Delaware Department of Agriculture

2015 Specialty Crop Block Grant Program- Farm Bill

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CONTACT

Jo-Ann Walston
Marketing Specialist II
Phone: 302-698-4592
E-mail: JoAnn.Walston@state.de.us

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Project Title Promoting the Health and Safety of Bees for Delaware's Specialty Crop Growers and Honey Producers

Project Summary For the past several years, there has been increasing concern regarding the health of managed and wild bees. Honey bees face many environmental stresses that have had a negative impact on colony health. Bee health is key to the health of agriculture in Delaware and many other states in the U.S. Over 90 crops in the U.S., including almonds, tree fruits, cotton, berries, and many vegetables are dependent on insect pollinators, primarily the honey bee, for reproduction (USDA 2013). Bee-pollinated crops account for 15 to 30 percent of the food we eat (USDA 2013). Other crops may not be completely dependent on pollinators, but benefit from bee pollination. Delaware growers produce several crops which require insect pollination. These crops include watermelons, cucumbers, strawberries, cantaloupes, apples, blueberries, cranberries, squash, and pumpkins. Watermelons make up the largest segment of these crops. In 2017, a total of 3900 acres of watermelons were harvested in Delaware (USDA/NASS 2017). The production of watermelons and cucumbers requires that more than 4000 bee colonies to be brought into the state to maximize pollination of these crops. In addition to the colonies brought in for production, Delaware has approximately 295 registered beekeepers who manage 1832 resident hives in Delaware (DE State Apiarist 2018).
This project's purposes were to:

- Inform people and organizations about Delaware's Managed Pollinator Protection Plan
- Highlight the value of pollinators for the health of Delaware's agriculture and ecosystems
- Show why it is important to protect pollinators that sustain the environment, ensure food security and human health, and
- Educate participants in the many ways they could participate and make a positive, lasting impact in promoting pollinator (particularly bee) health and safety.

Project Approach To begin, a project team drafted Delaware's Managed Pollinator Protection Plan, which listed Best Management Practices for pesticide users, landowners, growers and beekeepers. The Team consisted of Christopher Wade and Laura Mensch, Pesticides; Robert Mitchell, State Apiarist; and Faith Kuehn, Plant Industries Administrator. Thalia Pappas, Technical Writer, was hired for the duration of the grant. The goals of this Plan were to improve communication among the groups, develop practices that would reduce the exposure and subsequent risk of pesticides to bees and other pollinators, and support Delaware's beekeeping industry and agricultural sectors dependent upon bees. This plan provided the framework for discussion with a wide variety of stakeholders, and helped to identify areas of misunderstanding and miscommunication.

The draft Managed Pollinator Protection Plan was presented during the Fruit and Vegetable Growers and Urban Agriculture sessions during Delaware Agriculture Week 2016, and the 2016 Delaware Horticulture Industry Expo and Small Farms Conference. Presentations on the Plan were given to each of the three county chapters of the Delaware Beekeepers Association and the University of Delaware Cooperative Extension. A copy of the plan was made available on DDA's website, and comments were requested at all presentations. All presentations included information on BeeCheck™, and registration forms and information were provided. Eight comments were received. Comments received were incorporated, the revised plan was issued September 2016. It

resides on the Delaware Department of Agriculture's (DDA's website, https://agriculture.delaware.gov/pesticide-management/pollinator-protection-plan/ .

During the 2018 Delaware Agriculture Week, the project team presented the session, "Pesticides, Bee Safety and the Value of Forage" during the Fruit and Vegetable Growers Conference. During the project, more than 39 presentations were given, with at least 1825 stakeholders in attendance.

As bees don't recognize property lines, and Delaware's fruit and vegetable production fields are often contiguous with property in other types of land use, efforts to conserve bees needed involve the extended community. Conversations with one group often uncovered a pollinator project and contact person in another organization. While looking for suitable demonstration sites for bee habitat installations, the Team began to uncover a number of pollinator habitat installations that were established or in progress. The Team developed a categorization of potential bee habitats, and began to study existing programs and possible areas for information exchange. The categories included the following: state and federal lands, roadways, urban farms and production agriculture, commercial businesses, schools, houses of worship.

Goals and Outcomes Achieved

Goal 1 – Safeguarding Systems Performance Measures, increasing grower and beekeeper awareness of and participation in safeguarding systems

Target 1 – Driftwatch™ When the project began (9/30/2015), there were 13 individuals signed up for Driftwatch™. The project goal was 30 by the project's end, 9/29/2018. As of 9/29/2018, there are 112 active users, including 21 producers, 75 beekeepers, and 18 applicators. Approaches to increasing Driftwatch™ participation included public outreach efforts such speaking at stakeholders' meetings and events and issuing press releases. We also conducted training sessions for Delaware Department of Natural Resources' Mosquito Control staff, many of whom are signed up as applicators on DriftWatch™. In addition, we increased participation by including information about how to sign up for BeeCheck™ in the annual beekeeper registration renewal letters.

Beekeeper participation has been increasing steadily since DriftWatch™ was first launched in 2014.

Beekeeper Sign-ups (new users creating new accounts):

3 beekeepers signed up in 2014
5 beekeepers signed up in 2015
12 beekeepers signed up in 2016
20 beekeepers signed up in 2017
35 beekeepers signed up in 2018
75 total number of active unique beekeeper accounts to date.

Based on the rate of signups, it is clear that promotion from this project, starting in 2016, increased the number of participants. In April 2018, FieldWatch™ launched two free mobile apps (Android and iOS) called FieldCheck™ and BeeCheck™. The goal is to make it easier for users to access the DriftWatch™ map while they are on the go. Beekeepers were reminded to sign up for the Mosquito Control Spray Zone Notification System, http://www.dnrec.delaware.gov/fw/mosquito/Pages/MC-SZNS.aspx Registration is a two-step

proves that allows a user to select their spray zone area of interest and then register to receive an alert of upcoming spray activity in that area.

DDA's Pesticide Section and the State Apiarist held a training session with the DE Department of Natural Resources Mosquito Control Section to reinforce the importance of safeguarding systems.

An additional safeguarding system, a hive scale, has been purchased for the DDA apiary. This will be connected to a network of honeybee colony monitoring information systems has been implemented for seven apiaries located in New Castle County, DE, Chester County, PA and Cecil County, MD. Electronic hive scales, brood nest temperature and relative humidity sensors are currently monitored in 22 hives. Remote monitoring dashboards allow the apiary's beekeepers to collaborate and troubleshoot abnormal colony conditions. During the 2018 nectar flow, beekeepers were able to measure and compare colony foraging capability - a key indicator of colony health. Beekeepers were also able to quickly determine when colony nests became brood-less and implement corrective actions.

Target 2 – Pesticide incident reporting for bee exposure

Due to the retirement of Delaware's State Apiarist and the rewriting of the position description that followed, Delaware did not hire a full time State Apiarist, Meghan McConnell, until March 2017. One of the new State Apiarist's goals was to improve compliance with Delaware's Beekeeping law, including the required registration of beekeepers. When the project began, there were 173 registered beekeepers. At the end of 2018, there were 295. The State Apiarist has attended all three county beekeeper meetings each month, making regular announcements about the procedures for reporting suspected bee kills. Because of this increased awareness, there were 2 suspected pesticide kills reported in 2017, and 4 reported in 2018.

Goal 2. Acreage and quality of bee forage

Target 1 – Development of DE specific BMPs for bee forage to support pollination services and honey production. The following were accomplished:

- Together with Cooperative Extension and the Delaware Nursery and Landscape Association, a list of ~ 300 pollinator plant species, suitable for Delaware's climate and soils was developed, along with information on the plants' availability.
- Worked with Clark's Seed to develop information on a 5-clover seed mix, and its use as bee forage for marginal land or spend space land in residential areas.
- Developed educational materials and links for the following: 1) Planting clover and buckwheat, 2) Native Plants for Riparian and Freshwater Aquatic Zones, 3) Creating Native Bee Habitat on Marginal Farm Land, and 4) a one-page reference on websites that provide information on suitable bee forage, including the Pollinator Partnership and Monarch Refueling Project.
- Through collaboration with the Sussex Co. Conservation District, pollinator-friendly plants and practices are now included in the Conservation section of the Delaware Chicken Check List. This guide is intended to help lay out the steps in the building process, including permits needed and an overall timeline to keep in mind as a farmer moves forward in the

process of establishing poultry houses. http://dechickenchecklist.com/conservation-practices .

- Through the efforts of the project's Technical Writer, Thalia Pappas, 5 Delaware farms are now registered as Bee Friendly Farms. This Pollinator Partnership program provides guidelines for farmers to promote pollinator health on their lands, https://www.pollinator.org/bff . It also provides a variety of marketing incentives, such as signs that can be placed on the farmer's property and stickers that can be placed on farm products. Thalia has served as Co-Chair of Bee Friendly Farming.

Target 2 – Increase enrollment in CRP CP 42 Pollinator habitat

We redirected efforts to other programs for increasing pollinator habitat in Delaware, such as NRCS and Northeast SARE grants. After a discussion with Lynn Manges (Delaware USDA-FSA), the CRP 42 programs are much better suited for states that have vast acreage of potential pasture land that can be taken out of production or land not in production that can be upgraded to meet the criteria for enrollment. As of 9/29/2018, there were only 4 acres in CP42 in Delaware.
Chris Bohinski, Soil Conservationist with USDA/NRCS in Delaware and a part time farmer, has been promoting pollinator plantings. He has planted several 875 ft. rows of flowers trees and shrubs on his farm. Chris has been recommending pollinator habitat in NRCS grants falling under one of the following categories: Hedgerow Planting (Code 422), Field Border (Code 386) and Conservation Cover (Code 327).
Target 3 – Create demonstration and education sites where the public can learn about the types of forage and land management practices that favor honey and native bees and promote honey production

Three sites were established on State and Federal Land: 1) an apiary at DDA headquarters, with a second site at the Department of Natural Resources Jones Reserve in Dover, DE, 2) Blackbird State Forest, and 3) the Delaware Air National Guard site in New Castle, DE. Several sites were identified where bee forage is being increased as part of the mission of the organization. They were grouped into various organization types, including agriculture, transportation, residential, public gardens, schools, federal/state land and commercial businesses.

In the original grant proposal, a field tour of these sites was planned for 2018. Through the efforts of Thalia Pappas, many sites were bee and pollinator forage had been planted were identified across the state. The project team concluded that rather than spend funds on a one-day field tour where only a limited number of farmers and land managers could dedicate a day to attend, especially during the summer. The tour would provide hands-on experience to the participants, but would be limited to one day. The team decided that it would be better to highlight this work through a story map.

Story Maps are web applications that let authors combine maps with narrative text, striking images, and a variety of media. The applications are designed to be attractive and usable by a wide variety of audiences. DDA contracted with ESRI to host the map, and content was developed by the project team, primarily Thalia Pappas, with technical assistance from Jimmy Kroon, DDA's GIS Coordinator. An initial Story Map on the project was developed for the 2018 Delaware State Fair.

