of 32%. Qualitative feedback from teachers indicate that the garden project and its emphasis on core math concepts testing was a practical application providing students with problem solving tools that transferred into testing excellence.

Although similar numbers were not obtained when measuring increased consumption, the survey tool and “Cardiac Kids” emphasis on education provided challenges when trying to correlate the changes in behavior. Based on increased student, staff and parent interest in the project as well as the support received when challenges occurred in the project, there was a significant investment by the community in growing food for consumption.

Beneficiaries

While providing our school with fresh vegetables to use daily on our lunch salad bar was a key motivation, West Teays students and staff also have a very keen interest in helping our community. The first year staff voted to continue the garden throughout the summer. Everyone took turns watering and harvesting. We donated over 300 lbs. of tomatoes to our local food pantry. We are proud to state this statistic. This past summer fresh vegetables were donated to a nursing home. Of course, our greatest beneficiary are our students. For example, knowing that they grew the lettuce or tomatoes on the salad bar made students more apt to try what they have grown. We have worked with the MGs to cook many different kinds of vegetables into ‘taste-testing’ recipes for students to sample during lunch. We want our students to taste as many new foods as they are willing to try.

The number of beneficiaries that have benefitted from our project have expanded to over one thousand. Each time we see a child’s face light up by harvesting a head of broccoli, peas or radishes is a win-win situation. For a child to eat something they haven’t tried before is one of our goals and we have exceeded our expectations in this area. For West Teays Elementary to be able to donate a large portion of food to enable economically disadvantaged families to cook with fresh vegetables is a service project that goes hand-in-hand with our 7 Habits initiative which is to serve others.

Lessons Learned

Feral cats were overtaking the property adjacent to the school. During the second school year of operation, the WVU Extension Service tested the soil. We found that it had been contaminated by feces. This was a huge problem as we were selling the food to the cafeteria. In order to begin to solve the problem, we met with all stake-holders involved and came up

with a plan. We had to cover the beds for several months, so they were not available for use. To continue our planting season, we planted flower seeds into individual pots and used them for Mother's Day gifts. This provided the children opportunity to give their mothers something they had planted and grown.

Another costly expense we found was filling the raised beds with soil. That was approximately \$1500 and after the 2nd year we had to replenish the beds for another \$1200.00.

Finding the right quantity of produce that will achieve results in the cafeteria has been a concern. We normally feed between 250-400 students daily. If we are 'taste testing', it takes a lot of produce needed for recipes.

Contact Person

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Program Income

N/A





PROJECT TITLE

Incorporating Fresh from the Farm Products into West Virginia Schools

Amount Awarded: \$9,000.00

Project Summary

According to data provided by the WVDE Office of Child Nutrition, during the 2012-2013 school year, over half of West Virginia county school systems purchased local products from WV farms. While this was a huge growth in local purchases, it also became evident that there was a need for more assistance in helping school cooks incorporate local products.

The major changes in the USDA school meal pattern set the stage for introducing more nutrient dense vegetables into school menus. These requirements increased the demand for vegetables such as romaine lettuce, kale, broccoli, sweet peppers, tomatoes, sweet potatoes, butternut squash and carrots. The New Appalachia Farm and Research Center viewed the new requirements as an opportunity to explore ways to help schools include more local products through minimal processing.

This project was not a continuation of a previous specialty crop project.

Project Approach

The project focused on working with local high schools to explore ways to increase the availability of local produce in school menus. The approach involved working with local farmers to encourage growing for schools. Additionally, the project helped to identify products that could be easily introduced to the menus with minimal processing.

Initially, the project was targeting two high schools, one in Upshur County and one in Tucker County. Due to personnel changes, the focus school was in Tucker County working with the Agricultural Education Instructor, Terry Hauser, the Pro-Start Instructor, Brian Covell and Vice Principal, J.R. Helmick. The activities involved students of both the Agricultural Education and Pro-Start classes. The Ag students worked closely with Mr. Hauser who provided technical assistance and guidance on how to grow products in the school greenhouse. The Pro-Start class, which involves introductory culinary instruction, was responsible for minimal processing of the local produce. Chef Covell and Mr. Hauser worked closely with the school cafeteria staff to determine the best products to provide.

The project identified produce at the beginning of the project to make sure only specialty crops were used.

The role of the Tucker County High School administration and instructors were critical, as well as the cafeteria staff at that school. Without their cooperation and energy to overcome any bumps in the road, this project would not have been successful.

Goals and Outcomes Achieved

With this project, the incorporation of local produce has advanced from an occasional event to an everyday practice. The number of farmers selling to the school during this project increased

by 7 of which 5 of those are young student farmers. The Pro-Start class was involved in processing over 12 different vegetable and fruits. During the 2014-15 school year over 50 bushels of produce was processed and incorporated into school menus.

While initially focused on the high school, the cafeteria staff in 2 other Tucker County schools have benefitted from the local food movement. Cooks have done a wonderful job of experimenting and conducting taste tests with students.

When the project started, only 2 farmers were selling produce to the schools. The number of farmers increased to 9 as of the end of the 2015 school year. We are hopeful that this number will continue to grow. To accomplish the processing, the High School's Pro-Start kitchen was State inspected and certified. Additionally, students involved in processing were Serve-Save certified. With the stellar cooperation between Agricultural Education, Pro-Start and the Cafeteria staff, at least 6 recipes were developed to include the produce grown.

Beneficiaries

Perhaps one of the most valuable benefits of the Tucker County project is serving as a model for others and being showcased across West Virginia and beyond. The project has been a featured workshop at the annual WV Small Farm conference which is attended by over 600 people. At the 2014 Conference, students processed and Cryovaced green beans. During the 2015 Conference, all the fresh peaches used in the dessert were processed and Cryovaced by the Tucker County students.

