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Specialty Crop Block Grant Program – FY 2015

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Final Performance Report

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Project 1 (Final)

Integrated Management of Mealybugs and Leafroll Disease in Vineyards

Project Summary:

Leafroll virus disease is threatening the profitability of vineyards in New York. Reducing spread of leafroll viruses by mealybugs in diseased vineyards is critical for sustaining high quality production and increasing the productive lifespan of vineyards. Roguing to eliminate diseased vines and two adjacent vines on both sides within rows in combination with applications of the systemic insecticide Movento to reduce populations of melaybug vectors was shown to be highly efficient at reducing virus incidence. This integrated vineyard and disease management strategy was validated in a Cabernet franc vineyard in the Finger Lakes. Continued efforts are needed to apply this strategy to other vineyards, particularly to determine its actual performance and impact on the reduction of disease spread. Nonetheless, a few growers have already adopted our vineyard and disease management recommendation to mitigate the impact of leafroll disease.

Project Approach:

Several tactics can be deployed to mitigate the impact of viruses associated with leafroll disease. We previously showed that insecticide control of grape mealybug, i.e. Pseudococcus maritimus, the primary virus vector in Finger Lakes vineyards, can be achieved using spirotetramat (Movento), a systemic insecticide applied to foliage. However, this insecticide cannot be used to target overwintered grape mealybug crawlers that can carry viruses as early as budbreak, a time when spirotetramat cannot be applied since foliage is required. Targeting the crawler stage at budbreak is critical because it is the most efficient life-cycle stage for virus transmission. We are hypothesizing that a combination of a quick acting contact insecticide targeting overwintered crawlers at budswell in combination with spirotetramat will provide the best opportunity to limit virus spread with insecticides. To test this hypothesis, we will use a randomized block experimental design with three treatments: (i) No insecticide application (control), (ii) Two applications of spirotetramat (prebloom period and 30 days after), and (iii) application of a contact insecticide just prior to budbreak (Baythroid [B-cyfluthrin] or Lorsban Advanced [chlorpyrophos]) plus two applications of spirotetramat. Plot sizes will be roughly 32-48 vines. Data will be collected on mealybug prevalence on a subset of vines at regular time points. Virus incidence will be determined in individual vines within plots at the end of summer by ELISA or RT-PCR. Eliminating infected vines, i.e. roguing, can slow virus spread by reducing virus source vines and restricting mealybug movement through increased distance between infected and healthy vines. To test the efficacy of roguing at limiting virus spread, infected vines

within designated plots, replicated in at least six areas in selected vineyards, will be rogued and replaced with healthy vines of the same cultivar. These will be paired with control plots where infected vines are not removed. Healthy sentinel vines will also be used in control plots. Infected vines will be identified based on symptom expression and by conventional diagnosis techniques. Data on plant reinfection via mealybug inoculation, as well as changes in virus status of surrounding vines within a plot, will be taken over time. In addition, chemical control of mealybugs in vines adjacent to and within half of experimental plots (half of plots with roguing and half without roguing) will be used to investigate the impact of the combination of cultural (roguing) and chemical (vector control) approaches for reducing the rate of virus spread to newly established vines. No information is available on the cost of insecticide control of mealybug vectors in NY vineyards. We will determine the cost of insecticide applications and use these estimates to fine tune previously developed economic loss-minimizing management strategies for disease control. Integrating such information into a comprehensive and economical IPM program will increase the profitability of vineyards affected by leafroll disease.