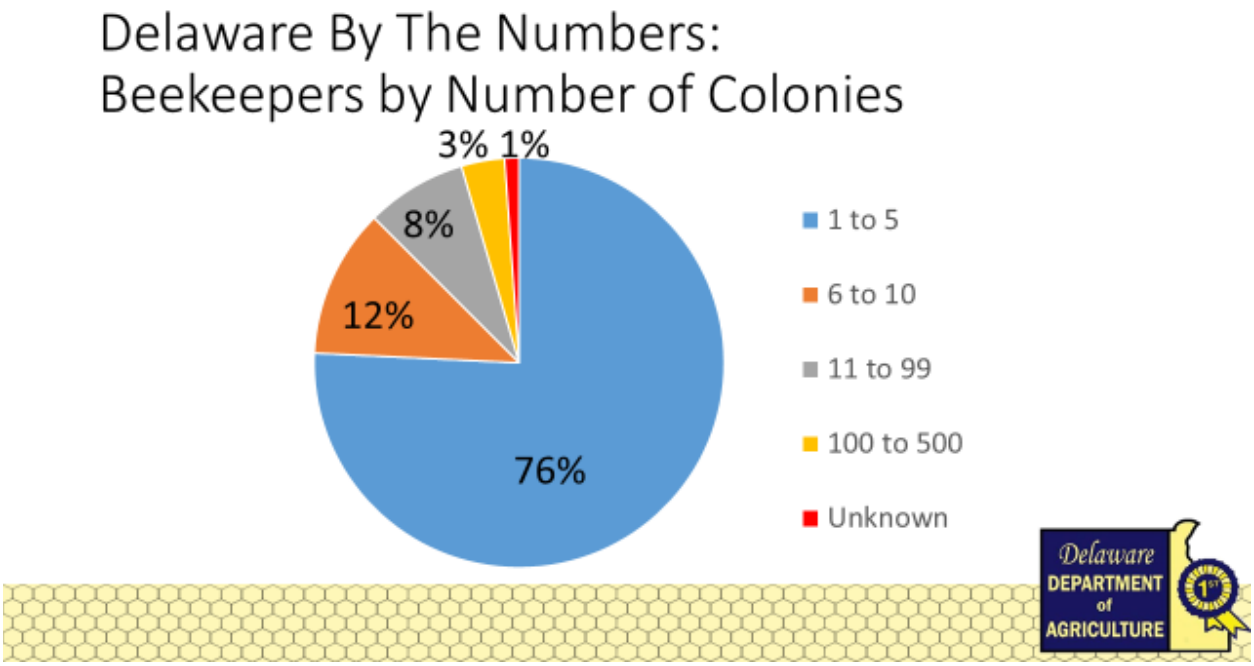
At the project's conclusion, the final version can be found here, https://arcg.is/1qH4rn0. The Story Map will be posted on DDA's website.
As a result of this project, but funded through a Northeast SARE Farmer Grant, Tina and Marvin Hill, Delmarva Poultry Industry (DPI) and DDA established a pollinator vegetative buffer on Hill Farm. Hill Farm is a Delaware Century Farm producing vegetables and poultry. The intent is to compare installation, maintenance and public appeal compared to traditional maintenance regimes. DPI subsequently received a $5,000 grant from Bayer's "Feed a Bee" program to install additional pollinator habitat on Delaware poultry farms. With this grant funding, 8 plots at 10,000 feet^2 each were installed. Also, a 1 ½ acre parcel was planted with pollinator trees and shrubs on a farm in Gumboro, DE.

As a result of this project, Lewes, DE is making application to be recognized as a Bee City USA, https://www.beecityusa.org/resources1.html . Wesley College in Dover, DE is making application to be recognized as a Bee Friendly Campus, https://www.beecityusa.org/what-is-a-bee-campus.html . Both are initiatives of the Xerces organization.
As a result of this project, we have made connections with 3 homeowners associations in Delaware who have installed pollinator and/or wildlife habitat in their common areas. A Grass Roots Community Conservation discussion was held on 9/26/2018 to share practices and inform homeowners, farmers and public officials. A lead speaker was Delaware Senator Stephanie Hansen, who established the Delaware Native Species Commission Reverse the trend of decline and extinction of Delaware's local plant and animal native species. This Commission will work to implement the recommendations of the Statewide Ecological Extinction Task Force and provide expertise and assistance to state and local lawmakers, policy makers, educators, and other stakeholders. Bee health and safety are part of the Commission's work.

Goal 3. Increased Honey Production
A team of beekeepers volunteered to assist the State Apiarist in developing BMPs for honey production as well as those for Urban and Sideline Beekeepers. Unfortunately, this team has not yet been able to coordinate their efforts. In the interim, the State Apiarist has worked with the honey categories for the Delaware State Fair and the Delaware Beekeepers Association to update and revise their judging guidelines and categories.

Data on honey production in Delaware will not be available until the 2018 Census of Agriculture is issued.

This Target proved to be much more complicated than originally envisioned, and regrettably there currently is no data available to mark progress. A Project Activity related to this target stated that Debbie Delaney (University of Delaware) and Bob Mitchell former DE State Apiarist) would present workshops on honey production. This technical support is a vital starting point for increased production, as the majority of Delaware's beekeepers are backyard and sideline (5 hives or less) vs. commercial beekeepers. And most of these beekeepers are relatively new to beekeeping and are struggling to keep their colonies alive vs. managing them for honey production. Delaware's commercial beekeepers are focused on managing their colonies for pollination services in the watermelon and cucumber industries.



The technical support to increase honey production listed in the grant application did not pan out for two reasons. First, in 2016 Dr. Delaney was denied tenure at UD and spent the next two years developing alternative plans and ultimately an alternative position which has a very small extension component. The State Apiarist retired in January of 2016, and it took 1.5 years to upgrade and refill this position. The new State Apiarist, hired full time in June 2017 was charged with developing BMPs for honey production. This has not happened, to date, in part because of lack of volunteer support from the Delaware Beekeeper's Association. After the State Apiarist was hired, her highest priority was getting compliance with Title 3, Chapter 75, Delaware's Bee Keeping Law, which requires all people who keep bees to register with the State. When the project began, there were 173 registered beekeepers. At the end of 2018, there were 295. This 70% increase is due primarily to compliance vs. a wave of new beekeepers.

In working towards the goal of increasing honey production and the price of honey, the new State Apiarist surfaced two issues: 1) many beekeepers who might sell honey didn't know the process of labeling and marketing and 2) categories for the promotional activities of honey shows at the State Fair and Delaware Beekeepers Association's annual meeting. The State Apiarist developed a fact sheet on honey labeling, which was made available to beekeepers. In addition, she gave a presentation on honey production and labeling at each of the 3 Association County meetings. She has worked with the honey categories for the Delaware State Fair and the Delaware Beekeepers Association to update and revise their judging guidelines and categories.

The Delaware Beekeepers Association does not track honey production or sales. Delaware currently hosts 19 Farmers Markets, and all of them offer honey for sale. As honey is categorized as a Specialty Crop, revenues from honey sales are lumped together with produce, and thus there is no honey-specific data. An informal survey of these markets showed that honey was selling for $9.00-$10.00/lb.

It is hoped that the 2018 Census of Agriculture will show an increase in the volume of honey produced and the price per pound. Based on knowledge of the current state, data should show this increase, but this depends upon beekeeper participation. Compliance can be challenging. One way to obtain reliable data might be to survey honey sellers in farmer's markets and stores selling local honey.

Beneficiaries

- Members of the Delaware Fruit and Vegetable Growers Association, 120
- Registered Delaware Beekeepers, 295
- Delaware seed dealers and garden centers promoting pollinator-friendly plants, 8
- Delaware Bee Friendly Farmers, 5
- Additional beneficiaries:
    - Bee Watchers Citizen Scientists
    - Winterthur
    - Delaware Department of Transportation
    - Delaware Department of Natural Resources, Mosquito Control
    - Delaware Nature Society, Abbots Mill
    - Mt. Cuba Center
    - Delaware Botanic Garden
    - Civic Associations: Fairthorne, Village of Fox Meadow, Champions Club at Greenway, Breakwater, Senators, and Dover Village
    - Duffy's Youth Garden
    - University of Delaware Master Gardeners
    - Eastern Apiculture Society
    - Bombay Hook National Wildlife Area
    - SW Pennsylvania Waste Management Association
    - National Plant Board
    - Delaware Garden Federation
    - Hill Farm
    - Brandywine Conservancy

Lessons Learned

1. *The importance of pollinator health was already 'instinctively' understood* by many people in various sectors of the public. Many were managing their land to provide pollinators forage and nesting, even if knowledge of the particulars of pollinator/floral biology was not well known and the value they brought to the big picture was not extensive or well known.
2. *We provided a valuable statewide and global context to pollinator protection work.* We did this by making people aware of the Presidential Memorandum to establish the Pollinator Health Task Force, development of a National Pollinator Health Strategy, Research Action Plan (PRAP), Public Education Plan and the goals to increase and improve pollinator habitat.

3. *To begin changing the mindset, find progressive thinkers open to new ideas within the community.* This was demonstrated across categories, on farms and in churches, schools, state and government agencies, DOT, urban and conventional farms, and commercial businesses.
4. *Methods to improve the environment for pollinator health can be relatively inexpensive* (can even save money), can have a big impact, don't have to be time consuming, and are straightforward (not complicated). Practices such as reduced mowing of open space and providing riparian buffers around drainage ponds is one example of a practice that reduces time for maintenance, can save money on maintenance costs and offer an attractive alternative to manicured landscapes. Planting native trees and shrubs when investing in landscape plants is another extremely effective practice.
5. *What is difficult is changing a mindset of an organization or agency,* especially when it comes to what qualities are considered attractive for a landscape, or trying to alter practices where equipment investment has been made and/or job structure/employees are entrenched (roadside mowing) that "have always been done this way", *even* if altering practices can be shown to *save* money in both the short and over the long term.
6. *Unless governmental agencies were providing funding and services with no strict land care requirements to meet/maintain*, the private sector (including farmers) were reluctant to engage, especially if it involved inspections or land oversight to check on compliance with the program.
7. *Farmers who understood the benefit of government programs and were willing to accept certain restrictions* made significant strides in adopting a wide range of programs for pollinator health.
8. *We had to manage how to liaison* with many of the businesses, organizations, and federal or state governmental agencies, fully realizing we were not necessarily integral to their primary goals or work products. Generally, if there was a trade off with highlighting some positive press/benefits follow-through was easier to obtain. Schools and some state agencies were extremely hard to engage regardless of various positive benefits we had to offer.
9. *There were many opportunities for synergy across programs.* We interacted with many different governmental and non-governmental agencies, the public and private sector. We found that there were many opportunities to connect various organizations to inform them of programs that could synergize or help their own efforts. We had the unique program view across disciplines that these organizations did not have the opportunity to explore.

Contact Person:
Faith B. Kuehn
Green Cabinet
2104 Old Orchard Rd.
Wilmington, DE 19810
fbkuehn@gmail.com, 215-208-4292

Project Title Consumer Fresh Produce Food Safety Campaign

Project Summary Americans are eating more fresh produce than they were decades ago, but with that has come an increase in foodborne illness, according to the U.S. Food and Drug Administration. In spite of the best work of conscientious fruit and vegetable farmers, illnesses can still occur, with contamination from soil, water, equipment, animals, insects or human handling. Bacterial outbreaks from such sources as E. coli, Salmonella and Listeria can cause severe illnesses among consumers and have a negative impact on specialty crop producers.

Work has been under way in Delaware for several years to improve producer food safety efforts through Good Handling Practices and Good Agricultural Practices training (known as GHP/GAP). This project addressed the other side of that coin, educating consumers about actions they can take to protect their families from foodborne illnesses while preparing recipes with Delaware specialty crops. We realized that consumers utilizing social media and other online venues enjoy watching quick – under two minutes – videos to learn how to prepare healthy and tasty food to feed themselves and their families. The Delaware Department of Agriculture (DDA) staff noted that while very popular, these online videos did not offer information on food safety.

This project aimed to educate Delaware fresh produce consumers about proper behaviors in handling and preparing these specialty crop products through an integrated online over-head video campaign. The recipes selected for the online videos were from the Delaware Department of Agriculture's recipe collection that was funded by a 2014 Specialty Crop Block Grant.

Project Approach This grant was originally written to create a food safety website focusing on fresh produce; and to conduct targeted online advertising reaching Delaware residents to increase awareness of fresh produce safe handling and preparedness techniques. Due to staffing changes and research into online initiatives that interest the average consumer; DDA submitted and received approval for a change of scope in May 2017. Initial literature reviews completed in 2016 regarding food safety and handling procedures were utilized in writing the scripts for the online videos.

We selected Miles Partnership to develop the seven recipe videos targeting food safety surrounding specialty crops. We felt they had the best experience in recipe video development and had done similar work promoting locally grown in Louisiana. After the development of the recipes and several rounds of selections, the final seven videos to be shot were: Asparagus and Bean Salad, Baked Apples and Oats, Corn Pudding, Minestrone Soup, Peachy Chicken Picante, Strawberry Rhubarb Pie, and Sweet Potato Biscuits.
Based upon the specialty crops involved, DDA staff with expertise in food safety were consulted to make sure food safety was being followed throughout including temperatures, correct utensils, cutting boards, and handling and storage of the fruits and vegetables were addressed. We sent specialty items to Miles Partnership including vegetable scrubbers, thermometers, and a can strainer.

One issue we had was determining what recipes from our collection would make interesting videos and getting buy-in from Miles Partnership and Delaware Tourism. A lot of education took place

on why different selections were made focusing on purchasing data from farmers' markets and farm stands and issues with food safety.

