

# New Jersey Department of Agriculture

## Specialty Crop Block Grant Program (SCBG) SCBG Agreement # 12-25-B-1685

Final Report  
(Revised 4/14/2017)  
(Revised 7/18/2017)  
(Revised 8/14/2017)

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### SCBG Project Reports:

American Cranberry Growers Association	Page 2
Garden State Wine Growers Association	Page 8
Jersey Fruit Cooperative	Page 11
Mercer County Board of Agriculture	Page 15
New Jersey Agriculture Society - NJALDP	Page 22
New Jersey Agriculture Society – Farmers Against Hunger	Page 27
New Jersey Blueberry and Cranberry Research Center	Page 41
New Jersey Blueberry Growers Association	Page 60
New Jersey Department of Agriculture	Page 64
New Jersey Peach Promotion Council	Page 68
Outer Coastal Plains Vintner Association	Page 80
Rutgers University	Page 86

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USDA AMS Agreement Number (12-25-B-1685)  
Final Performance Report  
December 22, 2016  
(Revised 8/14/2017)

American Cranberry Growers' Association  
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**PROJECT TITLE:**

“Reduced Cranberry Fruit Acidity May Lead to Reduced Sugar Content, Improved Consumer Health Benefits and Greater Cranberry Product Marketability”

**PROJECT SUMMARY:**

Cranberries contain more antioxidant polyphenolics than most other fruits making it uniquely outstanding for urinary tract, amelioration of metabolic syndrome, and other human health benefits. However, cranberry products are being criticized for the high sugar content in juices, sweetened-dried cranberries, e.g. Craisins®, sauces, etc. As a result, cranberry products are criticized for high sugar content and regarded as less appropriate for diabetics or those with metabolic syndrome that often serves as a diabetes precursor. The main reason is that cranberry has a very high content of organic acids, mainly malic and citric, typically 5x's normally found in other fruit crops, e.g. apples, grapes, peaches, etc. Palatability of fruit crops and fruit products to humans is determined by the sugar:acid ratio or balance. In addition, besides being high in acid content, cranberry is also low in natural sugar content relative to other fruit. Thus a major component in making cranberry products acceptable is the addition of 'added-sugar' which has become a major obstacle to marketability. One approach to reducing the amount of sugar added is to have fruit with lower acid content. Rutgers has developed a cranberry variety with lower acid content, Demoranville®, thus providing the opportunity for reducing added sugar to products made from fruit of Demoranville. The purpose of the project was to obtain empirical evidence that the cranberry phytochemicals thought to contribute to human health with consumption of juice from a lower acid cranberry variety, Demoranville, are present and bioavailable if consumed orally, i.e., normal dietary intake.

The **importance and timeliness of the project** is directed toward the obesity and diabetes epidemic that is impacting the US population. Cranberry is being considered a 'sugared drink' on par with soft drinks and being negatively impacted, even though the reports of the health benefits that cranberry consumption offers are being muted.

**IN SUMMARY:** New Jersey growers approached researchers at Rutgers about the fact that sales are declining because of consumer concerns that cranberry products have too much sugar added for palatability. We want to investigate whether the health benefits of cranberries help ameliorate the sugar concerns and/or whether products of different plant varieties would require less sugar to make them palatable.

## **PROJECT APPROACH:**

The essential tasks provided in project approach were to: 1) manufacture a low acid cranberry juice made with Demoranville fruit, 2) have human subjects consume low acid cranberry juice, and 3) determine if the health promoting phytochemicals can be detected in plasma/blood.

In September 2014, 25 kg of fruit of a low acid cranberry variety CNJ98 (titratable acidity, TA, citric acid equivalents of 1.7) was harvested from research plots at the Rutgers PE Marucci Center, Chatsworth, NJ and shipped to Dr. T. Wilson, Winona State University, Winona, MN for processing. Titratable acidity of a current industry standard, Stevens (TA = 2.3) and the CNJ98 (TA= 1.7) sample was established at Rutgers. Frozen Stevens and CNJ98 fruit samples (12kg) were thawed and pressed (2-ton press) to yield a first press juice. For our clinical trials a 27% industry standard cranberry juice (CBJ) with 110 Cal/240ml prepared from Stevens fruit and compared to 27% reduced calorie cranberry juice (RCCBJ) with 33% less TA was prepared from CNJ98 containing less added sugar (74 Cal/240 ml). The reduction in added sugar in RCCBJ was benchmarked to its reduced TA relative to Stevens. The metabolic benefit of the reduction in added to CNJ98 was the focus of the glycemic trials that followed in September and October.

***Pilot study:*** In July of 2014 we ran a pilot trial that sought to determine if using an indwelling catheter would be a potential way to efficiently collect blood samples as part of the glycemic response assay to normal and low titratable acidity cranberry juices. However the catheters consistently became occluded. Thus, a revised trial method was devised to examine glycemic response to 27% reduced calorie cranberry juice (RCCBJ) containing less added sugar (74 Cal/240 ml) relative to the 110 Cal/240 ml industry standard cranberry juice (CBJ) in healthy (n=6) and metabolic syndrome (n=18; 53±16 years; BMI=34.4 ± 3.9) populations in single cross-over fashion. Pre- and post-prandial blood samples were obtained and metabolic response was evaluated. Paul Limberg completed the analysis of metabolic markers. Rachel Dahl (Mayo Clinic lab) completed the acetaminophen analysis with HPLC to estimate gastric clearance following CBJ and RCCBJ. Plasma and CBJ samples from both studies were delivered to N. Vorsa at Rutgers for further analysis of phenolic metabolites in late November of 2015.

***Bioavailability of low acid cranberry, plasma study:*** Human plasma samples were collected at 0 (baseline), 30, 60 and 120 min after cranberry juice ingestion (see above). Considering the high protein content in plasma and the protein binding activity of phenolics, different extraction methods were evaluated for maximum extraction efficiency: Method 1: Direct extraction- Plasma samples were extracted with ethyl acetate by agitation (vortex), sonication and centrifugation; Method 2: Acid hydrolysis-Plasma samples were first hydrolyzed with hydrochloric acid (HCl) to precipitate proteins and release phenolics, and then extracted by ethyl acetate same as method 1, Method 3: Enzymatic hydrolysis-Plasma samples were first incubated with  $\beta$ -glucuronidase/sulfatase to unbind and hydrolyze phenolics, and then extracted with acetone by sonication and centrifugation, Method 4: Non-acid protein precipitation Plasma proteins were first precipitated by methanol/acetonitrile, samples were then centrifuged to get supernatant for phenolic analysis.

For each method different parameters (e.g. acid concentration, acid/enzyme incubation time, sonication time) were evaluated for maximum efficiency. Extracts were analyzed by UHPLC-MS-MS. Among them, methods 1 and 4 didn't show any quantifiable phenolics, potentially due to phenolic-protein interaction. Both acid and enzymatic hydrolysis methods lead to detection of

quercetin aglycone, indicates human absorbance of cranberry flavonol. **However, due to deglycosylation/degradation caused by acid/enzymatic hydrolysis, no flavonol glycosides were detected.** Considering that flavonol glycosides account for most of the cranberry flavonols, and lack of protein in urine, **a second study was performed based on urine samples after cranberry juice ingestion.** Urine samples were collected and analyzed by non-hydrolysis method to evaluate the bioavailability of cranberry flavonol glycoside.

***Bioavailability of low acid cranberry, urine study:*** Cranberries of the low titratable acidity Demoranville cultivar were cultivated in Burlington Co., New Jersey and harvested in September of 2014 washed, dried, and frozen at -70 °C. Cranberries (24kg) were thawed for 24 hours in a cold room at 6°C, prior to being thawed at room temperature for an additional 2 hours. The berries were then pressed with 5.5 tons pressure and filtered through an X3 fiber mesh to yield a first-press CBJ. The supernatant was pasteurized for 60 seconds at 70 ° C, and stored in vacuum sealed jars prior to ingestion in the study within 8 days. Additional CBJ aliquots were frozen at -70 ° C prior to chemical analysis.

Participants were randomized to receive a CBJ and the other half received the isocaloric control beverage on the first laboratory visit and two days later participants switched dietary interventions in single cross-over fashion. One of the participants received CBJ at their second laboratory visit was randomly picked to receive a second-time CBJ two days after the first-time trial. Dietary interventions consisted of a 27% v/v Demoranville CBJ sweetened with sucrose (74 Calories/240 ml serving) stored on ice and consumed within 2 hours of preparation. The isocaloric control beverage consisted of 240 ml of sucrose (74 Cal/240 ml) in water.

The overall scope of the project did NOT benefit commodities other than specialty crops.

Significant contributions and role of project partners in the project were:

1) JJWhite Cranberries provided the Demoranville fruit

2) Dr. T. Wilson formulated the juice, contributed to project design, carried out the human administration of juice to human subjects, monitored the and collected the tissue samples, e.g. plasma/blood and urine, contributed to the writing of the manuscript and presented results at the American Society of Nutrition at Experimental Biology in Boston this Spring 2015.  
<http://experimentalbiology.org/2015/Home.aspx>: FASEB presentations at 2015 were given:

#1) Dahl RA, Bolstad KT, Googins SL, Hunter SR, Mackay KE, Vorsa N, Limburg PJ, Wilson T. Reduced Acidity Cranberry Improves Glycemic Response in Persons with Metabolic Syndrome. April 2015 The FASEB Journal vol. 29 no. 1 Supplement 595.28

3) Dr. N.Vorsa contributed to overall project design, carried out phytochemical analysis of administered fruit juice, analysis of plasma/blood and urine analysis, manuscript writing/editing, corresponding author of the manuscript entitled 'Urinary clearance of cranberry flavonol glycosides in humans' (Wang Y., Singh, A.P., Nelson, H.N., Kaiser A.J., Reker N.C., Hooks T.L., Wilson T, and Vorsa N. 2016. J Agric. Food Chem. <http://dx.doi.org/10.1021/acs.jafc.6b03611>).

## **GOALS AND OUTCOMES ACHIEVED:**

- 1) Describe the activities that were completed in order to achieve the performance goals and measurable outcomes identified in the approved project proposal or subsequent amendments.

*A dietary research study with human subjects was carried out to show that consumption of cranberry juice made from a low acid cranberry variety, Demoranville, provided antioxidant phytonutrients through the diet. The research was successfully published in a peer-refereed journal, Journal of Agricultural and Food Chemistry (JAFC), of the American Chemical Society. Results were also presented at the American Society of Nutrition at Experimental Biology.*

*Being published in a peer-reviewed refereed journal provides strong validation of the scientific merit of the work.*

- 2) If outcome measures were long term, summarize the progress that has been made towards achievement.

*The report being published in JAFC is permanently archived in published literature. The abstract is posted on the Cranberry Institute website @*

[http://www.cranberryinstitute.org/doclib/doclib\\_detail.cgi/505/0/](http://www.cranberryinstitute.org/doclib/doclib_detail.cgi/505/0/)

- 3) Provide a comparison of actual accomplishments with the goals established for the reporting period.

*The primary goal of the research was to establish that consuming fruit from the low acid cranberry cultivar provides anti-oxidant phytonutrients that are bioavailable through diet. Initially the focus was on identifying cranberry flavonol glycosides in plasma. Although analysis of plasma did reveal the presence of cranberry flavonols in plasma the method(s) to extract from plasma required acid hydrolysis which deteriorated the certain compounds. We subsequently analyzed urine following consumption of low acid cranberry juice and recovered (provided evidence) the principal flavonol glycosides were in fact absorbed.*

- 4) Clearly convey completion of achieving outcomes by illustrating baseline data that has been gathered to date and showing the progress toward achieving set targets.

*Please see attached manuscript.*

- 5) Highlight the major successful outcomes of the project in quantifiable terms.

*A manuscript was published in a scientifically reputable journal (JAFC) indicating the research methods were valid and accepted by the scientific community. As such the results provide evidence showing cranberry consumption provides healthful 'nutrients' when consumed in the diet. The abstract of the manuscript is listed on the Cranberry Institute website (the principal website for cranberry related health news and scientific findings).*

*The Cranberry Institute website (which includes the published manuscript has the following number of (cite visits) in 2017: March (754), April (592), May (493), June (396), July 7/25/2017 (368).*

- 6) Website was created <https://cranberryresearchvorsa.wordpress.com>  
*The website lists a number of publications highlighting the health benefits of cranberry. The website also cites published scientific papers (AP Singh, N Vorsa , T Wilson . Cranberry Quercetin-3-Galactoside in Postprandial Human Plasma. Int J Food Nutr Sci.. 2014; 1:1-3) that have received substantial number of views (>900). See attachment.*

#### **BENEFICIARIES:**

- 1) Groups and other operations that benefited from the completion of this project's accomplishments are: 1) *NJ cranberry growers as well as those nationwide and 2) other researchers exploring the health benefits of cranberry.*
- 2) Clearly state the number of beneficiaries affected by the project's accomplishments and/or the potential economic impact of the project. *Over 700 cranberry growers that cultivate cranberry, public is provided with scientifically based findings of the effects of consuming cranberry (number unknown).*

#### **LESSONS LEARNED:**

- 1) Offer insights into the lessons learned by the project staff as a result of completing this project. This section is meant to illustrate the positive and negative results and conclusions for the project.

*The project was over ambitious for the scope of work and budget. The requirements of this particular USDA grants' program do not suit 'high risk' research. The conclusions were essentially positive in that consuming fruit from a low acid cranberry provides bioavailable beneficial antioxidants in the diet.*

- 2) Describe unexpected outcomes or results that were an effect of implementing this project. *Current extraction methods to detect cranberry compounds in plasma are limited to destructive methods.*
- 3) If goals or outcome measures were not achieved, identify and share the lessons learned to help others expedite problem-solving. *We believe the essential objectives were achieved, albeit not with original proposed plasma based method.*
- 4) Lessons learned should draw on positive experiences (i.e., good ideas that improve project efficiency or save money) and negative experiences (i.e., lessons learned about what did not go well and what needs to be changed).

*Health based studies are difficult. Based on plasma alone, one could have concluded that cranberry compounds were not bioavailable and thus likely not to contribute to the healthful health effects. The second approach, the analysis of urine, confirmed their bioavailability providing a scientific basis for consuming cranberry products even with sugar. Lesson learned is that projects based on scientific study are not straight forward and have a not so trivial risk of failure.*

5) Project management will create an online link to a website with information about the helpful benefits of cranberry consumption. Interested visitors to the website will be directed to respond to a brief online questionnaire /survey referring to how cranberry consumption may be beneficial to one's health. Benchmark - No such evidence exists now. Targets- Presentation by public media outlets including health related web-sites and news outlets presenting scientific data in lay-terms to public/consumers interested in improving one's health. Greater than 50% of visitors to websites and those exposed to news articles will indicate increased awareness of the health benefits of consuming cranberry products.

*1) With the website being recently created the 'participation rate' will require some time to determine. The original scientific publications continue to receive considerable attention. Lesson learned is that it would have better to have in the objectives of the proposal that the research be presented in a popular main cranberry website (as was done). The website has received over 2,600 visits in 4 months.*

*The positive experience is that this study shows that cranberry does in fact provide phytochemical anti-oxidants in the diet.*

**ADDITIONAL INFORMATION:**

Provide additional information available (i.e. publications, websites, photographs) that is not applicable to any of the prior sections.

Study showing effect of a diet supplemented with cranberry flavonoids on metabolic syndrome Parameters.

V. Shabrova, O. Tarnopolsky, A.P. Singh, J. Plutzky, N. Vorsa, L. Quadro. 2011. Insights into the Molecular Mechanisms of the anti-atherogenic actions of flavonoids in normal and obese mice. *PLoS ONE* 6(10): e24634. doi:10.1371/journal.pone.0024634.

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**Garden State Wine Growers Association  
SCBG #1685  
Final Performance Report  
November 14, 2016  
(Revised 4/14/2017)**

**PROJECT TITLE:**

**“NJ Wine Industry Targeted Consumer Awareness & Market Development – Northern New Jersey”**

**PROJECT SUMMARY:**

The Garden State Wine Growers Association (GSWGA) sought funds to assist with a targeted marketing and awareness campaign focused on the northern New Jersey counties of Passaic, Bergen, Hudson, Essex and Union. Sales in the South and West of the state were consistently increasing with great economic benefit to New Jersey wineries and to the State of New Jersey. However, the competition in the northeast counties of New Jersey for wine consumer’s attention and patronage was highly competitive. The GSWGA wanted to focus attention on this highly populated area where the demographic profile shows that wine consumers from this part of the state are sophisticated, affluent and committed when it comes to wine consumption and purchasing. One of the most highly visible ways for the NJ Wine industry to make an immediate impression on the northern part of New Jersey was to host an annual wine festival at a high profile location in northern New Jersey. Through this grant the GSWGA used funds to support a robust marketing campaign, for a north Jersey wine festival, targeted at creating high awareness of the event and the NJ Wine industry.

**PROJECT APPROACH:**

**Activities Performed**

As outlined in the approved grant application, the GSWGA took on a robust and in-depth marketing campaign for the “Jersey Skyline Wine Festival,” which took place in September 2014.

The GSWGA focused efforts on designing a well-rounded marketing and PR campaign that took the message of the festival, and more importantly, the NJ Wine Industry out to the consumers of North Jersey through various marketing platforms. These marketing efforts included a variety of grassroots efforts (postcards, roadway signage & local ad placements) to high profile marketing that extended well into the greater North Jersey area.

High profile marketing included a strong radio campaign on a prominent NJ/NY radio station, ad placement in major print media and extensive awareness advertising on highly visible digital media. The GSWGA did utilize funds from this project to market into portions of NY as well, recognizing that consumers from “bedroom NY communities” were also an important target audience for the NJ Wine industry. Specifically, geo-targeted ads were served to New York residents through Pandora internet radio. Also, ads were served via an underwriting campaign of the Leonard Lopate food podcast on New York public radio.

Creating further awareness of the “Jersey Skyline Wine Festival” and the NJ Wine

Industry to North Jersey and NY communities just beyond the NJ border is significant to the projected growth of this industry. In addition, the GSWGA utilized funds through this grant project to develop creative images for the festival that were highly identifiable. The graphic design was carried through all of the marketing and media. A sample graphic of this creative artwork is at the end of this 2nd Report. The GSWGA also designed and produced a highly attractive “value-added” coupon card that was distributed to all attendees at the “Jersey Skyline Wine Festival,” over the two days of the event. At the event alone over 2,000 value added cards were distributed. This “value added” coupon card was promoted at the festival by staff, on site signage and frequent public announcements during each day of the festival. As planned, the “value added” coupon card promotes tasting room discounts to anyone who visits a participating winery within one year of the festival. As an additional effort to support this program the GSWGA chose to also promote and distribute the “value added” coupon card at the “Grand Harvest Wine Festival” in early October as this event also takes place in North Jersey. Nearly 4,000 coupon cards were distributed at this festival, bringing the total number of coupon cards distributed over two weekends to 6,000. Seventeen wineries participated in the discount program. Upon the conclusion of the festival, a data recording sheet was shared with the 17 participating wineries. This data sheet asked the wineries to record the sales of guests who presented and used the value added discount card, as well as the zip codes of these customers.

### **GOALS AND OUTCOMES ACHIEVED:**

This project has now drawn to a conclusion. There will be no further work on this project. The goal of this project was to increase sales of New Jersey wine to residents of the five major counties of northern New Jersey thereby proactively impacting the overall sale of New Jersey wines in total. The target benchmark was to increase the total sale of New Jersey wines by 5% in the same time frame as the launch of the “value added” discount card was in effect. In 2013 the total gallonage sales figure for New Jersey wines was 349,922. The total for 2014 was 379,930, an 8.6% increase. While gallonage numbers do not break down wine sales by geographic region in the state, we feel the expansion of Garden State Wine Growers Association marketing to the northern New Jersey region and New York market, played a role in the increased sales totals and help us surpass the benchmark of 5%.

### **BENEFICIARIES:**

The direct beneficiaries of this project were the more than 40 member wineries of the GSWGA and wine consumers that were introduced to New Jersey wine for the first time. We estimate reaching over 6,000 individuals at the festivals where the value-added card was promoted. We believe the 8.6% increase in gallonage numbers of New Jersey wine produced in 2014 was supported by the new customer base exposed to New Jersey wine because of this program.

### **LESSONS LEARNED:**

The data collection forms in tasting rooms and the value-added cards we believe were good concepts. However, what we found in early 2016 when data collection forms were scheduled to be collected is that many of our wineries employ part-time staff in their tasting rooms, especially during week days. It is difficult to maintain control over the messaging that goes out from winery owner to staff. Thus, we anecdotally learned that cards were turned in but most were never

tracked because staff discarded them and did not record the information as originally instructed on the tracking sheets.

Anecdotally, our winery owners did convey that traffic in their tasting rooms has been consistently on the rise and we feel strongly that we have met the goal of a 5% increase in tasting room sales at the participating wineries during the period that the value added coupon card was valid.

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**Jersey Fruit Cooperative Assn., Inc.**  
**SCBG # 1685**  
**Final Report**

**Project Title:**

**Providing “Jersey Fruit” Growers; Knowledge, Education and Resources In Line with Industry Leading Sustainability Practices.**

**Project Summary:**

The initial purpose of this project was to bring the Jersey Fruit Cooperative to the forefront of sustainable farming in the Garden State. Consumers are more aware now than ever regarding the impact agriculture has on the land and local environment. In order for our organization to meet the expectations of the consumer and drive the market toward sustainable farming, our cooperative members would require education and training from an industry leader in sustainable agriculture.

Today more than ever we must look toward our own practices to ensure they are implemented in a way that has the longevity of the land, the health of the local environment, and also consumers’ desires in mind. Sustainable agriculture is a long walked path that must begin with the first step; education. Timeliness is important when we are talking about the health of the planet and all the people and animals that inhabit it. We do not want to leave behind an environment depleted of nutrients and tainted with excess chemicals; the overall goal of this program is to train our multigenerational growers how to leave their farms in as good or better shape than when it was handed down to them.

**Project Approach:**

In order to obtain the best education regarding sustainable agriculture, we looked to the West Coast where 3<sup>rd</sup> Party Sustainability Training Companies had a head start training farmers to make field level changes which preserve the local environment and precious natural resources. The selection process began with multiple phone conferences with select training companies in California. After careful consideration, SureHarvest of Soquel, California was chosen due to their proven track record in educating and transitioning growers and packers into more sustainable organizations.

During the acquisition of a SureHarvest as our 3<sup>rd</sup> Party Sustainability Training Company, it was brought to our attention that it would be beneficial to have a baseline measurement of the farms regarding pesticide residue in plant and soil samples. A field scout was contracted to take soil and leaf samples throughout the Jersey Fruit Cooperative farms. Plant and soil samples were sent to Penn State University for testing, results were made available to all farmers and SureHarvest for analysis.

SureHarvest made it clear to our growers, during the 5 hour training session; there is no finish line when it comes to running a sustainable operation. Every step in the farming, packing, and shipping process must be looked at and carefully analyzed on a daily basis to ensure they are in line with sustainable agricultural practices. SureHarvest explained further “if you can’t measure it, you can’t manage it;” meaning our farmers would have to begin measuring and charting many aspects of their operation before they can make any sustainable changes. The mood was heavy

our farmers heard sustainable agriculture meant more work, but they understood the importance of these changes and in an effort to save money it will push them to implement the changes. After the training, there was further discussion on how to market our fruit as coming from a sustainably focused cooperative. Some cooperative members expressed interest in taking the lead and developing a certifying body and seal that could be given to farms that met certain sustainability standards. The problem with that option is there is no guarantee any customers would accept our certification. The majority of our farmers agreed the best course of action was too slowly implementing sustainable changes on their farms and document every change. These changes can be used to present to customers as proof of our sustainable claims. There is no credible Sustainable Agriculture certifying body which could label us as a Sustainable Cooperative. Rutgers University's Agricultural Experiment Station showed an interest in organizing a sustainable agriculture certifying body but until one exists it would be better for our members to continue to document the sustainable changes on their farms.

### **Goals and Outcomes Achieved:**

The primary performance goal of educating our cooperative members on the importance of sustainable agriculture and how to implement these principles on their own farms was accomplished. A credible 3<sup>rd</sup> Party Sustainable Agriculture training company was contracted; plant and soil samples were taken and analyzed, yet our cooperative will not be able to market our sustainable ventures in ads just yet. We must first build a foundation of sustainable changes within our practices while documenting the progress. Only until we have a performance track record we will be able to highlight our sustainable practices with our customers and competition.

In order to compare leaf and soil samples, another round of testing must be completed before the start of the 2016 season. It's frivolous to analyze any data that has been collected thus far since there has yet to be any data collected to compare it to. I feel this grant was successful since the first step in a positive change in any process is education. Our cooperative members and the Rutgers University Cooperative Extension staff received industry leading training on the importance of sustainable agriculture. Comparing pesticide and herbicide spray application records from a season prior to our Sustainability Training (2014) and the season directly following (2015) showed little to no reduction of amount or frequency of spray across our farms. There are many contributing factors to this data; our growers are under the direction of Rutgers University IMP program which recommends spray schedules depending mostly on trap reports & weather conditions. I believe a smart sustainable step will include collecting more leaf and soil samples, along with dispersing of more traps to know exactly which pests are present to help tailor an accurate herbicide/pesticide spraying schedule. Our farms are almost finished transitioning their farms from overhead watering into drip irrigation, a huge sustainability step highlighted by SureHarvest in our training. Drip irrigation not only saves water usage but also requires less energy. After transitioning a ranch to drip irrigation before the start of the 2015 season, Stoney Creek Blueberries reported a decrease in the number of diesel pumps used from 3 to 1. This conversion consumed 12% less diesel fuel and also reduced harmful emission into the air. Stoney Creek Blueberries, our only farm operating with 100% solar energy, used 10,000 kW of power less in the 2015 season compared to the 2014 season, while also generating >2,000 kW of power more in the same timeframe. Whalen Farms in Shamong NJ, did record a 14.5% decrease in diesel fuel usage in the 2015 season as compared to the season prior to the Sustainability Training, which translates into a \$17,000 reduction in operating costs. Yet on that

same farm there was a 15 % increase in electricity use due to the packing and storage of a new cranberry crop.