In addition to sharing this initiative at the WV FFA statewide gathering, the Tucker County students, instructors and administrators were asked to share this model at a National FFA Conference in Illinois as an example of the possibilities for other programs in the nation. Tucker County High Vice-Principal, J.R. Helmick was also a featured presenter at the 2015 Farm to School Mid-Atlantic Conference in Rockville, Maryland. Participants attended from throughout the Mid-Atlantic including Virginia, New Jersey, Washington D.C., Delaware, Maryland and Pennsylvania, as well as West Virginia.

Lessons Learned

The leadership team is a critical part of success. The staff at Tucker County High School was incredible and made this project the success that it turned out to be. Keeping communication open was important. Also, the strength of students can't be underestimated. Both the Agricultural and the Pro-Start programs, these students were the driving force behind this effort and didn't stop providing energy and resources. Often overlooked, the school cafeteria staff can make or break introduction of new ways of doing something on the menu. They need to be involved from the very beginning of the project.

In addition to accomplishing the intent of the project, several complimentary developments occurred during the term of project. The students helped to construct a high tunnel on the school property to extend the production opportunities beyond the greenhouse. The school

purchased a tractor to be used by students on their farms and leased an acre of land to provide space for 3 students who did not have land to use for production. Over 60 students were Serve Safe certified to work with the products that were delivered to the school and processed for the recipes used in the school cafeteria.

While there was a change in the program due to the inability to include Upshur County in the project, the Tucker County High School staff and students were able to carry out the project objectives. One of the developments that occurred during this project was the Tucker County Pro-Start instructor took a similar position in another county. He transferred the processing program to his new location and the project was expanded to Monongalia Career and Technical Center.

Contact Person

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Program Income

No program income.

PROJECT TITLE

Bramwell Farmer's Market Healthy Eating Initiative

Amount Awarded: \$3,600.00 (Expended: \$712.85)

PROJECT SUMMARY

The goal of the project was to create a local Farmers' Market in Bramwell, WV where vendors sell fresh, healthy locally grown specialty crops. This would improve the health and quality of life for residents of Mercer & McDowell Counties. Healthy eating classes, food preparation classes and canning and freezing classes would help with the overall goal of the project. In addition this would help the area economically by giving local farmers a place to sell their crops and foods. Our partners in this project were National Coal Heritage Area, WV Farmers 'Market Association and the Town Of Bramwell.

This was a new Specialty Crop Block Grant Program project.

PROJECT APPROACH

We began June of 2014 recruiting and advertising for our farmers market. 2014 we had 3-5 vendors each week and 10-15 customers each week. We held healthy eating, food preparation and preserving classes once a week we had on the average of 5-8 people attend. 2015 we had 1-3 vendors each week and 8-10 customers each week. We held healthy eating, food preparation and preserving classes once a week we had on the average of 4-5 people attend. Our project partners help us with training and advice on running our farmers market. This is our 3rd year in running the farmers market and has not been successful in increasing our vendors, customer and class attendees.

We collected sales information from all of our vendors and they reported specifically on specialty crops.

GOALS AND OUTCOMES ACHIEVED

This is our 3rd year in running the farmers market and has not been successful in increasing our vendors, customer and class attendees. Our goals were not achieved, we had a decrease in attendance each year.

We were expecting a 20% increase each year and had an 8-10% decrease each year of the project.

We did attend the Small Farms Conference all years we within the project period. We did not create the 10,000 recipe cards, as we saw a small turn out to our cooking classes and farmers market which did not justify the expenditure.

BENEFICIARIES

The beneficiaries were local residents that did not have access to local grown and fresh specialty crops.

McDowell & Mercer counties have a large number of low income residents that lack locally grown foods.

We were hoping to increase 20% in “specialty crops” by our farmers market vendors. We had a small group of vendors and did increase growing “specialty crops” by our vendors by 15-17%. This increase sales as reported on our monthly reports.

LESSONS LEARNED

Lessons learned were it is hard to change the mind set of people that are accustomed to buying their foods and produce pre-packaged and pre-made. It was hard to get the community involved. Larger farmers markets in nearby larger communities were keep vendors from our market.

CONTACT PERSON

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ADDITIONAL INFORMATION





PROJECT TITLE

Tamarack Farmers Market

Amount Awarded: \$4,500.00

PROJECT SUMMARY

The Tamarack Farmers Market provided local specialty crop producers (corn, potatoes, sweet peppers, tomatoes, cucumbers, kale, cabbage, etc.) with a venue that extends their market to the traveling public and increases their sales significantly beyond their regular customer base. The *Tamarack Farmers Market* focused on the development and expansion of providing an upscale location which features specialty crop foods and value added specialty crops. Tamarack worked to promote strong local support as a base and develop a more extensive interest from travelers.

The project was important and timely due to the growing awareness of the general public that fresh local produce and specialty crops are an asset to the community as well as a healthy alternative to imported products. Tamarack wanted to capitalize on the movement for the local growers and give our traveling public something new to consider.

PROJECT APPROACH

The project provided an opportunity to highlight products and producers as well as making key farmer/grower/food connections. An additional goal of the project was to expand economic opportunities for specialty crop producers which, we achieved and resulted in expansion of their overall crops produced. In the three years the market sales were significant for the area.

Tamarack Market was the only one open on Sunday and was a stop for those travelers heading south. Project partners included:

- West Virginia Department of Agriculture (provided grants).
- Stonewall Marketing Group (design of collateral materials).
- WCIR (aired marketing ads).
- WTNJ (aired marketing ads).
- WAXS (aired marketing ads).
- Beckley Newspapers (ran ads in daily newspaper and local TV guide).

A management change at the facility and difficulty recruiting new vendors to replace those who had given up the market have caused this project to close prior to the end of the grant cycle resulting in a remaining balance.