We had to overcome a knowledge barrier on food styling of which DDA staff and Miles Partnership were very accustom to in order to move forward. In order to properly show food safety steps, DDA staff and Miles Partnership knew we would had to break protocol of shooting directly overhead and shoot from a side angle for several parts of each video. We also had to have the proper look for our audience and sourcing skilled talent with a female chef was difficult.

The Delaware Tourism Office (DTO) provided funding to assist with areas that contained agricultural commodities (chicken) that were not covered under specialty crop funding. We determined the amount of the budget and time that covered chicken in comparison with specialty crops and determined that chicken cost $1,180.05. In addition, DTO covered the cost of individual overhead photography to utilize later in advertising.

Miles Partnership developed the storyboards, scripts, and shot angles with review and approval from DDA and Delaware Tourism in October. In November, Miles began video production on set from on November 13 - 15, 2017. Shot off-site, we had a set liaison that shared photos and asked us questions throughout those days for clarification. We had three revisions on all materials developed to make sure it matched our needs and grant objectives and received all completed videos in the January 2018.

Goals and Outcomes Achieved All videos were produced and in-hand prior to the start of the Delaware growing season, so that videos could be distributed through online channels when the specialty crop would be available in season.

The following food safety, handling, and storage practices were taught in the videos:

- Asparagus and Bean Salad: Storage of asparagus, length of refrigeration, how to wash, and break ends of asparagus prior to preparation
- Baked Apples and Oats: How to wash apples, use of vegetable scrubber, and prevent browning in apples by waiting to peel or cut until just ready to use
- Corn Pudding: How to pick sweet corn that is ready to eat, usage of the vegetable scrubber under water to remove corn silks and any dirt, and knife usage to remove kernels from the cob
- Minestrone Soup: Proper storage of carrots, length of storage, how to use a vegetable scrubber, and to clean carrots prior to use for cooking
- Peachy Chicken Picante: How to choose peaches by the pressure test, using a brown paper bag to ripen peaches, use of different cutting boards for fruit and poultry, and wash hands after touching raw meat to reduce transfer of food borne bacteria.
- Strawberry Rhubarb Pie: Strawberry selection and use of knife to trim greens
- Sweet Potato Biscuits: How to choose a sweet potato to reduce the chance of spoiled potatoes, use of a vegetable scrubber and water to remove dirt and bacteria, and how to safely use a vegetable peeler

Video Title	Date Released on Facebook	People Reached	# of Views	Minutes Viewed	3 Second Video Views	10 Second Video Views	# of Shares	# of Clicks to Play	# of Clicks to de.gov/buylocal
Delaware Grown Asparagus and Bean Salad	5/12/18	5,859	2,639	717	2,639	1,117	1	50	14
Delaware Grown Strawberry Rhubarb Pie	5/25/18	7,822	4,016	1,048	4,015	1,621	13	75	31
Delaware Grown Baked Apples & Oats	10/16/18	884	241	109	241	105	1	5	18
Delaware Grown Minestrone Soup	12/14/18	1,157	278	90	278	94	4	7	21

The number of click-thrus to the https://de.gov/buylocal is an indicator that these viewers were looking to find either an on-farm market, farmers' market, or a u-pick location to purchase the specialty crop shown in the video.

In 2018, there was no reported food borne illnesses in Delaware related to any of the specialty crops showcased in the videos.

Beneficiaries The Delaware Department of Agriculture utilized the annual Farmers' Market Managers Summit held in March 2018 to reveal the video series. The market managers were excited to see the Strawberry Rhubarb Pie video and learn about the work that went into creating these videos for their constituents. They shared that this was a good way to educate consumers that were new to cooking with Delaware Grown produce. Many of our farmers' markets set up a demo tent utilizing produce available at the market that day. Some managers said that this would help train their volunteers on how to safely prepare new recipes that DDA was promoting to match the season.

An unexpected audience for the videos was our Delaware SNAP Education Program through the University of Delaware. The SNAP ED Coordinator has worked with all of the service centers to show the videos on the televisions in each waiting room. Cooperative Extension also hosts a monthly training - in person and on-line – where they prepare a recipe for their recipients using locally grown specialty crops. They had recently run out of recipes to showcase and requested permission to utilize the ones designed by Delaware Department of Agriculture through the Specialty Crop Block Grant.

We also had a couple of on-farm markets request to use our videos on their own social media and websites. Since the videos were branded with Delaware Grown, we had no problem with this because we knew they could be attributed to the Delaware Department of Agriculture.

So far, these videos have reached 16,972 viewers that we have counted through social media. SNAP Education in Delaware reaches more than 4,500 individuals. We will be integrating these videos into our website and that will increase the potential viewer audience by 5,000 each year.

Lessons Learned While many people have come to love the overhead food videos, it is important to realize that videoing the creation of recipes is not a task to be undertaken by amateurs. There is a need for a production crew, food stylists, and experienced food photographers and videographers. When you bring in all of this experience in a crew, it does take a lot of money to produce only a handful or more of videos.

If we had to do it all over again, we would make sure to be onsite during production, instead of working with a liaison. The stylist felt that yellow sweet corn would look best for the Corn Pudding recipe, even though we had specified to use a mix of white and yellow sweet. Had we been on site, we could have stopped production and provided the correct mix of corn. From experience in making this recipe over again during the recipe test phase, the PI knows it really should be made with all white sweet corn. The PI could have halted production and made sure the product was made to specification.

Another issue that we ran into was the selection of our chef. Based off of consumer research done in our Buy Local Promotion grant, we knew that the majority of our audiences making Delaware Grown purchasing decisions were females between the ages of 25 and 44; therefore, we wanted to make sure our chef was female. We wanted to empower the average woman to cook a healthy meal for her household. Through small scale testing with the chefs that Miles Partnership provided us, we found that male hands were a turn-off to our audience because they did not have attractive, clean looking nails and hands. The forearm hair, no matter how little that showed from under the cuff of their chef jacket, was considered unattractive and a potential contaminant to the food being prepared. We were adamant that we have a female chef with skill and well-manicured hands, but this took a lot of time to source and did slow our production timeline.

Contact Person:

Stacey Hofmann, Chief of Community Relations

- (302) 698-4542
- Stacey.Hofmann@state.de.us

Additional Information:

Published videos are available on Facebook @AgricultureDE:

Delaware Grown Asparagus and Bean Salad:
https://www.facebook.com/AgricultureDE/videos/1973991165957950/

Delaware Grown Strawberry Rhubarb Pie:
https://www.facebook.com/AgricultureDE/videos/1987984757891924/

Delaware Grown Baked Apples and Oats:
https://www.facebook.com/AgricultureDE/videos/259453354774275/

Delaware Grown Minestrone Soup:
https://www.facebook.com/AgricultureDE/videos/379674066101413/

Project Title Research and Demonstrations with an Established Experimental Blueberry Plot

Project Summary As a part of a previous Delaware Specialty Crop Block Grant, 'The Establishment of Highbush Blueberries on Delaware Soils' (2010 to 2013), we installed a blueberry planting at the Carvel Research and Education Center in Georgetown Delaware. The purpose of the first grant was to develop recommendations for successful blueberry establishment in Delaware. A second Specialty Crop Block Grant, 'Yield Evaluation of Established Highbush Blueberry Variety Trials and Crop Management Studies' (2013-2015) was awarded to collect yield data from some of the experiments established in the first grant and use the planting for educational field meetings for individuals interested in growing blueberries commercially. In the project proposed here we would continue to collect yield data from the variety trial and soil amendment study and begin a three year nitrogen fertilization rate and timing study with plants that are already established in the trial that had been a part of the mulch material study. We will also use the planting for a pruning workshop and an educational field meeting to share research results.

Careful variety selection is important for the success of blueberry growers because of the high upfront cost of plants and the decades-long life of the planting. For Delaware blueberry growers, however, deciding which varieties to grow is not straight-forward. There are forty-two blueberry varieties listed in The Mid-Atlantic Berry Guide and this is not an exhaustive list of what is available. Also, there are several active breeding programs that have recently released new varieties that have not been extensively grown or tested in this area. Several years of yield data collected from the already established variety trials will provide a valuable resource to growers making decisions about new blueberry plantings.

The variety trial at Georgetown includes 25 varieties. The varieties in the trial are nearly all newly released varieties from active blueberry breeding programs in Michigan, New Jersey and North Carolina. Eleven of the varieties in the trial are southern highbush varieties, one is a northern-southern intermediate, and the remaining thirteen varieties are northern highbush. Southern highbush blueberries are derived from crosses between the northern highbush blueberry (*Vaccinium corymbosum*) and various *Vaccinium* species native to the southern United States. Southern highbush varieties tolerate a wider range of soil conditions and more heat tolerant than northern highbush varieties, however they are less cold hardy. Data collected from the variety trial suggests that some of the southern highbush varieties grow more quickly and vigorously in southern Delaware conditions than the northern highbush varieties and produce good yields. Some southern highbush varieties have shown good cold hardiness, while others have not. Additional yield data from the variety trial as it came into full production allowed for more reliable variety recommendations for growers.

In the planting that was originally established various materials were tested as planting hole amendments. Early on there were significant differences between treatments in this. The yield data already collected in previous grants showed the importance of amending the soil with organic matter at planting for establishment and yield in the long term. Growers are sometimes reluctant to apply the recommended practice of using a planting hole amendment because of the cost, this motivated interest in collecting data on the long-term effects of planting hole amendments.

Nitrogen fertilization is important to maintain vigorous growth of blueberry plantings. The current recommendation for the Northeast is to apply half of the recommended nitrogen fertilizer at flowering and half six weeks later. In this project the practice of splitting the recommended rate into three applications was tested. Varying the fertilization rates and applying nitrogen later into the growing season than is currently recommended was also tested. These practices were tested because late application of nitrogen is discouraged in the Northeast due to potential for winter injury to new growth, but mid to late summer nitrogen application is a recommended practice in the southern U.S.

Project Approach Each year of the project Emmalea Ernest, University of Delaware Associate Scientist with the Extension Vegetable and Fruit Program, with assistance of miscellaneous wage employees of the program worked to maintain and collect data from the blueberry research and demonstration plot. This included pruning, weeding, mulching, fertilization and irrigation to maintain the plants throughout the growing season. Berries were harvested and yield data was collected from the three experiments from mid-June through mid-August. Details specific to each experiment are provided below.

Variety Trial: The variety trial includes twenty-five varieties. Most varieties are replicated four times in the planting with three plants per replication. Flowering observations were made for the varieties each year, which has provided valuable information about which varieties will be prone to damage from a "false spring" (warm weather that brings plants out of dormancy, followed by a hard freeze). Each year yield was measured twice a week on a per plant basis with the first harvest in mid-June and the final harvest in mid-August. Taste tests of harvested berries were conducted in 2017 and 2018. As the project has progressed, variety recommendations have been made to growers, including some adapted southern highbush varieties, based on the variety trial and taste test results. A final assessment of all the variety trial data will be presented to growers at the Fruit and Vegetable Growers Association of Delaware annual education meeting on January 14, 2019.

Nitrogen Fertilization Study: The purpose of this study is to determine the optimal rate and timing for nitrogen application in blueberries in southern Delmarva. Nitrogen fertilization treatment plots were assigned in an area planted with the variety 'Chandler' that had previously used for a mulch material study. The area was uniformly mulched in 2015, the year before this study began, and pH adjustments were made on a per plot basis. Yield data for the plots was collected. The 2015 yield data to assign plots to blocks with similar yield performance. Fertilizer treatments were then assigned within these blocks. Six nitrogen treatments were tested:

				Lbs of N/Acre Applied Each Date				
Trt #	**Trt Name**	**Rate Lbs/A of N**	**# Applications**	**27-Apr Bloom**	**18-May 3 wks**	**8-Jun 6 wks**	**7-Jul 10 wks**	**3-Aug 14 wks**
1	65 over 2	65	2	32.5		32.5		
2	65 over 3	65	3	22	21	21		
3	85 over 2	85	2	42.5		42.5		
4	85 over 3	85	3	28.3	28.3	28.3		
5	85 over 4	85	4	22	21	21	21	
6	105 over 5	105	5	21	21	21	21	21

Nitrogen application rates for the southeastern US are 76-115 lbs N/acre and the recommended rate for the northeastern US is 65 lbs N/acre. The treatments applied in our experiment cover this range of application rates and test the effect of multiple smaller applications and later applications.