**Beneficiaries:**

Many groups benefited from this program, not only the 13 farms growers of the Jersey Fruit Cooperative. I believe a safe estimate to the number of beneficiaries affected by our project's accomplishments could be in the tens of thousands, with the local community included. Implementing sustainable practices on our farms will improve the local environment, thus benefiting the communities our farms are a part of. There is also a large economic impact of sustainable agriculture on our farms' bottom lines. Transitioning to sustainable practices, though costly at first, will save the farms money in the long run. Farmers are learning to track performances in order to reduce waste and excess use of chemical fertilizers.

**Lessons Learned:**

The biggest lesson learned from this project was the road to running a sustainable farming operation was going to be bumpy. Our farmers were given a brief glimpse of hope when being walked through the practices of a sustainable operation that they were in fact already implementing a few important sustainable practices on their farm. Yet after the training session, I heard from most of the farmers that they felt very overwhelmed and would need to hire an individual or group of individuals to implement and track the sustainable changes on the farm. A positive note was struck during the training when data was shown to highlight how implementing sustainable practices would save money in the long term. Yes, there will be extra work up front, which seems futile, but over time the reduction of water, fuel and energy usage will save our growers money.

I do believe this project was successful, yet a recommendation for future projects of this caliber should include a farm audit by a 3<sup>rd</sup> Party Sustainability Company. The farm audit, though time consuming and invasive for the farmer, would highlight specific practices on the farm that should be looked into first. Many of the growers run small, multigenerational farms that would benefit more from direct, on the farm training, rather than in a classroom setting.

**Contact Person:**

Chad Puschel is the contact for the grant. He can be reached at 856-881-0200 or [Cpuschel@sunnyint.com](mailto:Cpuschel@sunnyint.com) .

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**Additional Information:**

The Jersey Fruit Cooperative, with the help from their sales agent Sunny Valley International, has begun marketing and selling the cooperative's sustainably grown peaches and blueberries to

a wider market through Farmhousefruit.com. This website is able to reach a larger audience and promote the sustainable efforts of the cooperative through Farm Updates, educational blogs and social media. Farmhouse Fruit will also build relationships with other specialty crops in New Jersey which are transitioning to sustainable practices in order to cross-market and bring attention to efforts of sustainable agriculture in The Garden State.

Mercer County Board of Agriculture  
Specialty Crop Block Grant Agreement # 12-25-B-1685  
Effective End Date; 09/29/16  
Final Report Due; 12/28/16  
(Revised 4/14/2017)

### PROJECT TITLE

**“On Farm Food Safety GAPS Training and Research for New Jersey Direct Farm Market Growers; Preparation for Impending Food Safety Modernization Act Implementation.”**

### PROJECT SUMMARY

- 1) The focus of this specialty crop block grant was to educate and prepare direct market growers for compliance with the FSMA Produce Rule through educational training workshops, print articles/fact sheets and on-farm walk throughs. This project also assessed actual pathogen risk on NJ farms through pathogen sampling in the packing house and of manure based composts. Additionally this project developed cost effective methods of compliance to the FSMA Produce Rule.
- 2) Due to multi-state food borne illness outbreaks involving fruits and vegetables FSMA was signed into law in 2011. These proposed rules will directly affect the current practices of NJ farms. Specific focus areas include water use, soil amendments, domestic and wild animals, worker health and hygiene, and equipment, tools buildings and sanitation.
- 3) This project built on a previously funded SCBGP-FB project. The Cumberland County Board of Agriculture received funding for “An Outreach Educational Training Program for Growers in Good Agricultural Practices (GAPs) and Good Handling Practices (GHP)” in 2012. This program focused on preparing growers for third party audits with measured outcomes including revamping the wholesale food safety manual and providing the education needed to pass a third party audit. Direct market growers are not affected by third party audits (unless they are a mixed-type facility) and are not the target audience of the 2012 SCBG funding for the Cumberland County Board of Agriculture. In addition FSMA rules will affect many direct market growers that have not and most likely will not need to participate in audit based food safety education programs.

### PROJECT APPROACH

The project was able to follow the work plan to complete the identified objectives.

- A Food Safety for New Jersey Direct Farm Market Growers training binder was created and used at trainings statewide in 2014, 2015, and 2016
- From 1/1/2014 to 9/26/2016 fourteen certificate based grower food safety workshops were held with 413 total participants
- Program successes and lessons learned were shared with Extension educators at the following small farm focused conferences with an audience of 164:
  - National Small Farm Conference 2016, audience of 24
  - Mid Atlantic Vegetable Workers Conference, 2014, 2015, 2016 audience of 68
  - National Value Added Conference 2014, audience of 32
  - American Society for Horticultural Science, 2015, audience of 40

- As a result of these presentations information was shared with four food safety outreach programs at Land Grant Universities and three presentations were made at the Great Plains Fruit and Vegetable Growers Conference.
- Three Rutgers fact sheets have been published, and one fact sheet is in near completion
  - What is On-Farm Food Safety – an introduction to Good Agricultural Practices and the Food Safety Modernization Act Produce Rule  
<http://njaes.rutgers.edu/pubs/fs1261/>
  - Worker Health and Hygiene – an overview of important worker hygiene concepts and appropriate topics for worker training on the subject  
<https://njaes.rutgers.edu/pubs/fs1230/>
  - Build Your Own Hand Washing Station – a simple low cost hand washing station that can be built and transported around the farm and to sales locations  
<https://plant-pest-advisory.rutgers.edu/diy-hand-washing-stations/>
  - Produce Traceability – a clear explanation of what traceability is and how to develop a farm traceability program (in-progress)
- The Rutgers On-Farm Food Safety booth and handouts were present at the following events with over 2000 farmer attendees
  - Northeast Organic Farming Association Winter Conference 2014, 2015
  - New Jersey Agricultural Convention and Trade Show 2014, 2015, 2016
  - Annie’s Project New Jersey Conference 2014
  - New Jersey Farm Bureau Convention 2014, 2015
- Farm walk throughs were offered to workshop participants from 1/1/2014 through 9/26/2016. 83 farms were visited throughout the state and food safety guidance was given.
- National Association of County Agricultural Agents conference was attended in 2014, 2015, 2016. The following oral and poster presentations were made to an Extension educator audience of 79, describing this projects outreach and impacts
  - 2014 – Developing Dynamic Farm Food Safety Programming for Direct Market Producers
  - 2015- On Farm Food Safety Sampling: Four Years of Results
  - 2016- Grower Training on the Food Safety Modernization Act
  - 2016 – Collaboration is Essential to Develop An Effective Farm Food Safety Program
- Five farms who produced animal manure based compost were sampled over an 18 month period, assessing Salmonella and generic E. coli through 50 total samples
- 4 farms participated in ATP swab sampling to evaluate product contact surface sanitation effectiveness. 81total samples were taken on farm
- ATP swab sampling was demonstrated at four grower meetings with 30 swab samples taken to show how to use the equipment and to demonstrate effectiveness of different sanitizers.
- 45 informational posts were made on the Rutgers Plant and Pest Advisory, On-Farm Food Safety blog. <http://plant-pest-advisory.rutgers.edu/category/commercial-ag-updates/food-safety/>
- Online program evaluations were conducted through SurveyMonkey.com to assess impact and change made on farms resulting from the Rutgers On-Farm Food Safety Program. Surveys were issued in 2014 and 2016 with a total of 73 respondents.

- Three articles were published for grower audiences:
  - Irrigation and Composts Pose Food Safety Risks, M. Melendez and W. Kline Growing for Market Magazine, 9/2014
  - Food Safety Critical in Value Added Food, Jane Primerano, The New Jersey Farmer. 3/2016
  - Food Safety Practices on New Jersey Peach Farms, W. Kline and M. Melendez, New Jersey Peach Buyers Guide. 4/2016
- Four articles were published for Extension Educator audiences:
  - Sustaining Interest: GAPs Training for Small Scale Produce Growers. Conference proceedings. National Small Farms Conference. 2016.
  - ATP Swab Sampling in Fresh Produce Packinghouses. Conference proceedings. Northeast American Society for Horticultural Science Conference. 2016.
  - Food Safety Education for New Jersey's Direct Market Produce Growers. Conference Proceedings. Northeast Regional Center for Rural Development What Works Conference. 2014. <http://aese.psu.edu/nercrd/publications/what-works-2014-proceedings/food-safety-education-for-nj-direct-market-growers>
  - Survey of Mid-Atlantic Farms for Foodborne Pathogens in Tomatoes, Leafy Greens, Irrigation Water and Soil. Proceedings American Society for Horticultural Science
- Build your own hand washing station information and materials were provided to growers who attended food safety workshops. These hand washing stations are easily transported and designed so that growers will build more of them and encourage more hand washing at the farm and the farm market. Materials for 50 hand washing stations were purchased and provided to participants along with detailed instructions on how to build additional stations.
- Reports were provided prior to the stated deadline from the New Jersey Department of Agriculture.
  - 1) This project only benefitted specialty crop producers.
  - 2) The Mercer County Board of Agriculture oversaw the work completed by Meredith Melendez and Wes Kline. Reports were made by Meredith Melendez to the Mercer County Board of Agriculture on a monthly basis and guidance was provided and sought to determine project trajectory.

#### GOALS AND OUTCOMES ACHIEVED

- 7) **Goal 1** – 50 growers make risk reduction changes to their operation based on the food safety workshops, farm visits and publications.
  - a. 413 growers attended the full day food safety training and received a completion certificate
    - i. 100% of participants would recommend the workshops to others (n=136)
    - ii. 98% indicated that the program met or exceeded their expectations (n=76)
    - iii. Participants indicated the following topics are most important to them (n=117)
      1. Postharvest sanitation
      2. Plan writing

3. Food Safety Modernization Act comprehension
4. Worker health and hygiene topics
5. Proper documentation
- iv. Participants indicated the following practice changes based on food safety education received (n= 136) 65 participants indicated a change in practices
  1. Sanitation of product contact surfaces
  2. Worker health and hygiene training
  3. Water testing and appropriate use
  4. Documentation of activities
  5. Written food safety plan
  6. Traceability program implementation
  7. Domestic animal location
- v. Comments included:
  1. “Thank you for the great information and having USDA staff available.”
  2. “Thank you for all of your assistance with this issue.”
- b. 73 participants responded to the online survey focused on food safety concepts discussed during the workshops, participants indicated that:
  - i. 59% had written the needed standard operating procedures
  - ii. 22% had started to write their needed standard operating procedures
  - iii. 16% intended to write their standard operating procedures
  - iv. 50% had completed the writing of their farm risk assessments
  - v. 25% had started to write their farm risk assessments
  - vi. 22% plan to write their farm risk assessments
  - vii. 62% had completed writing their farm food safety plan
  - viii. 19% have started writing their farm food safety plan
  - ix. 19% plan to write their farm food safety plan
  - x. 70% indicated that they had made improvements to their farm worker health and hygiene training program
  - xi. 70% indicated that they had made improvements to their equipment sanitation practices
  - xii. 67% indicated that they had started to test their irrigation and postharvest water quality
  - xiii. 67% indicated that they had improved their produce packing activities
  - xiv. 63% indicated that they had improved their produce harvesting activities
  - xv. 53% indicated that they had implemented a rodent control program
  - xvi. 50% indicated they improved their produce storage areas
  - xvii. 43% indicated that they had implemented a traceability program
  - xviii. 37% indicated that they had improved their product washing procedures
  - xix. 37% indicated that they had improved their product transport procedures
  - xx. 10% indicated that they had improved animal based soil amendment management
  - xxi. 7% indicated that they had improved their produce display areas
  - xxii. Comments included:
    1. “My quality of produce produced this year will be improved due to the training and on farm visit. I am very glad I attended.”

2. "I find the Rutgers Food Safety courses very helpful along with the other sources of information."
  3. "Keep up the good work!"
- c. Condensed presentations were made at regional produce meetings and commodity specific meetings including direct marketing, wholesale, community supported agriculture, agritourism and organic production topics.
- i. 40 talks were given
  - ii. 2391 audience numbers reached

8) **Goal 2** - 50 compost samples will be evaluated for Salmonella and generic E. coli. 50 samples were collected from five farms over a 18 month period. The New Jersey Department of Health lab processed the samples, evaluating them for Salmonella and generic E. coli. Results indicate that farms utilizing the National Organic Program standards for composting methods will have a reduced generic E. coli count over time. Farms using static, non-turning, methods have an increased chance of elevated generic E. coli levels that increase with time. Information was presented to the FDA to inform the development of the Food Safety Modernization Act Produce Rule, the Northeast Organic Farming Association of New Jersey Annual Meeting, the New Jersey Agricultural Convention and Trade Show, and at 18 commodity specific regional grower meetings in New Jersey.

- 9) **Goal 3**- 100 swab samples will be evaluated for ATP to assess product contact surface sanitation effectiveness.
- a. 81 ATP swab samples at four farms over two years
  - b. ATP swab sampling was demonstrated at:
    - i. Eight grower food safety workshops
    - ii. ATP swab sampling results on NJ farms was presented at nine regional grower meetings
    - iii. ATP swab sampling results on NJ farms presented at six Extension educator meetings
  - c. A total of 117 swabs were utilized to demonstrate sanitation of product contact surfaces
  - d. Swab sampling on-farm showed that there is a great need for this type of evaluation of sanitation steps in the packinghouse. ATP levels were typically high during active line production and typically low post sanitation step. Generic E. coli levels were low or zero and low or zero post sanitation. Results were mimicked in year two. The results show:
    - i. Bleach spray solution was more effective than Simple Green and other non-bleach cleaning products used.
    - ii. A standard operating procedure should be put into place to ensure that employees involved with the sanitation of product contact surfaces fully understand the process deemed acceptable by management. Two farm locations had significant ATP levels post sanitation step when management was out in the field or not at the farm. The SOP should be posted at the packing line and be used for employee training annually.

## BENEFICIARIES

- 3) New Jersey specialty crop producers received benefit from this project. The purpose of this project was to educate and prepare them for impending food safety regulations and reduce human pathogen risk on New Jersey farms. The project stated objectives were successful in achieving this benefit for participant farmers.
- 4) Clearly state the number of beneficiaries affected by the project's accomplishments and/or the potential economic impact of the project.

GROWERS IMPACTED 2891  
EXTENSION EDUCATORS IMPACTED 203

## LESSONS LEARNED

Growers are interested in learning how they can meet food safety standards, but the information needs to be provided in a series of ways starting with the formal training. This needs to be followed by one-on-one interactions through walkthroughs and individual consultation. This is a new area for many growers and they are starting at a basic level. Classroom learning will not provide sufficient time or information for them to be able to comply with food safety provisions. Extension, USDA and FDA need to understand that one-on-one contacts will help growers understand why good safety is important and how to comply with regulations. Growers are eager for information.

We had the opportunity to speak at 40 regional grower meetings, interacting with 2891 growers. This outreach gave us the opportunity to interact with producers who were new to the idea of on-farm food safety. In turn we had greater turn out at our full day workshops and had a broader reach in the state. Many program participants recognized the need for food safety education as part of their business plan, and planning for the future. The ability to conduct on-farm risk assessments through sampling required buy-in from growers. Trust was earned through historical interactions with Wesley Kline and Meredith Melendez. Trustworthiness of the team is critical to have acceptance from growers for on-farm sampling. Another critical component is to provide confidentiality with the sampling results. Timely reporting of sampling results back to the grower is also important. A benefit of state specific sampling results is that growers indicate a desire for educational presentations to be region specific. The complexity of the Food Safety Modernization Act Produce Rule slowed our ability to educate growers on specifics of the rule. Growers expressed angst over a Federal inspection, the expense of, and overall changes that would need to be made to their operation to come into compliance with the rule. Much time was spent during and after the workshops discussing specific operation finances to determine if the farm would need to be in compliance with the rule.

Stated goals and outcomes were achieved for this project.

## ADDITIONAL INFORMATION

Rutgers NJAES YouTube Channel – presentation from the 2016 NJACTS Food Safety Session

[https://www.youtube.com/watch?v=aCWvjlfG4Ts&list=PLKx8NLAujm\\_lsdBM6TUN-ObUt\\_V5pX142&index=9](https://www.youtube.com/watch?v=aCWvjlfG4Ts&list=PLKx8NLAujm_lsdBM6TUN-ObUt_V5pX142&index=9)

Agritourism Food Safety Checklist

<http://agritourism.rutgers.edu/pdfs/Agritourism%20Food%20Safety%20CheckList.pdf>

Rutgers NJAES Food Safety Publications

<http://plant-pest-advisory.rutgers.edu/food-safety/food-safety-publications/>

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New Jersey Agricultural Society  
12-25-B-1685 -3  
Final Performance Report  
12/15/16

**PROJECT TITLE;**

**New Jersey Agricultural Leadership Development**

**PROJECT SUMMARY**

**1) Provide a background for the initial purpose of the project, which includes the specific issue, problem, or need that was addressed by this project.**

The New Jersey Agricultural Leadership Development Project aims to create a cadre of agricultural professionals with the skills, knowledge and experience needed to enhance specialty crop production and advocate for this industry. The project provides opportunities for class members to gain personal and professional skills to successfully network, advocate, and build partnerships to support specialty crop production.

**2) Describe the importance and timeliness of the project.**

It is increasingly important for growers to identify and develop new skills to meet the challenges of the evolving marketplace. Our industry needs new, passionate, skilled leaders to step up to serve on county, state and national boards and move the industry forward. The project is important because it provides the training necessary for specialty crop producers and those who work with and support the growers, to come together and share an experience which will lead to a stronger network.

**3) If the project built on a previously funded project with the SCBGP or SCBGP-FB describe how this project complemented and enhanced previously completed work.**

The project built on previously funded Agricultural Leadership Development projects, which provided opportunity to take lessons learned from previous sessions and enhance our current work. Our past project has provided ideas for class management, speakers, tours, and evaluation, and also enabled us to realize that we would like to change our staff and the consultants being hired to direct the program. We felt it was important to hire two specialty crop producers, one as the director of the program, and the other as a consultant to provide real-world industry insight and discussion.

**PROJECT APPROACH**

The project began in January 2015, as we began recruitment of class members, a new director and an “Agricultural Liaison” consultant for the Agricultural Leadership Development Program. We actively created new recruitment materials, updated our website, reached out to potential class members, interviewed, and selected our class of 14 members by August of 2015, and started our first seminar in October 2015. Jennifer Matthews was hired to serve as Program Director and Kurt Alstede to consult for the program as the agricultural liaison. Jenn and Kurt worked to select the sessions, speakers, tours, and practical exercises. Jenn conducted the clerical work behind planning the seminars, while Kurt prepared “hot topic” discussions for each class to engage students in issues facing specialty crop production.

Specialty Crop Seminar Topics

October 2015: Teambuilding and Leadership, Tour of Alstede Farms (Discussion on Value Added Products, Innovative Production Techniques, Marketing, Strategic Planning), Wine Grower, Charlie Tomasello, Guest Speaker (Discussion on changes in wine industry).

November 2015: Public Speaking, Specialty Crop Agricultural Issues, and Hot Topics

February 2016: New Jersey Vegetable Growers Convention, Communications Topics

June 2016: Ornamental Horticulture/Nursery (Centerton Nursery Tour), Sod (Tuckahoe Turf Farm) and Vegetable Production (Dusty Lane Farm), Horticulture (USDA Plant Material Resource Center), Wine Production (Willow Creek Vineyards).

Some of the sessions included tours other than specialty crops, such as aquaculture, livestock and the equine industry. However, only a portion of each seminar cost was applied to the grant. Staff compensation was only partially allocated to the grant, and other costs such as mileage, insurance, van costs, and other items were not allocated.

### **1) Present the significant contributions and role of project partners in the project.**

We utilized the help of a variety of partners in the project in providing tours and training sessions. Alumni supported the project during the first and third seminars by providing insight into their experiences during panel discussions. The New Jersey Farm Bureau provided meeting space for the second seminar and a variety of speakers who visited during the convention independently with the class. The New Jersey Vegetable Growers Association provided complimentary admission for the class members to attend their convention and time was provided for class members to attend sessions prior to the formal sessions run by the class.

Regina Efimchik, Director of the Dean's Office and IT Staff at Rutgers School of Communication and Information provided public speaking and communications programming during three seminars which cumulatively built upon previous skill development. Lastly, tours to farms provided by industry specialty crop producers and industry speakers such as Jack Rabin, Rutgers Associate Director for Farm Programs, enabled class members to directly observe and discuss specialty crop production and issues.

## **GOALS AND OUTCOMES ACHIEVED**

### **1) Describe the activities that were completed in order to achieve the performance goals and measurable outcomes identified in the approved project proposal or subsequent amendments.**

A variety of programming with class speakers, discussions, individual and team exercises, industry tours and networking events helped us achieve our performance goals. After each class, we surveyed the participants to determine their level of prior experience with each topic, level of competency following instruction, and their view of the usefulness of the topic as an industry leader.

### **2) If outcome measures were long term, summarize the progress that has been made towards achievement.**

The positive results of the "increases in competency" and "usefulness" are indicators that the class members are building long-term skills that can continued to be used for years to come to serve the industry.

### **3) Provide a comparison of actual accomplishments with the goals established for the reporting period.**

The class reported a 24% overall increase in the level of competency gained following instruction. Each class member was asked to rank each topic on a scale of (1 = Very experienced, 2 = Moderately Experienced, 3 = No Experience) to show their level of experience with the topic prior to instruction.

Seminar 1: Class Average = 1.60

Seminar 2: Class Average = 1.65

Seminar 3: Class Average = 1.71

Seminar 4: Class Average = 1.8

The class also ranked the usefulness of the content in preparing them to serve as a leader in the agricultural industry using a scale of (1=Very Useful, 2 = Moderately Useful, 3 = Not Useful)

Seminar 1: Class Average: 1.31

Seminar 2: Class Average: 1.42

Seminar 3: Class Average: 1.19

Seminar 4: Class Average: 1.42

#### **4) Clearly convey completion of achieving outcomes by illustrating baseline data that has been gathered to date and showing the progress toward achieving set targets.**

Each class member was asked to rank each topic on a scale of (1 = Very experienced, 2 = Moderately Experienced, 3 = No Experience) to show their level of experience with the topic prior to instruction. The class average was computed for each Seminar.

Seminar 1: Class Average = 2.51

Seminar 2: Class Average = 2.29

Seminar 3: Class Average = 2.20

Seminar 4: Class Average = 2.64

This baseline data enabled us measure increases in awareness of specialty crop production.

#### **5) Highlight the major successful outcomes of the project in quantifiable terms.**

- 14 class members (seven of whom are specialty crop producers), one director and one consultant who are specialty crop producers were engaged in the program
- 23 alumni of the program were directly involved as guest speakers or tour leaders
- The class showed a 24% increase in the level of competency gained following instruction.
- The class ranked the usefulness of the material for all seminars as 1.33 on a scale of (1=very useful, 2 = Somewhat Useful, 3=Not Useful)

### **BENEFICIARIES**

#### **1) Provide a description of the groups and other operations that benefited from the completion of this project's accomplishments.**

- County Boards of Agriculture – Somerset, Morris, Sussex, Burlington, and Atlantic Counties all benefitted from having representation in the class.
- Cranberry Growers Association – two representatives are current class members.
- Farm Bureau Young Farmers and Ranchers – three representatives are current class members.
- New Jersey Vegetable Growers Association – three representatives in the current

class.

- New Jersey Nursery and Landscape Association – one representative in the current class.
- New Jersey Beekeepers Association – one representative in the current class.

**2) Clearly state the number of beneficiaries affected by the project’s accomplishments and/or the potential economic impact of the project.**

The project has enabled fourteen class members, one director who is a specialty crop producer and one specialty crop “liaison” to benefit directly from engaging in the program. These 16 people have increased their knowledge base and network to serve as leaders in the industry, benefitting hundreds of specialty crop producers who have well qualified, trained leaders serving on their county boards, commodity boards, and state and national boards.

**LESSONS LEARNED**

**1) Offer insights into the lessons learned by the project staff as a result of completing this project. This section is meant to illustrate the positive and negative results and conclusions for the project.**

One of the best decisions we made in advancing the project was to hire a Specialty Crop Producer, Kurt Alstede, to become a consultant to the program. His expertise related to specialty crop production prompted the class to have one hot-topics discussion per session and a thorough reviews of the content learned in class.

Another lesson learned was that the class benefitted by holding two of its sessions during both the NJ State Vegetable Growers Convention/New Jersey State Agricultural Convention and NJ Farm Bureau Conventions. This enabled a high level of networking with specialty crop producers and enabled us to utilize the scheduled speakers and conference sessions to enhance the project.

**2) Describe unexpected outcomes or results that were an effect of implementing this project.**

We have seen participants in the class grow through their time in the program from shy, timid and without confidence into leaders who now can comfortably speak in front of an audience, approach and introduce themselves to someone they do not know or make a phone call to ask for support on an issue concerning their farm. We expect this personal growth to take place in the program, but the examples of it shine through in unexpected ways.

As a result of the project, for example, one student reported that he/she was able to introduce himself to a faculty member at Rutgers to initiate a conversation, which led to him being invited to speak to undergraduate students in our industry. Other class members reported that they may now try introducing new specialty crops at their farm, as a result of seeing the research facilities showcasing hops and hazelnuts. Others took note of the robots and innovative technology being used at a Centerdon Nursery and Dusty Lane Farms and discussed how they could improve their efficiency in operations and be able to operate systems on-farm remotely.

The online Facebook group has also become an active place for sharing of job postings, conferences, articles, and other resources. We hope to continue encouraging the use of this site with alumni to further increase alumni networking.

**3) If goals or outcome measures were not achieved, identify and share the lessons learned to help others expedite problem-solving.**

We changed our target and performance measure during the grant period when we realized that we could not collect the data expected. The new data better reflects our original goal of increasing awareness of specialty Crop production amongst agricultural professionals. We would suggest thinking through what is feasible with your survey questions at the time of writing the grant in great detail. With the timing of the class, this grant only accounted for four seminars, out of ten plus our domestic trip. The class cannot be evaluated for long-term achievements until they are through the program and then potentially one year beyond graduation.