GOALS AND OUTCOMES ACHIEVED

- Actively recruited specialty crop producers that have sold produce at other markets.
- Developed signage for the Tamarack Farmer's Market and worked with news local and state media outlets and printed materials to promote the market locally.
- Promoted the farmer's market on Tamarack's website, Facebook, and other social media outlets.
- Included a section in the Tamarack Newsletter highlighting the market each month.
- Purchased thirty second radio ads with three local radio stations that aired during local programming.
- Purchased ads in local newspapers and local TV guides.
- Created tri-fold handout promoting market and a different vendor each month.
- Year two exceeded year one's goals significantly and year three's goal was not met because of poor weather at the beginning of the growing season.
- Tamarack actively recruited specialty crop producers that have sold produce at other markets. Signage was developed for the Tamarack Farmer's Market and worked with news local and state media outlets and printed materials to promote the market locally. Year two exceeded year one's goals significantly and year three's goal was not met because of poor weather at the beginning of the growing season.
- There was a decrease in sales for 2014.
- Informational pieces such as handouts each month promoting vendors, promoting benefits of each healthy and promoting certain vegetables. These were created by Tamarack's ad agency and Tamarack Artisan Services Department used in 2013 and 2014.
- Tamarack collected daily sales reports after each market on Sundays.

The farmer's market was actively promoted on Tamarack's website, facebook, Tamarack's Monthly Newsletter and other social media outlets. Thirty-second radio ads were purchased with three local radio stations that aired during local programming. Tamarack also purchased ads in local newspapers and local TV guides. Tamarack's ad agency created a tri-fold handout promoting market and a different vendor each month.

Monthly handouts were completed and distributed by the vendors. (Images below); developed handouts to educate the public about the nutritional benefits of consuming specialty food crops will encourage more support for crop producers and the support of local economies. These were created by Tamarack's ad agency and Tamarack Artisan Services Department used in 2013 and 2014. These were distributed within the Tamarack facility and available to an average weekly visitorship of over 900 people.

In order to expand the Tamarack Farmer's Market and increase sales for specialty crop producers an implementing effective marketing schedule through radio, periodicals, and newspapers. To educate customers of the benefits of consuming specialty crops. This goal was met in 2012 but went down in 2013 and 2014.

Attendance and sales were evaluated through vendor reports and surveys of farmer's market customers at the end of each day. Reports were compared from year to year to evaluate vendor sales and customer growth. Customer growth and vendor sales both went down after the highest benchmark was set in 2012.

The goal of having an increase in vendor participation from 2013 to 2014 was not met. There was a decrease of vendors for 2014 because of sickness of vendors, too much rain, not enough crops to attend and over saturation of available farmers markets in the area (Fayette and Raleigh County). Average vendor participation dwindled to 3 or less vendors on market days making it unfeasible to continue the market.

BENEFICIARIES

Local Farmers and Specialty Food Producers were benefited by expanding their market to Tamarack's traveling public along with expanding their reach to new customers not seen in markets they set up at earlier held in the week. Local customers were given the benefit of receiving another outlet to buy fresh and healthy produce. Customers traveling north and south during the summer and fall months on their way to their vacation stop, also benefited from an outlet to buy fresh produce such as a variety of apples, cucumbers and tomatoes that could be eaten on their way. With an average visitorship of 500,000 people per year, approximately 1 million visitors were able to see and purchase local specialty crops at the Tamarack Farmers Market.

During the three years the market was in operation all sales went to the vendors in the amount of approximately \$10,000. Tamarack benefited from the locals coming in to buy produce who decided to venture inside. Additional sales were made in the value added specialty crop section of the indoor market, however, numbers and impact are not available.

Participating vendors were offered the opportunity to sell their products wholesale and participate in other non-Saturday markets as a result of their exposure at the Tamarack Market. Unfortunately, several opted to attend new and more local markets in their communities.

LESSONS LEARNED

- Tamarack learned this type of project is very beneficial overall. It promotes connections between producers and local residents. It promoted healthy eating habits for the participants.
- Staff learned these kinds of projects should be taken seriously and promoted that way to receive all potential. Tamarack had significant success in its second year, but without vendors participation it's almost impossible to maintain that success.
- A significant amount of vendors need to be attracted to the project and be consistent with attendance in order for this type to success year after year.

- Due to several issues that would affect any market, vendors have to contend with bad weather, poor crop turnouts, and poor customer participation.
- This project had to stipulations that impacted the success in the long run: 1). Only accepting vendors from a 50 mile radius and 2). Only produce grown within that 50 mile radius could be sold.

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ADDITIONAL INFORMATION





Program Income

No program income.

PROJECT TITLE

Novel Approaches to Nematode Management in Peach and Apple

Amount Awarded: \$10,800.00

Project Summary

The project addresses the need to manage plant-parasitic nematodes in tree fruit production in Mid-Atlantic orchards. Of particular importance in West Virginia is the stem pitting disease in peach induced by tomato ringspot virus (TMRSV). TMRSV is transmitted by the dagger nematode, *Xiphinema americanum*, and causes production of disorganized conductive tissue in tree roots and stems, leading to stunting and eventual death of trees. Young trees may become infected well before they have begun production, and die within two to four years. A similar disease, Union Necrosis and Decline, is found when the dagger nematode transmits TMRSV to apple.

Other nematode pests in West Virginia include the Root Lesion nematode, *Pratylenchus* spp., and Root Knot nematode, *Meloidogyne* spp. The loss of conventional nematicides registered on bearing tree fruits has meant that growers diagnosed with nematode problems now have few options for managing this problem, leading to on-going problems with declining trees and premature tree mortality. Growers are currently using suppressive rotation crops PRIOR to planting, but no good management options are available for ESTABLISHED orchards.