Yield data were collected from this experiment from late June through mid-August in 2016-2018. Leaf samples were collected from each plot in mid July 2016 and early August 2017 and sent for leaf tissue testing to assess nitrogen status. There were no statistically significant differences in leaf nitrogen content observed between treatments in either year. There were no statistically significant difference in yield between nitrogen treatments in any of the three years. In this experiment the nitrogen rate and timing did not significantly affect yield. This suggests that the current nitrogen rate recommendations for the Northeast are adequate for blueberry production in Delaware and that the higher rates recommended for states in the South are not beneficial in southern Delaware.

Soil Amendment Study: In the planting that was originally established various materials were tested as planting hole amendments. Past data has shown the importance of amending the soil with organic matter at planting for establishment and yield in the long term. Significant differences were observed between treatments in this study for the first four years that yield data was collected (2013-2016). In 2017 and 2018 there were no statistically significant differences between the treatments, however the plants that received no soil amendment at planting were still numerically the lowest yielding. Growers are sometimes reluctant to apply the recommended practice of using a planting hole amendment because of the cost. In this experiment, the effects of at-planting amendment significantly affected yield in the first four years of fruit production. This data on the long term effects of planting hole amendments (which in this experiment were still evident 5 years after planting) has been used to make science-based recommendations that will increase the success of growers trying to establish blueberries.

Blueberry Pruning Training: A blueberry pruning workshop was held on Saturday, February 25, 2017 in the blueberry planting at the Carvel Research and Education Center (http://extension.udel.edu/weeklycropupdate/?p=9900). Eighteen blueberry growers attended the workshop and participated in a hands-on pruning demonstration. An additional training was held on February 3, 2017 at a new blueberry grower's farm for 11 of their workers.

A blueberry experimental plot tour was held on June 26, 2018 in the blueberry planting at the Carvel Research and Education Center (http://extension.udel.edu/weeklycropupdate/?p=12024). Nine blueberry growers participated in this event, which included a tasting of berries from the varieties in the variety trial, an update on recent trial results and a tour of the plot.

Dissemination of Results: Yield results and flowering timing from the variety trial were presented to participants in the pruning workshop on February 25, 2017 and the experimental plot tour on June 26, 2018. Results from the soil amendment study and final results of the mulch materials study were presented at the Cumberland Shenandoah Fruit Workers Conference on December 1, 2016 to 19 agricultural professionals in a talk titled "Planting Hole Amendment and Mulch Effects on Blueberry Establishment and Yield in Southern Delaware". A summary of results from early-on in the variety evaluation was published in UD Cooperative Extension's Weekly Crop Update

Newsletter (http://extension.udel.edu/weeklycropupdate/?p=8951). A blueberry pruning video was made in the blueberry experimental plot in 2016 and posted on YouTube (https://www.youtube.com/watch?v=eJS3JKHPccE). The video currently has more than 54,000 views.

Goals and Outcomes Achieved

Goal 1. *Provide research-based recommendations on blueberry varieties, nitrogen fertilization and planting hole amendments to growers in Delaware.*

Recommendations on variety selection, soil amendments and nitrogen fertilization based on the results of research conducted during this project have been shared with growers at the pruning workshop, experimental plot tour, Weekly Crop Update newsletter and the meetings of the Fruit and Vegetable Growers Association of Delaware. Results have also been conveyed to individual growers who contact UD Extension with questions about blueberry production.

Thirty-three past participants in blueberry workshops who had provided contact information were either emailed or mailed a survey in October 2018. Seventeen responded to the survey. Eight of the respondents are commercial blueberry growers, seven are home gardeners with blueberries and two are/were interested in blueberries but are not currently growing any.

Eight-two percent of respondents said that the blueberry variety trial results had helped them decide which blueberry varieties to plant, and 41% had planted Southern Highbush blueberry varieties. All respondents who had attended a field day when they could see the plants in the variety trial and taste berries from the different varieties said that that experienced had helped them decide which varieties to plant. Seventy-one percent of respondents said they had used something they learned about soil amendments for blueberries on their farm or in their garden.

Goal 2. *Increase blueberry growers' knowledge of pruning techniques, recommended nitrogen fertilization practices, variety selection and soil amendments using workshops/field meetings held in the blueberry plot.*

During this project two meetings were held in the blueberry experimental plot. One focused on pruning and the other on variety selection and crop management. An additional pruning training was held at a new blueberry grower's farm. In total, thirty-eight people participated in these workshops, (the goal was to reach 30 individuals through these meetings). In the survey of workshop participants described in Goal 1 individuals were asked about knowledge gained or adoption related to the following topics: blueberry pruning, blueberry plant establishment, soil amendments for blueberries, mulch materials for blueberries, and choosing blueberry varieties. Seventy-six percent or more of the participants indicated that they had learned something new about each of these topics. The goal was that sixty percent of participants would indicate knowledge gained. Fifty-nine percent or more of the participants applied something they had learned about each of these topics on their farm or in their garden (no target was set for adoption for this goal but target was 50% for Goal 1).

Beneficiaries Blueberries are a significant opportunity for fresh market growers in Delaware, especially small-scale growers. There is demand for the crop and interest by growers (more than 50 Delaware farmers are on the UD blueberry contact list), but only a few commercial plantings. This project helped Delaware Cooperative Extension personnel to make variety and production practice recommendations based on local research that have allowed Delaware blueberry growers to be more successful. In the timeframe of this project Delaware Extension personnel advised a new grower in successfully renovating an abandoned blueberry planting that had been out of production. They also advised several growers in the establishment phase and one current grower expanding their acreage. The eight commercial growers who responded to the survey manage a combined 20 acres of blueberries. All of them indicated that this project had been impactful for their farms, having adopted at least one practice based on the outreach or research activities done as a part of this project.

Lessons Learned In general terms the recommendations for growers based on the research conducted as a part of this project are as follows:

- Certain new Northern Highbush blueberry varieties are well adapted to production in Delaware and have desirable quality, yield and seasonal maturity attributes, other varieties are not well adapted or are lacking quality attributes or have other drawbacks like requiring excessive pruning.
- Certain Southern Highbush blueberry varieties that have not been grown in Delaware in the past can be successfully grown in Southern Delaware without risk of winter injury. Some of these varieties are easier to establish and are more tolerant of sandy soils. Other Southern Highbush varieties experience severe winter injury in some years and are not recommended.
- To encourage establishment and early yields, low pH organic soil amendment such as peat moss, well composted wood chips, or waste silage is recommended at a rate of 1 gallon per plant, mixed with the backfill soil at planting. The effects of using an at-planting amendment were statistically significant into the fifth year from planting.
- Nitrogen fertilizer recommendations for the Northeast are adequate for blueberries grown in Delaware. There was no benefit to yield seen from using the higher nitrogen rates, or later applications that are recommended in the Southern US.

As a result of bird feeding in the experimental plot in 2016 a bird scaring device was installed. It was effective in reducing, but not eliminating bird damage in the plot. Timely harvest was also necessary to prevent losses.

There continues to be demand for blueberry-related Extension programming, but the full experimental plot is too expensive to maintain in the long term. A smaller demonstration plot with some of the recommended varieties that could be used for taste tests, pruning and management workshops is being considered.

Contact Person

Emmalea Ernest, 302-856-7303, emmalea@udel.edu

Project Title Delaware Buy Local Promotion Program

Project Summary Delaware's family farms sold $4.3 million worth of agricultural products directly to consumers in 2012, up from $3.5 million in 2007, according to the U.S. Census of Agriculture. Data from our community-run farmers' markets also indicate a dramatic increase in sales over the last few years, with sales reaching over $3 million in 2015 and 2017. While those figures do include non-specialty crop products, it is one indicator of the increasing level of interest that Delaware and area consumers have in local farm products, particularly fresh produce. This trend of buying locally grown foods shows no sign of slowing down, and indeed, is expected only to increase. Supporting farmers who sell direct to consumers is a critical part of any plan to promote and enhance the viability of specialty crops.

The Delaware Department of Agriculture's ongoing Buy Local campaign, launched in 2014, has the goal of tapping into this interest and increasing direct-to-consumer sales from Delaware family farms, primarily focusing on fresh produce (i.e., specialty crops). The Buy Local initiative directs consumers to an online directory with an easy-to-remember short link (de.gov/buylocal) listing farm stands, farmers' markets and other outlets to purchase local farm products. We tracked the trend of people utilizing the website through Google Analytics, and saw an increase in traffic when a well-positioned social media post was boosted online through Facebook. What the analytics also showed us was that not enough people were utilizing our resources because there was not a consistent brand to build the consumers perception of Delaware farmers producing specialty crops. The other issue is that consumers perceived the Buy Local initiative to be tied directly with the government, not with our farmers.

Our initial efforts were on building awareness of Delaware specialty crops and where the consumer could buy local, utilizing social media posts for advertising and a buy local 12 month calendar. Once we determined that Delaware farmers were in need of one consistent brand that encompasses all we produce in Delaware, mainly specialty crops, that the consumer readily recognizes – whether at a grocery store, a farm stand, farmers' market, or even a restaurant that serves locally grown Delaware specialty crops, we shifted gears to work on developing the Delaware Grown brand.

Project Approach:

The Delaware Buy Local grant was divided into three distinct projects that helped build the awareness around specialty crops produced by our family farmers: (1) Buy Local Calendar; (2) Buy Local Advertising; and (3) Delaware Grown/Raised Branding.

(1) Buy Local Calendar: DDA staff visited farms, farmers' markets, and farm stands each year to take photos of Delaware's locally grown produce. A recipe was selected to match each photo for each month. Our staff did all of the graphic design for each calendar. We had originally planned on dedicating three (3) pages each year to non-specialty crops that are produced in Delaware, however, we only used one (1) page for the 2017 calendar and chose to use only specialty crop photos for 2018. Each calendar page has our Buy Local Guide website de.gov/buylocal on the bottom. We updated the Delaware Local Produce Availability Chart in 2018 to include more fruits and vegetables grown in Delaware and utilized real photographs of produce instead of clipart. Our calendar is specifically designed so that when it's hung on

a wall a person can lift the remaining pages up and view our Delaware Local Produce Availability Chart. In addition, each page has a recipe to make that corresponds to the specialty crop in the main photograph for that month.

(2) Buy Local Advertising: DDA has utilized social media, mainly Facebook and Instagram to promote Delaware specialty crops. In 2016, DDA developed three videos related to Christmas trees to run in December 2016. In 2017, we promoted specific specialty crops through still images taken at local farmers' markets. The overall goal of these social posts were to direct viewers to our de.gov/buylocal page to find a farmer's market, farm stand, or u-pick to get fresh, local Delaware produce.

In 2018, we worked to build out the Delaware Grown brand through a photography project, the development of collateral materials, and website design for a delawaregrown.com.

(3) Delaware Grown/Raised Branding: We selected Miles Partnership, a marketing firm on state contract, to manage our branding project related to specialty crops. Downs and St. Germain Research firm does all of the consumer brand research for Miles Partnership. Based upon information that we provided in our kick-off meeting, they developed an internet survey to determine consumer awareness and perception of Delaware grown specialty crops. A total of 362 participants were involved in the survey – 252 Delaware residents and 110 Delaware visitors, comprised of 6 key markets where Delaware specialty crops are shipped and also visit Delaware (Philadelphia, Baltimore, Washington, D.C., New York City, Harrisburg, PA, and Salisbury, MD).

From the research, we learned that we have three different consumer profiles looking to purchase Delaware specialty crops:

a. "Ellen" is the middle aged, college educated consumer who has a strong preference for locally grown produce. It is extremely important for her children to eat locally grown produce. The purchase behavior indicates that she purchases fruits and vegetables 2-3 times per week, primarily at the grocery store, but will also go to farmers' markets and farm stands. She tends to seek out information on specialty crops in the store or at markets. What we learned from "Ellen" is that DDA does not put any information into grocery stores regarding Delaware grown specialty crops and we are missing out on a huge market.
b. "Mike" is a millennial, 18-34 years old who purchases fruits and vegetables once a week. He tends to purchase organically grown fruits and vegetables that are pesticide free and focuses on nutritional value. This consumer group wants to eat at restaurants that source locally grown produce. "Mike" seeks produce information through online searches and social media. What we learned from "Mike" is that DDA has a presence promoting specialty crops through social media and Instagram is a big place this age group is seeking our information because its visual, our current de.gov/buylocal website is not mobile/user friendly, and while we know Delaware farmers are selling produce to our restaurants there is no consistent designation on menus to point this out.
c. "Mary" is a highly educated, well-to-do consumer visiting Delaware. She prefers to purchase local fruits and vegetables at farm stands and farmers' markets and will seek

out information at the local market or even a local grocery store. What we learned from "Mary" is that we need to build awareness, help this consumer have a positive experience picking fruit and vegetables at the local farmers' market or farm stand that builds a connection with a farmer, so that when they return home he/she seeks out Delaware grown specialty crops.