**4) Lessons learned should draw on positive experiences (i.e., good ideas that improve project efficiency or save money) and negative experiences (i.e., lessons learned about what did not go well and what needs to be changed).**

We learned that a maximum of three specialty crop tours per day is the most efficient and allows for ample discussion and question and answer time with the growers. We tried squeezing in four tours in one day and it was just one too many to allow enough discussion.

We were able to improve efficiency by having class members share lodging rooms.

We changed one of the seminars from a two-day seminar to a three day seminar, resulting in 4 seminars being allocated to this grant rather than five. The three-day seminar offered benefit as it was the NJ Vegetable Growers Convention on Tuesday, followed by the State Agricultural Convention through Thursday, which offers a great networking benefit with specialty crop producers, which is why we made the change.

**ADDITIONAL INFORMATION**

Provide additional information available (i.e. publications, websites, photographs) that is not applicable to any of the prior sections.

Website: [www.njagsociety.org](http://www.njagsociety.org)

Photos – see attached pdf file

**CONTACT PERSON; Kristina Guttadora**

**(609) 462-9691 [njagsociety@gmail.com](mailto:njagsociety@gmail.com)**

Alstede Farms

Value Added Processing

Agritourism, Production

Tuckahoe Turf Farm

Dusty Lane Farm

Pepper and potato production

Willow Creek Winery - Right to Farm, Soil

Disturbance Issues, Agritourism

Centerdon Nurseries

\* Use of robot technology to increase greenhouse space

New Jersey Agricultural Society  
USDA 12-25-1685-2  
Final Performance Report  
12/17/2016

## **PROJECT TITLE**

**“Fresh Produce Education and Marketing”**

## **PROJECT SUMMARY**

**1) Provide a background for the initial purpose of the project, which includes the specific issue, problem, or need that was addressed by this project.**

The purpose of the project was to educate socioeconomically challenged residents and the general public about the importance, sources, and strategies for increasing fruit and vegetable consumption. We sought to increase customer relationships with specialty crop producers and provide people with easy, budget-friendly recipes using specialty crops.

**2) Describe the importance and timeliness of the project.**

The project is important and timely because food insecure residents continue to struggle to include fresh produce in their diets. Through education and programming, the project is able to guide them in increasing their consumption.

The general public is becoming increasingly supportive of local farms, farm markets, u-pick and other sources of specialty crops. Knowing where to go and how to cook with the produce will increase consumption, leading to a greater economic benefit for specialty crop producers. According to the USDA National Farmers Directory, there was a 76% increase in farmers markets from 2008 to 2014, with continued expansion through 2016. People are buying more specialty crops and the increase in education and marketing around them will continue to help increase the competitiveness of specialty crops.

**3) If the project built on a previously funded project with the SCBGP or SCBGP-FB describe how this project complemented and enhanced previously completed work.**

We were able to use our recipe book and recipe handouts from our previous SCBGP during this cycle’s programming. We also were able to evaluate our previous program to adjust the structure of our workshops from two-part workshops with registered clients in four separate church locations, to a series of one-day demonstration events with one partner agency.

## **PROJECT APPROACH**

**Briefly summarize activities and tasks performed during the entire grant period. Whenever possible, describe the work accomplished in both quantitative and qualitative terms. Specifically, discuss the tasks provided in the *Work Plan* of the approved project proposal. Include the significant results, accomplishments, conclusions and recommendations. Include favorable or unusual developments.**

## **Activities and Tasks**

### **Website Promotion of Specialty Crops**

We built a nutrition and culinary education web page to highlight uses of fruits and vegetables with our Recipe Book, which features 60+ recipes. We also loaded our four videos, nutrition handouts and specialty crop handouts.

### **Cooking with Specialty Crops Videos**

With the popularity of online time-lapse culinary videos, we decided to create videos that would highlight the use of specialty crop fruit and vegetables for quick-preparation meals. We utilized free production space at the Burlington County Agricultural Center kitchen to produce four videos, which we shared via social media and will continue to use in future outreach. We posted them during the season and again during the holidays. The videos had 1,463 views and 36 shares.

### **Specialty Crop Passport Challenge**

We completed the “The Value of Fresh Fruits and Vegetables Challenge” by purchasing promotional passport books, which were distributed to families through three New Jersey elementary schools. We provided an assembly program to one school and in-class workshops amongst the entire first grade at another school to promote the project. 126 families registered to participate by tracking the purchases they made of specialty crops at various local farmers markets, u-pick farms, roadside stands, Jersey Fresh items at grocery stores, nurseries and wineries/breweries. We collected emails from each family who registered and created an online survey to track visits and purchases and evaluate increased use and consumption.

### **Nutrition and Culinary Program**

We partnered with Crisis Ministries of Trenton to educate 110 low-income residents on how to increase their consumption of specialty crop fruits and vegetables. We conducted three half-day programs with their clients where we provided tastings of meals prepared with fruits and vegetables. Our staff completed the ServSafe training and used the Burlington County Agricultural Center’s kitchen for the preparation of the tastings. Each family received a bag of ingredients corresponding to the tasting, which enabled them to practice cooking the recipe at home. They also received a copy of our recipe book, which included a list of farms that participate in our program and are local sources of produce. We also created handouts specific to the recipes and designed magnets that highlighted locations of farmers markets in Trenton where fruits and vegetables are available. We asked recipients to sign in, and then we mailed postcard surveys to each client to complete the survey, with an incentive to receive an extra “shop” trip from the food pantry.

### **Nutrition Outreach**

We completed nutrition outreach at 16 locations where we handed out complimentary specialty crop fact sheets, nutrition brochures and magnets with our program and website information.

## 2016

- Gloucester County Fair – 4 days
- Move for Hunger Event
- ShopRite Stores Outreach – 5 days
- MOMS Organic Market – 2 days
- Tour des Farms
- South Jersey Dream Center
- Monmouth County Fair – 3 days
- Burlington County Garden Expo
- Camden Center for Family Services Health Fair
- Cowtown Rodeo
- Burlington County EARTH Fair

## 2015

- Somerset County Fair – 2 days
- EARTH Center Middlesex County
- Mercer County Fair – 2 days
- Monmouth County Fair – 4 days
- Haddonfield Farmers Market

Recipe books were sold to the general public at outreach events at \$5/each and have produced income of \$1515, having sold 303 books, which will be used toward purchasing additional recipe books for sale to the general public to continuing expanding interest in cooking with fresh fruits and vegetables.

### Significant Results and Recommendations

We feel that the nutrition and culinary education program produced through this grant has enabled us to reach a large audience between the multiple projects which took place. With 16 fair outreach days interacting with thousands of people, over 100 low-income clients reached through nutrition/culinary education, 303 recipe books sold to the general public, 126 families being served, and nearly 1500 social media views of our videos, we were able to reach a very large audience, and have the materials and program built to continue reaching our audience beyond the grant period. We recommend that farmers could sell our recipe books, and/or provide recipe handouts, and run the videos on a screen in their markets to help increase sales of products. Once people are exposed to a new vegetable, or a different way to use or prepare a meal, they seemed to be inspired to try it and expand their consumption.

#### **1) If the overall scope of the project benefitted commodities other than specialty crops, indicate how project staff ensured that funds were used to solely enhance the competitiveness of specialty crops.**

The scope of the project directly benefitted specialty crop producers. The grant funding only covered activities where specialty crops were being promoted through our educational programming and promotional marketing. Staff hours, mileage, and expenses were logged specifically for this grant.

#### **2) Present the significant contributions and role of project partners in the project.**

Crisis Ministries of Trenton allowed us to use their facilities for the Nutrition and Culinary Program. They advertised the event to clients and provided an incentive of one extra pantry “shop” for anyone who completed the survey.

The Burlington County Agricultural Center allowed free use of their kitchen space.

Newell Elementary, Elizabeth Haddon Elementary and Bear Tavern Elementary helped facilitate “The Value of Fresh Fruits and Vegetables Challenge” with their students by handing out the packets to students, collecting the completed passports and emailing communication to their staff and parents.

## **GOALS AND OUTCOMES ACHIEVED**

**1 Describe the activities that were completed in order to achieve the performance goals and measurable outcomes identified in the approved project proposal or subsequent amendments.**

### **Website Promotion of Specialty Crops**

After building the nutrition and culinary education web page, we advertised it on our nutrition brochures, magnets and social media outlets.

### **Cooking with Specialty Crops Videos**

We posted our specialty crop videos to our Facebook page during the season and again at the end of the season during the holidays. We also added the videos to our nutrition and culinary education web page. We tracked the views, shares and comments on Facebook for feedback.

### **Specialty Crop Passport Challenge**

The specialty crop passport challenge spanned a 5-month period from June-October. Halfway through that period (early September), we sent a reminder email to all participants to take advantage of the fall specialty crops and to continue to visit farms, farmers markets, roadside stands, nurseries and wineries/breweries. During this time, we designed an online survey to measure the challenge outcomes. At the end of the challenge period, we sent a follow-up email with a link to the survey on our nutrition and culinary education web page. Participants that completed the survey will receive a reusable tote bag, specialty crop recipe book, and a small prize for each child.

### **Nutrition and Culinary Program**

Any client at Crisis Ministries that participated in the tastings received a bag of ingredients to prepare the tasting recipe at home and a copy of our specialty crop recipe book. We waited two months to give participants time to prepare the recipe and use the recipe book provided. During this time, we designed a self-addressed stamped postcard survey to measure outcomes, and at the end of the two-month period, we mailed the surveys to the participants.

### **Nutrition Outreach**

We designed specialty crop handouts, a nutrition brochure and magnets with our program and website information and tracked the number of each of these educational tools distributed.

**2) If outcome measures were long term, summarize the progress that has been made towards achievement.**

We will continue to track the number of views, shares and comments as we use the specialty crop videos in future outreach. We will also continue to distribute our specialty crop handouts, brochures and magnets at outreach events to further promote specialty crops to the general public and advertise our Nutrition and Culinary webpage for more information. We did not design the other activities to be measured long-term, although we did intend for the participants to continue to use and benefit from the programs educational and marketing materials. For example, 93% of the families that participated in the specialty crop passport challenge indicated that they would continue to expand their visits to farms, markets and nurseries that sell specialty crops. And, while it is difficult to follow-up with participants of the nutrition and culinary program at Crisis Ministries due to their transient nature, we hope that they will continue to use their nutrition handouts, recipe book and local farmers markets.

**3) Provide a comparison of actual accomplishments with the goals established for the reporting period.**

The overall goal for this project was to create a sustained increase in demand for specialty crops through nutrition and culinary education. The two activities that we planned to measure quantifiably were the Specialty Crop Passport Challenge and the Nutrition and Culinary Program workshops. We planned to measure the Specialty Crop Passport Challenge with one survey upon completion of the activity. Alternatively, we had proposed a pre- and post-survey method for the Nutrition and Culinary Program workshops. The website, video and outreach promotion of specialty crops supported the two main quantifiable activities.

**Website Promotion of Specialty Crops**

The goal of the website promotion activity was to update the New Jersey Agricultural Society website by creating a Nutrition and Culinary Education web page. The web page would include recipes featuring specialty crops, as well as nutrition handouts and crop fact sheets. We accomplished this goal by including the three nutrition handouts used in our workshops, 25 different specialty crop fact sheets, and a link to our recipe book with more than 60 recipes.

**Cooking with Specialty Crops Videos**

The goal of the Cooking with Specialty Crops Videos activity was to create video material promoting specialty crops. We achieved this goal by designing, filming and editing four time-lapse recipe videos encouraging the use of specialty crops. These were posted individually on our Facebook page during the season, added to our Nutrition and Culinary Education web page, and then re-posted to Facebook as a link to our web page during the holiday season.

**Specialty Crop Passport Challenge**

The goal of the Specialty Crop Passport Challenge was to quantifiably measure the outcome of the activity by asking participants to complete one survey at the end of the challenge period. The

survey questions asked participants to record total visits and visits to each of the locations selling specialty crops (farmers markets, u-pick farms, roadside stands, nurseries and wineries/breweries). However, the survey did not ask participants if the number of visits was an increase over typical frequency. The original target outcome was that 70% of participants would specify that they had increased purchases of specialty crops at these locations. While we do not know specifically if there was an increase in purchases as a result of the project, 93% of the participants did indicate that they would continue to expand their visits to these locations. Although we were unable to measure change in purchase of specialty crops, we were able to measure change in consumption and usage of specialty crops. The survey asked participants to estimate current consumption and usage as a result of the project and indicate whether this consumption was an increase over previous consumption. 73% of participants did specify that their consumption and usage of specialty crops increased as a result of the challenge. Because consumption/usage and purchase are inherently linked in this project, we can deduce that if consumption/usage increased by 73%, purchase of specialty crops also increased by a similar percentage.

### **Nutrition and Culinary Program**

The original target outcome for the Nutrition and Culinary Program workshops was that 50% of participants would increase their scores from pre- to post-survey. After we revised our program from a two-part workshop to a series of three stand-alone tastings at Crisis Ministries, we also reworked our performance measure from a pre- and post-survey to one follow-up survey two months after the tasting. In the follow-up survey, the participants were asked if they increased consumption and cooking of specialty crops after receiving the recipe book (and ingredients) at the tasting. 57% of the participants indicated that they increased consumption and cooking after the tasting. The survey also asked participants if they increased visits to local farmers markets, and 79% said yes. Therefore, the target level of achievement was still met despite the change in survey method.

### **Nutrition Outreach**

The goal of the nutrition outreach activity of this project was to conduct nutrition and specialty crop education at health fairs, county fairs, schools, gleanings and other similar events and locations. We completed nutrition outreach at 16 locations where we handed out complimentary specialty crop fact sheets, nutrition brochures and magnets with our program and website information. Instead of schools (where we implemented the passport challenge), we chose to further our outreach program at grocery stores, garden and earth fairs and other agricultural events, where we thought we would have increased impact with a more targeted audience. We also chose not to continue outreach at gleanings events because the nature of gleanings was not conducive to prolonged educational activities (volunteers come and go, handouts are difficult to handle outdoors in a field, etc.).

- 4) **Clearly convey completion of achieving outcomes by illustrating baseline data that has been gathered to date and showing the progress toward achieving set targets.**

#### Baseline Data for the Nutrition/Culinary Program:

Before receiving the cookbook, did you eat and cook with fruits and vegetables? 86%

After receiving the cookbook, did you eat and cook with fruits and vegetables more often? 57% replied yes.

Before receiving the cookbook, did you shop at local farmers markets? 50%  
After receiving the cookbook, did you shop at local farmers markets? 79%

#### Baseline Data for the Specialty Crop Passport Challenge:

47% of families that completed the survey reported that they consumed NJ specialty crops 3-5 times per week as a result of the project, and an additional 13% reported consuming NJ specialty crops every day. 73% of families reported that this was an increase compared to previous consumption.

### **5) Highlight the major successful outcomes of the project in quantifiable terms.**

#### **Nutrition/Culinary Program**

We found that 87% of people who completed the survey said that they prepared the recipe at home using the ingredients provided and 79% replied that they used other recipes in the cookbook. Therefore, we feel that providing easy, budget-friendly recipes in an environment that encourages people to try cooking can increase consumption by showing people how easy it is to get started which can hopefully jumpstart a lifestyle change to include fruits and vegetables in their diets.

The population surveyed showed an increase from 50% to 79% of people visiting farmers markets as a result of the program we provided. This shows that education and promotion can inspire lifestyle changes. Simply knowing where to go to purchase fruits and vegetables and being inspired to cook them increased the consumption we saw in this population.

#### **Specialty Crop Passport Challenge**

The Specialty Crop Passport Challenge was conducted over a 5-month period, from June-October 2016. When asked to total the number of visits to farms, markets or stores that sell NJ specialty crops over that time period, families reported a range of 4 to 30 visits, with 33% of families saying they visited at least 6 times. We found that 87% of families who completed the survey visited at least one community farmers market, u-pick farm and nursery. In addition, 93% of families visited at least one farm or roadside stand, and 54% visited at least one winery or brewery.

Although families were told to include purchases of NJ specialty crops made at grocery stores, 60% said that grocery stores were not their main source of these crops. We found that 93% of families said that their children were definitely or at least possibly more enthusiastic to try new fruits and vegetables, and 93% also said that they would continue to expand their visits to farms, markets or stores that sell NJ specialty crops. Therefore, we feel that presenting this project as a fun challenge that families could do together inspired participants to seek out more farms, markets and nurseries, purchase and try more NJ specialty crops, and make plans to continue to

frequent these locations. Parents realized that children are more likely to try new fruits and vegetables if they are involved in purchasing, sampling, preparing and cooking the produce. One parent commented, “Yes!! My children were more enthusiastic to try new fruits and vegetables. We tried kohlrabi for the first time. I was also able to introduce my 4 year olds to eating beets and peppers. My girls would love to go with me and taste all the veggies. They also liked helping me prepare foods when we came home.”

## **Nutrition Outreach**

We estimate through 30 days of community outreach events including county fairs, grocery stores, health fairs, etc. that we reached at least 4,000 people. We handed out all of our brochures, magnets and crop sheets which totaled this amount.

We also sent an email to all of our gleaners and email list to view our website with the updated crop sheets, reaching an estimated 1,200 people. We also encourage our gleaners to buy seasonally while they are at the farms with us for our Farmers Against Hunger program to further increase sales of specialty crops.

## **Lessons learned:**

We asked our low-income recipients what was the greatest the challenge they faced buying or eating more fruits and vegetables. 71% reported that cost is the main challenge. 14% reported that availability was the main challenge and 14% reported flavor was their main challenge.

We learned that visual demonstrations of the cooking practices were highly effective in generating interest and these could potentially be used outside the food pantry setting at farmer markets to encourage customers to purchase unusual vegetables or items they may not have planned on buying during that trip to the market. For example, our tasting of black bean and spinach burger encouraged a young woman to create this meal at home, and the next week she returned and shared her success. This model could be used in the agricultural community to increase consumption of specialty crops.

We felt that it was difficult to measure this project in terms of long-term impact because some of the target audiences, like Crisis Ministries participants and the general public at the fairs and other outreach events, were transient in nature. We also needed to communicate with some of the participants through a third party, as in the case of the elementary schools.

We learned that the general public at fairs and outreach events took interest in and benefitted from the one-page handouts with recipes, nutritional information, and crop facts. We printed them in a rainbow of colored paper which made an attractive display. We found that 2-3 recipes per page, rather than just one, may be more beneficial and cost-effective. Demonstration and recipe pages at markets may be another useful tool for farm markets to increase their sales of specialty crops.

## **BENEFICIARIES**

### **1) Provide a description of the groups and other operations that benefited from the completion of this project's accomplishments.**

- 96 low-income clients reached through the Nutrition and Culinary Education program partnership with Crisis Ministries benefitted from the project.
- Approximately 4,000 people benefitted from our outreach at events by receiving handouts and brochures.
- 126 families benefitted from the Specialty Crop Passport Challenge, and 155 farms, farmers markets, roadside stands, nurseries, and wineries/breweries were reported to have been visited by the families who were encouraged to log their purchases.
- 50 farms who participate in Farmers Against Hunger benefitted from this project through advertising and promotion of their farm names in our recipe books.
- 20 farms benefitted as we encouraged volunteers to attend gleanings who then became customers at their markets and received recipes
- 1,463 Facebook views of culinary videos may have provided additional benefit to the general public in understanding how to prepare fruits and vegetables

## **LESSONS LEARNED**

### **1) Offer insights into the lessons learned by the project staff as a result of completing this project. This section is meant to illustrate the positive and negative results and conclusions for the project.**

Half-way through the project, we were struggling with the design of our workshops as a two-part series with the same clients. We considered working with schools as proposed in our second year report rather than the churches we expected to work with when the grant was written. In March 2016, however, we were able to establish a positive partnership with Crisis Ministries, where the population was our target audience, the volume of people exposed to our tastings and demonstrations was more substantial, and an educational event that did not require a commitment through advanced registration was less intimidating and conducive to our target audience. The positive outcome was that we had a strong partnership with the pantry which made the program successful.

On our Fruit and Vegetable Challenge, we handed out 400 packages, and only had 126 participating families. We asked the parents to return the packages if they were not able to participate and unfortunately we did not receive them back, so perhaps a different strategy for distribution of the challenge would be better.

We also learned that we could not pass out handouts to our gleaners, due to the nature of working outside, so instead we sent email reminders of the information on our website.

## **2) Describe unexpected outcomes or results that were an effect of implementing this project.**

Some unexpected outcomes or results we found were the increases in low-income clients utilizing their local farmers markets as a result of the grant. We did not expect an increase from 50% to 79%. The magnets provided an easy reminder for clients.

We also were surprised by the results of the Fruit and Vegetable Challenge. Although we had hoped for more families to participate, the 126 families who did participate showed an overall sense of interest and excitement about the project. It became a family “activity” for the children to keep adding specialty crops to their books and challenge themselves to try new products and markets.

Parents shared these remarks:

### **Did you try anything new as a result of the project?**

*My son learned that grocery stores and fruit/vegetable picking farms are not the only place to obtain and buy fruits and vegetables, since he learned through this excellent project that roadside stands and farmers markets exist. He learned that there are all different types of tomatoes and he tried the different types at the farmers market. He also tried for the very first time: chick peas, beans, and peaches.*

*We tried some delicious varieties of peppers that were new to us.*

*We tried some new vegetables that were in season that we normally wouldn't have bought.*

*We planted eggplant in the garden again this year. Hadn't done it in several years because we didn't have luck. However, I bought a six-pack at Hallock's and had great success. The hot weather was perfect, and we had enough to make some trays of Eggplant part for the winter!!*

*My children started loving corn and cucumbers after visiting the farm stand.*

### **Were your children more enthusiastic to try new fruits and vegetables or other specialty crops?**

*Definitely YES!!*

*Yes! Our kids are super picky and because of this project they were much more willing to try things they never have.*

*They were excited to get their passport marked up with different farms/markets. Definitely learned what some of the different fruits and vegetables looked like. We stopped at a market and got some Italian plums that they had never seen and made a plum tart.*

*Yes, they even started to enjoy talking to the farm stand attendants.*

*Yes, they love getting food at farmers markets!*

**3) If goals or outcome measures were not achieved, identify and share the lessons learned to help others expedite problem-solving.**

We were not able to complete pre and post-surveys, as we found that we could not have workshops where we met with the same clients multiple times. We were able to adjust our surveys and measure our goals in other ways, as outlined above. It was also difficult to measure a “sustained” increase in demand, as the project was not designed in a way where we could stay in touch with all beneficiaries.

**4) Lessons learned should draw on positive experiences (i.e., good ideas that improve project efficiency or save money) and negative experiences (i.e., lessons learned about what did not go well and what needs to be changed).**

We learned that when people are provided budget-friendly, easy to use recipes, they have a greater interest in consuming the fruits and vegetables. As we met with the general public at outreach events, many stopped at the table to take recipes, share stories with us, and let us know that they would try these at home. This could be a great tool for farms to use at their markets to promote sales.

We also may have been able to reach a wider audience by providing the tastings and demonstrations to schools serving food insecure children. We could reach a greater number of people at one time. However, working with the Crisis Ministries was a very effective way to reach our target audience, with little planning, administrative issues, etc.

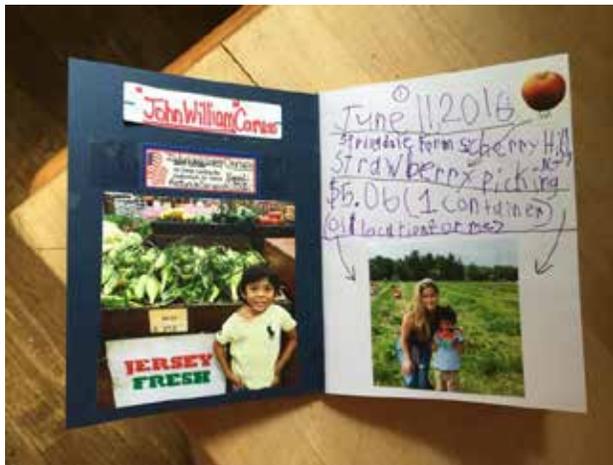
When conducting evaluation, it was a challenge to obtain results with a population with whom we may not stay in contact. We would change the programming and evaluation methods to survey clients and participants at the time of the programming or outreach.

**ADDITIONAL INFORMATION**

**Provide additional information available (i.e. publications, websites, photographs) that is not applicable to any of the prior sections.**

Culinary and Nutrition Education page on the NJ Agricultural Society Website: <http://www.njagsociety.org/culinary-and-nutrition-education.html>. This page, which includes an overview of the program, online access to our recipe book, fruit and vegetable fact sheets and nutrition and seasonality handouts, was developed as part of this project. Our series of four culinary how-to videos featuring NJ produce recipes from our recipe book are also linked to this page.

**CONTACT PERSON**  
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# SWEET POTATO AND GINGER SOUP



## 1 SWEET POTATO

Native to Peru and cultivated in the Americas, Spanish explorers introduced sweet potatoes to Europe, Africa and Asia. A one-cup serving has 7 times the daily recommendation for Vitamin A, which is found as the antioxidant beta-carotene. Sweet potatoes are also an excellent source of Vitamin C, fiber, many B Vitamins and several minerals. Some studies have linked eating sweet potatoes regularly to a decreased risk of diabetes.

## 2 GINGER



Ginger is used in many cultures as a natural remedy for many ailments. The part of the plant used in cooking is called the rhizome, which is the fleshy stalk. Ginger contains several phytochemicals that can act as antioxidants and anti-inflammatory agents, possibly inhibiting tumor growth. Although dried ginger has benefits, fresh ginger contains higher levels of gingerol and shogaols, which are the main active disease fighters.



## 3 LIME

Limes are a key player in nutrition history! In 1747, a British doctor found that limes could prevent scurvy - a disease caused by a deficiency of Vitamin C that plagued many sailors. British sailors became known as "limeys", and it was one of the first proven links between diet and disease. In addition to Vitamin C, limes contain flavonoids and limonoids which may protect against cancer and other diseases.