Recently, new biological control materials and nematicides have become commercialized, however, little information has been available to determine their effectiveness for managing nematodes in peach and apple orchards. This project seeks to evaluate their efficacy against the dominant nematode problems in West Virginia orchards, and to expand monitoring of plant parasitic nematodes in order to provide improved nematode management recommendations for apple and peach growers with nematode problems.

This project was new.

Project Approach

Objective 1. Evaluate new nematode biocontrol materials.

Two nematicide trials established in 2014 were continued in 2015, one in an existing peach orchard at the Kearneysville Tree Fruit Research and Education Center (KFTREC) in Jefferson County, WV and the other in a commercial orchard in Hampshire County, WV.

The KFTREC orchard is in a block of 12-year-old peach, cv. Bounty. Plots will consist of three-tree blocks, with the center tree used for data collection. Alternate rows adjacent to foliar sprays were left untreated to serve as buffer strips between treatments in order to minimize drift. Three replicates of each of the following treatments were established on May 8, 2014, with treatments repeated May 13, 2015:

- 1) Untreated control,
- 2) Ditera DF (100 lb/A),
- 3) Ecozin-Sp (Spring applications only, 30 oz/A repeated at 14-day intervals),
- 4) Ecozin-Sp&F (Spring and Fall applications, Fall applications were on Oct. 7 and Nov. 4, 2014. No materials were applied in Fall 2015),
- 5) Movento foliar spray (9 oz/A applied with air blast sprayer), and
- 6) Nema-Q. (3 Gal/A).

Each product was applied at the maximum label rate as either a soil-applied spray, or foliar spray as per label recommendations. Soil applied materials were incorporated via sprinkler irrigation. Densities of *Xiphinema*, other plant-parasitic nematodes, and free-living nematodes (those not feeding on plants) were determined in all treatments by taking eight random soil cores (2.5 cm-dia. X 30-cm-depth) from the drip line of the center tree prior to the initial application in spring, 2014, at 30 days post-application, and early autumn. Trunk diameter measurements and nematode sampling were repeated in May 13, July 28, Nov. 3, 2015, and June 29, 2016. Tree response to treatment was measured by measuring trunk diameter, and disease incidence. Peach yield data were collected by harvesting all fruits on the center tree in each plot on Aug. 3, 2015. Final nematode collections and growth measurements to assess response to these nematicides were conducted June 29, 2016.

The Hampshire County site is in a block of 5-year-old peach cv. Contender on Bailey rootstock. This site was identified by the grower as having severe problems with nematodes, and symptoms of Peach Stem Pitting Disease were observed on some trees. Plots consisted of 12 trees each, and three replicates each were treated as above on May 14, 2014 with 1) Ecozin (Spring only), 2) Nema-Q, 3) DiTera, or 4) Untreated. Treatments were repeated on May 16, 2015. Trunk circumference was measured on all trees before treatment and on Oct. 7, 2014. Trunk measurements in 2015 were on May 16, Aug. 3, and Nov. 7. Soil samples were collected to determine nematode population density pretreatment, on May 8, June 19 and Oct. 7, 2014 and May 13, July 28, and Nov. 7, 2015 at KFTREC, and on May 14 and Oct. 7, 2014, and on May 16, Aug. 3, and Nov. 7, 2015 at Hampshire County. Final nematode collections and growth measurements to assess response to these nematicides were conducted June 29, 2016.

A third trial was established at a commercial orchard in Jefferson County in 2014, and repeated in 2015. Ecozin was applied in spring of each year at labeled rates to two rows of Loring peach, with untreated rows between. Nematode samples were collected June 23, 2014, March 17 and November 11, 2015. No statistically significant differences occurred between treatment and control, and dagger nematode population densities increased over this time period, although more slowly in treated plots than controls.

Results:

Xiphinema rivesi was the dominant dagger nematode at the Kearneysville site whereas the Hampshire County site was dominated by *Xiphinema americanum*. No significant differences among nematode populations were observed, nor did tree growth or survival differ

significantly among nematicide treatments. The sprayer irrigation and reliance on natural rainfall may have been insufficient for adequate incorporation of these products. Due to severe freezes and resultant crop losses, yield data were available only in 2015, however, no treatment differed significantly from tap water controls. Tree growth and survival was also not reduced by any treatment, compared to controls. None of the nematicidal materials provided significant benefits, and nematode management will need to continue to rely on cultural controls.

Due to the lack of observed response, additional work was undertaken to evaluate a novel biocontrol bacterium, *Bacillus firmus*. *B. firmus* has been commercialized in Europe for managing root knot nematode, and is available in the US from Bayer Crop Science in two formulations. First sold as Bio-Nem it has also been used as a seed treatment (Votivo) and as a soil drench, however, neither is registered for use on perennial fruit trees. Laboratory and greenhouse trials were conducted to assess whether *B. firmus* (actually, a mixture of *B. firmus* and *B. cereus*) has potential for managing nematodes important in the Mid-Atlantic tree fruit industry.

Laboratory trials assessed efficacy and mode of action of *B. firmus* and *B. cereus* against *Meloidogyne hapla* and *Xiphinema americanum*. Early research suggests these bacteria produce nematicidal secondary metabolites, while later work implicated induced resistance in the host. *B. cereus* and *B. firmus* were isolated and pure cultures of each were used to evaluate nematode survival when incubated in solutions of the bacteria, as well as to assess nematode attraction to roots, infection and reproduction. The bacteria provided similar results and were only weakly toxic to nematodes, but induced repulsion of *M. hapla* in vitro and in sand cultures with tomato. Lower levels of root infection were observed in vitro and in sand cultures when *B. cereus* was applied to roots (*B. firmus* was not tested in the latter trial), however egg production per female was not affected. Results suggest that some activity against root knot nematode however, results against *Xiphinema* spp. were inconsistent and not statistically significant, with some evidence that *B. cereus* actually attracted *Xiphinema*. We conclude that *Bacillus* has potential to repel root knot nematodes, but is not likely to be effective against dagger nematodes.