Through the survey, we wanted to get an understanding of what people thought of Delaware specialty crops. Fresh was the term most used to describe agricultural specialty crops grown in Delaware. Fresh fruits and vegetables are much more associated with Delaware than horticultural crops, cut flowers, or evergreens. Nearly 8 in 10 residents and visitors believe its important top buy from local growers of produce. The top six Delaware-grown fruits having the highest awareness were: strawberries, watermelon, berries, apples, peaches, and cantaloupe. About 3 in 4 residents and visitors rate fresh fruit grown in Delaware as excellent or very good. The top six Delaware-grown vegetables having the highest awareness were: sweet corn, tomatoes, cucumbers, pumpkins, green beans, and lettuce. About 3 in 4 residents and visitors rate fresh vegetables grown in Delaware as excellent or very good. Honey had the highest awareness for horticultural crops grown/raised in Delaware.

Based upon the popularity of "fresh" to describe Delaware specialty crops, Miles Partnership developed two rounds of brand names with ten in each. The first round was not encompassing of all specialty crops and focused on the taste – "delicious" – which we pointed out that a Christmas tree or flower cannot be delicious. Miles came back with a second round of brand options and we selected an overall brand, "Delaware Grown" with a tag line of "Pick Fresh. Pick First." Overall this matches the research that consumers of Delaware grown specialty crops want to know they are getting the best and directly benefitting the community. They feel savvy and "in the know" when they purchase products with the minimum amount of time "off the vine."

Goals and Outcomes Achieved:

(1) Buy Local Calendar: Each year we ordered additional copies of our calendars to deliver to consumers throughout the state due to an increased demand and better distribution channels. We distributed 4,000 calendars for 2016 and 2017; and 5,500 copies for 2018. Calendars were distributed to Extension offices, Public Health nutrition staff, 34 public libraries, agricultural events, rest stops, various chamber of commerce offices, farmers' markets; senior centers, and agriscience classrooms.

The Delaware Department of Agriculture's communications team made a decision to hold off on designing the 2019 calendar and come out with a 2020 calendar in July 2019. This would allow for the calendar to sync with our recipe card collection and get distributed during a time when the growing season is still in production and consumers could utilize the recipes over two seasons when making local food purchases. In making this change, we have received a lot of phone calls from citizens who have received previous years' copies asking when they will receive the 2019 calendar because they found it so useful in the kitchen.

(2) Buy Local Advertising: DDA has utilized social media, mainly Facebook and Instagram to promote Delaware specialty crops, with some posts on Twitter. We used funding from the Specialty Crop Block Grant to pay for posts in 2016 and 2017. We funded the promoted posts in 2018 through state allotted online marketing funds. The Delaware Department of Agriculture redesigned their entire website putting it on a WordPress platform, which was likely the reason for lower numbers from December 2017-March 2018. (See Chart)

We utilized $20,700 of the Buy Local Advertising funds to hire Remsberg, Inc. to photograph Delaware specialty crops in order to provide quality photographs to use in social media, print media, publications and the new website promoting Delaware Grown specialty crops. We completed eight days of photo shoots including two farmers' markets, five family farms that included u-pick and whole sale, and one farm-to-table with the Secretary of Agriculture and family. We received the full-rights to 1,691 high quality photographs. We have used these assets in social media, print media, and will utilize them in the 2020 DDA specialty crop calendar and other promotional material to advertise Delaware specialty crops.

We paid Miles Partnership to create a web design ($20,800), using the research that we gained in the consumer study while developing the brand. We received three revisions and then the design was shifted to the state to be implemented on our WordPress platform. With state funding, we purchased the domain delawaregrown.com ($4,000) and all of the network certificates. The state team is still translating the design into our system and the website will be functional in early 2019.

Since Miles understood the brand, the voice, and what consumers have asked for, we felt it was best to stay with Miles to create the collateral assets for Delaware Grown. They developed a tri-fold brochure, letterhead, tradeshow pop-up banners, backdrop wall, and static banner ads ($8,450). The Delaware Department of Agriculture has the full design files for these assets, which will allow us to keep a common look and feel, but to change out photographs depending on the specialty crop with assets created by Remsberg, Inc. These materials will be used by our marketing staff, farmers, farmers' markets, and grocery stores selling Delaware Grown specialty crops.

Month	2015		2016		2017		2018	
	Promotion	**de.gov/ buylocal**	**Promotion**	**de.gov/ buylocal**	**Promotion**	**de.gov/ buylocal**	**Promotion**	**de.gov/ buylocal**
January				1,044		668		434
February				910		780		188
March				3,154		1,017	Cabbage (St. Patrick's Day) *DDA launched new website: agriculture.delaware.gov	379
April				3,038	Asparagus: $20	1,197	Farmers' Market Season Kickoff	593
May				2,321	I just wanna go to a Delaware Farmers Market: $20	1,949	(1) Don't miss out on picking up early-season fruits, vegetables, and herbs at your local farmers' markets (2) Delaware Grown Asian Asparagus and Bean Salad: $50 (3) Delaware Grown Strawberry and Rhubarb Pie: $50	1,021
June				2,635	Locally Grown at FM with WIC: $20	2,478		988
July				2,643		2,146	(1) How to pick the perfect blueberries (2) Delaware Grown Photoshoot at Historic Lewes Farmers' Market	1,254
August		2,485		1,734	(1) Summer Squash: $20 (2) Eggplant: $20 (3) Cherry Tomato: $20	1,334	(1) DYK that Delaware has over 20 farmers markets offering locally grown	889

							produce? Find one near you at de.gov/buylocal (2) Watermelons are a great source of vitamins A, B6, and C, as well as potassium! These sweet treats are an important crop in Delaware, bringing in more than $10 million to our economy each year. Pick one up today to enjoy all weekend long (3) Today is World Honey Bee Day! Celebrate by hosting a Brunch for Bees. Invite your friends and family to enjoy a meal full of pollinator-dependent foods to show how important honey bees are to everyday life. Enjoy dishes like an apple pie, cucumber salad, zucchini fries, grilled eggplant, and fruit salad (strawberries, raspberries, blueberries, watermelon, grapes). With more than 90 foods impacted by bees, the list of possibilities is long!	
September		1,437		1,321	Acorn Squash: $20	871	Fall is fast approaching! Acorn squash are great for décor, but even better in simple recipes	650

							like our Parmesan Roasted Acorn Squash. Try a new recipe to celebrate National Acorn Squash Day	
October		1,367		1,028		663		
November		1,802		1,899	Christmas Tree Map: $60	1,232		
December		1,820	(1) Delaware Christmas Trees: $250 (2) Delaware Christmas Trees/Agtourism: $250 (3) Delaware Christmas Trees: Sussex Co.: $200	3,090	(1) Holiday Farmers' Markets: $20	1,057		

(3) Delaware Grown/Raised Branding: We selected Miles Partnership, a marketing firm on state contract, to manage our branding project related to specialty crops. Downs and St. Germain Research firm does all of the consumer brand research for Miles Partnership. Based upon information that we provided in our kick-off meeting, they developed an internet survey to determine consumer awareness and perception of Delaware grown specialty crops. A total of 362 participants were involved in the survey – 252 Delaware residents and 110 Delaware visitors, comprised of 6 key markets where Delaware specialty crops are shipped and also visit Delaware (Philadelphia, Baltimore, Washington, D.C., New York City, Harrisburg, PA, and Salisbury, MD).

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d. "Ellen" is the middle aged, college educated consumer who has a strong preference for locally grown produce. It is extremely important for her children to eat locally grown produce. The purchase behavior indicates that she purchases fruits and vegetables 2-3 times per week, primarily at the grocery store, but will also go to farmers' markets and farm stands. She tends to seek out information on specialty crops in the store or at markets. What we learned from "Ellen" is that DDA does not put any information into grocery stores regarding Delaware grown specialty crops and we are missing out on a huge market.
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f. "Mary" is a highly educated, well-to-do consumer visiting Delaware. She prefers to purchase local fruits and vegetables at farm stands and farmers' markets and will seek out information at the local market or even a local grocery store. What we learned from "Mary" is that we need to build awareness, help this consumer have a positive experience picking fruit and vegetables at the local farmers' market or farm stand that builds a connection with a farmer, so that when they return home he/she seeks out Delaware grown specialty crops.

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The Delaware Department of The Delaware Department of Agriculture utilized the annual Delaware Ag Week to reveal the new brand to the farmers in January 2018. The family farmers in attendance were extremely impressed with the work that went into representing the industry to help increase their profits. Several farmers are already utilizing the Delaware Grown brand in their boxes, labels on produce, and signage. We have also been able to get the brand into one local grocery store and will be increasing that for the upcoming year to include major stores such as ShopRite and Redners. All 20 farmers' markets utilized signage with the Delaware Grown brand.

The Delaware Grown brand was also part of a networking event for growers and buyers at the Delaware Wine, Beer, and Spirits festival. The largest need of this audience was Delaware Grown honey.

Beneficiaries:
This project helped increase visibility and income for Delaware farmers who raise specialty crops in Delaware. We know that residents and visitors who are purchasing Delaware Grown specialty crops can identify with the brand and use that to seek out other quality products grown by our Delaware family farms. The farmers' markets also benefited because they could highlight Delaware crops a little more than just 'buy local.'

Due to developing a brand and increasing promotions through social media, we reached 49,525 unique individuals inquire further about where to buy Delaware Grown produce. Sales at the 19 Delaware farmers' markets for 2018 were $2,883,702.46, with $1,503,940.27 attributed to specialty crop purchases.

Through print media, Delaware Grown ads were placed in the Southern Delaware Explorer located at 500 locations across Sussex and Kent County including hotels, chamber of commerce's, the Newark, Smyrna, and Dover Visitor Centers, the Cape May & Lewes Ferry terminals, real estate offices, convenience and grocery stores, restaurants, credit unions and banks. The Delaware Grown ad that was placed in the Delaware State News, The Milford Beacon, and the Sussex Post, and included an online banner ad, reached over 350,000 viewers.

Lessons Learned:
We learned that utilizing a marketing design firm that utilized consumer research effectively is extremely important. We were able to come out with a finished product that looks professional, is attractive, and is supported by the industry.

This grant was written prior to the current PI being employed by the Delaware Department of Agriculture; therefore, we had a lot of scope changes. If this was to be done again, the recommendation would be to focus on consumer brand-study and brand development in Year 1; create a website and collateral in Year 2 with a soft roll-out; and in Year 3 get all the farmers, grocery stores, and other retail locations on board to grow the brand with a push out of calendars and other publications.

Contact Person:

Stacey Hofmann, Chief of Community Relations

- (302) 698-4542
- Stacey.Hofmann@state.de.us

Additional Information:

Creative Assets

Example of a print ad.

Project Title Genetically Characterizing Partial Resistance to Downy Mildew of Lima Bean

Project Summary Lima beans are Delaware's largest acreage vegetable crop and important for the state's processing vegetable growers. The majority of the lima bean acreage is green baby lima bean grown for processing (9,600 acres planted in 2017). The oomycete plant pathogen *Phytophthora phaseoli* causes downy mildew, which is the most important pathogen of lima bean in the eastern U.S.

Downy mildew has been a problem for lima bean growers in Delaware since it was first reported in the state in 1904. Breeding for resistance to this disease was a major goal of the USDA lima bean breeding program from the late 1940s until the 1980s. Because of resistant varieties developed by the USDA, Delaware lima bean growers did not experience serious losses from this disease from the early 1980s until the emergence of two new races of the pathogen (Race E and Race F) which overcame the existing resistance, causing epidemics and major yield losses in 2000 and 2003. Since the emergence of races E and F, growers have had to rely on fungicides to control downy mildew. Race F of *P. phaseoli* is currently the prevalent race of the pathogen in the mid-Atlantic region.