## 4 COCONUT MILK



Coconuts are fruits that belong to the Palm family. Coconut milk is made from the flesh and is a good source of fiber, Vitamins C and E and several B-vitamins and minerals. When used to make soups and curries, coconut milk should be used in moderation because it is also high in saturated fat. However, one of its main fatty acids, Lauric acid, appears to have antiviral and antibacterial benefits, therefore possibly providing protection from infections.

SCBG Agreement # 12-25-B-1685

Final Performance Report

December 13, 2016

(Revised 4/14/2017)

## **New Jersey Blueberry and Cranberry Research Center**

### **PROJECT TITLE:**

**“Evaluation and Integration of Behavioral Approaches with Conventional Controls to Manage Key Insect Pests of Blueberries”**

### **PROJECT SUMMARY**

The New Jersey blueberry industry occupies 7,500 acres and has a utilized production value of \$80,805,000 (USDA NASS). Blueberries suffer major yield losses due to insect pests. Oriental beetle and plum curculio are two major blueberry pests in New Jersey. Two new invasive insect pests, the brown marmorated stink bug and the spotted wing drosophila, threaten the industry now. The marketplace has zero tolerance for pest defects or evidence of insects in blueberries. Therefore, New Jersey blueberry growers rely heavily on conventional insecticides to manage pest problems. Regulators are very concerned about surface water pollution, negative effect on wildlife, and worker exposure from these broad-spectrum pesticides. Several of the blueberry industry’s most effective pest management tools are currently under review, scheduled for cancellation, or severely restricted under the Food Quality Protection Act. This tolerance reassessment of broad-spectrum insecticides will hurt the blueberry industry because of our minor crop status, consumers’ zero tolerance evidence of insect, high potential for insect infestation, and quarantine and pesticide contamination concerns. We must develop new, selective, insect management strategies. Here we evaluated and developed innovative insect-behavior-based approaches that are economically and operationally viable and fit into existing pest management programs.

Attract-and-kill formulations based on Specialized Pheromone & Lure Application Technology (SPLAT®; ISCA Technologies, Riverside, CA) were tested against oriental beetle (SPLAT A&K OrB), brown marmorated stink bug (SPLAT A&K BMSB), spotted wing drosophila (SPLAT A&K SWD), and plum curculio (SPLAT A&K PC) under laboratory and field conditions. We showed that all these formulations increased insect mortality under laboratory conditions. In field experiments, we demonstrated the efficacy of attract-and-kill formulations against oriental beetle and spotted wing drosophila. Educational information on oriental beetle, plum curculio, and spotted wing drosophila biology, monitoring, and management was provided to over 200 blueberry growers mainly from New Jersey, Pennsylvania, and Maryland at various grower meetings. This information was also provided via newsletter articles.

### **PROJECT APPROACH**

**Activity: Determine an optimal SPLAT attract-and-kill formulation for each target pest.**

ISCA Technologies Inc. developed SPLAT attract-and-kill (A&K) formulations for all of the four key blueberry pests included in this project. These are oriental beetle (SPLAT A&K OrB), brown marmorated stink bug (SPLAT A&K BMSB), spotted wing drosophila (SPLAT A&K SWD), and plum curculio (SPLAT A&K PC). For SPLAT A&K OrB, we used 2.5 and 5% of the major sex

pheromone component (Z)-7-tetradecen-2-one. For SPLAT A&K BMSB, we used 2.5 and 5% of methyl (E,E,Z)-2,4,6-decatrienoate, the male-produced aggregation pheromone of another pentatomid common in eastern Asia, *Plautia stali*. For SPLAT A&K PC, we used 5% of the plum curculio (PC) major aggregation pheromone component grandisoic acid. For SPLAT A&K SWD, the attractant and concentration cannot be disclosed at this point due to proprietary agreement. The formulations contained 2% of the pyrethroid cypermethrin.

*Field Aging Study.* Three SPLAT formulations were applied during this trial: SPLAT OrB, SPLAT OrB + 2% cypermethrin, SPLAT OrB + 2% permethrin. These formulations were applied at the selected sizes (100 $\mu$ L, 500 $\mu$ L, 1000  $\mu$ L, 3,000  $\mu$ L, and 10,000  $\mu$ L for SPLAT OrB; 1,000  $\mu$ L for the two SPLAT OrB A&K formulations) using an automated SPLAT applicator syringe, 0.5 cm from the ends of 1.7 cm  $\times$  15 cm standard economy grade tongue depressors (Brightwood, Puritan Medical Products Company, LLC., Guilford ME) wrapped in aluminum foil (First Street, Amerifoods Trading Co., Los Angeles CA). Tongue depressors containing SPLAT dollops, each labeled with the formulation, original dollop size, and replicate number (three replicates were made per treatment, per sampling date), were then hung from twist ties on a field aging apparatus in an outdoor environment in Riverside, California. Temperatures were recorded at 3 minute intervals throughout the aging study through the deployment of a HOBO temperature recording device, placed near the middle of the sampling area. Samples were collected from the field at Day 0, 7, 14, 21, 28, 42, 56, and 84 days. At each sampling interval, a set of three replicates from each treatment was taken from the field and immediately analyzed for release rate according to the following procedure.

*Release Rate Study.* The SPLAT OrB and SPLAT OrB A&K samples were placed inside a manual volatile collection system (Analytical Research Systems, Inc., Gainesville FL) at room temperature for collection of compounds released from each sample. The system consisted of an air delivery system with mass flow controllers to regulate airflow into a volatile collection chamber. Incoming air was passed through a charcoal filter and molecular sieve before entering the chambers containing the SPLAT sample. Volatiles were collected into a volatile collector trap (1/4" OD x 3" L- Analytical Research Systems, Inc., Gainesville FL) filled with 80/100 mesh Porapak Type Q (Supelco Analytical, Bellefonte PA) as the adsorbent. All volatile collector traps, Teflon, and brass surfaces in contact with the samples or moving air, were rinsed with acetone and hexane before each use. Air flow in the system was balanced by a combined pump and vacuum, equalized in both parallel chambers with flowmeters, and maintained at slightly positive internal pressure (monitored by a simple manometer), to avoid contamination in the event of a leak occurring. After volatiles were collected for a period of 2 hrs, volatile collector traps were sealed with parafilm tape and stored at -4° C until analyzed. The sample preparation process involved rinsing each volatile collector trap with 150  $\mu$ L of a solution containing a known amount of an internal standard compound, chemically similar to the active ingredient and with purity of >99%, in acetone (HPLC grade). Depending on the amount of volatiles captured, the eluted sample was either ready for gas chromatography analysis or needed to be concentrated under a nitrogen stream. The SPLAT samples used for this analysis were saved and used for the percent AI remaining analysis.

*Percent AI remaining analysis.* After collection from the field, each SPLAT-containing tongue depressor was placed, dollop-end down, in a 50 mL self-standing centrifuge tube (Corning, Inc., Corning NY). Weighing dishes were placed inside airtight plastic bags. All aged samples were

stored at -20° C until the sample preparation/analytical process. Sample preparation for analysis: Samples were extracted using a procedure modified from Meissner et al. 2000. Dollops of 100 µL, 500 µL and 1000 µL were transferred into 15 mL scintillation vials, while dollops of 3000 µL and 10,000 µL were transferred to 100 mL vials. The proper amount of an internal standard solution and ethyl acetate were also added to the vials. Samples were vortexed for 30 seconds and placed inside an ultrasound bath at 58° C for 30 minutes. The samples were then placed in a freezer at -20° C for at least 2 hrs. during which time the wax solidified and settled to the bottom of the vials. The vials were then removed from the freezer, and 1 mL of solution was removed from each vial with a 10 mL syringe (Luer Lok/AirTite/Norm-Ject, Fisher Scientific) and filtered through a 0.45 µm PTFE membrane (Millex-FH, Millipore, Carrigtwohill Ireland) into a 1.5 mL GC vial (Agilent Technologies, Inc.). The semiochemical portion of the sample was analyzed with a gas chromatograph (GC7890A, Agilent Technologies, Inc.) equipped with an autosampler (7693) and a flame ionization detector. A capillary column [HP\_Innowax (30 m × 0.25 mm. i.d. × 0.25 µm, Agilent J&W GC Columns)] was used. Data acquisition and processing were performed using an Agilent ChemStation version B.04.02 SP1. Separation was achieved with oven temperature programmed from 50-240° C, with a two-minute hold at the maximum temperature. Hydrogen was the carrier gas, at a flow rate of 2.1 mL/min. Injector and detector temperatures were 250 and 300° C, respectively. Injections were splitless. When necessary, further analyses were performed with an Agilent 5975 quadrupole mass spectrometer equipped with Enhanced ChemStation software version E.00.00.202 (Agilent Technologies, Inc.) and a VF-WAXms capillary column (30 m × 0.25 mm. i.d. × 0.25 µm, Varian, Inc., Lake Forest CA). Helium was the carrier gas in the constant flow mode of 2 mL/min. The source was kept at 200° C, and the transfer line and injector were maintained at 260° C. The oven temperature program was a linear gradient from 40 to 260 at 10° C/min. Electron impact ionization in the positive ion mode was used (70eV), either scanning a mass range from 25 to 300 m/z or acquiring data in the selected ion mode. Mass spectra matches were made by comparison with NIST 2005 version 2.0 standard spectra (NIST, Gaithersburg, MD).

The results of the 84-day aging study on SPLAT OrB MD (no insecticide), SPLAT OrB A&K (cypermethrin), and SPLAT OrB A&K (permethrin), in 1 g dollops, show that the percentage of pheromone remaining in the three treatments after 84 days is comparable between formulations. The cypermethrin treatment retained a slightly higher quantity of pheromone at the end of the study compared with the other two treatments, but this difference was not significant.

**Activity: Test optimal SPLAT attract-and-kill formulations under laboratory conditions.**

**SPLAT A&K OrB:**

The residual killing activity of SPLAT OrB (without killing agent) and SPLAT OrB A&K (with killing agent) was determined in the laboratory. A dollop of SPLAT was placed in the middle of a 30 cm Petri dish. The residual experiment started at day 0, and repeated after 15, 21, and 30 days with the aged dollops. At each sampling date a single oriental beetle male beetle was placed in the Petri dish. The comparative killing effect of the formulations was accessed by exposing 5 oriental beetle males to each formulation and determining the number of beetles that died 24 and 48 h after exposure.

In Petri dish assays, male oriental beetles had higher 24 hr. mortality when left in proximity to all ages of SPLAT A&K OrB as compared with SPLAT OrB and SPLAT blank (control). Even after

30 days of aging, SPLAT A&K OrB effectively caused 100% beetle mortality in the Petri dish assay.

#### SPLAT A&K OrB – Video Recordings:

Experiments were conducted using video cameras and a software (EthoVision XT v.10.8; Noldus, Wageningen, The Netherlands) to study the effects of SPLAT OrB and SPLAT OrB A&K on OB behavior. We employed the use of field-deployed cameras for monitoring 0.5 gram dollops of each SPLAT formulation to determine if oriental beetles came into contact with the material under field conditions. Experiment 1: a field experiment was conducted from 17 June through 02 July in a blueberry field cv. 'Bluecrop,' located at the P.E. Marucci Blueberry/Cranberry Center in Chatsworth, New Jersey. Half-gram dollops of SPLAT OrB was applied to four 6-inch wooden stakes, four additional untreated stakes were used as a control. Treated and control stakes were placed out in a semi-circular array in the research plot. An 8-channel, closed-circuit video recording system (Q-See, Anaheim, CA 92807) with a custom modified hot-swappable 500 GB hard drive was used to record the behavior of beetles responding to the stakes. Eight weatherproof, infrared night-vision capable, color CCD cameras on 60 ft cables (420 lines of resolution) were aimed at each stake in the array. Cameras were held in lab-stand clamps attached to 1 meter-long sections of metal pipe driven into the ground. The DVR system was modified to receive uninterrupted power from exchangeable 12 volt deep-cycle marine batteries to facilitate recording of continuous video for multiple days. Experiment 2: a field experiment was conducted from 21 July through 30 July, in the same research plot located at the Rutgers PE Marucci Center. Half-gram dollops of SPLAT were applied to each base of eight large metal lab-stands that had been placed in a similar semi-circular array as in Experiment 1. Three treatments were used, with 2-3 reps per treatment: SPLAT OrB, SPLAT A&K OrB, and SPLAT blank (control). The resulting video files were converted into MPEG format using a batch-conversion process with PRISM Plus v2.45 video file converter (distributed by NCH Software, Inc. Greenwood Village, CO). These converted files were compatible with EthoVision XT, which was used to evaluate the frequency of beetles coming into contact with SPLAT dollops, and the length of time those beetles spend in contact with the dollop. The values for visit frequency (mean  $\pm$  se) and cumulative time (as seconds and % of total time) in contact (mean  $\pm$  se) were calculated.

Results from Experiment 1 show that oriental beetles visited SPLAT OrB-treated wooden stakes  $20 \pm 8.6$  % of the time, and spent about 10 min near the treated stakes per visit. They contacted SPLAT OrB  $14.7 \pm 7.8$  % of the time and spent about 7 min in contact with the dollop. Results from Experiment 2 show that oriental beetles spent twice the amount of time near SPLAT OrB-treated wooden stakes than near SPLAT A&K OrB-treated stakes, indicating a possible repellent effect of the pyrethroid insecticide.

#### SPLAT A&K BMSB:

The residual killing activity of SPLAT BMSB (without killing agent) and SPLAT BMSB A&K (with killing agent) was determined in the laboratory. A dollop of SPLAT was placed in the middle of a 30 cm Petri dish. The comparative killing effect of the formulations was assessed by exposing 4 adults to each formulation and determining the number of stink bugs that died 24 and 48h after exposure.

In Petri dish assays, SPLAT BMSB (2.5%), SPLAT BMSB (5%), SPLAT A&K BMSB (2.5%), and SPLAT A&K BMSB (5%) caused 6.3, 12.5, 68.8, and 75% adult brown marmorated stink bug mortality, respectively. SPLAT blank (control) caused 0% mortality.

#### SPLAT A&K PC:

In 2015, an experiment was conducted to test the efficacy of SPLAT A&K against plum curculio (PC). The experiment was conducted in Petri dish arenas in the laboratory. Treatments were: SPLAT PC (with 5% grandisoic acid), SPLAT A&K PC (with 5% grandisoic acid + 2% cypermethrin), SPLAT PC BLANK (control, no pheromone or toxin), and SPLAT A&K PC BLANK (control, no pheromone + 2% cypermethrin). The toxin was added to the SPLAT product by mixing 0.5 grams of cypermethrin WSP (40% a.i. powder) into 10 grams of either SPLAT PC BLANK or SPLAT A&K PC BLANK. Applications of ~ 1 g dollops were made with 1 mL syringes, assuming that density was close to 1g/mL. Each treatment was applied to four dishes at a time and this was repeated 3 times for a total of 12 arenas tested per treatment. All treated arenas were aged overnight in a fume-hood to allow SPLAT dollops to solidify before adding insects to the arenas. Arenas consisted of 9 cm diameter plastic Petri dishes covered with fabric mesh. Arenas were placed on a translucent white light bench that was kept lit-up for the entire 20 hrs. of exposure. One PC was added to each arena at the beginning of the exposure period in the laboratory at approx. 24°C. PC used in the experiment were collected from unsprayed plots on a commercial blueberry farm located in Hammonton, NJ from 4 April through 17 May. Field collected PC (approx. 380) were placed in ventilated 32 oz. deli containers and kept in a 15°C Incubator on a 14:10 L:D cycle with untreated blueberry foliage and moist cotton balls until the PC were needed for the assay. PC were moved from the 15°C Incubator, and were kept in the lab at 24°C under a 15:9 L:D cycle the day before being used in an assay. Four arenas of each treatment were placed on the light bench during each round of exposure. PC adults were exposed during three rounds, each on a separate date: 10 July, 12 July, and 14 July. All PC were checked for vitality before being placed in exposure arenas. Efficacy of the treatments was assessed by checking the exposed PC for mortality 20 hrs. after placing PC in the arenas, and then again 24 hrs. later after they had been removed from exposure arenas. The number of PC (alive or dead) was recorded. Percent mortality was calculated from the total number tested.

In Petri dish assays, 0% PC died in any of the SPLAT treatments during the exposure portion of the experiment (20 hrs.). None of the adults died either 24 hrs. after removing them from the treated arenas. These results indicate that PC does not make contact with the SPLAT A&K PC.

#### SPLAT A&K SWD:

##### Experiment 1:

The bioassay apparatus consisted of two 32 oz. plastic “drink-type” containers with lids. One container was placed upside down and served to support the second upright container. A hole was drilled through the adjoining container bottoms and a florist’s water pick, filled with water, was inserted. A rubber cap was placed on top of the water pick and supported a single, medium-sized blueberry leaf. The leaves were in healthy condition and came from Bluecrop variety blueberry bushes that had not been previously treated with any pesticides. A 0.25 g dollop was applied to the top of the leaf. A cotton ball, treated with 15% sugar water, was placed in the upper container, supplying food and water for the SWD. At the beginning of each bioassay, five live SWD flies of a single sex were placed into the upper container. Each set of five flies were four to six days old

and had been kept at 20°C for three to four hrs. before being placed in the container. Each bioassay was replicated three times.

Four SPLAT formulations were tested as follows:

1. SPLAT Formulation No. 2 (SPLAT Blank + attractant + Imidan).
2. SPLAT Formulation No. 3 (SPLAT Blank + attractant + 30% sugar).
3. SPLAT Formulation No. 4 (control: SPLAT Blank + Imidan).
4. SPLAT Formulation No. 5 (control: SPLAT Blank).

The pesticide Imidan 70WP was added to SPLAT formulations 2, 3 and 4 just prior to the bioassay as a toxicant and was not part of the SPLAT formulation. Imidan is a broad spectrum, non-systemic insecticide that is non-disruptive to mating behavior. Formulations 2, 3 and 4 were mixed with Imidan to achieve 0.02% active ingredient - Phosmet, N-(Mercaptomethyl) phthalimide, S-(0,0-dimethyl phosphorodithioate). Each formulation was applied as 0.25 g dollops. Data were collected at 1 hr., 2 hrs., 18 hrs. and 24 hrs. for the following:

- The number of SWD that had direct contact with the SPLAT dollop.
- The number of SWD that landed on the top surface of the leaf, but did not have direct contact with the SPLAT dollop.
- The number of SWD that landed on the underside of the leaf.
- The number of dead SWD.

#### Male SWD

*SPLAT Formulation No. 2 (with Imidan added).* No male flies made contact with the SPLAT dollop in any of trials, and no flies were observed in contact with the top of leaf. For all three trials, three observations were made of flies on the underside of the leaf; these observations occurred at one and two hrs. In Trial 1, four flies were dead at 24 hrs. In Trial 2, three flies were dead at 18 hrs. and all five were dead at 24 hrs. None of the flies in Trial 3 died during the 24 hr. period.

*SPLAT Formulation No. 3 (with Imidan added).* In Trial 2, two SWD made contact with the SPLAT dollop, and one fly did so in Trial 3. One fly was observed on the top of the leaf during Trial 1, and one fly was observed on the underside of the leaf in Trial 3. For Trial 1 and 2, one fly each was dead after one hr. All five flies for each of the three trials were dead at 18 hrs.

*SPLAT Formulation No. 4 (control with Imidan added).* For all trials, no flies made contact with the SPLAT dollop. Six observations were made of flies on the top of the leaf; one at one hr. in Trial 3 and five at 24 hrs. (one in Trial 1, one in Trial 2 and three in Trial 3). No flies were observed on the underside of the leaf in any of the trials. For all trials, only one fly died during the bioassay period. This occurred at 18 hrs.

*SPLAT Formulation No. 5 (Control; no Imidan added).* For all trials, no flies made contact with the SPLAT dollop or any part of the leaf. All five flies were alive at 24 hrs.

SPLAT Formulation No. 3 had the highest mortality rate for male SWD, with all five flies for each of the three trials dead at or before 18 hrs. Formulation No. 3 was the only one that contained sugar and was also the only formulation in which SWD were observed directly on the SPLAT dollop.

#### Female SWD

*SPLAT Formulation No. 2 (with Imidan added).* For all trials, no flies made contact with the SPLAT dollop. During the 24 hr. period, seven observations were made of flies on the top of the leaf (three in Trial 1, two in Trial 2 and two in Trial 3) and five observations were made of flies

on the underside of the leaf (three in Trial 2 and two in Trial 3). In Trials 1 and 2, one fly each was dead at 24 hrs.

*SPLAT Formulation No. 3 (with Imidan added).* Three flies were observed making contact with the SPLAT dollop over the 24 hr. period, two in Trial 1 and one in Trial 2. During the 24 hr. period, one fly was observed on the top of the leaf (Trial 3) and two flies were observed on the underside of the leaf (both in Trial 1). All five flies were dead at 24 hrs.

*SPLAT Formulation No. 4 (control with Imidan added).* No flies made contact with the SPLAT dollop in any of the three trials and all flies were alive at 24 hrs. During the 24 hr. period, three flies were observed on the top of the leaf (one in Trial 1 and two in Trial 2) and two flies were observed on the underside of the leaf (one in Trial 1 and one in Trial 2).

*SPLAT Formulation No. 5 (control; no Imidan added).* No flies made contact with the SPLAT dollop in any of the three trials and all flies were alive at 24 hrs. During the 24 hr. period, six observations were made of flies on the top of the leaf (two in Trial 1, four in Trial 2) and one fly was observed on the underside of the leaf (Trial 2).

SPLAT Formulation No. 3 also had the highest mortality rate for female SWD, with all five flies for each of the three trials dead at or before 24 hrs. As with the male SWD, No. 3 was the only formulation for which SWD were observed directly on the SPLAT dollop.

#### Experiment 2:

Five additional SPLAT formulations were tested as follows:

1. SPLAT Formulation No. 6 (water + sugar + protein + Imidan).
2. SPLAT Formulation No. 7 (protein + Imidan).
3. SPLAT Formulation No. 8 (water + sugar + Imidan).
4. SPLAT Formulation No. 4 (control: SPLAT Blank + Imidan).
5. SPLAT Formulation No. 5 (control; SPLAT Blank).

As with the previous SPLAT formulations, Imidan 70WP was added to the SPLAT, just prior to the bioassay, as a toxicant and is not part of the SPLAT formulation. Each formulation was applied as 0.25 g dollops.

Data were collected at 1 hr., 19 hrs., 24 hrs. and 48 hrs. for the following:

- The number of SWD that had direct contact with the SPLAT dollop.
- The number of SWD that landed on the top surface of the leaf, but did not have direct contact with the SPLAT dollop.
- The number of SWD that landed on the underside of the leaf.
- The number of dead SWD.

#### Male SWD

*SPLAT Formulation No. 6 (with Imidan added).* No male SWD were observed on the SPLAT dollop in any of trials, however, one fly was found dead on the dollop at 48 hrs. During the 48 hr. period, 25 observations were made of flies on the top of the leaf (six in Trial 1, eight in Trial 2 and eleven in Trial 3) and nine observations were made of flies on the underside of the leaf (three in Trial 1, three in Trial 2 and three in Trial 3). At 24 hrs., three flies were dead in Trial 1, three were dead in Trial 2 and one was dead in Trial 3. All flies were dead at 48 hrs. in all three trials.

*SPLAT Formulation No. 7 (with Imidan added).* In Trial 1, three male SWD were observed on the SPLAT dollop at one hr. At one hr., four observations were made of flies on the top of leaf (one in Trial 1, two in Trial 2 and one in Trial 3) and seven flies were observed on the underside of the

leaf (one in Trial 1, three in Trial 2 and three in Trial 3). All flies for the three trials were dead at 19 hrs.

*SPLAT Formulation No. 8 (with Imidan added).* In Trial 1, one male SWD was observed on the SPLAT dollop at one hr. During the first 24 hrs., 18 observations were made of flies on the top of the leaf (seven in Trial 1, six in Trial 2 and five in Trial 3) and 17 observations were made of flies on the underside of the leaf (seven in Trial 1, four in Trial 2 and six in Trial 3). At 19 hrs., two flies were dead in Trial 2 and one fly was dead in Trial 3. At 24 hrs., Trials 2 and 3 each had three dead flies. The remainder of the flies for the three trials were dead at 48 hrs.

*SPLAT Formulation No. 4 (control with Imidan added).* In Trial 3, one male SWD was observed on the SPLAT dollop at one hr. Over the 48 hr. period, 26 observations were made of flies on the top of the leaf (six in Trial 1, nine in Trial 2 and eleven in Trial 3), and 18 observations were made of flies on the underside of the leaf (seven in Trial 1, six in Trial 2 and three in Trial 3). At 19 hrs., one fly in Trial 1 was dead. At 48 hrs., all five flies in Trial 1 were dead and two in Trial 2 were dead.

*SPLAT Formulation No. 5 (control; no Imidan added).* No male SWD were observed on the SPLAT dollop in any of trials. Over the 48 hr. period, 31 observations were made of flies on the top of the leaf (twelve in Trial 1, eight in Trial 2 and eleven in Trial 3), and 14 flies were observed on the underside of the leaf (three in Trial 1, seven in Trial 2 and four in Trial 3). At 48 hrs. one fly from Trial 3 was dead.

#### Female SWD

*SPLAT Formulation No. 6 (with Imidan added).* In Trial 2, one female SWD was observed on the SPLAT dollop at one hr. During the 48 hr. period, eight observations were made of flies on the top of the leaf (two in Trial 1, three in Trial 2 and eight in Trial 3), and 23 observations were made of flies on the underside of the leaf (twelve in Trial 1, three in Trial 2 and eight in Trial 3). At 19 hrs., all five flies in Trial 2 were dead and one fly from Trial 3 was dead. The remaining four flies from Trial 3 were dead at 48 hrs. In Trial 2, one fly was dead at 24 hrs. and three more were dead at 48 hrs.