Objective 2. Improve nematode management recommendations to growers.

Grower visits to five sites identified three growers with potential nematode problems. Soil samples were collected for nematode assays from 9 blocks in Jefferson County, and 6 blocks in Hampshire County. Nematode assays were conducted at the WVU Nematode Diagnostic Lab and significant populations of dagger nematode were identified in 13 of 15 samples.

Results:

Due to the lack of response to the tested nematicides, and the lack of commercially available alternatives, nematode management plans must continue to rely on crop rotations with suppressive rotation crops PRIOR to planting. Effective management options are not available for ESTABLISHED orchards. As a result, relatively few growers are currently monitoring

nematode populations in established orchards, as there are so few options to implement, even if they did identify a problem.

A revision to the Nematicide recommendation for the 2015 VA-WV-MD Spray Bulletin for Commercial Tree Fruit Growers was submitted to provide growers with updated recommendations on use of these and other materials.

- a. Non-eligible specialty crops were not included in this work. All work was completed on eligible crops.
- b. Contribution of project partners

Growers involved in this project provided land in established orchards, maintained peach trees (including pruning, pesticide application), and harvesting, and assisted with nematode sampling. Some growers also assisted with nematicide application for the tested materials. Technical assistance and sprayer application equipment were also provided by the WVU Kearneysville Fruit Tree Research and Education Center. A research-grade formulation of *Bacillus firmus* was supplied by Bayer Crop Science.

Goals and Outcomes Achieved

- a. Activities and outcomes

Nematode population dynamics and peach tree survival were assessed after application of four novel nematicides registered on peach. None of these products produced any measurable benefit, therefore we do not recommend their use under West Virginia conditions.

Growers are advised to continue to emphasize use of nematode-suppressive rotation crops prior to planting, especially on sites known to be infested with dagger nematodes, *Xiphinema* spp.

Bacillus firmus (and *Bacillus cereus*) show promise for managing root knot nematode (*Meloidogyne* spp.), but do not appear to have similar activity against dagger nematodes.

Growers with nematode problems or Peach Stem Pitting disease remain interested in nematode analyses and nematode management plans, unfortunately, long-term management options are limited. Growers will be able to save money by avoiding the expense of applying products with limited efficacy against dagger nematode.

- b. Long-term outcomes

Research is continuing on *Bacillus firmus* (and *Bacillus cereus*), however, these bacteria are not yet registered for use in commercial peach orchards.

- c. Comparison of actual accomplishments with goals.

All research goals under Objective 1 (Determine efficacy of four new nematicides) were accomplished, and additional research into the mode of action of *Bacillus* spp. was conducted.

The outreach goals under Objective 2 (improve nematode management recommendations to growers) were limited by the failure to demonstrate any significant benefit from the management objectives tested. Thus, relatively few growers have long-range nematode management plans, primarily due to the lack of demonstrated benefit from existing management options.

d. Data gathered:

Dagger nematodes (*X. rivesi*) per 100 cm³ soil at Jefferson County. Means of three reps. Differences among treatments are not statistically significant.

Treatment	6-19-2014	10-7-2014	7-28-2015	11-7-2015	6-29-2016
Untreated	4	31	5	113	41
DiTera	11	40	21	116	44
NemaQ	9	17	8	50	25
Ecozin-Sp	15	97	39	56	37
Ecozin-Sp&F	11	41	13	28	57
Movento	17	81	48	96	32
Std. Err.	4.4	22	16.3	50.6	19

Dagger nematodes (*X. americanum*) per 100 cm³ soil at Hampshire County.

Means of three reps. Differences among treatments are statistically significant only on Aug. 3, 2015.

Treatment	10-7-14	8-3-15	11-7-15	6-29-16
Untreated	256	9 b	68	125
DiTera	196	44 ab	39	73
NemaQ	72	67 a	60	34
Ecozin-Sp	213	81 a	31	44
Std.Err.	67	19	21	18

Peach tree growth and yield response to nematicide treatments at Jefferson County.

No treatments were statistically different from Untreated controls.

Treatment	Kg Peach /tree 8-3-15	Trunk area 6-29-16 (cm²)	% Increase in Trunk Area – 2014-2016
Untreated	40	291	22
DiTera	36	292	16
NemaQ	35	275	16
Ecozin-Sp	36	290	30
Ecozin-Sp&F	52	316	18
Movento	46	269	19
Std. Err.	8.9	18.3	3.5

Peach tree growth and % Mortality in response to nematicide treatment at Hampshire County. No treatments were statistically different from Untreated.

Treatment	Trunk area 6-29-16 (cm2)	% Increase in Trunk Area – 2014-2016	% Tree Mortality 2014-2016
Untreated	74	5.7	22
DiTera	73	-1.7	31
NemaQ	3571	-2.9	36
Ecozin-Sp	74	8.4	19
Std. Err.	4.6	12.3	7.1

e. Major successful outcomes

Nematicide trials were conducted at three peach orchard sites infested with dagger nematode to evaluate four products for efficacy and tree response. None of the products proved successful for managing dagger nematode or reducing the incidence of Peach Stem Pitting disease.

Beneficiaries

a. Other groups benefitting

The novel nematicide products tested are also registered on other tree fruit, and there is every reason to believe that their efficacy would be similar for nematode management in apple, pear, cherry, nectarine and other tree fruit crops throughout the Mid-Atlantic region.

b. Number of beneficiaries affected

Past research has shown that dagger nematode occurs in approximately 74 % of West Virginia peach orchards surveyed while Root Lesion, Root Knot, and Ring nematode were found in 77, 31 and 29 %, respectively. As a virus vector, a single dagger nematode has the potential to transmit a fatal virus infection to peach trees, especially where alternate virus reservoir hosts are present. Although higher population densities are needed for other plant parasitic nematodes before damage occurs, the long life of tree fruits allows populations to build to damaging levels in orchard settings.