Advanced lines from the lima bean breeding program are annually screened for race F resistance in the field, and several advanced breeding lines with resistance to race F have been developed and are being tested. Through work funded by previous Specialty Crop Block Grants we have developed a protocol for scoring tens of thousands of DNA variants across the genomes of lima bean lines and developed genetic markers predictive of resistance to race F. The goal of this project is to leverage these developments to address a moderately more difficult but important aim: to map the genes associated with the partial resistance to downy mildew observed in some cultivars ('Cypress', 'Maffei 15' and 'B2C'). Partial resistance substantially reduces the level of an epidemic and makes it easier to manage with fungicides. Lines with both partial resistance genes and complete resistance genes may maintain their resistance for a longer period, because use of single genes for complete resistance tends to drive the emergence of new races of the pathogen and cause a "break down" of genetic resistance. This phenomenon was observed during the USDA's efforts to breed for downy mildew resistance in the 1940s-1980. The goal of this project was to determine how many genes are involved in the partial resistance reaction and identify genetic markers to indirectly select for these genes. This will aid the breeding program in achieving more durable downy mildew resistance.

Project Approach Emmalea Ernest made crosses between the chosen susceptible and resistant lima bean lines with greenhouse grown plants in December 2015. A total of 44 successful crosses were made. The F_1 seed from eleven of these crosses was planted in the greenhouse to obtain F_2 seed in March-May 2016. The F_2 populations developed are derived from two parental combinations: Maffei 15 and Jackson Wonder, and Cypress and Jackson Wonder. In summer 2016 Emmalea Ernest and hourly wage employees planted the F_2 seeds in an area covered by a drip irrigated rain shelter (high tunnel frame with a poly film roof but no side walls) to maximize seed quality. There were 406 F_2 seeds planted from the cross Maffei 15 x Jackson Wonder, 628 seeds planted from Jackson Wonder x Maffei-15, 328 seeds planted from Cypress x Jackson Wonder and 410 seeds planted from Jackson Wonder x Cypress. Leaf tissue was collected from the F_2 plants in July 2016 and frozen at -80 C. At least 30 seeds from each F_2 plant were collected in October and November 2016.

Emmalea Ernest, Tom Evans and Nancy Gregory, with assistance from miscellaneous wage workers, screened 384 $F_{2:3}$ families from crosses between Cypress and Jackson Wonder in greenhouse humid chambers in December 2016 to April 2017 to determine their disease reaction to race F of downy mildew. Individual plants were rated for the amount of sporulation. Additionally, lesion length and plant height were

measured. Adjusted means for sporulation rating and lesion length as a percent of plant height were estimated and used to represent the phenotype for each of the corresponding F_2 plants.

Lab personnel, supervised by Randy Wisser, extracted and quantified DNA from 864 F_2 plants sampled in the project. Genotyping-by-sequencing (GBS) was performed on a subset of the samples (251 of the 384 F_2-derived/phenotyped families described above in addition to multiple control samples). Subsequent analysis steps were performed by Randy Wisser. The data were first processed using an internal bioinformatics pipeline (RedRep; https://github.com/UD-CBCB/RedRep), using a reduced representation reference genome. Extended analysis of the GBS data was performed using a new whole genome reference sequence, the results of which led to additional sequencing to resolve unexpected outcomes. Consequently, fewer than the anticipated number of individuals could be genotyped (as noted above).

After quality control and a series of data processing steps on the GBS data, approximately 1000 polymorphic markers were used to construct a genetic map and to perform quantitative trait locus (QTL) mapping for partial resistance to race F. A 670 cM genetic map comprised of 11 linkage groups (LG) was constructed that constitutes ~50% of the physical map (i.e. a draft reference genome assembly of the cultivar Bridgeton). Using stepwise regression, a major effect resistance locus, explaining ~50% of the phenotypic variation in the aforementioned traits, was identified on LG_9 (Figure 1; henceforth referred to as *PlPp_9.1*). It was also determined that markers previously associated with complete race-F resistance to *P. phaseoli* (1) were located within the same scaffold sequence as *PlPp_9.1*, indicating that these two resistance loci are linked or that *PlPp_9.1* is a weaker allele of the race-F resistance gene. Moreover, the lack of dual resistance to race F and race E in prior screenings of lima bean accessions has suggested that these resistance loci are also linked, such that *PlPp_9.1* likely corresponds to a complex resistance locus in lima bean. Further studies are required to determine the nature of the relationship between these *P. phaseoli* resistance loci. The practical implications of these findings are that stacking these apparently different resistance alleles into a single variety is either implausible (under the assumption they are actually alleles of the same gene) or will require a high-throughput screening method to obtain favorable recombinants (under the assumption they are tightly linked).

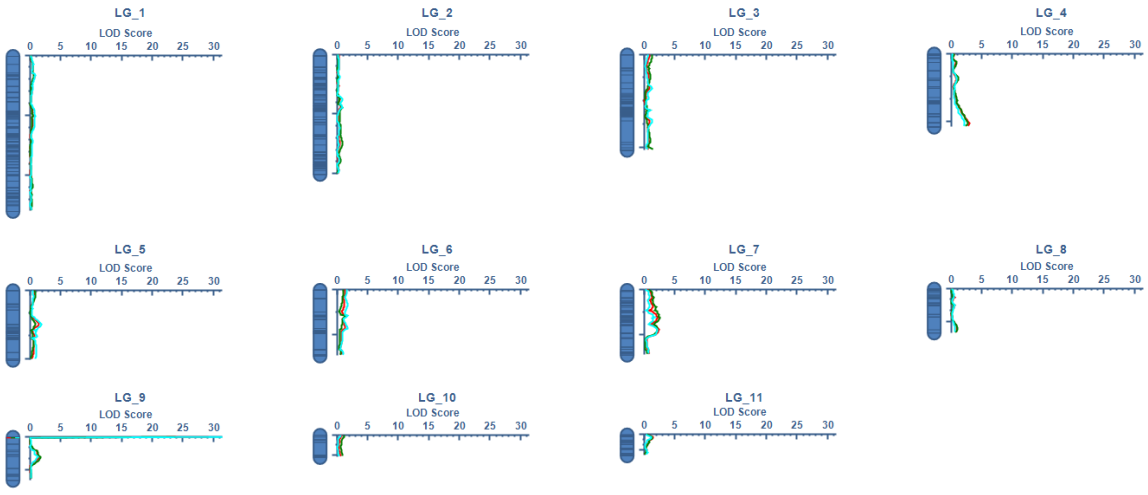

Figure 1. Linkage map and LOD scores for measures of sporulation (red), lesion length (green) and overall severity (cyan). Note the LOD scores exceeding 30 at the "beginning" of LG_9 (line along LOD axis).

Goals and Outcomes Achieved

The first goal of this project was to develop molecular breeding tools that will allow partial resistance to race F to be used in the lima bean breeding program to produce cultivars with durable resistance to downy mildew. The experiments designed were meant to determine the genetic basis of partial resistance and identify markers that could be used to indirectly select for partial resistance to race F in lima bean. Segregation for partial resistance to race F had been observed in inoculated experimental populations and the impact of partial resistance seen in suppressing epidemic downy mildew in field situations, but the number of genes involved in the partial resistance phenotype was unknown, and an effective method to select for partial resistance genes was not available, especially in combination with major genes for resistance, which mask the partial resistance phenotype. Using the genotype information from an F_2 mapping population and phenotype information from their corresponding $F_{2:3}$ families, at least one major effect locus from Cypress that confers partial resistance to race F (*PlPp_9.1*) and associated markers were identified.

The second goal of this project was to enhance the use of genotype data already developed for lima bean and to inform further development of these resources and their use in the breeding program. Populations that were generated during the project and can be used in future genetic studies and the genotyped population was used to produce a genetic map of lima bean and further our ability to apply genomic analysis to lima bean. The target for this goal was to create and genotype at least at least two populations of at least three hundred individual lines to produce a high density genetic map of lima bean. Not as many of the F_2 plants were genotyped as planned because additional sequencing was needed to resolve unexpected outcomes in the initial genotyping. However, approximately 1000 polymorphic markers were used to construct a genetic map from the Cypress x Jackson Wonder population and to perform quantitative trait locus (QTL) mapping for partial resistance to race F. A 670 cM genetic map comprised of 11 linkage groups (LG) was constructed that constitutes ~50% of the physical map (i.e. a draft reference genome assembly of the cultivar Bridgeton).

Beneficiaries The lima bean industry generates over 500 jobs in Delaware providing salaries of about $15 million per year. The value of lima bean production in Delaware and Maryland totaled $9 million in 2017 (2). In recent years, Delaware farms have planted about 12,000 acres of baby lima beans annually. This represents ~ 29% of the U.S. frozen lima bean acreage. As the U.S.'s second largest lima bean producers, processors in the Mid-Atlantic region rely on lima bean profits to support production of other less profitable vegetable crops such as spinach, peas, snap beans and sweet corn, which total nearly $ 42 million/year for DE, MD and NJ (2; 3). Lima bean cultivars with durable resistance to *P. phaseoli* will increase grower profitability by reducing yield loss, fungicide costs and the likelihood of the development of new races of the pathogen. Lima bean production in Delaware has kept vegetable processors in the region and processors remain interested in Delaware because of the research and Extension support that lima bean has received in the State.

Lessons Learned As a part of this project methods for producing, tissue sampling and phenotyping larger experimental populations of lima bean were implemented successfully. Building on these experiences will allow for additional efficiency in similar future projects and allow for better estimates of costs and time necessary to carry them out.

Implementation of GBS for genotyping of lima bean as a part of this project presented some unanticipated challenges related to the discovery of valid genomic variants. The data generated as a part of this project furthers the understanding of the lima bean genome and the development of resources for lima bean.

Contact Person

Emmalea Ernest, 302-856-7303, emmalea@udel.edu

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Project Title Understanding the Food Safety Modernization Act for Produce Farmers

Project Summary The intent of this project was to encourage farmers to provide growers with an understanding of the Food Safety Modernization Act (FSMA) Produce Safety Rule as it relates to the growing, harvesting, packing and storage of fresh fruits and vegetables. For the first time ever, approximately 150 Delaware produce farmers will be regulated in regards to food safety and it will be important for them to be prepared. According to the National Agricultural Statistics Service's 2012 Census of Agriculture, Delaware had over 220 fruit and vegetable farms. Of that number, more than half of Delaware farms had sales of less than $50,000 per year and are less than 50 acres in size. There are over 160 fresh market vegetable farms, with an estimated 42 selling less than $25,000 in sales.

This project was formulated to prepare growers, especially small and very small farmers, for the FSMA regulations. These new regulations include increased paperwork, mandatory on-farm inspections and increased water testing. As large farms are in compliance currently, small farms will have to be in compliance come the beginning of 2019 and very small farms must be in compliance in the beginning of 2020.

Delaware received a Cooperative Agreement from the Food Drug Administration (FDA) in June 2016 for implementation of the Produce Safety Rule. The Produce Safety Rule is one of the seven rules being introduced through the Food Safety Modernization Act. Funding for *"Understand the Food Safety Modernization Act for Produce Farms"* is now covered under the FDA Cooperative Agreement.
Throughout the prior two years, the FDA and the states have decided it is a benefit for growers to encourage "Education before and while regulation". In order to continue the theme of improving farmer's understanding of food safety through education, we amended the scope of this grant in early 2018, with its approval in June 2018. This amended scope would continue to support and promote grower participation in third-party audits (both USDA and commercial auditing schemes); something the Delaware Department of Agriculture has promoted in the past with the assistance of another USDA Specialty Crop Block Grant. Since the new FSMA regulations have proven to cause economic burden to Delaware grower's, by the amended grant, we were able to continue to offer cost-share reimbursements to help offset the cost of the Third-Party Food Safety Audits; which typically range in price from $600-$3000 per commodity. These third-party food safety audits assist the farming community to continue fostering preventive food safety practices by encouraging growers to continue developing Food Safety Plans and encourage best growing and handling practices.