*SPLAT Formulation No. 7 (with Imidan added).* In Trial 3, one female SWD was observed on the SPLAT dollop at 19 hrs. During the first 24 hrs., seven observations were made of flies on the top of the leaf (two in Trial 1, one in Trial 2 and four in Trial 3), and 13 observations were made of flies on the underside of the leaf (four in Trial 1, four in Trial 2 and five in Trial 3). At 19 hrs., four flies from Trial 1 were dead, all five flies in Trial 2 were dead and one fly from Trial 3 was dead. The remaining fly from Trial 1 was dead at 24 hrs., and three additional flies from Trial 3 were dead.

*SPLAT Formulation No. 8 (with Imidan added).* Female SWD were observed twice on the SPLAT dollop; once at 19 hrs. in Trial 1 and once at 24 hrs. in Trial 2. During the first 24 hrs., 15 observations were made of flies on the top of the leaf (five in Trial 1, five in Trial 2 and five in Trial 3), and 21 observations were made of flies on the underside of the leaf (six in Trial 1, seven in Trial 2 and eight in Trial 3). At 19 hrs., two flies from Trial 1 were dead, and one fly each was dead in Trials 2 and 3. One additional fly from Trial 2 was dead at 24 hrs., and all flies for the three trials were dead at 48 hrs.

*SPLAT Formulation No. 4 (control with Imidan added).* Female SWD were observed twice on the SPLAT dollop: once at one hr. in Trial 1 and once at 19 hrs. in Trial 3. During the first 24 hrs., 23 observations were made of flies on the top of the leaf (nine in Trial 1, seven in Trial 2 and seven in Trial 3) and 20 observations were made of flies on the underside of the leaf (five in Trial 1, eight

in Trial 2 and seven in Trial 3). At 24 hrs., all flies for the three trials were alive. At 48 hrs., four flies were dead (one in Trial 1, two in Trial 2 and one in Trial 3).

*SPLAT Formulation No. 5 (control; no Imidan added).* For all three trials, no female SWD were observed on the SPLAT dollop. During the 48 hr. period, 32 observations were made of flies on the top of the leaf (ten in Trial 1, eleven in Trial 2 and eleven in Trial 3) and 14 observations were made of flies on the underside of the leaf (five in Trial 1, four in Trial 2 and five in Trial 3). All flies in the three trials were alive at 48 hrs.

The highest mortality rate for SWD in this set of bioassays for both males and females was SPLAT Formulation No. 7. This formulation is an ISCA product used as a lure for fruit flies attracted to hydrolyzed protein.

### Experiment 3:

The efficacy of SPLAT A&K SWD was evaluated for controlling spotted wing drosophila infestation in blueberries at 6.5 L/ac. The experiment was conducted in separate blocks of two varieties of highbush blueberry: the mid-season-ripening cv. 'Bluecrop' and the late-ripening cv. 'Elliott'. All variety blocks were planted in a common field located at the P.E. Marucci Blueberry/Cranberry Center in Chatsworth, New Jersey. The SPLAT treatment was repeated in three blocks of each variety, a block consisted of 5 rows by 21 plants per row for a total of 105 bushes per block. Each block was divided into two treatment-plots of 50 bushes each (5 rows x 10 plants) separated by a 1 bush-wide buffer strip between plots. Fifty bushes were treated with SPLAT A&K SWD and the other 50 bushes were left as an untreated control. Applications were made on 27 July and 4 August with an R&D Sprayer's MeterJet® Spray gun (Spraying Systems Co., Wheaton, IL), using a 1.0 liter plastic bottle. The sprayer was calibrated to deliver 6.5 L per acre at 40 psi, using a single D3 orifice, yielding 5.37 ml per bush. The volume per bush was divided into four shots at 1.34 mL per shot. Each treated bush received four shots, spread evenly around the bush. Leaf clusters and ripe blueberries were taken from each plot 1 and 4 days after treatment (DAT), on 28 and 31 July after the first application week 1, and again on 5 August after the second application week 2. A second set of samples were taken on 5 August and aged on a table outside for an additional 3 days, these were treated as the 4 DAT samples from 8 August. Five leaf clusters and 75 fruit were taken from each plot on each sample date and divided into five assay containers with each container considered a replicate. Leaf clusters and loose berries were placed in assay containers consisting of a 32 oz. deli container with a hole cut in the bottom in which a florist's water pick fit tightly, plant stems were inserted through the water pick. Each assay container included a leaf cluster consisting of 3 leaves, control leaves were untreated, SPLAT-treated leaves had varying amounts of product in splattered drops or dollops on the upper and lower leaf surfaces. Assay containers received 15 ripe berries placed loose in the bottom. For both samples taken during week one, control berries were untreated, and approximately 1/3 of treated berries were partially coated with treatment product. For week two, all assay containers received untreated berries, with only SPLAT-coated leaf clusters as treatment. Leaf clusters were supplied with water and were kept in a horticultural planting lab during the length of the experiment. Flies were added to the assay containers within 2-3 hrs. after leaf clusters were setup in the lab. On each sample date a total of 10 adult drosophila flies (5 females and 5 males) were removed from a lab colony and released into each assay container. Flies were 4-6 days old at time of use so they were sexually mature. Flies were anesthetized with small puffs of CO<sub>2</sub> gas injected into the rearing tubes to facilitate handling and placement in the assay containers. After drosophila

flies were added to the assay containers, the containers were placed on a light bench in a horticultural planting lab under a 14L:10D photoperiod, and were kept at ambient outdoor temperature ranging from ~20-30°C during the 3 days prior to observation, and the additional 4 days allowed for continued oviposition by female flies. Adult fly mortality data were collected on day 3 after exposure to the treated fruit and foliage. Berries were removed from assay containers on day 7 and placed in 8 oz. deli containers and incubated under the same conditions for 10 additional days before evaluation on day 17.

Larval infestation data were collected using the salt water extraction method of submerging the berries in warm salt water (~1000 ml NaCl: 5 gal H<sub>2</sub>O) which causes larvae to leave fruit. Larvae and pupae caught by a 30 mesh sieve were counted and the number of larvae per berry was calculated (no. larvae/no. ripe fruit, "larvae" includes all larvae + pupae). Percent control for adult flies was calculated [% Adult Control = [1-(% live flies in treated / % live flies in control)]\*100]. Percent reduction in larval infestation was calculated [% Larval Control = [1-(No. larvae in treated / No. larvae in control)]\*100]. Data were analyzed using ANOVA and means separation by Fisher's LSD test at  $P = 0.05$ . Percent data were arcsine square-root transformed and count data were  $\ln(x+1)$  transformed prior to analysis.

In laboratory assays, SPLAT A&K SWD resulted in 70-100% adult mortality. Larval infestation was reduced by 58-100%.

#### Experiment 4:

An experiment was conducted in 2016 to evaluate the residual activity of SPLAT SWD A&K under field conditions. Ten blueberry bushes (cv. 'Elliott') were randomly selected from a blueberry field at the Rutgers P.E. Marucci Center, Chatsworth, New Jersey. Five bushes were treated with SPLAT SWD A&K using a R&D Sprayer's MeterJet® Spray gun (see above) and five bushes were untreated controls. Five terminals were randomly collected from untreated and five from treated bushes and transferred to the laboratory. Terminals were collected on the day of treatment (day 0), and 7, 14, and 21 days after treatment and placed individually in deli cup containers (~1000 ml volume). Following, ten adult SWD flies (five males and five females) were released inside each container. Adult SWD mortality was recorded after 24 hours.

SWD mortality was significantly higher on terminals treated with SPLAT SWD A&K on the day of treatment and 7 and 14 days after treatment as compared with the untreated control and on terminals collected 21 days after treatment with SPLAT SWD A&K. These results indicate that the insecticidal activity of SPLAT SWD A&K lasts for about two weeks under field conditions.

#### **Activity: Evaluate the SPLAT attract-and-kill formulations under field conditions.**

##### Experiment 1:

A field experiment was conducted to determine the efficacy of SPLAT A&K SWD applied at 6.5 L/ac for controlling spotted wing drosophila infestation in blueberries. This test was conducted in a blueberry field located at the P.E. Marucci Blueberry/Cranberry Center in Chatsworth, New Jersey. The SPLAT A&K SWD treatment was repeated in three blocks of the late-ripening blueberry variety cv. 'Elliott'. Each block consisted of 5 rows by 21 plants per row for a total of 105 bushes per block. Each block was divided into two treatment plots of 50 bushes each (5 rows x 10 plants) separated by a 1 bush-wide buffer strip between plots. Fifty bushes were treated with

SPLAT A&K SWD and the other 50 bushes were left as an untreated control. Applications were made on 27 July and 4 August with an R&D Sprayer's MeterJet® Spray gun (Spraying Systems Co., Wheaton, IL), using a 1.0 liter plastic bottle. The sprayer was calibrated to deliver 6.5 L per acre at 40 psi, using a single D3 orifice, yielding 5.37 ml per bush. The volume per bush was divided into four shots at 1.34 mL per shot. Each treated bush received four shots, spread evenly around the bush. On 5 August, the number of adult drosophila in the field plots was enhanced through release of lab-reared flies. Twenty five vials containing approximately 10 flies of mixed sex each were released in each plot, totaling 250 flies per plot. In total 150 vials equaling approximately 1500 flies were released in the 6 plots (3 control + 3 SPLAT). Vials were spaced out evenly across each plot with 5 vials in each rows placed at the base of every other bush. Flies were from a lab colony and were mixed ages from 3-10 days old at time of release. Ten 1-pint (by volume) samples of ripe blueberries were harvested from each plot on 11 August, 7 days after the second application of SPLAT A&K SWD (4 August), and 6 days after release of lab-reared flies (5 August). The sampling method was two diagonal transects across the center of the plot, 5 pints were taken per transect, one pint from each row. Ultimately two pints came from each of the five rows in a plot. Pint samples were weighed and placed in 32 oz. deli containers, then incubated on a light bench in the lab under a 14L:10D photo period, and 25-28°C for 10 days prior to evaluation.

Larval infestation data were collected using the salt water extraction method of submerging the berries in warm salt water (~1000 ml NaCl : 5 gal H<sub>2</sub>O) which causes larvae to leave fruit. Larvae and pupae caught by a 30 mesh sieve were counted and the number of larvae per pint sample and larvae per Kg berries was calculated (no. larvae/mass ripe fruit, "larvae" includes all larvae + pupae). Percent control or percent reduction in larval infestation was calculated [% Larval Control = [1-(No. larvae in treated / No. larvae in control)]\*100]. Data were analyzed using ANOVA and means separation by Fisher's LSD test at  $P = 0.05$ .

SPLAT A&K SWD reduced larval infestation by 58% compared with untreated control.

#### Experiment 2:

A second field experiment was conducted to determine the efficacy of SPLAT A&K SWD compared to the fruit fly bait GF120 (Dow Agrosiences) for controlling spotted wing drosophila infestation in blueberries. GF120 is a product registered for use in blueberries to control the tephritid fruit fly pests such as the blueberry maggot (*Rhagoletis mendax*). Both the SPLAT-SWD and GF120 were applied at 6.5 L/ac.

This experiment was conducted in a mid-season variety blueberry field, cv. 'Bluecrop,' located at the P.E. Marucci Blueberry/Cranberry Center in Chatsworth, New Jersey. Each treatment was repeated on five bushes blocked by treatment, with blocks separated by a 3-bush buffer. The first application was made on 24 July, and samples were taken on 25 July (1 DAT). After a severe rain event on the afternoon of 25 July washed most of both products off the bushes a second application was made on 27 July and samples were taken on 28 July (1 DAT) and 31 July (4 DAT). Applications were made with an R&D Sprayer's MeterJet® Spray gun (Spraying Systems Co., Wheaton, IL), using a 1.0 liter plastic bottle. The sprayer was calibrated to deliver 6.5 L per acre at 40 psi, using a single D3 orifice, yielding 5.37 ml per bush. The volume per bush was divided into four shots at 1.34 mL per shot. Each bush received four shots, spread around the bush. Leaf clusters and ripe blueberries were taken from each treated plot 1 day after the first treatment

application, on 25 July and then again 1 and 4 days after the second treatment application (DAT) on 28 July and 31 July. Five leaf clusters and 75 fruit were taken from each treatment plot on each sample date and divided into five assay containers with each container considered a replicate. Assay containers consisted of a 32 oz. deli container with a hole cut in the bottom in which a florist's water pick fit tightly, plant stems were inserted through the water pick. Each assay container included a leaf cluster consisting of 3 leaves, control leaves were untreated, treated leaves had varying amounts of product (SPLAT or GF120) in splattered drops or dollops on the upper and lower leaf surfaces. All assay containers received 15 ripe berries placed in the bottom of each container, control berries were untreated, and approximately 1/3 of treated berries were partially coated with treatment product. Leaf clusters were supplied with water and were kept in a horticultural planting lab during the length of the experiment. Flies were added to the assay containers within 2-3 hrs. after leaf clusters were clipped from bushes. On week 1, 1 DAT a total of 20 adult drosophila flies (10 females and 10 males) were removed from a lab colony and released into the assay containers, while on the remaining assay dates a total of 10 adult drosophila flies (5 females and 5 males) were added to each container. Flies were 4-6 days old at time of use so they were sexually mature. Flies were anesthetized with small puffs of CO<sub>2</sub> gas injected into the rearing tubes to facilitate handling and placement in the assay containers. After drosophila flies were added to the assay containers, the containers were placed on a light bench in a horticultural planting lab under a 14L:10D photo period, and were kept at ambient outdoor temperature ranging from ~20-30°C during the 3 days prior to observation, and the additional 4 days allowed for continued oviposition by female flies. Adult fly mortality data were collected on day 3 after exposure to the treated fruit & foliage. Berries were removed from assay containers on day 7 and placed in 8 oz. deli containers and incubated under the same conditions for 10 additional days before evaluation on day 17.

Larval infestation data were collected using the salt water extraction method of submerging the berries in warm salt water (~1000 ml NaCl : 5 gal H<sub>2</sub>O) which causes larvae to leave fruit. larvae & pupae caught by a 30 mesh sieve were counted and the number of larvae per berry was calculated (no. larvae/no. ripe fruit, "larvae" includes all larvae + pupae). Percent control for adult flies was calculated [% Adult Control = [1-(% live flies in treated / % live flies in control)]\*100]. Percent reduction in larval infestation was calculated [% Larval Control = [1-(No. larvae in treated / No. larvae in control)]\*100]. Data were analyzed using ANOVA and means separation by Fisher's LSD test at  $P = 0.05$ . Percent data were arcsine square-root transformed & count data were  $\ln(x+1)$  transformed prior to analysis.

SPLAT A&K SWD provided 100% adult mortality and 100% protection against larval infestation compared with untreated control. GF-120 provided 60-100% adult mortality and 75-100% protection against larval infestation.

### Experiment 3:

The objective of these field trials was to determine the efficacy of a prototype, water-based SPLAT A&K SWD for controlling SWD infestation in highbush blueberry in New Jersey. These tests were conducted in separate blocks of two varieties of highbush blueberry: the mid-season-ripening cv. 'Bluecrop' and the late-ripening cv. 'Elliott'. All variety blocks were planted in a common field located at the P.E. Marucci Blueberry/Cranberry Center in Chatsworth, New Jersey. The SPLAT treatment was repeated in three blocks of each variety, a block consisted of five rows by 21 plants

per row for a total of 105 bushes per block. Each block was divided into two treatment plots of 50 bushes each (5 rows x 10 plants) separated by a one bush-wide buffer strip between plots. Fifty bushes were treated with SPLAT A&K SWD and the other 50 bushes were left as an untreated control. Applications were made on 27 July and 4 August with an R&D Sprayer's MeterJet® Spray gun (Spraying Systems Co., Wheaton, IL), using a 1.0 liter plastic bottle. The sprayer was calibrated to deliver 6.5 L per acre at 40 psi, using a single D3 orifice, yielding 5.37 ml per bush. The volume per bush was divided into four shots at 1.34 mL per shot. Each treated bush received four shots, spread evenly around the bush. On 5 August the number of adult SWD in the field plots was enhanced through release of lab-reared flies. Twenty-five vials containing approximately 10 flies of mixed sex each were released in each plot, totaling 250 flies per plot. In total, 150 vials equaling approximately 1500 flies were released in the six plots (3 controls + 3 SPLAT plots). Vials were spaced out evenly across each plot with five vials in each row placed at the base of every other bush. Flies released were obtained from a lab colony of SWD and were mixed ages from three to ten days old at time of release. Ten 1-pint (by volume) samples of ripe blueberries were harvested from each plot on 11 August, 7 days after the second application of SPLAT A&K SWD (4 Aug), and 6 days after release of lab-reared flies (5 Aug). The sampling method was two diagonal transects across the center of the plot, with 5 pints taken per transect, one pint from each row. Ultimately, two pints came from each of the five rows in a plot. Pint samples were weighed and placed in 32 oz. deli containers, then incubated on a light bench in the lab under a 14L:10D photo period, at 25 to 28°C for 10 days prior to evaluation. Larval infestation data were collected using the salt water extraction method of submerging the berries in warm salt water (~1000 ml NaCl : 5 gal H<sub>2</sub>O) which causes larvae to leave fruit. Larvae and pupae caught by a 30 mesh sieve were counted and the number of larvae per pint sample and larvae per kg berries was calculated (no. larvae/mass ripe fruit, "larvae" includes all larvae + pupae). Percent control or percent reduction in larval infestation was calculated [% Larval Control = [1-(No. larvae in treated / No. larvae in control)]\*100]. Data were analyzed using ANOVA and means separation by Fisher's LSD test at P = 0.05.

There was a 58% reduction in infested fruit in the plots treated with SPLAT A&K SWD compared with control plots.

#### Experiment 4:

Previous field studies conducted in New Jersey blueberry fields demonstrated that oriental beetle captures remained consistently low in SPLAT OrB (and SPLAT OrB A&K) treated plots throughout the beetles' flight period. A disruption index of 87.75% to 89.45% was observed in the treated plots when compared to plots that did not receive SPLAT OrB treatment. (Disruption Index = [(avg. beetles / trap in control plots + 0.01) – avg. beetles / trap in treatment plots + 0.01]/avg. beetles/trap in control plots + 0.01] × 100). This previous study also revealed that effective mating disruption of OrB can be achieved with as little as 250 (1 gram) point sources of SPLAT OrB per hectare. In order to make the product cost efficient for blueberry growers, further studies tested the minimum point source density of 250 point sources per hectare by reducing the amount of material from 1 g per point source to 0.5 g and 0.25 g. Field trials evaluating the performance of SPLAT OrB and SPLAT OrB A&K at these lessened application rates were carried out over two consecutive years, with the following treatments applied in June of 2014 and 2015 in three commercial blueberry farms in Hammonton, NJ.

1. Control; No SPLAT treatment.

2. SPLAT OrB applied as 250 dollops at 0.25 grams / dollop (1% (Z)-7-tetradecen-2-one).
3. SPLAT OrB applied as 250 dollops at 0.5 grams / dollop (1% (Z)-7-tetradecen-2-one).
4. SPLAT OrB A&K applied as 250 dollops at 0.25 grams / dollop (1% (Z)-7-tetradecen-2-one + 2% cypermethrin).
5. SPLAT OrB A&K applied as 250 dollops at 0.5 grams / dollop (1% (Z)-7-tetradecen-2-one + 2% cypermethrin).

For all SPLAT treatments, the formulation was applied to small strips of paper and placed on the ground at the base of blueberry plants, to ensure maximum impact on oriental beetle populations—sex pheromone-mediated mate finding and copulation is known to occur at or near the soil surface shortly after adult emergence, close to the emergence site—and to eliminate any chance of phytotoxicity to the blueberry crop. Treatments were assigned to plots in a randomized complete block design, with three replicate plots per treatment. Each plot was 1 hectare in size, with 50 m spacing between plots. All fields received the grower's standard fungicide and insecticide programs, but no applications of imidacloprid were made during the study. Efficacy of the various treatments for OrB population suppression was evaluated on the following criteria:

- Trap shutdown. Three traps (Trécé, Adair, OK) baited with 300 mg of (Z)-7-tetradecen-2-one were placed in each plot and monitored regularly (minimum of once per week) to determine the number of male beetles captured in treatment and control plots. These traps were installed 2 weeks prior to SPLAT application, to compare data on oriental beetle activity before and after semiochemical treatment. Lures were replaced every 3 weeks. Traps were checked weekly from June-August.
- Female-mimic lures. Attraction of male oriental beetle was assessed in each plot using five screened cages, each containing a female-mimic lure. Cages were placed in plots for three nights, and then retrieved to determine male presence. Cages were placed in plots twice during the period of activity of oriental beetle in 2014 (June 27 and July 15), and three times in 2015 (June 23 and 29, and July 10).
- Grub density. Five pots containing a 2 to 3-year-old blueberry plant were placed near the center of each experimental plot. New females were placed weekly for a total of 3 weeks (June 26 and 30, and July 4 and 10 in 2014; June 23 and 29, and July 10 in 2015). Virgin females were tethered to the plant using a fishing line carefully tied to the elytra. Pots with tethered virgin females were placed in the field at the end of June, and the number of grubs in each pot was later determined in by destructive sampling.

In 2014, trap shutdown results indicate that effective mating disruption and A&K of the oriental beetle using SPLAT OrB can be achieved and sustained for 6 to 8 weeks in blueberry fields, and suggests that 125 g of SPLAT OrB per hectare (1.25 g AI/ha) is effective when applied as 0.5 g point sources in blueberry fields. As in the 2014 trial, the results of the 2015 study show significant reductions in oriental beetle trap captures in all SPLAT OrB treated plots, for both A&K and MD, at both application rates. Taken together, the results of this two-year study suggests that the smaller dollop sizes of 0.5 and 0.25 g for SPLAT OrB are still sufficient to achieve effective control of oriental beetle through mating disruption or A&K. In addition, these data indicate that with continued optimization, further reductions in the amount of AI required per hectare could be possible, especially with A&K formulations.

In 2014, beetle captures in traps baited with female-mimic lures were higher in control plots than in SPLAT-treated plots, across all replicates and collection dates, with all formulations and

application rates. The plots treated with SPLAT formulations resulted in comparatively low oriental beetle trap captures, for both the MD treatments and the A&K treatments. As in 2014, applications of SPLAT OrB and SPLAT OrB A&K achieved significant reductions in captures of male oriental beetles in traps baited with 0.3  $\mu\text{g}$  pheromone lures. SPLAT OrB A&K seems to have achieved a slightly higher degree of control than SPLAT OrB for mating disruption, for both dollop sizes, 0.5 g and 0.25 g.

Counts of oriental beetle grubs found in tethered female plots throughout 2014 remained very low, near zero, for all treatments and controls, for all replicates. As a result, no meaningful conclusion can be drawn from these data regarding the impact of SPLAT OrB MD and SPLAT OrB A&K on populations of oriental beetles in the treated blueberry fields. The number of oriental beetle grubs found in virgin female-baited pots was slightly higher in 2015, but was still relatively low. Applications of both dollop sizes of SPLAT OrB A&K and the larger dollop size of SPLAT OrB MD resulted in lower grub counts than were found in control plots. There was no significant difference between grub count in SPLAT OrB MD applied as 0.25 g-dollops and untreated control plots.

#### Experiment 5:

A field experiment was conducted in 2016 to test the efficacy of SPLAT SWD A&K on suppressing SWD fruit infestation in a blueberry farm located in New Lisbon, Pemberton Township, New Jersey. The experimental field (cv. 'Elliott') was kept insecticide free during the entire season. SPLAT SWD A&K applications were done on a weekly basis on 12 July, 19 July, 26 July, and 4 August with a R&D Sprayer's MeterJet® Spray gun (Spraying Systems Co., Wheaton, IL), using a 1 L plastic bottle (Fig. 1). The sprayer was calibrated to deliver 6.5 L per acre at 40 psi, using a single D3 orifice, yielding 5.37 ml per bush (this volume per bush was applied into four shots of 1.34 mL per shot; all the shots were spread evenly around the bush). The field was divided into 8 plots. Four plots were treated with SPLAT SWD A&K and the other four plots were un-treated controls. Every plot consisted of 18 rows of 21 bushes per row for a total of 378 bushes per plot. In the SPLAT-treated plots, we treated one of every 4 bushes within rows (6 bushes per row, total of bushes treated per block = 108). Fruit samples were collected during each of the four weeks at the time of application on 12 July (pre-treatment), 19 July, 26 July and 4 August. For each plot, we collected six fruit samples of  $\frac{1}{4}$  pint each (~250 ml volume) for a total of 24 fruit samples on each sampling date. Fruit samples were taken every other bush in the center of each plot, from the two central rows and 4 bushes from the plot's edge. The samples were weighed and placed in 0.5 L deli containers (~1000 ml), then incubated on a light bench in the laboratory under a 14L:10D photoperiod and at 25-28°C for 10 days prior to evaluation. Larval infestation data were collected using a salt water extraction method consisting of submerging the berries in warm salt water (~1000 ml NaCl: 5 gal H<sub>2</sub>O), which causes the larvae to leave the fruit. SWD larvae and pupae caught by a 30 mesh sieve were counted and the number of larvae per pint was calculated.

There were no differences in the number of SWD larvae per berry between plots treated with SPLAT SWD A&K and control plots prior to the SPLAT treatment (12 July) ( $H=1.56$ ,  $DF=1$ ,  $P=0.21$ ). However, we found significant differences between treatments in all of the three weeks after the SPLAT treatment. Fewer SWD larvae were found in berries collected from SPLAT SWD A&K treated bushes as compared with the control bushes on 19 July ( $H=12.40$ ,  $DF=1$ ,  $P<0.001$ ),

26 July ( $H=24.74$ ,  $DF=1$ ,  $P<0.001$ ) and on 4 August ( $H=60.87$ ,  $DF=1$ ,  $P<0.001$ ). These results indicate that SPLAT SWD A&K was effective at suppressing SWD fruit infestation under field conditions.