Three of the five growers surveyed had orchard blocks with high levels of dagger nematode, and the Hampshire County grower suffered dramatic losses during the three years of this study, when 28 % of trees in that block were lost (See table 4 in “Data”). Such disease losses are not sustainable, and management tactics are still needed to address problem sites such as this one.

As the nation’s 11th largest peach production state, this study affects a wide circle of impact. In addition to the five growers that were the subject of the study, the loss of 28% of trees from infestation represents a significant threat to the state’s overall production and devastating economic blow to the state’s orchard industry. Extrapolating the study results and WV peach production figures from 2016 (3,500 tons/\$3,815,000 economic impact: USDA NASS), a 20% loss of crop would represent a \$763,000 loss for the industry demonstrating the need for continued research and focus on this specialty crop threat.

Lessons Learned

The novel nematicides tested were not effective, thus growers remain vulnerable to significant losses from Peach Stem Pitting disease. The use of *Bacillus* spp. does show promise for some nematode species, however further work is needed before this product is commercially available.

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Additional Information

Nematicide recommendations are available in the current issue of the VA-WV-MD Spray Bulletin for Commercial Tree Fruit Growers. Available at: <http://pubs.ext.vt.edu/456/456-419/456-419.html>

Results from testing of *Bacillus* spp were published in a Masters thesis: Valencia, L. 2016. *Bacillus firmus* for the biological control of *Meloidogyne hapla* and *Xiphinema americanum*. Masters thesis. West Virginia university, Morgantown, WV. 62 p.

Program Income

None.

PROJECT TITLE

Marinara Sauce Production and Marketing

Amount Awarded: \$9,000.00

Project Summary

Many West Virginia small farmers are responding to the local food opportunity, but as they expand they are having trouble getting all their work done. Many know they have more market than they have time to satisfy. They have resigned to spending lots of time standing at a farmers' market to get their products sold and then having little to do and no source of income during the winter. One farmer, while lamenting the forecasted frost said under her breath, "The sooner the better", meaning she was worn out. This mentality and reality will prevent so many from growing their operations to a point that they can give up the off-farm job. This project was designed to teach farmers how to grow a crop that except for some scouting, would require little to no summer attention until harvest. Then the crop was to be picked and sent to a processor and packaged for sales in the next year.

The original intent was to make a paste of tomatoes, but the project was met with weather and wildlife issues that forced the farmers out of production until the next season. To make this study successful, the team reassessed the situation and changed crops. Our goal was to find a crop that would allow little summer attention, show resistance to white-tailed deer, possess a longer harvest window, enjoy a long marketing window, offer reliable yields, and had value adding opportunities with wide margins. The answer was the butternut squash plant.

Motivation for project:

Considering the lack of marketing and growing experience our farmers possess I felt compelled to find a crop that would allow less urgency at planting and harvest. Our small farmers had to create more income without adding more intense harvest pressure at peak season. We needed a crop that was all in or all out at harvest. Combine the fact that the crop could stay in the field and stay in the shed till market; squash was the answer. The Project Manager has been working with farmers for 43 years and soon learned that the most recent figures from the ERS USDA state that the farmers share of the food dollar was 10.5%. By performing the required processing added another 15.5% to the farmer's bottom line. So now the farmers who could plant in the spring and harvest at a leisurely pace in the fall could actually add an additional 15.5% by just adding this simple process seemed logical.

The job creation aspect of this principal toward other crops including the tomato project was, or could be important for every region of the state. Working with a single crop one soon learns of other opportunities for that very crop. That has happened for us as we now near planting time have more farmers growing crops that they process themselves.

The project did not build on any SCBGP projects.

Project Approach

The same farmers who failed with the tomatoes were enlisted to try again with more fence, irrigation, and better marketing, but this time to modify the crop and grow squash. This crop was more advantageous as it had a great shelf life and market appeal. So really the title should have been amended to read, " **Fun and profit with butternut squash in the mountains of West Virginia**". That it was!

Four farmers were engaged to plant a total of 2 acres of Waltham Butternut Squash. Another grower planted an additional two rows of Argonaut. Two growers planted on plastic mulch and two chose a no-mulch option. One grower used drip irrigation.

Generally, the fields yielded an average of 2,000 lbs. on an acre basis. This yield was attributed to inexperience, some blight, some very hot weather and generally low plant food inputs. That 4,000 lbs. of squash harvested was enough to try out and continue the model.

About 800 lbs. were marketed through the normal channels at farmers' markets and special orders for "farmers' market prices" of \$1.50 per lb. the market was maximized and value adding commenced. Some of the squash was sent to a processor about 350 miles away who could process the squash with a steam peeling technique that was very affordable at \$0.40 per pound. Next, the use of a squash peeler was enlisted that was in the community (Picture attached). This process was performed by a local ProStart (a department in the local vocational technical school where students learn the basics of food preparation) in a neighboring community. A time motion study was conducted to determine the cost to peel, cut, and package and freeze squash. Then this squash was moved to local schools for use in their cafeterias.

The project was repeated a second year and each grower increased the size of their plantings. In 2016, an additional buyer for the squash was found, and pick up of the product commenced in December after a couple of months of storage. This provided an additional option as the processing expense could be avoided and the farmers could enjoy larger individual sales.