Goals and Outcomes Achieved:

Reducing the spread of leafroll viruses in diseased vineyards was a major objective of our project. We explored cultural practices and applications of insecticides as two means to reduce spread. Our findings suggest that roguing, i.e. the elimination of infected vines and two adjacent vines on both sides within a row, regardless of their infectious status, in combination with the application of Movento, a systemic insecticide against the grape mealybug, seems optimal to lower the incidence of leafroll viruses, in spite of a slightly increased financial cost for the management of the vineyard ($50-250 per acre). This recommendation has great potential to reduce virus spread in a diseased vineyard. Unfortunately, due to time limitations, and the fact that we are dealing with a perennial crop, we were unable to estimate its performance at the farm level. Therefore, we did not quantify the impact of our project on the profitability, competitiveness and sustainability of farm operations. However, roguing and the application of Movento are anticipated to prologue the profitability of diseased vineyards. This is because the number of infected vines is reduced and mealybug vectors of leafroll viruses are controlled. In other words, increasing the number of healthy vines in a diseased vineyard and managing mealybug vectors enhances the production of high quality fruits and increases the productive lifespan of a diseased vineyard. It is expected that a follow-up project will put us in a position to determine such impact at the farm level.

Presentations on project progress and outcomes were made at seven different venues in 2015-2017, reaching to close to 450 participants:

1) Fuchs, M. 2016. *Updates on leafroll and red blotch diseases*, Long Island Horticulture Forum, March 4, Riverhead, NY (15 participants).

2) Fuchs, M. 2016. *Clean vine certification program*. Viticulture, March 5, Rochester, NY (160 participants).

3) Fuchs, M. 2017. *Updates on leafroll and red blotch diseases*. Eastern Winery Exposition, March 22-24, Syracuse, NY (40 participants).

4) Fuchs, M. 2017. *Clean vines for the eastern US: Why and how?* Summer grape conference and field day, July 25, Dunkirk, NY (75 participants).

5) Loeb, G, Fuchs, M, Gomez, M. 2016. *Managing the spread of leafroll in Vinifera grapes using insecticides and vine removal*. Cornell Fruit Field Day, July 20, Geneva, NY (150 participants).

Also, an article on *'The economic impact of grapevine leafroll disease on Vitis vinifera cv. Cabernet franc in Finger Lakes vineyards of New York'* by Atallah, S, Gomez, M, Fuchs, M and Martinson, T was published in the 2015 December issue of the Finger Lakes Vineyard Notes.

Roguing and the application of Movento was optimal to reduce the incidence of leafroll viruses in a diseased Cabernet franc vineyard at Sheldrake Point Winery in the Finger Lakes region of New York. This is a major breakthrough for the management of the devastating leafroll disease. This finding was shared with growers in New York and beyond. As a result, several growers in the Finger Lakes (Sheldrake Point Winery, Lamoreaux-Landing Wine Cellars, Wagner Vineyard Estate Winery, Hosmer Winery) have adopted our disease management recommendations. They have added two applications of Movento to their spray programs and are scouting more diligently for diseased vines to be eliminated in their vineyard. It is anticipated that our recommendations will be even more widely adopted once the actual impact of our recommendation on vineyard profitability will be measured through a follow-up funded project.

Beneficiaries:

Leafroll is a viral disease that affects grape production by reducing fruit yield and quality, and by limiting the profitability of vineyards. Unfortunately, integrated pest management (IPM) strategies are lacking for this disease. The NY grape, juice and wine industries benefit directly from our proposal. Through our research and extension efforts, 10 winery operations in the Finger Lakes and Long Island regions of NY have adopted our disease management recommendations. Without this program, NY grape growers will continue assuming huge risks due to viruses associated with leafroll disease in their vineyards. By adopting an IPM program, they will deal less with production uncertainties. Our project also benefits the NY economy by assisting local grape growers to enhance the quality of their products; thus, more dividends are expected from juices and wines produced in NY in contrast to juices and wines made from vines purchased from other states. Our project promotes sustained growth of the thriving NY grape, juice and wine industry through the development and adoption of an IPM program for leafroll viruses and their mealybug vector.