**Activity; Develop and execute an effective extension and outreach plan.**

Information on the biology, monitoring, and management of oriental beetle, plum curculio, and spotted wing drosophila was presented at the RCE Blueberry twilight meetings on April and May 2015 and 2016. Approximately 50 growers attend each of these meetings. Results from this project were presented at the following grower meetings: Agricultural Convention and Trade Show. Atlantic City, New Jersey (about 50 blueberry growers attended this session); Rodriguez-Saona, C. and R. Holdcraft. 2015. Evaluation of a novel attract-and-kill technology for control of oriental beetle. Atlantic Coast Agricultural Convention and Trade Show. Atlantic City, New Jersey (about 50 blueberry growers attended this session); Rodriguez-Saona, C. 2015. Progress towards managing spotted wing drosophila on blueberries. Mid-Atlantic Fruit & Vegetable Convention. Hershey, PA (about 70 small fruit growers attended this session). These meetings were attended by regional growers, extension specialists, IPM and county agents, regulatory agency personnel, and industry representatives. Information on plum curculio, oriental beetle and spotted wing drosophila biology, monitoring, and management were also provided in yearly newsletter articles (Blueberry Bulletin, RCE).

Results from this project were presented at the following scientific meetings and invited presentations: Holdcraft, R. and C. Rodriguez-Saona. 2016. Evaluating the behavior of oriental beetle (*Anomala orientalis*) in proximity to pheromone point sources used in mating disruption and attract-and-kill. XXV International Congress of Entomology. Orlando, Florida, USA; Rodriguez-Saona, C., D. Polk, A. Raudenbush, R. Holdcraft, and A. Mafra-Neto. 2015. Challenges in blueberry pest management: Insect invasions. Symposium: Beyond Corn and Soybeans: Challenges to Integrated Pest Management in Specialty Crops. The 63rd Annual Meeting of the Entomological Society of America. Minneapolis, Minnesota; Rodriguez-Saona, C. 2015. The impact of an invasive pest on integrated pest management: The spotted wing drosophila in blueberries in the US. Faculty of Science and Technology. University of Bolzano, Italy; Holdcraft, R. and C. Rodriguez-Saona. 2015. A novel attract and kill technology for oriental beetle, *Anomala orientalis*, control in blueberries. The 63rd Annual Meeting of the Entomological Society of America. Minneapolis, Minnesota.

Grower surveys were conducted to measure increase in grower understanding and options for managing oriental beetle, plum curculio, and spotted wing drosophila at the RCE Blueberry Twilight meetings on May 24, 2016 (oriental beetle and plum curculio) and on April 26, 2016 (spotted wing drosophila). This served as our post-presentation survey.

Overall, >95% of growers (out of 31) indicated that they have a better understanding of behavior-based methods for monitoring/managing insect pests. About 90% of these growers indicated that they have a better understanding of the concept of mating disruption for controlling insect pests. And, about 75% of these growers are more inclined to use mating disruption for controlling pests.

For oriental beetle, >95% of growers (out of 31) are concerned about this pest. About 85% felt they have a better understanding of the biology of oriental beetle, and > 83% of these growers understand better all of the management options available to manage this pest.

For plum curculio, >95% of growers (out of 31) are concerned about this pest. About 90% felt they have a better understanding of the biology of oriental beetle, and 100% of these growers understand better all of the management options available to manage this pest.

For spotted wing drosophila, >90% of growers (out of 13) indicated that they monitor for this pest. About 80% of respondent indicated that they found SWD in their farm and about 60% of these growers indicated that they have increased labor costs due to this pest.

No survey was conducted for brown marmorated stink bug because this insect has not become a pest of blueberries in New Jersey.

In summary, results from these post-presentation surveys show an increase in knowledge among New Jersey blueberry growers on plum curculio, oriental beetle, and spotted wing drosophila biology, monitoring, and their management.

### **Significant Contributions**

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- We evaluated four novel attract-and-kill formulations for managing oriental beetle, plum curculio, brown marmorated stink bug, and spotted wing drosophila.
- We showed that all these formulations increased insect mortality under laboratory conditions.
- In field experiments, we demonstrated the efficacy of attract-and-kill formulations against oriental beetle and spotted wing drosophila.
- We are working with ISCA Technologies towards the commercialization of SPLAT OrB and SPLAT SWD A&K.
- Educational information on oriental beetle, plum curculio, and spotted wing drosophila biology, monitoring, and management was provided to over 200 blueberry growers mainly from New Jersey, Pennsylvania, and Maryland at various grower meetings. This information was also provided via newsletter articles.

### **GOALS AND OUTCOMES ACHIEVED**

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Four attract-and-kill formulations were evaluated for managing oriental beetle (SPLAT A&K OrB), brown marmorated stink bug (SPLAT A&K BMSB), spotted wing drosophila (SPLAT A&K SWD), and plum curculio (SPLAT A&K PC). Our studies showed that these formulations are effective under laboratory and field conditions.

Brown marmorated stink bugs have not become a pest of blueberries in New Jersey; thus, our focus was directed mainly on oriental beetle, plum curculio, and spotted wing drosophila.

We worked with ISCA Technologies on the creation of these formulations.

We conducted an extensive extension and outreach program to increase grower understanding on the use of behaviorally-based strategies such as mating disruption and attract-and-kill for managing insect pests of blueberries.

Growers increased their understanding on ways to monitor and control oriental beetle, plum curculio, and spotted wing drosophila in blueberries.

At least 200 growers attended presentations given at meetings. In a post-presentation survey, >80% of growers indicated an increase in knowledge of management strategies (i.e., behavior-based control methods) for oriental beetle, plum curculio, and spotted wing drosophila. Although the number of respondents of the surveys was low (44), we are confident that our survey data represent a meaningful sample of all growers attending these meetings. If this is true, we can conclude that at least 160 growers (out of 200) who attended the meetings where results from this project were presented increased their understanding on options for managing oriental beetle, plum curculio, and spotted wing drosophila in blueberries.

This project improved the ability of New Jersey blueberry growers to identify oriental beetle, plum curculio, and spotted wing drosophila in their farm. Cooperative extension agents are now able to recommend the best monitoring and management methods currently available.

Growers and Rutgers Cooperative Extension agents were informed about the potential of using behaviorally-based strategies as alternatives to chemical control.

In the long-term, we expect some of these behaviorally-based strategies to be registered in blueberries. These strategies will reduce pesticide use and minimize non-target pest and environmental impacts. Infestation of fruit and plants in blueberry farms due to these pests is expected to decrease, resulting in less rejected product and high value to growers.

## **BENEFICIARIES**

The beneficiaries of this project include:

Over 200 fruit growers including not just blueberries but also raspberry growers from New Jersey and other US states. In New Jersey, at least 80 blueberry growers benefitted from this project.

Packers, processors, marketers, and export agencies will be able to access, sell, and export better quality fruit with reduced insecticide residues.

Fruit consumers will be able to buy better quality of fruit.

Extension personnel including at least 3-4 fruit IPM and county agents in New Jersey were provided with information to help growers in making informed management decisions.

## **LESSONS LEARNED**

1. We determined optimal SPLAT attract-and-kill formulations for oriental beetle (SPLAT A&K OrB), brown marmorated stink bug (SPLAT A&K BMSB), spotted wing drosophila (SPLAT A&K SWD), and plum curculio (SPLAT A&K PC). We worked with ISCA

Technologies on the development of these formulations.

2. We tested optimal SPLAT attract-and-kill formulations for oriental beetle, brown marmorated sting bug, spotted wing drosophila, and plum curculio under laboratory conditions. All attract-and-kill formulations showed efficacy in controlling these pests under laboratory conditions.
3. We evaluated the SPLAT attract-and-kill formulations for oriental beetle and spotted wing drosophila under field conditions. SPLAT A&K OrB was as effective as a SPLAT OrB formulation for mating disruption. SPLAT A&K SWD suppressed fruit infestation by spotted wing drosophila in blueberry fields.
4. We developed and executed an effective extension and outreach plan. Information on the biology, monitoring, and management of oriental beetle, plum curculio, and spotted wing drosophila was provided at yearly RCE Twilight Meetings and in newsletter articles. Results from this project were presented at several grower and scientific meetings.

**PROJECT COORDINATOR**

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New Jersey Blueberry Growers Association

SCBG Agreement # 12-25-B-1685

Final Report

January 30, 2015

*(Revised 4-26-2016)*

**Project Title:**

**“Advertising Jersey Fresh Blueberries Project – 2014”**

**Project Summary:**

New Jersey remains in the nation’s top 5 blueberry production. In 2013, NJ growers produced over 65 million pounds. Each year, acreage devoted to cultivated blueberries continues to increase, both domestically and internationally. This increase in competition has made it necessary for the New Jersey Blueberry Growers Association to find ways to maintain existing market share, as well as increase new markets. We believe that given our resources, a radio campaign best maximized our assets most efficiently, and enabled us in reaching consumers throughout our marketing area.

The New Jersey Blueberry Growers Association is a non-profit organization dedicated to the promotion, education and research of New Jersey blueberries. We represent all New Jersey blueberry growers.

The purpose of this grant was to maximize advertising opportunities on behalf of New Jersey produced blueberries during the 2014 growing season. Consumer interest in blueberries has grown considerably over the past several years. This increase in consumption has been attributed largely due to the health benefits associated with eating blueberries and products containing blueberries. The industry, both domestically and internationally has responded by increasing acreage to the point where seasonal oversupplies have become a problem.

National Industry trade groups have responded by conducting programs of promotion and research designed to increase consumer consumption through new blueberry products. New Jersey remains a “fresh market” producer whereby most of its blueberries are sold fresh as opposed to being processed into a product.

New Jersey’s fresh market season typically lasts for about six to eight weeks. The New Jersey Blueberry Growers Association used their grant in a consumer-oriented radio campaign designed to promote New Jersey produced blueberries. The campaign aired during peak production weeks, and broadcasted in markets throughout the Northeastern Seaboard. The purpose of these ads was to differentiate New Jersey blueberries to the consumer, and promote them as a nutritious alternative in their diets.

None of the projects that were executed as part of the “Advertising Jersey Fresh Blueberries Project” in the 2014 SCBG application were submitted for funding to any other Federal or State grant program.

**Project Approach:**

The focus of the campaign was directed at strong female audiences. The demographic was women 35 years old and older. Studies show these are the prime demographic category that does most of the shopping and meal preparation.

Each market station was chosen based on demographic strength. The media was purchased via a review of Arbitron/Nielson rating data with a focus on stations with strong female audiences. In particular, the focus was narrowed to women 35 plus who do the family shopping. Each station selected was very strong in that demographic. Stations also had a long history of success overall in that demographic and in the individual markets. Markets were also chosen because of physical coverage of the northeast regions with substantial populations.

Based on data that was presented by the media consultant and the \$40,000 budget, the following reflects the number of targeted audience the radio campaign reached.

New Jersey Blueberry  
Demographic Data and Cost Estimates

<u>Market</u>	<u>Population</u>	<u>Target Gross Women 35 Plus</u>	<u>Net Reach</u>	<u>Budget</u>
New York Mid-Somerset Morristown Mon-Ocean Nassau-Suffolk	15,673,755	950,274	764,795	\$15,000.00
Boston Worcester Cape Cod Manchester Portsmouth	3,977,000	450,200	323,752	\$ 5,000.00
Philadelphia Camden Wilmington	4,357,000	305,700	231,139	\$20,000.00
<b><u>Stations Utilized</u></b>				
<u>New York</u>		<u>Boston</u>		<u>Philadelphia</u>
WOR		WBZ		KYW
WINS		WMJX		WBEB
Metro Traffic		Metro Traffic		Metro Traffic

Measurable outcome was based on listeners reached for the media outlets chosen. These reports are based on statistical science similar to those used for the Neilson rating for television

audiences. According to the Arbitron ratings the information based on existing audiences for each station in the log sheets did not change.

### **Goals and Outcomes Achieved**

The New Jersey Blueberry Growers Association was the prime oversight entity of this project. The Association worked with the New Jersey Blueberry Industry Advisory Council and contracted with a professional advertising agency, and closely supervised their activities as it pertained to creation of a commercial and broadcast schedule.

Tim Wetherbee, a member of the New Jersey Blueberry Growers Association and the Chairman of the NJ Blueberry Industry Advisory Council and Al Murray, Council Liaison to the NJ Blueberry Industry Advisory Council served as the primary oversight to this project. The following timeline was followed:

March/April 2014. Tim Wetherbee coordinated media buy subject to the approval of the New Jersey Blueberry Growers Association.

July, 2014 - Advertising activities commenced as detailed in the media plan that appears above.

January, 2015 – A meeting of the NJ Blueberry Growers Association and the New Jersey Blueberry Industry Advisory Council was convened to discuss the project results. The members who attended the meeting represented 85% of New Jersey’s blueberry industry. Based on their findings, the following summarizes the goals and outcomes:

- New Jersey’s crop was lighter than normal due to the harsh winter of 2013-2014. The expected crop of 65 million pounds turned out to be 55 million pounds.
- Despite weather conditions, the quality remained excellent, and the entire crop was sold. Consequently, it is difficult to assess a sales increase percentage since demand was met and nothing remained in inventory. The combined assessment of the organization through a review of their sales data indicated a cumulative increase of approximately 4% in consumer demand. This proprietary data was based on industry (i.e. chain store, wholesale, brokers, food service) calls seeking volumes of blueberries from New Jersey blueberry farmers, cooperatives and sales organizations.
- Typically, data from the USDA NASS would be used to determine if returns were higher to the individual farmer via the average price per pound indicator, however, with a lighter crop, the New Jersey Blueberry Growers Association members do not think this benchmark would provide an accurate measurement due to the lighter than normal 2014 crop.
- The media outlets selected proved to be appropriate. Combined proprietary sales data offered by the members showed that the 2014 New Jersey Blueberry market was segmented into the following market shares. New Jersey/New York/New England accounts for 60% of New Jersey’s market. The other 25% reflects the Canadian market, and the rest represents other auxiliary markets spread throughout the United States. By

targeting 60% of the market with the advertising budget, the New Jersey Blueberry industry was able to concentrate their efforts in the most populous market and during a time in the season when other blueberry producing states were competing for this same market share. Neither the NJ Blueberry Growers Association, nor their media consultant was aware of any other states advertising in these markets during New Jersey's peak season.

### **Beneficiaries**

The beneficiaries of this project were New Jersey's 148 family farms that produce blueberries. Well-timed, and narrowly targeted, advertising was intended to increase the demand for New Jersey blueberries helped to efficiently move that perishable product through a crowded marketplace.

### **Lessons Learned**

New Jersey was the first state to develop the cultivated blueberry market, and has a long-established reputation and market presence. The grant was used exclusively for advertising in selected, prime markets, so there were no unanticipated events associated with working with a media buyer and approving selected radio stations.

Winter and spring weather conditions experienced throughout the blueberry producing states determined what the production volume would eventually result. A smaller crop did not create marketing pressures that larger crops typically cause. The resulting advertising was important in helping maintain existing, traditional markets for New Jersey blueberries.

SCBG Agreement # 12-25-B-1685  
Final Performance Report  
December 23, 2016

**New Jersey Department of Agriculture**

**Project Title:**

**“Another Great Season – A project designed to maximize the effectiveness of the Jersey Fresh product branding and advertising programs.”**

**PROJECT TITLE**

**“Another Great Season – A project designed to maximize the effectiveness of the Jersey Fresh product branding and advertising program.”**

**PROJECT SUMMARY**

- 1) This project supported New Jersey’s \$ 250 million fruit and vegetable industry promoting the Jersey Fresh brand on television, radio, at the point of sale and on the internet. New Jersey continues to lose specialty crop acreage. Through the Jersey Fresh product promotion and branding program this project provided support for all of the fruit and vegetable growers throughout the Garden State. The Jersey Fresh program benefits from high in-state brand recognition by consumers. According to consumer research Jersey Fresh fruits and vegetables rate higher in quality and freshness than out of state produce.
- 2) New Jersey continues to lose specialty crop acreage. It is more important than ever to assist specialty crop growers as the current age of a farmer in New Jersey in 2012 was 59 years old. With the current generation of specialty crop producers retiring soon the next generation must make a decision whether or not to stay in farming. This program is important due to its positive impact on creating and/or maintaining demand for all specialty crops in the Garden State.
- 3) Advertising and branding is not a “one and done” process. Advertising is an ongoing process that requires continual doing in order to keep it top of mind and not have your message crowded out by other messages. This project has built on past SCBG’s which have also supported consumer awareness and recognition of the Jersey Fresh brand. All of these efforts have followed the same market development and product promotion process which has created and maintained an impressive total brand awareness of 79% which is greater than Ready Pac, Foxy and Bonita brands. All past and current SCBG activities have featured the same Jersey Fresh logo which has been in use since 1984. Creating and maintaining high consumer brand awareness is an indication of a successful marketing campaign. Continuing high consumer demand for a brand is an indication of a quality product. Furthermore support from retailers for shelf space in the produce aisle requires a shared benefit in promoting Jersey Fresh specialty crops. The NJDA has maintained the same Jersey Fresh brand and logo for the past 32 years so that every effort builds upon all of the previous efforts. Due to advertising and product promotion, retailer support and a well-recognized brand the Jersey Fresh program continues to be the most efficient methodology of supporting specialty crops in the State of New Jersey.

**PROJECT APPROACH**

According to the law items promoted by the Jersey Fresh program must be fruits and vegetables.

**Significant Contributions:**

**NJDA Jersey Fresh Project Staff:**

Al Murray, Assistant Secretary of Agriculture, the administrator of the Jersey Fresh program provides oversight for project development and approves the budget, projects and creative themes.

Joe Atchison, Market Development Representative, is providing Jersey Fresh product development and procurement services.

William Walker, Agricultural Marketing Specialist, provides professional marketing support, supervises the Jersey Fresh interns and assists in point of purchase advertising materials distribution.

Logan Brown, Economic Development Representative, serves as the projects reporting and compliance officer.

**Princeton Partners, Inc. is responsible for activities that relate to media development and placement and other advertising services**

Jeff Cheseman

President

Princeton Forrestal Village

205 Rockingham Row

Princeton, NJ 08540

Tel; 609 452-8500

**Activities Performed:**

**Print Advertising – Joe Atchison**

Produce News – 6 Ads

Produce Business – 4 Ads

The Packer – 1 Ad

Best Met Publishing (Food Trade News) 1 Ad

Edible Jersey – 3 Ads

**Television Advertising- 2014 – Joe Atchison**

About 32 Jersey Fresh television ads were shown on broadcast networks covering the Northern New Jersey and New York City area.

**Television Advertising – 2015- Joe Atchison**

The balance of the television advertising (approximately 185 ads) was placed from the June to October 2015 Specialty Crop growing season.

**Jersey Fresh Point of Purchase (POP) Advertising Materials were purchased:**

Jersey Fresh Price Cards - Small

Jersey Fresh Price Cards Large

Jersey Fresh Stickers, small and large

Jersey Fresh Truck Decals  
Jersey Fresh Pennants  
Jersey Fresh Aprons  
Jersey Fresh Posters  
Jersey Fresh Store Hangers  
Jersey Fresh Hats  
Jersey Fresh Banners  
Jersey Fresh Bin Wrap

Jersey Fresh Intern Program – Bill Walker

With USDA support the NJDA was able to amend this grant to include a 2015 Jersey Fresh Marketing Intern program. The two interns made drop deliveries and visited the headquarters of four major produce retailers and made single store visits to more 150 retail supermarket stores. The purpose of these visits to promote and personally deliver Jersey Fresh point of sale advertising materials.

Account Management Fees

Account management fees were incurred by the advertising agency contracted to conduct Jersey Fresh advertising.

Consumer Awareness Survey – Joe Atchison

The Consumer Awareness Tracking Study was conducted in the fall of 2015 to gauge the Expected Measureable Outcomes as defined in the original project.

**Goals and Outcomes Achieved**

According to the consumer survey conducted in November 2015 a total of 837 qualified consumers were surveyed in New Jersey, Eastern Pennsylvania and in Staten Island, NY. Jersey Fresh continues to hold a strong brand presence among consumers. The association of tomatoes, sweet corn and blueberries with the Jersey Fresh brand is still strong.

According to the 2015 survey; the target for “Consumer inclination to purchase fruits and vegetables if they are advertised as Jersey Fresh.”

Benchmark; 66%

Target; 68%

Performance 64%

Awareness of the Jersey Fresh Program

Benchmark; 78%

Target; 80%

Performance; 76%

"Compared to out of state products is the following New Jersey product better?"

	Tomatoes	Corn	Blueberries
Benchmark;	76%	71%	62%
Target;	78%	75%	65%
Performance;	74%	69%	61%

Weather may have created the drop in the quality of fruits and vegetables. Also the budget for Jersey Fresh continues to diminish. Another consumer survey will be conducted in late 2016.

### **BENEFICIARIES**

This project benefited about \$500 million of fruits and vegetables, nursery and greenhouse horticultural products in New Jersey.

The impact of Jersey Fresh advertising and promotional efforts has been documented as \$31.54\* in new revenues for every dollar spent on the Jersey Fresh program. Therefore the potential impact of this project is expected to be about \$11.4 million. (\*"Returns to the Jersey Fresh Promotional Program, the Impacts of Promotional expenditures on Farm Cash Receipts in New Jersey" Ramu Godvindasmy, Rutgers, The State University, March 2004.)

### **LESSONS LEARNED**

- 1) The Jersey Fresh advertising and promotional campaigns continue to be both effective and popular with growers and the consuming public.
- 2) Although recently declining funding is starting to erode consumer awareness and preferences for the brand the core brand remains extremely strong.
- 3) The Jersey Fresh brand identity continues to be strong both with growers and consumers. The years of investment in the program, combined with more than a century NJDA staff time, has made an effective combination to create and sustain this powerful program.
- 4) Future Jersey Fresh projects will benefit from some of the results of this project's consumer awareness study. One interesting and valuable lesson in the consumer survey is the source of consumer's news and current events. The consumers who participated indicated that they regularly use television (40%) and the internet (38%) for news and current events. The effectiveness and relative cost advantages of social media advertising (over television or other traditional media) will mostly likely inform future budgets for the Jersey Fresh program.

### **ADDITIONAL INFORMATION**

Can be provided upon request

### **CONTACT PERSON**

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New Jersey Peach Promotion Council  
USDA AMS Agreement Number (12-25-B-1685)  
Final Performance Report  
Date of the Report – December 14, 2016

### **PROJECT TITLE "Promote and Handle Jersey Fresh Peaches"**

## **PROJECT SUMMARY**

- ⊖ This project seeks to build upon past projects. New in this year's project proposal is the expansion and development of new Twitter and Facebook applications. The production of new U-tube videos in areas like health education and consumer utilization is also new as is the placement of new forms of advertising in new sources. Development of press releases will be enhanced. The development and expansion of the peach recipe contest is new and the NJPPC is also seeking to conduct some special promotions with the "running" community focused on peaches as a healthy food for consumers. The NJPPC is seeking increased in-store promotions focusing on later in the season when peaches are squeezed off the shelf. The NJPPC hopes to print new point of sale materials like new health cards to promote the health aspects of peaches. The Council will also have research focused on new types of peaches with better characteristics including firmness and handling attributes in conjunction with the Rutgers New Jersey Agricultural Experiment Station. Many of these peaches in the development stages and there is a need to continue the development new way of measuring impact of all of our work, all new.

The peach industry in New Jersey is faced with an increasingly competitive market. New Jersey is ranked 4th in peach production in the United States. California and South Carolina are ranked 1<sup>st</sup> and 2<sup>nd</sup> respectively. Occasionally New Jersey will flip flop with Georgia into 3<sup>rd</sup> position if there is a bad freeze in the southeastern US. Peaches from these three states, as well as other states, flood potential New Jersey peach markets at the same time as New Jersey peaches are available. In addition, the New Jersey peach industry faces competition from many other produce commodities on the limited shelf space in the produce section of retail establishments and at community and direct farmers markets. Additionally, the poor quality of southern hemisphere peaches hurts the image of quality needed to increase peach consumption. It also reduces the anticipation of a new local peach season. Most peaches are marketed by large food retailers who have increasingly stringent requirements on food safety, packaging and general category management. This makes it difficult for small to medium sized growers to sell through these markets

It is crucial to the viability of the New Jersey peach industry that we reach consumers, enticing them to consume more peaches, and, likewise, it is of importance that we induce retailers to focus on carrying peaches grown and harvested in New Jersey, fostering an environment in which New Jersey's peach industry will be sustainable and profitable.

This project is focused on creating and maintaining awareness about the New Jersey peach industry and the quality attributes of New Jersey peaches, leading to strong consumer recognition and strong buyer support, which will help keep the New Jersey peach industry viable. The New Jersey peach industry cannot assume that by being in the backyard of millions of potential consumers that it will get the support of consumers and buyers. The industry must proactively educate and promote the benefits of the industry to key target audiences. The project also has a focus of utilizing new promotional tools, e.g. social media, as well as exploring opportunities for new market channels.

Building on past accomplishments;

2013: 1) The Council has completed the consumer and buyers video; 2) The Council has completed at least nine new press releases; 3) The Council has redesigned and updated our Facebook page; 4) The Council has expanded our onsite special peach promotions at many market sites; 5) The Council has started the Perfect Peach Pie Recipe Competition.

2012, 1) The Council totally revised NJ Peach Website as jerseypeaches.com; 2) Filmed extensive raw footage of peach production and marketing for U-tube videos; 3) QR codes were developed and incorporated into the ads to allow Smartphone users to go directly to the Council's website; 4) New radio and internet ads were developed for use in the total consumer advertising program.

2011, 1) The Council implemented a system of public appearances by New Jersey Peach Queen at peach marketing sites and public relations events; 2) Developed and placed media ads in retail and consumer publications focusing on "Not Just Any Peach ... a Jersey Fresh Peach, Garden State grown... nutritious...delicious... the best" in buying peaches. 3) The Council wrote and published a peach recipe booklet for sale and distribution at peach promotional events 4) Started research on developing details on the harvest, handling and storage of the new and novel peach variety Gloria which has unusual peach texture characteristics; 5) Developed and directed a major competition for a "Best Display" and/or an award for best supporter of Jersey Peaches in the supermarket. A special ceremony was held with the NJ Secretary of Agriculture to present the Grand Champion award to Pennington markets.