Goals and Outcomes Achieved

The results were remarkable. First, a crop was found that did exactly what was desired - increase production in a way to better manage labor and reduce the intensity of harvest. A crop was grown that allowed multiple opportunities to add value, either through simple and low cost storage requirements or through the peeling and freezing for use in homes and institutions. A crop was found and grown that at present is in great demand. The simplicity of this crop provides a way to help farmers learn the basics of processing, storage, and marketing and still return a profit. Probably the most hopeful and encouraging accomplishment is that every farmer who started the project is expanding for next year. A harvest and storage protocol was developed that will serve the farmers for years to come.

Our outcomes were met as follows:

- 1) The yield was established from year one at 2,000 lbs. per acre. Year 2 saw 100% increase to 4,000lbs per acre. That is nowhere near the expected yield.
- 2) The crop yield is still being determined, as the no. 2 squash are presently being processed and there is great variation in the return yield due to spots that must be removed and not enough experience to say with certainty just what they yield. The year 1 squash yielded about 65%. An increase is expected as the farmers become more proficient with growing, harvest, handling and storage.
- 3) The crop expenses were very simple as some folks only paid about \$249.00 per acre for seed. Their yield of 2,000 lbs. per acre resulted in cost per pound of squash was \$0.13. Resulting in a market of \$1.50 per pound was \$3,000.00 on an acre basis and a \$1,751.00 gross profit. The wholesale market of which was compared was \$0.65 per lbs. Those that went farther with irrigation and plastic mulch enjoyed higher yields and with an investment of \$550 per acre saw a higher proportion of No. 1 squash.
- 4) The processing costs were steady at \$0.40 per lbs. the difference in the two methods was the travel. The initial plan was to use a processor in a neighboring state. The service was fine and the project was better for using it. A local processor who had just come into a squash peeler, also processed for the same amount of \$0.40 per pound. The advantage being that local labor was employed and it reduced freight, which is why local was favored. Hauling the squash 340 miles could push the cost of processing much higher and require an increased level of coordination and pressure on the processor, which could affect the quality.
- 5) There was no income from the squash, but the program is contracting for frozen squash at \$2.50 per pound. That is the equivalent of \$1.88 per pound of fresh squash. At a standard yield of 6,000 per acre the gross income could be \$11,200 per acre.
- 6) The packaging costs for processed were included in the \$0.40 per lbs.
- 7) Marketing expenses to date have been informal and used existing transportation for the delivery.

In an attempt to compare actual outcomes with those predicted is nearly impossible but the general terms are the squash had an established a yield of 6,000 lbs. per acre. The processing was established at \$0.40 per pound. This figure can be used by farmers to use in their operations and the established the cost per acre of the crop at 4,000 lbs.

Seed at	\$249.00
Irrigation tape at	\$378.31
Storage totes 5 @ \$145 = \$725.00/5-year life=	\$145
Plastic mulch 5 rolls @\$61.00 X 5 =	\$305.00
Marketing expense was \$0.30 lbs. (carried below)	
Labor to plant 10 man hours @ \$12.00 or	\$120.00
Labor to Harvest 20 man hours @ \$12.00 =	\$240.00
Land use, rent @	\$60.00
Machine 3 hours @ \$25.00 =	<u>\$75.00</u>
Total =	\$1,572.00

Cost per lbs. for fresh market	\$0.40
Adding in processing at \$0.40 @ 2800 lbs.	\$1,120.00
Marketing @2800 lbs.	\$840.00
	<u>\$1,960.00</u>
Cost per pound of processed squash	\$1.27
Net per acre for processed @\$2.50 =	\$3,444.00

Beneficiaries

This project quickly became a community project as it involved many groups and individuals. This was unanticipated. First gained was a new grower/partner, the Preston Workshop, which employs workers with intellectual disabilities. This relationship started when they were asked to help harvest the crop for the farmers, but soon after the group heard of the project, they asked to join as a grower.

This was one step closer to developing a trained and tested farm workforce. Their first contract job was to assist a blueberry farmer cover plants and do some general maintenance. The curriculum they learned was developed as an Ohio State DACUM model that consists of 34 tasks. The group also, through a related enterprise, provided pallet bins for the squash and since then they have sold bins across the state.

Now, another Workshop has reached out to learn how to harvest and do farm work in another area. The opportunities related to this are limitless as small farmers who are inherently understaffed can enlist the help of these individuals, pay a flat fee, and not have any collateral expenses to maintain employees or worry about finding farm laborers.

Another partnership that developed out of the project was one with Appalachian Sustainable Development in Duffield, VA who agreed to purchase the No. 1 squash. That leaves the farmers to process the No. 2 graded squash. This relationship required the group of 7 farmers (as of 2016) to become GAP Certified and were encouraged to begin the journey towards organic certification.

The local Pro-Start department provided the processing service for the group and now they can teach their students that a whole community can benefit from a crop through the project outcomes.

At this point we have 8 farmers in this program with 6 acres. This new growing season we have 10 farmers included who will collectively grow 15 acres. The financial impact could easily reach \$100,000 this year. The important lesson is that a cropping/marketing plan has emerged where our goal is to produce No. 1 for the wholesale market and still have a very profitable processing market that could easily grow to greater proportions as processed rather than fresh. Now farmers are looking at other crops to grow to process including green beans and yes we are back to tomatoes.

Lessons Learned

The long term outcomes of this study reveal that the fresh market option would be very profitable but intentionally left out is the marketing expense as it can be very high using a farmer's market pricing model. The reality of marketing squash is that there is a limited number one individual can sell face-to-face, so if the profit is there the volume is not.

The original premise was to find a crop that could be planted in addition to the fresh market crops and not take time away from the other crops until they were to be harvested in the fall. Finding a market that would allow the farmer the opportunity to harvest at a less than a frantic pace that could promote reduced harvest labor cost was also key. It was important that the crop also offer the potential for storing and value adding. The additional outcome of marketing through wholesale channels was unexpected but a welcome outcome. The opportunity to take this crop to organic production offers a market premium and the fact that there is an increasing list of integrated pest and disease controls in the organic arsenal. Growing winter squash can increase farm income and minimize the frantic harvest schedule and marketing schedule, while offering a more prolonged cash flow.