Project Approach During year 1, a mailing list of Delaware Produce Growers of the state was collected.
During year 2, a full day Produce Safety Alliance training for growers was presented in Harrington, DE on March 16, 2017 and March 17th 2017. The first half of the day was a GAP update session which included new science, what's new in produce safety, new research, information on salmonella and the Delmarva Produce Safety Taskforce. The afternoon was a session on food safety plan training. During this training, 45 Delaware Produce Growers were trained. This training was fully subsidized, including meals and course materials by this grant. We later co-hosted another Produce Safety Alliance training with Maryland where an addition 10 Delaware growers became trained. At this point, Delaware signed into a cooperative agreement with the FDA and the activities this grant was meant to support, was now covered under the cooperative agreement. Due to the length of the Produce Safety Alliance training course, it was important to keep a captive audience to stress the importance of on-farm food safety culture. To maintain our audience the entire day, we utilized some additional funding to provide meals to two additional produce safety alliance trainings in the beginning on 2018.

During the beginning on 2018, we requested an amendment to the scope of the grant which was meant to encourage growers to continue developing Food Safety Plans and promote compliance through third-party food safety audits. Once our amendment was approved, we were able to issue 12 third-party food safety audit reimbursements during 2018, totaling $9,427.80. We were able to surpass our expected measurable outcome of a minimum of 11 food safety audits. We were also able to purchase our USDA auditor additional education and outreach materials they need to adequately preform their job through both Cornell and Penn State University with this grant funding. In addition, we were able to secure a booth for our USDA Auditor for education and outreach of food safety at Delaware's annual "Ag-Week".

Goals and Outcomes Achieved Throughout the lifetime of this grant, Delaware hosted five Produce Safety Alliance trainings and co-hosted an additional training for education related to the Produce Safety Rule. Of these six trainings, USDA funding was used to support the activities related to four. Since additional funding was awarded, we amended this grant to continue with the purchase of education and outreach materials but to also assist in offsetting the financial burden farmers endure while satisfying buyer requirements of third –party food safety audits. Since the approved amendment in June 2018, we were able to issue a reimbursement to twelve farmers who have participated in either a USDA or commercial third-party food safety audit. Of these twelve reimbursements, (4) were USDA Harmonized Food Safety Audits (~33%), (2) were GlobalGAP (~16%), (2) were CanadaGAP (~16%), (3) were PrimusGFS audits (~25%) and the remaining (1) audit was an additional third party commercial audit (~8%). We were able to surpass our expected measurable outcome of a minimum of 11 food safety audits

Beneficiaries The beneficiaries of all activities preformed under this grant are the approximate 150 fruit and vegetable producers, of all operation sizes, within the State of Delaware. These individuals were direct beneficiaries of the four Produce Safety Alliance trainings performed under this grant, and the educational materials that were provided at that time. 97 individuals were trained during these sessions. These individuals also were beneficiaries at the numerous education and outreach events, including ag week, operating under FDA Cooperative Agreement funding.

After amending the scope of this grant, to provide third-party cost-share reimbursement to eligible fruit and vegetable growers in Delaware, we were able to issue payment for 12 cost-shares .

Lessons Learned The initial reasoning behind the grant provided excellent intentions for the growing community for "education and outreach". Going into the implementation of this grant, we did not anticipate such a lucrative award from the Food and Drug Administration (FDA) for education and outreach efforts related to the Produce Safety Rule. Part of this anticipation was due to the reputation of the FDA to not focus heavily on the education piece. Since we received funding through the FDA in June 2016, we realized there was little we could use our remaining USDA Specialty Block Crop award funding on. At this point in time, we choose to amend the scope of the grant to assist growers in offsetting the financial burden of third-party food safety audits, by supporting the maintenance of a food safety culture at their operations during a critical time, where Produce Safety Rule inspections are forthcoming in 2019.

Contact Person:

Name: Andrea Jackson
Phone #: 302-698-4545
Email: Andrea.Jackson@state.de.us

Project Title Increasing Access to Fresh, Locally Grown Specialty Crop Produce in Low-Income Areas of Wilmington, Delaware

Project Summary Wilmington is the largest city in Delaware with a diverse and predominantly low-income population residing in its neighborhoods. The city as a whole has about double the poverty rate of the state average, but some neighborhoods have rates higher still (e.g., West Center City).
The food landscape in Wilmington is dominated by small food stores or corner stores, which without intervention, sell predominantly unhealthy foods (such as sugar-sweetened beverages, chips, and candy) and tobacco. Yet people rely on these stores regularly, and it is not uncommon for residents to report shopping in them more than once per day. For many low-income adults and children, stopping at the corner store for a snack, drink, or meal item is part of the daily behavior pattern. These stores are, in fact, the norm, as is the unhealthy food inventory and marketing that they host, which hinder the effectiveness of efforts to improve nutrition and healthful eating patterns. Indeed, a recent University of Delaware graduate student, Serita Moss, noted in her 2015 dissertation that "as the percentage of minority population increases, access and availability decreases."

To help expand access to and build demand for healthier foods in Wilmington, The Food Trust began the Wilmington Healthy Corner Store Initiative in 2013. In total, 20 stores were enrolled in the program, which sought to increase the inventory of new, healthy foods in the stores, train store owners on merchandising and display techniques to promote their sale, and provide equipment and marketing materials to help store and market healthy foods. The Food Trust also launched Heart Smarts™ in five of these stores. Heart Smarts™ combined nutrition education and heart health screenings with healthy food incentives to teach and encourage shoppers to buy and cook healthy foods.

The strategy behind our program is to create healthier neighborhoods through establishing neighborhood food stores as hubs to increase community access to healthy food, nutrition education, and preventive health services through an inclusive and participatory model. We work to create significant and sustainable improvements in stores' healthy food inventory and also increase effective placement and marketing of healthy foods to increase purchases of these items. We also strive to help the store find better food distribution options to lower prices and improve quality, and we connect that store to the surrounding community through community engagement and outreach, such as paid community ambassadors trained to support the environmental changes in the stores, and promoting the purchase and consumption of culturally relevant foods, such as fresh produce from a nearby farm. With neighborhood food stores better connected to the community and with transformed food and beverage environments, we then help store owners, community members, and health care partners to leverage these spaces to drive further positive behavioral change among residents via our Heart Smarts™ program, which combines store-based nutrition education with free health screenings and counseling.

Wilmington has only one healthy food retailer, but the city is home to a growing urban agriculture movement and is surrounded by Delaware's farms that grow numerous specialty crops (among many other agricultural products). Most of these foods, however, are not accessible to low-income residents in Wilmington. This has a triple negative impact by hindering demand for and consumption of these healthy foods by residents at high risk for diet-related chronic diseases, preventing Delaware's specialty crop farmers from accessing this market, and keeping Wilmington's neighborhood food stores – most of which are independently owned and operated small businesses – from benefiting from the sales and competitive edge that selling and marketing Delaware-grown fresh and seasonal produce could bring.

Thus, in 2015, with funds from this Specialty Crop Block Grant, The Food Trust sought to promote Delaware-grown specialty crops (fruits and vegetables) in eligible neighborhood stores participating in the Wilmington Healthy Corner Store Network, as well as at four farm stands, all located in low-income areas. During this three-year grant, The Food Trust first worked with a local produce distributor to reduce barriers to EBT use at the four farm stands and enable corner stores in low income and low food access neighborhoods in Wilmington to stock, promote, and sell a variety of Delaware specialty crops to community residents. The Food Trust and its partners also conducted nutrition education to promote Delaware-grown produce in corner stores, developed a pilot program in collaboration with a local supermarket to begin to help corner stores more easily source fresh Delaware grown specialty crops, and worked with a corner store owner on capacity building to develop a new business making fresh-cut fruit salads.

This grant demonstrated a clear demand for Delaware grown specialty crops in the neighborhoods we serve in Wilmington, DE. Items like fresh-cut Delaware watermelon in single-serve clamshell containers (stocked in refrigerators purchased for the corner stores with other grant sources) typically sold out in less than 24 hours. In addition, it showed the important role that small urban neighborhood food stores (such as corner stores and small grocery stores) can play in promoting these foods to low-income Delaware residents, as well as providing an additional market for Delaware farmers. The two items that sold best in these small stores were grab-and-go produce such as fresh-cut Delaware watermelon and popular seasonal items such as sweet corn and tomatoes. These sorts of specialty crops in particular fit well into the typical uses for these stores: a place to obtain a quick meal or snack, and a convenient place to pick up a common ingredient or two to prepare a meal at home.

This project built on progress made through a previous project funded through the Delaware Department of Agriculture Specialty Crop Block Grant Program. The prior grant focused on building the capacity of corner storeowners to market locally grown fruits and vegetables, through providing comprehensive storeowner trainings, healthy food marketing materials, and resources to equip them to source, stock, and promote Delaware-grown fruits and vegetables.

Project Approach In the project's work plan, the first set of activities was to provide technical assistance to increase the sales and sustainability of four Urban Acres farm stands, with a focus on building demand for Delaware-grown produce, and understanding and overcoming barriers to SNAP and FMNP use at Urban Acres Produce farm stands, with the goal of increasing farm stand sales of targeted specialty crops among low-income consumers. Urban Acres' four farm stands were located in Wilmington's low-income and low food access neighborhoods. The Food Trust worked with Urban Acres on a SWOT analysis to identify strategies and best practices to improve the marketing, operations, and sales of Delaware-grown produce at the four Urban Acres Produce farm stands, and helped Urban Acres to address EBT technical challenges to enable SNAP participants to purchase the stands' Delaware-grown produce.

The Food Trust and Urban Acres also worked, as planned, with five corner stores in low income and low food access neighborhoods in Wilmington to help these stores consistently stock, promote, and sell a variety of culturally appropriate, Delaware specialty crops to community residents. As a result, the five store owners were able to provide a total of 10 different varieties of Delaware specialty crops. The top sellers were sweet corn, watermelon, peaches, cantaloupe, strawberries, and blueberries. None of these had previously sold Delaware specialty crops on a consistent basis, and the storeowners noted their shoppers' enthusiasm and positive feedback in gaining access to these fresh foods. Monitoring efforts included The Food Trust staff

collecting Urban Acres' produce invoices on a routine basis to ensure only Delaware specialty crops were sourced, delivered and distributed to the five corner stores enrolled in the pilot program.

The Food Trust also worked with the corner stores to create a packaging and promotion strategy for the Delaware specialty crops. For example, the team researched clamshell containers to hold affordable portions of fresh-cut Delaware specialty crops, including cut watermelon and fruit salads made from Delaware-grown fruits that would easily fit within the corner stores' existing coolers. The team developed, printed, and distributed three types of marketing materials: external advertising, internal promotion, and healthy recipe cards for shoppers. External advertising consisted of weatherproof banners that highlighted the healthy, local produce options offered in the stores. Internal advertising consisted of "Delaware Grown" produce tags and labels that highlighted which healthy produce items were locally sourced. The Food Trust also worked with Urban Acres and corner stores to create recipe cards that helped families prepare healthy meals with the Delaware specialty crops available in the stores. Monitoring efforts included The Food Trust staff conducting pre-production marketing calls with various stakeholders including Delaware based farmers and the Delaware Department of Agriculture to gather input on different marketing strategies to promote Delaware specialty crops within a retail environment.

Storeowners also participated in a series of four trainings to improve their capacity to stock and market locally grown produce. All five store owners participated in training and other technical support to improve their skills and capacity to stock and sell Delaware-grown fruits and vegetables, and all demonstrated basic proficiency for ordering, handling, displaying and promoting fresh produce. Stores reported, and staff observed, a reduction in "shrink" over the course of the pilot, as owners' skills improved with regard to handling fresh produce and accurately forecasting the amount of product that they could sell.

In addition to increasing access to Delaware-grown fresh produce, Food Trust staff also conducted activities to build demand by working to increase the knowledge and intention of local residents to purchase targeted specialty crop products in healthy corner stores. To educate consumers about the fresh taste and health benefits of Delaware grown produce, The Food Trust provided in-store nutrition education programming in participating healthy corner stores. As part of these in-store lessons, The Food Trust's nutrition educator conducted taste tests and cooking demonstrations of easy-to-make and affordable recipes that featured Delaware specialty crops, such as watermelon and corn. The Food Trust also worked with corner store owners to plan and develop recipe cards that highlighted seasonal produce available in Delaware.