2010, 1) The Council conducted successful visits to promote Jersey peaches to produce directors of buyers of supermarkets and produce distributors, reminding them of start of Jersey peach season. Retail, distributor visits included ShopRite, Foodtown, A&P, Whole Foods, Acme, Wegmans, Pennington; 2) Created Peach trifold brochure on NJ peach industry and the benefits of buying NJ peaches; 3) Created and printed peach banner to use at market promotion events and other public relations events; 4) Developed an events calendar to use for listing all promotional events on web page and in press releases. Regularly updated events during the marketing season.

2009 1) The Council published 1400 copies of newly revised New Jersey Peach Buyers and Merchandising Guide; 2) Distributed point of sale materials designed by NJDA and the Peach Promotion Council; 3) Developed and helped stage media event with the NJ restaurant association in the northern more urban part of the state at the height of peach season; 4) Worked with the NJ Department of Agricultural to have August as Peach Month in New Jersey; 5) Organized and staged a peach tasting PR event will be held with the Rutgers NJAES faculty and staff at the Rutgers NJAES Agricultural Research and Extension Center in Upper Deerfield Township, Bridgeton, NJ.

In 2014 through the NJPPC's will focus on:

Expanding our efforts on promoting Jersey peaches via the "Not Just Any Peach a Jersey Fresh Peach, Garden State grown... nutritious...delicious... the best" theme.

- Three primary target audiences: media, consumers, and buyers with secondary audiences including chefs, produce clerks, merchandisers, community farm market organizations, and others.
- Utilize print and audio visual materials, press releases, media and peach social events, website, other internet media (Face Book and others), advertising (web, print), in-store activities; audio visual aids; direct contact with buyers and employment of merchandising groups for large retailers.
- Research on improving the genetic handling characteristics and implementing ripening handling technology to improve the quality of New Jersey Peaches
- Focused research on measuring the effectiveness and impact of our programs.

## **A: PROJECT APPROACH**

**1) Consumer Advertising** -Approved and budgeted \$4,000. All funds were expended in 2014 the first year of this grant. Our marketing consultant coordinated the design and placement of 16 radio and internet advertisements covering New Jersey and metropolitan New York and Philadelphia directly to consumers during July and August of 2014 the height of NJ Peach Season. These ads in consumer publications focused on “Not Just Any Peach ... a Jersey Fresh Peach, Garden State grown... nutritious...delicious... the best” and the availability of Jersey peaches. The following is a detailed chart of where the ads were placed and the audience or impact of people reached

<b>Total Audience Reach</b>	<b>22,020,664</b> (16 Print Outlets; 2 radio stations)
<b>Total Cost:</b>	
Philadelphia Inquirer	482,457 circulation
Edible Jersey	40,000 copies 250+ distribution sites; 140,000 readers
News Transcript	38,861
Independent	31,121
East Brunswick Sentinel	31,047
Princeton Packet Time Off	70,000
Wayne Today	19,548
Sussex Aim	10,087
Suburban Trends	9,333
Millennium Radio-11 stations	1.4-million weekly
Greater Media Radio-3 stations	700,000 weekly

It is difficult to full measure the impact of this advertising on New Jersey peach consumption. Our budget is not large enough to have any tie in with the supermarket industry that is serving the 7 plus million people in New Jersey and at least twice that amount in the surrounding metropolitan areas of Philadelphia and New York City where our consumer advertising is focused. We have always felt our competition from the southeastern states, California, and other produce commodity supplier’s forces us to advertise our product to consumers. We also have many of our own retailer members both in community farmers markets, with their own farm markets, CSA’s U-Pick and other in-season agritainment activities that are impacted by our

advertising in their marketing areas of mostly north and central New Jersey and the market in New York.

2) Trade advertising - Approved and budgeted \$5,000. All funds were expended in 2014 the first year of this grant. Our marketing consultant coordinated the design and placement of 2 trade ads in the major publications reaching wholesale peach buyers and merchandisers, Produce Business and Produce News;

Produce News (Special NJ peach issue)	12,898 circulation
Produce Business (Summer issue)	19,000 circulation

Our produce buyer members tell us this exposure is very important for two reasons. 1) We maintain our viability as an option for peach purchases from retailers; 2) We get lots of free editorial exposure to complement the advertising we buy. Numerous members do individual stories in Produce News in addition to a feature story on the NJPPC and our activities for the NJ Peach Industry. A section of the paper is actually devoted to the New Jersey Peach Industry in early July to kick off our season. The Produce Business magazine does a comprehensive feature article on our members and the NJ peach industry and why the council does for the industry in their “high summer” issue in July to kick off the NJ peach season.

4) Social Media: Approved and budgeted \$5,000. All funding was spent over the 3 years of the grant. We worked hard to get more activity on our Facebook page have more activity by making more posts and contact more of our peach marketer members to link to our page. The total reach in 2014 was 15,012 during the same time period as in 2013 from early April until November 1. This represents an increase of 42 % over 2013. August was the heaviest month in 2014 but that may have been because more posts were made in this month in comparison to 2013 when July was the busiest month. More posts were made because the market got sluggish and we tried to put more information into promoting peaches. Of course the fruit was later. We averaged about 5.24 new likes per week for a total average of 346 likes per week for the season. We did not have like information for 2013. We also had 1245 people that were engaged in using the Facebook page in 2014 for the period from April through November. This averaged out to about 46 per week. We did not have this data for 2013 to compare.

A **Twitter** account was opened and used but not heavily promoted so usage was less than 500 2014.

We did not use money from this grant to change monitor or manage either our Facebook Page or our Twitter account in 2015 and 2016. We did not buy any advertising space or purchase time to boast either site in any year of the grant.

.Our **Website [www.jerseypeaches.com](http://www.jerseypeaches.com)** had 232,737 total hits in 2014. We investigated and got quotes on redesigning our website in 2014, but costs were prohibitive so our consultants focused on updating the technical data and adding new information on peach marketing. We had difficulty getting our contracted webmaster to make these timely changes and it wasn’t until September after the peach season ended that all the new information was included. This probably affected the fewer users and hits we reached down from the 410,387 total hits we had in 2013. This hit data was not available for 2015. The following is a breakdown in usage during that period.

**JERSEYPEACHES.COM WEBSITE TRAFFIC: 2014 compared to 2013**

<u>2014</u> <u>by Month</u>	Page	Visits	Hits	<u>2013</u> <u>by Month</u>	Page	Visits	Hits
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	Views				V Views		
July, 14	10,485	9,352	100,126		July, 13	10,492	10,449
August, 14	9,694	9,150	83,328		August, 13	8,839	9,870
September, 14	8,021	7,908	37,522		September, 13	7,925	7,607
October, 14	3,173	3,451	11,761		October, 13	6,423	6,035
Totals	31,373	29,861	232,737		Totals	33,679	33,961

**JERSEYPEACHES.COM: WHO VIEWED WHAT PAGES in 2014**

Rank	Page	Page Views	Visits
1	/Home page	13,337	12,688
2	/shippers_nj_peach_promotion_council.asp	4,376	2,527
3	/industry_facts_nj_peach_promotion_council.html	1,215	1,194
4	/consumers_nj_peach_promotion_council.html	997	968
5	/growers_nj_peach_promotion_council.html	743	706
6	/press_releases_nj_peach_promotion_council.html	631	619
7	/recipes_nj_peach_promotion_council.asp	600	483
8	/media_nj_peach_promotion_council.html	554	541
9	/members_membership_nj_peach_promotion_council.	502	487
10	/buyers_nj_peach_promotion_council.html	498	483
Other Items (78)		7,778	9,165
Total(s)		31,231	29,861

In the summer of 2015 we contracted a new host site and a website developer who redesigned our site, updated much of the site and now maintains it. Things that were improved were the size of the site with the ability to easily visit and read from I-phones and other smart phones and tablets. The website is also has revolving picture show on the home page. The site was up and fully operation in the early spring of 2016. The need for this was to adapt to modern technology and a decline in the number of hits and visits in 2015 implying that our site was getting boring to visit. Additionally we had our general 3 peach marketing videos completed and placed on the home page of our web site; We completed our contract with VIP Videographers to review and edit many hours of video for educating the general consumer, educating the peach buyers and merchandisers and educating children. These videos are A Produce Manager’s Guide to Handling and Displaying Jersey-Fresh Peaches...; Jersey Peaches...Peach Perfect Peaches!; John Boy Teaches Children about Peaches. These are all completed and also available for distribution; 500 CDs were produced and 400 have been distributed.

4) **Retail Promotions** - Approved and budgeted \$7500. All funding was spent over three years of the grant. Our consultants made very few preseason and in-season visits at the buying offices with produce directors and vice presidents of produce because our directors felt this was not cost effective. We did attend two meetings of buyers and vice presidents of produce at the Eastern Produce Council (EPC) Dinner sponsored by the NJ Department of Agriculture to kick off the

peach season and the New York Produce Convention sponsored by the EPC at the end of the season. Information was distributed on buying New Jersey peaches including our DVD's produced on the peach industry and our peach buyers guide. Individual discussions in 2015 and 2016 were conducted with approximately 45 potential buyers at other promotions and at the produce meetings.

Our marketing and technical consultants also visited twenty two major food retail stores during the season to monitor the impact of our promotional efforts and to document whether buyers of NJ peaches had quality displays and were using Point of Sale material in 2014 and 2015.

Our consultants coordinated the distribution of peach information, point of sale material and in some cases the appearance of the New Jersey Peach Queen when available in 2014 and 2015. We attended 16 promotional events to handle the news media covering the events in 2014 through 2016. Many of these were called "peach parties" or festivals by the organization staging the event. The events were held at farm markets, on the farm, community farms markets, and restaurants, and at individual fairs and festivals. There were 26 such events in 2014 with the purpose of marketing and promoting Jersey-grown peaches. Venues are very creative, holding peach events, with tastings, peach pies and pastries, children's stories and games, drawings for baskets of peaches, peach face-painting, peach-pie contests, special pricing, and more, for examples in 2014:

- Hammonton Farmers Market brings back past Peach Queens from the 40s-60s to meet the current Peach Queen. This event was covered by NBC TV, Philadelphia.
- Chatham Borough crowns 2 peach queens—a child & a high-school student, Terhune Orchards offered a workshop on canning and freezing peaches.
- Alstede Farms Peach Festival featured pick-your-own peaches, homemade peach ice cream, slushies, pies, and other peach desserts, and a Sunday peach breakfast.
- Collingswood Farmers Market held a peach cooking demonstration and kick-off to its 3-night restaurant promotion of peach menus.
- West Windsor Farmers Market held a "little peach chefs" cooking lesson.

The 2014 and 2015 New Jersey Peach Queens were selected at the New Jersey (state) Peach Festival and 4 H Fair in Mullica Hill, Gloucester County. They were used at various promotional events which included supermarkets and parades. At the Peach Festival, Directors of NJPPC set up a display of NJPPC and distributed peach promotional and point of sale material. Directors also provided peaches and peach products for the commercial peach pack competition and for distribution. There is also another venue for the consumer peach pie contest. The NJ Festival was not held in 2016 and the 2015 Peach Queen was hired and used at 5 promotional events in 2016

In 2015 we reached out to our established lists of past and potential buyers and new people via email, text messages and phone calls to generate more interest in selling peaches. We mailed and handled requests for point of sale material and buying information. We mailed and distributed our new videos on merchandising and buying New Jersey Peaches. Our marketing consultant visited wholesale buyers and set ups some in store promotion with stores that had dieticians to promote the health benefits of peaches. Peaches were sampled in supermarkets and a fact sheet was written and distributed on the health benefits of peaches.

The promotional peach parties were described in detail in the 2014 report for this grant budget line in this grant. In 2015 twenty nine of these retail promotions were held at farmers markets, on-farm markets and restaurants with the purpose of marketing and promoting Jersey-

grown peaches. This was an increase of 2 over the 2014 but was deemed better because the volunteers and others staging the promotion had more experience.

In 2016 our work with promotional peach parties increased to 32. Our peach queen participated in 5 of these at farmers markets, on-farm markets and restaurants. Eleven peach pie contests were held at these promotional peach parties in 2016. NJPPC awarded two grand prizes for 'Perfect Peach Pies' in north and south New Jersey at the restaurant Tortilla Press in Collingswood, NY that were judged from finalists by food feature writer at Philadelphia Inquirer. Finalists were also judged by Chef Bruce Lefebvre at the restaurant Frog & Peach in New Brunswick, NJ.

**5) Consumer Contests:** Approved and budgeted \$4,000. All funds were spent in the years 2014 and 2015. Our marketing consultant expanded Perfect Jersey Peach Pie Recipe Contest with various institutions and retailers. Selected institutions, farm markets and community markets were contacted and selected for the staging areas for entries. This year during July and August, 8 community farmers markets, one on-farm market and the New Jersey Peach Festival were to handle the 45 entries statewide. This was an increase of 20 entries over 2013. This staging of entries and judging was done at locations that generated a lot of public awareness of NJ peaches. Good publicity was generated (NBC TV Philadelphia covered the Brigantine contest). Awarding of prizes was done at two restaurants, New Brunswick's Frog and Peach for North Jersey winner; Tortilla Press for South Jersey winner. Finalists enjoyed both events and brought friends and family for dinner at each restaurant which increased the awareness of NJ peaches and generated publicity for peaches and the restaurants.

**6) Media Releases** – Approved and budgeted \$2,000. Most of the money was spent in year 2014 and 2015 of the grant. Our consultants wrote twenty media releases to print, broadcast media and social media postings covered promotional events peach activity calendar, peach pie contest, new peach varieties; on peach tree planting, new BOD members, new peach video, new growers, new peach varieties, peach buyers guides, crop status reports, availability and quality of NJ peaches, peach buyers guides (remove), environmental conditions and their effect on the peach season, etc. Pictures were taken and submitted with the releases and in 6 instances follow-up interviews were set with the technical consultant or a grower. 65 media mentions were release-generated & referenced; 24 came from personal media contact; and 6 printed our press releases in full. Jersey peaches garnered 13 segments on TV (Fox, ABC, NBC, Comcast News, and News 12). Total readership/viewership reach was conservatively 8-10-million over the season.

**7) Point of Sale (Print Materials)** – Approved and Budgeted \$4,000. The funding was spent over all three years of the grant. Very little of this money was spent in 2014. Our marketing consultant was hired to design and layout the health brochure which should have been finished in 2015. The final draft was received but was unsatisfactory and rejected. A new consultant was hired in early 2016 and designed a new health brochure which was accepted and 10,000 copies printed and distributed at retail promotions previously discussed. The balance of the funding was used to print a small quantity of the trifold peach marketing brochure that had been designed and printed 6 years ago. These brochures were also distributed at peach promotional events and retail demonstrations.

**8) Research** – field work and postharvest work and research supplies – Approved and budgeted \$5500. All funding was spent over the three years of the grant. Professional pomologists one our technical consultant and others from Rutgers NJAES were contracted to conduct this new product and post-harvest research. Most of this was done at the Rutgers Agricultural Research and Extension Center (RAREC) in Upper Deerfield Township, Cumberland County at their post-harvest research laboratory and storage facilities. Research was conducted a 5 test plantings and 4 commercial plantings on 5 farms in Cumberland, Gloucester and Salem Counties in New Jersey. Our technical consultant who is contracted to NJPPC did most of the preliminary evaluations of new varieties of peaches and nectarines, and transported or arranged for handling and transport to the post-harvest laboratory at RAREC. New advanced selections of New Jersey varieties were harvested and collected for post-harvest evaluations. These evaluations were conducted and data was collected by the Rutgers team both in the commercial plantings and at the post-harvest facilities. From the 26 advanced selections 10 of the best selections were brought for 3 years to the post-harvest facilities for quality, handling and storage evaluations of varying harvest dates. From both the field and post-harvest and handling evaluations 6 have been selected for commercialization to fill market season needs and increase shelf space for grower/marketers of NJ peaches;

These six varieties are:

NJN103 aka NJ K54-42 an attractive, early season, very large, firm, semi-freestone, cream-white fleshed nectarine with firm-melting flesh of very good flavor, sub acid, good storage and handling characteristics, and low susceptibility to disease.

NJN102 aka NJH21-44 a very attractive, early season, large, semi-freestone, yellow-fleshed nectarine with firm-melting flesh of very good flavor, sub acid, good storage and handling characteristics, and low susceptibility to disease.

NJ 357 aka NJH7-47 – a very attractive. almost full red skinned, early-midseason, large, yellow -fleshed freestone peach with very firm melting flesh of good flavor, sub-acid, excellent storage and handling characteristics, and low susceptibility to disease.

NJ 358 aka NJ K64-197 an attractive, bright red skinned, late season, very large, yellow-fleshed, freestone peach with a very firm, melting flesh of very good flavor, acidic, but sweet, excellent storage and handling characteristics, and low susceptibility to disease.

NJ 359 aka NJ K65-76 an attractive, red blushed bright skinned, very late season, yellow-fleshed, freestone peach with firm melting flesh of very good acidic, but sweet flavor, excellent storage and handling characteristics and low susceptibility to disease

NJ 13-23 an attractive, red skinned, very early season, yellow fleshed clingstone flat peach with moderately firm, melting flesh of exquisite low acid flavor. Had some problems with fruit cracking so was not given a generic name as of yet.

Rutgers provided the following report on their research in addition to the evaluation of the above cultivars” Peach cultivars with diverse flesh types are becoming more commonly available and provide opportunities for market expansion and enhanced customer appeal. Efficient harvesting, handling, and storage practices for different flesh types need to be developed. We conducted a three-year study to quantify storage performance of peaches with different flesh ripening characteristics. Samples of 20-30 commercially mature peaches of the cultivars ‘Bounty’ (yellow melting flesh), ‘Gloria’ (yellow partially stony-hard flesh), ‘White Lady’ (white melting flesh),

‘Klondike’ (white melting flesh), and ‘Scarlet Rose’ (white stony-hard flesh) were evaluated at time of harvest, after 14 days in conventional cold storage (0°C, 95% RH), and after removal from 14 days of cold storage and then three days on a shelf at room temperature. We evaluated multiple harvest dates for each cultivar. Fruit flesh firmness, mass, diameter, total soluble solids, and total titratable acidity were measured at each evaluation time. Small, but significant changes in flesh firmness occurred in storage for all cultivars. Softening rates in cold storage averaged 0.1 to 0.6 lbs. per day. Rehardening of fruits harvested after already soft occurred in ‘Bounty’, ‘Klondike’, and ‘Gloria’. Softening rates on the shelf were; ‘Bounty’ 4.3, ‘Gloria’ 2.3, ‘White Lady’ 2.9, ‘Klondike’ 3.5, and ‘Scarlet Rose’ 0.8 lbs. per day. ‘Scarlet Rose’ fruit retain firmness on the shelf dramatically longer than the other cultivars tested and present an opportunity for product differentiation to the consumer.”

9) Research Travel, Fees and mileage – Approved and Budgeted \$3,000. All funding but \$103.26 was spent over the three years of the grant. This money was used to pay mileage and travel fees to collect and harvest fruit, evaluate it in the field and transport it back to post harvest facilities for technical consultant and for labor as part of the contract to Rutgers. It was also used to travel to present results to peers in postharvest pomology to solicit input for continued research and to present data for possible commercialization to propagate trees for planting. The results of actual research were presented as described above.

**All of the work done with this funding was done with the focus on the promotion of marketing of peach and nectarines.**

We did not have any project partners unless all the work was done by directors of the New Jersey Peach Promotion Council and their employees who all volunteer their time, and the individual contractors and faculty and staff Rutgers University New Jersey Agricultural Experiment Station.

### **GOALS AND OUTCOMES ACHIEVED**

We continue to maintain a viable peach industry although in 2016. Our production will be down because of 5 nights of below freezing temperatures while our peach trees were in full bloom. We had less production but prices were strong and movement was good on wholesale markets. Those growers that sell directly to consumer report good prices and movement. The final statistical data for 2016 is not yet available although the following is a statement for the regional market new reporter Holly Mozal of USDA Market News who interview and collects statistical data sellers and shippers: “The crop was lighter than normal due to the freeze and rains during pollination. Early season movement was very good despite varietal gaps and hail issues. As you know, a few growers didn’t even have a crop to sell. Fruit finish was beautiful; however, size for most varieties was larger than normal. Mid-to Late season (August) demand slowed and competition from fruit from other areas and heavier than normal volume of 3” and larger peaches didn’t help movement. Growers were concerned about moving fruit despite lighter pack outs. Early in the season they thought they would be done by Labor Day based on the demand, but because demand slowed, movement went 2-3 weeks beyond the holiday”. “I tried our custom average tool (CAT) to determine an average price for NJ peaches for the season. Although I rely on the accuracy of the weekly prices, this tool can be a quick snapshot on pricing complete with graphs. To recreate the information yourself, just click “custom average pricing” from our main

webpage and fill in the criteria you are looking for. <https://www.marketnews.usda.gov/mnp/fv-home>. I entered the following information:

Primary criteria: 6/8/16 thru 9/24/16, peaches, NJ, South NJ,

Secondary criteria: I only changed the size to get a separate price for each. Otherwise it would lump all three sizes together for the average.

My overall average prices were:

2 ¾' up \$18.83

2 ½-2 ¾" \$16.01

2 ¼-2 ½" \$13.52"

We did see our website hits increase in the first year of funding but decline in 2015 We did not get our website design finished until early spring 2016 thus did not increase web site usage in 2015 or 2016. This was due to limited funding and difficult with our previous web designer (see accomplishments data);

We did increase our retail promotion in all three years of the grant by trying to be more efficient and by training more volunteers to coordinate these promotions. We used the peach queen more in 2014 and 2015. We had more special peach market promotions called peach promotional parties and our Perfect Peach Pie Contest became more popular and garnered great publicity for the peach industry (see accomplishment data); We also started in 2015 and 2016 to work with supermarket dieticians to do demonstrations in supermarkets; (see accomplishments data);

## **BENEFICIARIES**

5) The beneficiaries of this project are the 80 growers and their workers and staff encompassing 5,500 acres of peach trees (a decline of 900 acres since 2012). We continue to see slight increases in the wholesale price per pound of peaches as the volume of peaches produced remains sort of static between 56,000,000 and 60,000,000 pounds. A significant number of suppliers and laborers are dependent and employed in the infrastructure of the peach industry. Peaches from New Jersey could easily be consumed by the 25 million people within 250 miles of production, packing and storage areas. We continued to target this market. There is ample scientific evidence to support consumption of increasing amounts fruits and vegetables. NJ peach growers continue to use all methods available to differentiate local or NJ peaches from all other produce, and from peaches produced in other areas and shipped to suppliers and marketers in our target market, Our directors, members, volunteers and consultants believe that NJ peaches can be profitably sold in this market because they are fresher, taste better and the industry of tree growing and farming has many benefits.

USDA REQUEST BEGINS BELOW;

### **Promote and Handle Jersey Fresh Peaches**

- Please elaborate on the Expected Measurable Outcomes as indicated in your approved project proposal.

Note: the Peach Production by State is by tons in the accepted project proposal rather than average dollar amount (as listed in the final report). Could you provide comparable data in order to envision a better picture on the status of peaches in NJ?

Year USDA NJASS Figures	Total Production (tons)	Season Average Price (\$ per ton)	Value of Utilized Production (\$1,000)
-------------------------	-------------------------	-----------------------------------	--

2010	34,000	\$ 920	\$ 31,280
2011	32,000	\$ 1,220	\$ 36,600
2012	30,000	\$ 1,320	\$ 39,600
2013	18,120	\$1,510	\$ 27,891
2014	22,450	\$1,320	\$ 27,300
2015	21,170	\$1,310	\$ 27,585
2016			

The final USDA NJASS figures for peaches but we did see one figure of 14,000 tons but we fell that is way too low. The crop was very irregular around the state in 2016 but based on USDA Market News (see commentary above under goals and outcome achieved) the NJPPC believes we produce about 75% of a normal crop or about 22,000 tons and the average price per ton because of the our promotion and the lighter southern states crop of about \$1400 per ton. Thus the NJPPC estimates the value of the crop to be about \$30,800 for 2016.

The other figures you requested are in goals and outcomes achieved.

### **LESSONS LEARNED**

1a) We have learned it is very difficult to make long term plans because of the volatility of the peach market strongly influenced by the supply and demand. When demand is strong it is often due to supply of peaches being limited. When supply is plentiful the demand is low and price fall. When these thing happen we have to redirect our efforts since our long term plans have not always addressed the correct ways to promote our produce; For example in 2015 the volume of peaches (supply) was lower and demand was strong. In 2016 or crop (supply) was reduced because of the spring frost up and down the northeastern US which created strong demand for NJ peaches.

2a) We had some problems with people we contracted. Our web designer and master felt we were too demanding and resigned; The first contractor we hired to develop a peach health brochure did a poor job and we had to settle and got nothing . Because we have very limited funding it is difficult to get the very best promotional or marketing people to work with us. Using volunteers is always unreliable and unpredictable which limits three year planning. In New Jersey we have limited technical people available to give us advice and expertise on peaches.