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Additional Information

This report will be captured in a PowerPoint presentation to share at the 13th West Virginia Small Farm Conference in February 13th, 2017 in Charleston, West Virginia.





Program Income

There was no income from the squash, but the program is contracting for frozen squash at \$2.50 per pound. That is the equivalent of \$1.88 per pound of fresh squash. At a standard yield of 6,000 per acre the gross income could be \$11,200 per acre.

PROJECT TITLE

2014 Specialty Crop Producer Education Program

Amount Awarded: \$21,643.14

Project Summary

Specialty crop educational programs enhance the competitiveness of products offered to the public, meet regulatory regulations by state and federal agencies, and provide important information on industry trends and practices critical to keeping pace with changing technology and consumer demands. Ultimately, the health and safety of both the specialty crop producer and consuming public are essential for the industry to grow both through expansion and new enterprise start up. Several educationally based programs and certifications specific to specialty crops were identified and targeted for delivery in this project request. Good Agricultural Practices/Good Handling Practices, Hazard & Critical Control Point, Better Process Control School, MarketReady™ for specialty crop producers and Annie's Project (risk management) were, in most cases, be developed and delivered to the industry to encourage both enterprise start up and expansion through education and knowledge.

The purpose of this project was to target new, beginning and female owned agribusinesses by providing solid training and tools in agribusiness planning, regulatory entry through the provision of required courses at an affordable rate and provide important technical assistance to emerging farmers in the first five years of operation. By focusing on one-time introductory value-added specialty crop processing coursework (BPCS) compliance requirements, networking and business planning fundamentals, this project helps to insure market entry and expanding specialty crop choices in the marketplace while moving entrepreneurial efforts forward.

Similar projects have existed in previous SCBGP awards, however, the courses and programs are only utilized once with an emphasis on market entry or expansion; these programs are an industry entry point in specialty crop production/manufacturing.

Project Approach

This project helped met the knowledge and regulatory needs of both the production and manufacturing sector of the West Virginia specialty crops industry. The original project tried to anticipate the educational needs of the Food Safety Modernization Act in advance of its 2015 implementation. In some cases, it has been difficult to determine the industry need and try to encourage proactive rather than reactive programming. For this reason, this project continued to focus on food safety and agribusiness development activities through curriculum and program delivery of Annie's Project, MarketReady, Better Process Control School and Good Agricultural Practices/Good Handling Practices training. The project was unable to hold a HACCP course due to nationwide curriculum adjustment in anticipation of the FSMA legislations. In order to build capacity within the West Virginia specialty crop industry, these educational

programs are essential for both start-up and expansion. Each of these programs meet regulatory requirements, industry mandates or best practices in terms of certification, plan development and implementation and improved production specialty crop production practices designed to meet third party and independent audits for sales consideration. At the conclusion of each program, market entry, regulation/compliance and/or enterprise development/addition were the goals as they relate to expanding specialty crops.

The specific approach to each program was to identify new participants through inquiry, referral or Extension program recruitment, conduct the program, evaluate its effectiveness through a determination of new enterprises and specialty crops that enter the marketplace.

Goals and Outcomes Achieved

1. Specialty crop production enterprise entry (new business development; may or may not be a part of an existing farm operation) by at least 10 companies (Better Process Control School, GHP/GAP, Annie’s Project)
2. Implementation of at least 5 enterprises in the GHP/GAP audit program as documented through an audit attempt (GHP/GAP program).
3. The introduction of at least 10 new value added specialty crop items in the marketplace (Better Process Control, Market Ready)

The project was able to exceed its listed goals and outcomes:

Goal/Outcome	Annie’s Project	MarketReady	Better Process Control School	GHP/GAP	Total
New Business Development	2	1	2	9	14
GHP/GAP Audits	0	0	0	7*	7
New value added crops to the Marketplace	3	5	26	9	43

*Note: Successful GHP/GAP audits were prepared for (training, mock audits, site visits) during the grant period, however, the actual audits were not conducted until 14 days after the grant completion date. The result was 7 additional farms with 9 crop introductions (squash, potatoes, etc.)

Beneficiaries

In addition to the more than 150 program participants, the addition of 7 additional GHP/GAP auditees is very critical to increased specialty crop production in the state. These growers have provided a valuable model for successful audit completion and their ability to now provide produce to buyers in a geographic area with a huge market is very promising for sustainable production in the future. Their benefits include increased demand, potential for additional

products to make market entry and enterprise planning leading to successful and sustainable business operation and development.

Additional beneficiaries (in addition to the new businesses and products available) include consumers who will have access to specialty crops that are compliant.

Lessons Learned

Providing current training in a confusing period with new federal regulations in the food production and processing industry. Final curriculum standards and legislative implementation is still very much a “work in process”. The inability to conduct all of the training from this allocation meant that the goals that were achieved could have been furthered as \$9,338.23 was not expended on this project (mainly for HACCP which was originally thought to be a required component of all growers and processors). The merging of the PSA curriculum with very similar GHP/GAP training will eventually lead to the “blending” of this program in order to eliminate repetitive content. Also it is critical to try and anticipate the training needs of new agribusiness producers/processors and provide continuing education for existing member of the specialty crop industry to expand markets and production, it can be difficult to anticipate the regulatory and industry needs/standards. Future programs need to incorporate the ever changing industry standards for successful market entry and growth.

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Additional Information

Supplemental material provided to Annie’s Project and MarketReady as tools for specialty crop agribusiness development.



Program Income

One hundred and fifty dollars of program fees were recorded as program income. These funds were reinvested into the project for curriculum printing and material costs.