Lessons Learned:

One of the major lessons learned by grape growers and vineyard managers is the efficacy of Movento at reducing the level of mealybug populations in vineyards. They also learned that Movento alone is not sufficient to management leafroll diseased; vines need to be scouted and infected ones removed to reduce the virus inoculum and limit virus spread. Based on our findings, a number of vineyard operations in the Finger Lakes (Sheldrake Point Winery, Hosmer Winery, Lamoreaux-Landing Wine Cellars, Wagner Vineyards Estate Winery, Hazlitt 1852 Vineyards, Fox Run Vineyards) and Long Island (Beddel Cellars, One Woman Wines and Vineyards, Wollfer Estate Vineyard, Lenz Winery) have adopted Movento and are more thoroughly scouting for mealybugs and diseased vines. It is expected that our vineyard and disease management recommendations will be more widely adopted as the impact at the farm-level is determined.

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Project 2 (Final)

Effective Spraying of Fruit Crops: Workshops to Improve Knowledge and Profitability Whilst Decreasing Spray Costs and Losses

Project Summary:

The project was chosen due to my experiences of fruit growers asking what appeared to be very simple or straightforward questions concerning fruit spraying. The was also a dearth of knowledge and understanding regards new developments, particularly regarding reducing operator contamination and environmental pollution within application technology. None of these concerns should be a surprise to anyone due to the fact that very little, if any, attention is given to this important subject within the NY DEC sprayer operator license tuition and examination! I am afraid to say, in my opinion, this cause for concern regarding tuition for sprayer operators is across all the USA. Over the past twenty years I have met plenty of growers who learned at their father's knee, many young growers who were never taught this subject area at college.

Ten one-day workshops were held across the fruit-growing regions of NY State in the winter months of 2016 and 2017. 260 fruit growers learned about the basic underlying science and how they can make the correct adjustment of their existing sprayers. Growers now have a better appreciation of how droplets are retained in the crop canopy and on the fruit, the correct settings of their existing sprayers and how easy it is to measure and monitor spray application. Access to information on new equipment is always a challenge for growers and in the workshops modern machines were shown and their relative merits were discussed. Safe handling, operator protection and correct nozzle selection to improve deposition and reduce drift were discussed.

Project Approach:

A 1-day in-depth training course on better spray application techniques will improve fruit growers' knowledge of modern spraying techniques. The current system of extension delivery presents predominately research-based information in short, intense bursts. The grape industry, for example, is a rapidly expanding industry in New York, with many new entrants with vineyards in watershed areas. The apple industry is expanding with modern trellis designs and related improvements in application technology. There are a growing number of young people, predominately the sons and daughters of fruit growers, the future of our industry, who do not have the opportunity for in-depth training at local colleges and universities; this course will provide a detailed training opportunity. The course will help growers reduce pesticides by 30% - 40%, and, via hands-on training, will improve growers profitability. This innovative course

will be unique, providing an intensive, applied course and will be held in the growers' home regions.

A series of one-day in-depth workshops were held in the fruit regions of NY. A class room was organized by the local Cornell extension educator and a training course was held from 9.00 am to 4.00 pm. The content was based upon the engineering aspects of fruit spraying, so the basic layout/terminology was defined to ensure all were on the same page – students ranged from experienced growers to newcomers. New techniques within the engineering aspects were discussed in part one. After coffee break droplet formation and nozzle selection/calibration were detailed, again new developments and safety were discussed. After lunch the other fluid, air, was discussed in order to encourage a greater awareness of how airflow, speed and direction affects deposition. Too much air at too high a speed results in poor deposition and distribution. Improving output via filling systems, engineering controls, precision spraying and safety were the final section of the day-long course.

Specific accomplishments were a greater understanding of the detail of spraying in relation to their own farms, in particular calibration, airflow and improved timeliness were key accomplishments. I have met many of the course members since the course occurred over 3 years ago and they tell me the have applied some of the new technologies to their own businesses.