3a) We have only limited success working with the restaurant industry. We have a few restaurants but Programs like Farm to Fork which some of our members promote have been more successful than anything we did. In reality we had inefficient funding to spend any more time working to achieve this goal;

3b) The idea to have a tie in with a runners association could not be achieved with any running group or other interested sponsors. We had insufficient funding to sponsor an event in its entirety and to achieve this goal;

3c) Without conducting expensive surveys which our grant funding does not cover we have few impact measurements with quantitative data. Most of the federal and state agencies have cut funding Specialty Crop reports prepared by the National Agricultural Statistical Service and the New Jersey Agricultural Statistical Service. Our best source of information is our grower members and our allied members who give us feedback on peach prices and movement in addition what and when we get information form USDA

Market News

4a) Lessons learned should draw on positive; The new media wants to do more reporting on agricultural issue but have less feature writers to do this work. We have some excellent sources of information in our industry and find that when we write press releases on happenings and issues in the growing and marketing of peaches it will be reported and published. We get great exposure and publication on what we what at a very low cost relative to what we spend on advertising to by publicity

**CONTACT PERSON**

Name the Contact Person for the Project Santo John Maccherone – Chair of NJPPC

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or

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**12-14-2016**  
**(Revised 4/14/2017)**

**PROJECT TITLE:**

**“Enhancing Market Value and Brand Recognition of New Jersey Wines.”**

**Project Summary**

As New Jersey’s wine industry has grown, it has become increasingly clear that areas of the state, particularly in the southern region known as the Outer Coastal Plain, are prime for production of high-quality wine grapes. Our soils are sandy and well-drained, our summers are long, and our winters are only occasionally severe enough to hurt vines. This region has often been compared to the Bordeaux region of France in terms of climate. While the vintners of the Outer Coastal Plain have been producing world-class wines for quite a few years now, public opinion of New Jersey wine has failed to keep pace. The average wine consumer will often have a negative perception of the quality of the product we grow, and even become discouraged from purchasing based on these misperceptions. The purposes of this project were to;

1. Gather data from consumers in our target demographic in order to better understand current purchasing trends and define areas where improvement could be made. A survey was used to gather this information and contained the following questions:
  - a. State
  - b. Age (21-30, 31-40, 41-50, 51+)
  - c. Years Drinking Wine (1-4, 5-9, 10+)
  - d. Bottles per Month (1-4, 5-8, 9+)
  - e. Average Price per Bottle (<\$10, \$10-\$15, >\$20)
  - f. Typical Type to Drink (Red, White, Equal)
  - g. Familiarity with Outer Coastal Plain (1-5)
  - h. Heard of Coeur d’Est? (Yes or No)
2. Using gathered data, create a multimedia advertising effort aimed at raising awareness of a high-quality blend called Coeur d’Est produced by member wineries of the Outer Coastal Plain Vineyard Association (OCPVA).
3. Use metrics from the OCPVA Facebook page and the OCPVA website to track traffic potentially driven by our marketing efforts.
4. Attempt to drive a trend in consumer responses toward higher average \$/bottle amounts, bottle/month amounts, familiarity with OCPVA, and familiarity with the Coeur d’Est brand.

This project was initiated just prior to release of the first vintage of Coeur d’Est, so our advertising efforts were timely and relevant. We hoped to build on the success of the previous SCBG issued for the development and launch of the Coeur d’Est brand.

**Project Approach**

In an effort to maximize our survey responses, a website was created

([www.coeurdest.com](http://www.coeurdest.com)) where the survey could be taken online. Mailing lists were purchased in our desired demographics and eblasts were sent out to help stimulate survey collection. The surveys were also distributed to member winery tasting rooms to help increase sample size further. In the first phase, we included a “wine passport” style booklet to help incentivize survey responses and increase recognition of Coeur d’Est. In subsequent survey phases a coupon was used as an incentive instead of the wine passport. We also used cost-effective coasters with a QR code linking to the survey website to help drive traffic. In the end 241 responses were collected. These were split into 5 survey groups based on the following dates of submission:

1. Group 1 - 6/26/2014 to 10/31/2014
2. Group 2 - 11/8/2014 to 6/28/2015
3. Group 3 - 7/3/2015 to 1/2/2016
4. Group 4 - 2/17/2016 to 4/28/2016
5. Group 5 - 5/1/2016 to 9/29/2016

We then analyzed the changes in responses of these groups for trends in accordance with the targets that were set. In addition, new Net Facebook Likes on the OCPVA Page and Unique Website Visitors to [www.OCPVA.com](http://www.OCPVA.com) were tracked each month. These numbers were then compared against the dates during which our advertising campaigns were run.

A 30 second video to highlight Coeur d’Est and a 60 second video to highlight the OCP as a whole were used as media pieces for the online video and television advertising spots. There was also a banner ad that ran on multiple websites to complement the more mainstream advertising methods.

### **Goals and Outcomes Achieved**

The market research goal for this project was to gather and define relevant demographic and psychographic traits of our target consumers. This goal was achieved through the collection of 241 surveys that inform us about the type of consumer interested in purchasing New Jersey wine. According to responses, the most likely consumer to show interest in NJ wine via responding to our survey is as follows:

1. NJ resident (79.67%)
2. Female (64.73%)
3. Aged 51+ Years (38.02%)
4. Drinking wine for 10+ years (61.25%)
5. With Preference for Red wine (58.75%)
6. Drinking 1-4 bottles per month (39.83%)
7. At a price from \$10-\$15 (43.15%)
8. Rating their familiarity with the OCP as “5” (23.24%)
9. Responding “No” to “Heard of Coeur d’Est?” (53.53%)

After receiving and compiling all surveys, we actually ended up seeing the opposite effect on awareness of the region than we expected. As the Survey Groups go from 1-5:

1. Group 1 had 48.15% of respondents submit a “5” for familiarity with the OCP,
2. Group 2 had 22.15%,
3. Group 3 had 43.48%,
4. Group 4 had 8.00%,
5. Group 5 had 16.22%.

We saw a similar effect with the awareness of Coeur d’Est:

1. Group 1 had 55.56% respond “Yes”,

2. Group 2 had 45.19%,
3. Group 3 had 47.83%,
4. Group 4 had 36.00%,
5. Group 5 had 29.73%.

While this data was initially surprising, after some thought I believe the trend was produced due to an increasing range of our surveying. As we reached out further in order to get more survey responses and better demographic data, we ended up polling consumers in the tri-state area that have naturally lower familiarity than a NJ consumer due to proximity. This points toward a need for better marketing efforts aimed at attracting and educating consumers in nearby states as well as NJ.

One target set forth in the Expected Measurable Outcomes were to see an average response of “3.5” for familiarity with the OCP at the end of the survey. The actual awareness level calculated to be “3.04”, slightly off the mark of our target.

The change in percentage of respondents replying “Yes” to “Heard of Coeur d’Est from Group 1 through Group 5 was -25.83%.

Another target set forth was to see an increase in respondents who purchase more than 8 bottles per month and an increase in respondents who spend more than \$15 on average per bottle. The following summarizes responses for these categories through each Survey Group:

1. Group 1
  - a. Bottles/Month: 5-8 (51.85%, Highest Response)
  - b. 9+ : 14.81%
  - c. \$/Bottle: \$10-\$15 (55.56%, Highest Response)
  - d. \$15-\$20: 40.74%, \$20+: 0.00%, Total 40.74% towards target
2. Group 2
  - a. Bottles/Month: 1-4 (41.35%, Highest Response)
  - b. 9+ : 25.00%
  - c. \$/Bottle: \$15-\$20 (42.31%, Highest Response)
  - d. \$15-\$20: 60.87%, \$20+: 0.00%, Total 60.87% towards target
3. Group 3
  - a. Bottles/Month: 5-8 (43.48%, Highest Response)
  - b. 9+: 30.43%
  - c. \$/Bottle: \$15-\$20 (60.87%, Highest Response)
  - d. \$15-\$20: 42.31%, \$20+: 6.73%, Total 42.31% towards target
4. Group 4
  - a. Bottles/Month: 1-4 (44.00%, Highest Response)
  - b. 9+: 24.00%
  - c. \$/Bottle: \$10-\$15 (44.00%, Highest Response)
  - d. \$15-\$20: 38.00%, \$20+: 8.00%, Total 46.00% towards target
5. Group 5
  - a. Bottles/Month: 1-4 (45.95%, Highest Response)
  - b. 9+: 13.51%
  - c. \$/Bottle: \$10-\$15 (54.05%, Highest Response)
  - d. \$15-\$20: 24.32%, \$20+: 0.00%, Total 24.32% towards target

Overall, we did not see a linear increase in either “Bottles Purchased” or “Average Price per Bottle”, but what we can see is an increase in these target demographics in Groups 2-4, when our strongest marketing efforts were being employed and our advertising campaign was run

(9/21/2015 through 10/18/2015). We hope this bump points toward our success in reaching our targeted consumers.

Unique Website Visitors on [www.ocpva.com](http://www.ocpva.com), and new Facebook Likes on the OCPVA website, were tracked and split into 5 Online Data Groups corresponding to the dates of the 5 Survey Groups. The numbers recorded are as follows:

1. Group 1
  - a. Average Facebook Likes/Month - 18.4
  - b. Average Unique Visitors/Month - 595
2. Group 2
  - a. Average Facebook Likes/Month - 2.25
  - b. Average Unique Visitors/Month - 565
3. Group 3
  - a. Average Facebook Likes/Month - 4.33
  - b. Average Unique Visitors/Month - 380
4. Group 4
  - a. Average Facebook Likes/Month - 5.00
  - b. Average Unique Visitors/Month - 409
5. Group 5
  - a. Average Facebook Likes/Month - 2.00
  - b. Average Unique Visitors/Month - 581

We were unable to realize our goal of a 20% increase in New Facebook Likes per Month and a 25% increase in new Unique Website Visitors per month. The data that was gathered will be used as a solid baseline for any future online performance tracking.

The major successful outcomes of this project are listed below:

1. Collection of 241 surveys from a wide range of interested consumers that convey valuable information regarding purchasing habits, preferences, and demographic traits of people in our targeted markets.
2. Creation of 2 short videos highlighting the OCP to give wineries a low-cost, unifying option for digital marketing.
3. Collection of surveys allowed us to give the respondents the option to opt-in to more information from the OCPVA, thus adding 201 demographically-relevant names to our mailing list.
4. Suggested efficacy of our marketing efforts evidenced by favorable bumps in Group 3 for survey questions “Familiarity with OCPVA” and “Heard of Coeur d’Est?”.
5. General marketing and awareness-building of the OCP and the Coeur d’Est brand supplied by our advertising efforts.

### **Beneficiaries**

The major beneficiaries of this project were the vineyards and wineries of the Outer Coastal Plain. While we did not see many major favorable changes in regards to survey responses through time, the responses themselves are still immensely valuable to growers when deciding on varieties to plant, cultural practices to perform, yield determinations, and fruit value. They are also useful to winemakers when determining style and product makeup to best maximize consumer appeal. Tasting room managers and winery owners can make better pricing decisions and set more relevant production goals when information of the type generated by these surveys is available. The patrons of the wineries in the OCP also benefit due to an increased understanding of their taste and purchase preferences. Wineries can focus on creating

wines that better meet consumer expectations, not only driving more traffic, but creating a more enjoyable experience in the tasting room. Giving customers these experiences will help keep NJ wineries competitive as the industry grows.

This project will benefit New Jersey's fifty licensed wineries, 192 New Jersey wine grape growers on a total of about 2,000 acres of wine grapes producing 1.5 million gallons of wine.

### **Lessons Learned**

The most obvious insight after looking at the data is that we set our targets way too high. Having never performed a survey like the one given within this project, we had no idea what kind of results we would get back. We do feel, however, that the results represent a well-varied and diverse population within our targeted demographic. In future surveys of this type, we will be looking at performance against the data gathered in this project, and will in this way serve as a foundation for our efforts to build upon.

The unexpected downward trends for responses to "Familiarity with the OCP" and "Coeur d'Est" point toward some interesting thoughts. It seems as though the reputation of OCP wines are extremely localized. Whenever there was a high percentage of NJ respondents, the familiarity with OC was higher. In the beginning of the project period, we incentivized response to our survey by using a "wine passport" type promotion. I believe this may have unintentionally created a stronger draw to locals rather than tourists due to its requirement for proximity to the OCP. As we switched over to the coupon later in the project period, we saw an increase in non-NJ respondents. This tells me we need to be thinking about how a given advertising method affects which audience is reached, both regionally and demographically.

Another lesson learned through implementation of this project is that we need to work on our online marketing efforts. We were unable to make significant improvements to traffic on both our Facebook page and website throughout the project period. This points toward a lack of "digital connectivity" between the winery pages and those of the OCPVA. Making sure that all wineries are linking to each other's pages and events, as well as linking to the OCPVA, will create a digital community that can help drive consumer traffic amongst itself.

Looking back, simpler incentives seemed to work better to increase survey response rate. The distribution of the coupon seemed to spur responses better than the "wine passport".

### **Additional Information**

OCPVA Website - [www.OCPVA.com](http://www.OCPVA.com)

Coeur d'Est Survey Website - [www.coeurdest.com](http://www.coeurdest.com)

Below is the banner ad created to drive traffic to our survey



If you would like to see the short videos created for the advertising campaigns please go to the following links:

1. 30 Second video - <https://youtu.be/jk7-ojZZ3ls>
2. 60 Second Video - <https://youtu.be/K51GEQKFab0>

**Contact Person**

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Rutgers Cooperative Extension of Middlesex County  
Final Report - 12-25-B-1685  
11/29/2016  
(Revised 4-13-17)

### **PROJECT TITLE;**

“Revitalizing the New Jersey Strawberry Industry Through Needs Assessment and New Varieties”

### **PROJECT SUMMARY**

While strawberries are very valuable for many New Jersey growers, the numbers of acres planted in strawberries has dwindled below the minimum needed for U.S Department of Agricultural Statistical tracking (USDA Economic Resource Service Report, NASS 2012). The lack of statistics on New Jersey strawberries makes it difficult to determine the status of the industry and to measure any gains or losses over time. An assessment of the NJ strawberry industry in terms of acreage, value, price per unit, pest problems, production and marketing practices, and challenges is needed to help the industry move forward. As a result of this need, this primary objective of this project was to survey small fruit growers to determine characteristics and needs of the industry in New Jersey.

This project was completed over a two year period and allowed for adequate time to collect answers from a wide distribution across all geographical regions of New Jersey.

The NJ Small Fruit Council and the National Sustainable Strawberry Initiative (NSSI) provided seed money to begin new strawberry variety development at the New Jersey Agricultural Experiment Station (NJAES). This current project and funding enabled the second primary objective to progress with the further development and release of new selections to a larger number of growers throughout the state and region. One of the new Rutgers NJAES varieties was distributed to 22 states in 2015 and harvested in 2016 (Blondeau 2016). Previously funded projects helped to create a foundation of grower participants that enabled the research team to collect more detailed data for this SCBG project.

### **PROJECT APPROACH**

**Goal 1:** *Assess the status of the production and marketing of minor small fruit (strawberries, brambles, ribes) in New Jersey and identify opportunities and challenges for farmers.*

The research team worked closely with colleagues at Rutgers University to develop a comprehensive survey that would gather the data needed to achieve the goals of the project.

The survey “Revitalizing the Needs of the Small Fruit Industry” was composed of 5 parts including 9 primary questions with 122 responses. After developing the survey, the research team reached out to colleagues and cooperating agricultural agencies to identify the estimated 130 small fruit growers who could complete the survey. Potential participants were identified through lists provided by the New Jersey Department of Agriculture, New Jersey Direct Farm

Marketing Association, Rutgers Cooperative Extension, and New Jersey Farm Bureau. In addition, the research team identified participants at statewide agricultural meetings and events.

The survey was distributed and information about new cultivars was provided at the following meetings:

- New Jersey State Agricultural Convention;
- 
- Mid-Atlantic Fruit and Vegetable Growers Association Meeting;
- North Jersey Fruit Growers Meeting;
- North Jersey Vegetable Growers Meeting;
- Central Jersey Fruit and Vegetable Growers Meeting;
- New Jersey Turf and Ornamental Meeting;
- New Jersey Farm Marketing Association Meeting.
- 

The total number of fruit and vegetable growers reached at the meetings mentioned above exceeded the target number of 300 plus growers.

Data collection was also accomplished by conducting in-person interviews including: on-farm visits and statewide and regional agricultural meetings.

The research team worked closely with a Rutgers University Statistician, Kevin Sullivan to code and enter 75 completed surveys into an excel spreadsheet.

On-going project updates were presented to growers at agricultural meetings and events such as the 2016 New Jersey Agricultural Convention and the 2016 Mid-Atlantic Fruit and Vegetable Meeting. These presentations encouraged further participation in the survey project and expanded farmer's interest in growing strawberries. The project team was able to gather additional survey participants by making announcements regarding the survey after each small fruit session. The results from this survey were presented at the American Society of Horticultural Science (ASHS) on August 8<sup>th</sup>, 2016 in Atlanta, Georgia.

Although the survey didn't reveal significant economic data, growers expressed through conversation with the project team an increase in early season profits that ranged from 5-10% which is similar to the targeted increase of 10%..

Based on the publicity that accompanied the project, there was an increase in awareness among consumers about early season strawberry varieties produced throughout this project.

**Goal 2:** *Expedite the evaluation and release of strawberry selections from the Rutgers NJAES breeding program.*

Parent material of NJAES selections was maintained and propagated for research trials at the Rutgers NJAES Experiment Station. Parent material was then further propagated into plugs for farmers at Kub-Pak Greenhouses in Allentown, New Jersey. Over the course of the project, plug plants were planted in 16 observational trials at 13 farm-sites. There were 4 additional replicated trials planted at 2 NJAES locations. Quantitative and qualitative data was collected from each trial and statistically analyzed by a University Statistics Professional. The quantitative data collected throughout this project expressed units of quantity, amount, and ranges of measurements related to small fruit production, sales, and management. The qualitative data collected throughout this project was used to reveal descriptive data related to small fruit production, sales, and management. This data was analyzed by all members of the project team.

During the first year of the grant period, the Rutgers Sensory Lab conducted a blinded taste test. This taste test included 150 participants who rated the Rutgers NJAES selections along with standard commercial varieties. Results were collected by the project team and given to Kevin Sullivan, Rutgers statistician to analyze.

As a result of field trial and taste test data, patents were pursued over the course of the two-year grant period. Necessary paperwork was submitted to the patent office for review. The release of one selection in 2016, Rutgers Scarlet™ was included in promotional efforts and celebration of the 250<sup>th</sup> year of Rutgers University.

Select activities and progress were documented by the videographer. An online project site was created to enable team members to have access to project information and progress.

## **PROJECT PARTNERS**

The key project team members included the following:

- Bill Hlubik, PI. Provided oversight and project supervision.
- Pete Nitzsche, Co-PI. Provided oversight and project supervision.
- Gillian Armstrong, Project Coordinator. Conducted surveys, gathered data and worked in cooperation with PI to keep the project on task.
- Matthew Millburn, Project Coordinator. Facilitated the production and data collection for new NJAES strawberry varieties.
- Richard Weidman, Program Assistant. Assisted with production and data collection for new NJAES strawberry varieties.
- Dave Smela, Program Assistant and Videographer. Captured key elements of the project using video and pictures.

## **GOALS AND OUTCOMES ACHIEVED**

### **Goal 1:**

The primary goal of this project was to assess the status of the production and marketing of minor small fruit (strawberries, brambles, ribes) in New Jersey, and to identify opportunities and challenges for farmers.

The following activities were completed to achieve the primary performance goal and measurable outcomes of the project:

**Activities:**

- Survey development
- Survey distribution and collection
- Data entry
- Data analysis
- Reporting

These activities enabled the research team to achieve the performance outcomes of the project which included: collecting data from 75 out of an estimated 130 total small fruit growers; providing project updates and information to over 300 growers at meetings and events; and updating contacts and information for small fruit growers.

As a result of this project, the investigators gained a better understanding of the obstacles and opportunities facing the small fruit industry. The survey was intended to provide baseline information to help determine the current status and needs of the small fruit industry in New Jersey.

**Summary of Survey Results**

- Strawberries accounted for 56% of conventional and 59% of organic small fruit acreage reported.
- The greatest challenges to growing small fruit ranked by participants as very important to extremely important were: marketable yield (79.9%), weather (65%), weed control (64%), variety selection and availability (63.9%), and labor availability (55.6%).
- The most important factor in marketing small fruit was to attract new customers (68%), help sell other crops (64%), and helps extend the marketing season (60%).
- Eighty-seven percent of participants reported that the value of marketing small fruits at their farm market was greater than the isolated value of the small fruit sales.
- The most important attributes reported by growers when considering selection of strawberry varieties were: flavor (93.8%); disease resistance (76.4%); yield (73.3%) and size (72.2%).
- Participants reported that 55% of their strawberry acreage is planted using the annual plasticulture system and 45% of their acreage is planted in matted row system. This was based on a total of 152.01 acres.
- Twenty-eight percent of respondents reported selling strawberries through wholesale markets at an average of \$2.20 per pound. Eighty-one percent of 61 respondents selling strawberries through retail methods at an average price of \$3.31 per pound.
- Primary methods of retail strawberry sales included: farm stands (82%); pick-your-own (47.5%); community farmers markets (26%); and community supported agriculture (19.7%). Growers reported selling through multiple marketing outlets.

- Fifty-two percent of 50 respondents reported they would increase their retail sales in 2016. Forty-six percent of 50 respondents reported they would maintain the same retail sales in 2016. Two percent of 50 respondents reported they would decrease retail strawberry sales in 2016.
- The average number of years respondents have been farming is 28 years with a range of 2 to 56 years.
- Eighty-seven percent of respondents were men and thirteen percent were women.
- Seventy-eight percent of 74 respondents were full-time farmers and twenty-two percent were part-time farmers.
- The percentage of total farm income attributed to small fruit: 0% of their income (1.33% of farmers); 1% - 24% of their income (68% of farmers); 25%-49% of their income (10.66% of farmers); 50%-74% of their income (6.76%); 75%-99% of their income (2.66%); 100% of their income (4%); and (6.66% of farmers) refused to provide that information.

**See attached survey data questions and responses.**

### **Goal 2:**

The second goal of this project included expediting the evaluation and release of strawberry selections from the Rutgers NJAES breeding program.

#### **Activities:**

- Expanded the release of the Rutgers Scarlet strawberry selection to 22 states
- Initiated the patent process for 3 Rutgers NJAES selections
- Facilitated three informal strawberry taste tests:
  - Grasso Girls Farm: May 22<sup>nd</sup>, 2015
  - Rutgers EARTH Center: June 10<sup>th</sup>, 2015
  - Rutgers EARTH Center: June 10<sup>th</sup>, 2016
- Facilitated one formal taste testing with Rutgers University Sensory Lab
- Completed variety trials to compare Rutgers NJAES research selections with commercially available varieties.
  - Replicated 4 trials from 2015-2016 located at the EARTH Center and the Snyder Research Farm
  - Conducted 16 observational trials on 13 farm sites from 2015-2016

### **Summary of Data**

- In 2015, Earth Center data harvest data indicated no significant difference among standard varieties Flavorfest and Chandler, and four other Rutgers NJAES selections. With regards to brix (sugar) data, three of the Rutgers NJAES selections were significantly higher than Flavorfest and Chandler. Firmness data did not show

significant difference among commercial varieties and all but one Rutgers NJAES selection

- The 2015 NJAES Snyder Research Farm data indicated that the Rutgers NJAES strawberry selection 'Rutgers Scarlet' had the highest firmness rating which was significantly firmer than the commercial variety Wendy, but not significantly different than Chandler and four other Rutgers NJAES selections. That same year's study revealed that Rutgers Scarlet had the highest brix (sugar) rating but that rating was not significantly different than other commercial varieties and NJAES selections.
- The 2016 NJAES Snyder Research Farm data revealed that there were no significant differences in yield between a local standard variety Chandler when compared to Rutgers Scarlet <sup>TM</sup> and four other NJAES selections.
- As per conversation with four Middlesex County strawberry growers, media attention and promotion of new NJAES varieties increased fall 2016 early season profits from 5% to 10%.

The team worked with two commercial nurseries to grow Rutgers Scarlet for commercial use. Both nurseries combined sold over 300,000 plants. In 2015, 92 growers from 22 states received 110,300 dormant strawberry plants. An additional 22 growers from New Jersey received plants in 2015.

\*See attachments for full replicated research trial results and data\*

## **BENEFICIARIES**

The research team selected farms to trail Rutgers Scarlet strawberries throughout the duration of this project. Each of the farms indicated intent to increase Rutgers Scarlet production and sales for the upcoming season. These farms included:

- Specca Farms, Springfield NJ
- Donaldson Farms, Hackettstown NJ
- Cecil Creek, Gloucester NJ
- Hlubik Farms, Chesterfield NJ
- VonThun Farms, Monmouth Junction NJ
- Grasso Girls Farm, Mullica Hill NJ
- Hauser Hill Farm, Middlesex NJ
- Giamarese Farm, East Brunswick NJ
- Muth Farms, Williamstown NJ
- Chickadee Farms, Pennington NJ
- Fernbrook Farms, Chesterfield NJ
- Terhune Orchards, Princeton NJ
- Alstede Farms, Chester NJ

## **Anonymous Growers Comments:**

“Strawberries are a very important start to the season. With tailgate markets and roadside stands the early spring crop is the first fruit out”

“Adds to plant sales in the spring, needs to have a longer season- maybe 8 weeks if possible”

“The Rutgers Scarlet is the way a strawberry always wanted to taste, extremely well received by our customers”

“Would love to grow up a larger patch maybe 2 or 3 acres, but very good quality for my current small patch”

Based on positive feedback received from the growers and the public, the research team will continue to produce the Rutgers Scarlet variety.

The Rutgers strawberry breeding program received extensive media coverage that was initiated by the Rutgers University press. This increase in promotion leads to an increased demand for direct market Rutgers Scarlet strawberries. Four growers estimated a 5 to 10% increase in strawberry sales due to these promotional efforts. The team estimated reaching 3.9 million readers, listeners, and viewers via television, radio, newspaper, and the internet. (Alexander, 2015)

### **LESSONS LEARNED**

The team learned that it is very difficult to have growers complete the survey without face to face contact. The research team found the best way to reach farmers was at grower meetings. Growers commented that the survey should have fewer questions and be less time consuming. The research team noted that on-farm site visits were difficult due to grower availability. The team noted that experienced direct marketers were more receptive to answering questions on the survey compared to less experienced growers. Moving forward, the research team will make future surveys much shorter in length. Lesser questions will allow growers to fill out the surveys quickly and more efficiently.

### **Challenges to achieving goals and outcomes**

Growers are reluctant to share economic data and in some cases, they may not be able to separate profits from specific crops on any given sales day. Growers also felt the survey was too long and too specific. This made it very hard for the research team to collect a large number of surveys.

### **Unexpected outcomes or results**

Informal discussions with growers revealed a wide range of grower management practices for strawberries. Several large scale growers have verified the need for continued research in nutrient and cultural practices to maximize strawberry flavor and production.

### **CONTACT PERSON**

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