Another core set of activities in the work plan was to develop and pilot an innovative model to deliver fresh Delaware-grown produce to a group of Wilmington Healthy Corner Stores. The bulk of our efforts to this end occurred in Year 1, when The Food Trust worked with Urban Acres to deliver Delaware grown specialty crops to the five stores, in addition to its four farmstands. To monitor these efforts, Food Trust staff collected Urban Acres' produce invoices on a routine basis to ensure only Delaware specialty crops were sourced, delivered and distributed to the five corner stores enrolled in the pilot program.

We made further progress on tackling the challenge of delivering Delaware-grown produce to urban corner stores by developing two additional models. In Year 2, using match funds from other funders, a second, smaller pilot program was developed for sourcing and promoting Delaware-grown specialty crops in Wilmington corner stores. The match funds for this effort were provided via a grant to The Food Trust from the Kresge Foundation and a subcontract to The Food Trust from Nemours Health & Prevention Services, through its CDC Partnerships to Improve Community Health (PICH) funding). During Year 2, The Food Trust met with stakeholders throughout Wilmington to discuss the best ways to increase the supply of

Delaware-grown specialty crops for participating healthy corner stores in low-income neighborhoods of Wilmington. Wilmington currently lacks a food hub or produce wholesaler that would consistently provide corner store owners with convenient access to Delaware-grown specialty crops, and as such, efforts to significantly increase the number of corner stores sourcing and promoting Delaware specialty crops has been challenging to expand.

In Year 3, The Food Trust met with staff at an existing community-oriented supermarket in Wilmington and worked to establish a loyalty card program that would enable corner store owners to purchase Delaware-grown specialty crops from the store (retail) but with a 10% discount on purchases as a result of the generosity of the store owners. The Food Trust developed a "shopping list" of Delaware-grown produce and encouraged store owners to sign up for the loyalty card and source their Delaware-grown produce from the store, as a means of having sustainable access to these foods. There were several challenges in implementing this pilot fully in the final year. First, the loyalty card processing facility was located in a separate location from the store at significant distance to store owners. Storeowners are often reluctant to leave their stores for any significant time and getting them to obtain the loyalty cards was difficult. Even so, The Food Trust team sees significant promise in exploring fresh produce distribution strategies, such as this novel strategy. Additional time and resources will be needed to implement a more robust pilot program.

Finally, at the end of Year 3, The Food Trust provided capacity building to a highly engaged store owner of a healthy corner store participating in the Wilmington Healthy Corner Store Network who had a kitchen/deli at his corner store and a license to prepare food. As a previous participant in the Urban Acres pilot, this storeowner recognized the demand for cut fruit salads by his shoppers, as he remembered them selling very well. The Food Trust worked with him on his business model and provided information on which Delaware-grown produce was in season, to increase its availability, freshness, and affordability for the fresh-cut fruit salads.

Collaborations with local partners have been an integral part of the project. The Food Trust team focused on building partnerships for implementing the corner store program, and encouraging the development of new relationships, including cross-sector partnerships to enhance program impact and long-term sustainability. These community partners included Nemours Health & Prevention Services, Delaware Urban Farm and Food Coalition, Christiana Care Health System, Delaware Center for Horticulture, and Urban Acres (a local food distributor). During the grant's second year (2016), the Wilmington Healthy Corner Store Network welcomed several new partners, including the Delaware Food Bank, Wilmington Police Athletic League, and Conscious Connections (a local education and agriculture nonprofit). The Food Trust worked with the Police Athletic League to help spread the word about healthy corner stores to nearby community centers and residents, and inform residents of new, healthy foods, including Delaware-grown produce, being sold in nearby corner stores. The Food Trust also strengthened its partnership with the University of Delaware Cooperative Extension, which supported community events and provided some nutrition lessons and taste tests in Wilmington corner stores.

Goals and Outcomes Achieved

Goal 1: Understand and overcome barriers to SNAP and FMNP use at Urban Acres Produce farm stands, with the goal of increasing farm stand sales of targeted DE specialty crops among low-income consumers.

In Year 1, The Food Trust provided technical assistance to Urban Acres as planned regarding the operations of their four farm stands, which operated as part of the Nemours PICH collaborative grant in Wilmington's low-income and low food access neighborhoods. This included working together to develop a SWOT analysis, which helped to pinpoint key barriers to SNAP and FMNP, and developing best practices to promote Delaware-grown produce at the four farm stands as well as resolving the technical challenges identified. The team helped Urban Acres to address EBT technical challenges, develop outreach and marketing strategies to boost market sales of fresh Delaware specialty crops, and improve use of SNAP at market. The technical issues with EBT were resolved, with no significant reported downtimes for the EBT machines, at the four farm stands, and Urban Acres and the evaluation team at Nemours reported a steady increase in sales of Delaware-grown produce over time.

The project team also planned and hosted a field trip with Urban Acres to visit several Delaware specialty crop producers to expand Urban Acres' network of Delaware farms from which to source specialty crop produce for the farm stands. In addition, The Food Trust created promotional materials specifically for Delaware specialty crops, including produce stickers and banners, for use in both the farm stands and participating corner stores (see below), and distributed these for use at Urban Acres farm stands.

Goal 2: Increase availability, promotion and sales of Delaware-grown targeted specialty crops in healthy corner stores.

The Food Trust and Urban Acres worked with five corner stores starting in Year 1 in low income and low food access neighborhoods in Wilmington to help these stores consistently stock, promote, and sell a variety of culturally appropriate, Delaware specialty crops to community residents. The project team also partnered with Urban Acres to conduct a pilot program, in which this local distributor made adjustments to its sourcing practices and transportation routes to deliver Delaware specialty crops directly to the five corner stores, in addition to its farm stands. While the pilot project succeeded in regularly delivering Delaware-grown fresh produce to the corner stores, the model as implemented was not profitable enough for the distributor to continue to sustain it.

In Year 2, The Food Trust met with stakeholders throughout Wilmington to discuss how best to increase the supply of Delaware-grown specialty crops for participating healthy corner stores in low-income neighborhoods of Wilmington. Wilmington currently lacks a food hub or produce wholesaler that would consistently provide corner store owners with convenient access to Delaware-grown specialty crops, and as such, efforts to significantly increase the number of corner stores sourcing and promoting Delaware specialty crops have been challenging to expand.

To better understand these barriers and identify community-driven solutions, The Food Trust facilitated a workshop in 2017 to gather input and generate ideas from community stakeholders. This feedback was then used to understand some of the barriers to healthy food sourcing and explore several mechanisms for improving fresh produce distribution of Delaware-grown specialty crops to corner stores. Ultimately, the magnitude of this challenge outmatched the scope and budget of this grant, but The Food Trust did advance two "parallel path" options, which we strongly recommend be explored and tested robustly:

- Hub and spoke – Leveraging a strong local partner and grocery store to serve as a wholesaler or distributor for corner store owners to purchase Delaware specialty crops. Many corner store owners

already shop at this supermarket, which is well-stocked with healthy foods, including seasonally available Delaware-grown fresh produce.

- Scaling healthy food businesses – Supporting a current Wilmington Healthy Corner Store Network store owner in launching a new business related to fresh food distribution (e.g., cut fruit salads featuring Delaware-grown specialty crop produce that were popular in the Urban Acres pilot).

Goal 3: Increase the knowledge and intention of consumers to purchase targeted specialty crop products in healthy corner stores.

Most of the DE SCBG funds directed toward this goal were used during Year 1, when the project team worked with five healthy corner stores to procure, stock, and market Delaware-grown fruits and vegetables. In Year 1, The Food Trust provided in-store nutrition education programming in three participating healthy corner stores, reaching 176 community participants. As part of these in-store lessons, The Food Trust's nutrition educator conducted taste tests and cooking demonstrations of easy-to-make and affordable recipes that featured Delaware specialty crops, such as watermelon and corn. The Food Trust also worked with Urban Acres and corner store owners to plan and develop recipe cards that highlight seasonal produce available in Delaware. For example, a lesson on choosing and preparing low-sodium foods featured a healthy salsa recipe made with local corn and tomatoes. In-store nutrition education lessons were offered once weekly for two hours, with a series of four lessons per store; 96% of customers reported increased knowledge related to shopping and preparing fresh local produce featured in the lessons, as measured by participant surveys.

In Year 2, the project team was able to tap other funding to continue with ongoing education for consumers shopping in Wilmington healthy corner stores about the fresh taste and health benefits of Delaware specialty crop fresh produce, such as watermelon and sweet corn. In Year 2, four enrolled stores provided in-store nutrition education lessons and healthy cooking demonstrations, reaching 145 participants. All four stores also continued providing free recipe cards highlighting Delaware specialty crops and conducting store-based marketing with "Delaware Grown" produce tags and labels that highlight which healthy produce items were locally sourced. Monitoring efforts included The Food Trust staff conducting protocol visits with participating corner stores to ensure these materials were only being used for Delaware specialty crops.

These efforts have helped to continue to build consumer demand for Delaware specialty crops in targeted low-income neighborhoods of Wilmington, and further boost community awareness of, and demand for, fresh Delaware-grown fruits and vegetables. The store-based nutrition lessons also help educate residents about convenient new ways to use their neighborhood corner stores to achieve a healthy, affordable diet for themselves and their families.

Beneficiaries In Years 1 and 2, a total of 1,825 individuals shopped in the five participating healthy corner stores that featured Delaware Grown produce, marketing materials promoting the purchase of these foods, and merchandised displays featuring these items. In addition, 321 community members over this period of time received nutrition lessons in participating Wilmington Healthy Corner Stores that featured Delaware-grown produce.

Lessons Learned A major challenge experienced in implementing the grant was a lack of sustainable and cost-effective fresh distribution options for corner stores to obtain Delaware grown produce through traditional wholesalers, jobbers, or redistributors, and an inability to change these systems with limited resources. One of the main goals is to work on the larger systems changes necessary in order to make local

produce distribution a more viable option for smaller stores. Small stores have an interest in selling fresh local produce when the cost and convenience of obtaining it is comparable to obtaining conventional produce. Few customers of these stores are able to pay a premium for locally grown fruits and vegetables. For local produce to compete with conventional produce, however, an expansion of the existing resources for small stores to obtain local produce is necessary. This could include funding for additional local produce delivery services that are dedicated to serving the needs of smaller stores. A distribution strategy that works for smaller stores must also take into account the challenges involved with a store owner leaving their store for any extended period of time. In order for a distribution strategy to be successful, it must be something that the store owner can easily access without much time spent leaving the store, and it must be able to compete with the traditional sources store owners use in terms of pricing and convenience. We believe we have two viable options worth scaling: hub-and-spoke sourcing of Delaware-grown produce with a local supermarket and delivery of fresh-cut fruit salads featuring Delaware-grown produce.

The food system infrastructure in Wilmington is such that healthy and affordable foods are not only difficult for residents to obtain, but they are also difficult for store owners to obtain as well. While Jetro and Restaurant Depot are about 40 minutes away via I-95 in Philadelphia, the reality is that represents precious time away from stores that often only have one employee in them at a time and there is also a perceived lack of value in driving this distance out of the City. Most corner store owners make infrequent trips to such wholesalers, and instead shop retail or source from corner store jobbers (redistributors) that sell little in the way of healthy foods. The result for some stores is inconsistently stocked healthy foods – and this is a particular problem for fresh fruits and vegetables – higher prices for customers, and in some cases poor selection and quality.

Contact Person
Karen Shore, MPH
Director
The Food Trust
One Penn Center
1617 John F. Kennedy Blvd, Suite 900
Philadelphia, PA 19103
Phone: 215.575.0444 Ext 7106; email: kshore@thefoodtrust.org

Additional Information

The Food Trust is a public health nonprofit, working to increase access to healthy foods, improve equity, and improve the diets and well-being of low-income individuals and families. A healthy diet, including one rich in fruits and vegetables, is a key behavioral strategy to preventing chronic diseases and helping all people achieve optimal health. But stable access to affordable, nourishing meals is out of reach for millions of low-income Americans who lack access to fresh, affordable, and healthy foods in their communities, and face numerous barriers to eating healthy diets. In the past decade, The Food Trust has become a national leader in developing effective strategies to significantly increase the consistent availability and marketing of healthy, culturally relevant, and affordable foods in neighborhood food stores, and helping people learn how to select and shop for these foods to increase positive dietary behaviors. Food is connected to all social determinants of health, and so cross-sector work in underserved communities has become key to how we work with small stores, while remaining committed to community engagement.