Goals and Outcomes Achieved:

Growers will be able to operate the sprayers correctly, thus applying the spray onto the target rather than into the air where it drifts, is wasted and can cause off-sight damage. Growers will understand how to improve their timeliness and therefore apply sprays when needed and not be forever chasing the calendar. Correct application at the correct time will allow growers to use 30-40% less spray over the season leading to improved profitability for course attendees. Apple growers who export to Western Europe will be able to comply with the increasing standards on pesticide application technology set by GLOBALGAP certification standards. Sprayer operators of New York will be safer due to a better understanding of the application process, resulting in less drift complaints, less pesticide use and better timeliness. There will be less human health issues associated with pesticide application.

Orchard workshops were held in Albion, Hudson Valley, Chazy and Newark. Vineyard workshops were held in Geneva and Hudson Valley. These were in-depth workshops covering correct filling of sprayers, nozzle selection, drift reduction, calibration, tank rinsing, safe operation, awareness of excess application, electronic aids to better spraying and new models of sprayers. Over 250 Participants learned how to spray effectively at 10 workshops.
This course benefits all residents of NY State by supplying safe, high quality, locally grown fruit, fruit products and wine to consumers.

Beneficiaries:

This course benefits all residents of NY State by supplying safe, high quality, locally grown fruit, fruit products and wine to consumers. Growers learned better, more accurate methods of pesticide application to both fruit trees and vineyards. Less pollution, both soil and airborne drift will be a direct result and much better coverage of leaves and fruit resulting in a better-quality fruit at the end of the season.

The request for a specific number of beneficiaries is very difficult to assess as far as numbers are concerned. Project staff can only say that those who purchase NY apples and grape-juice/wine are the recipients at the end of the food production chain – it is nearly impossible to ascertain how many people consume these excellent fruits.

Lessons Learned:

Just advertising the workshops is not enough. We had a number of growers bring their workers to the workshops, they realized the value of this education for their staff whereas other growers didn't even attend. It takes a coordinated effort with local educators to reach out and encourage growers to participate.

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Project 3 (Final)

Business Tools to stimulate Growth of New York State's Year Round Greenhouse Vegetable Industry

Project Summary:

Controlled environment agriculture (CEA) is a growing sector in New York State to help meet consumer interest in year-round, locally grown vegetables and small fruits. A major barrier to more rapid development in this area is lack of cost and market value information as part of the business planning process. In collaboration with CEA producers, suppliers, and buyers a suite of tools were developed including: cost accounting spreadsheets which provide a framework for assessing capital and operating costs and making decisions regarding which crops and production systems make the most economic sense; consumer willingness to pay for CEA/in-state lettuce and tomatoes, in which we found consumers to not differentiate in price between CEA and field produce but may be willing to pay an 18% and 30% premium for in-state grown lettuce and tomatoes, respectively, as compared with out-of-state; and a survey of commercial produce buyers interest in hydroponically grown products. The project culminated in a 2-day business planning workshop with 36 attendees representing 24 new and transitioning businesses attending. Collectively this group has proposed projects to develop an additional 90 acres of greenhouse crops (including tomatoes, peppers, leafy greens, herbs, strawberries, mushrooms, and tilapia [fish]). If these plans come to fruition, they would employ an anticipated 359 additional full-time employees and 155 part-time/seasonal employees.

Project Approach:

The CEA industry in New York State is growing by more than 10% annually in wholesale farm gate value (as indicated by the two most recent USDA Census of Agriculture survey's [2007 and 2012]. While some proposed CEA projects do come to fruition there also much hype and unrealistic expectations in this sector. CEA typically uses fairly sophisticated growing systems (ex: greenhouses with supplemental light and hydroponic production systems) which allow for high output but at initial high capital investment as well as annual operating costs. Prior to this project there was a lack of publically available cost accounting tools for New York State (and more broadly the Northeast). Due to this lack of information it was difficult for producers to put together realistic business plans and obtain financing for projects. The CEA producers we work with (and individuals planning CEA businesses) cite the difficulty in obtaining capital as the #1 barrier to bringing projects to fruition. The tools developed in this project (with significant input along the way from producers, suppliers, and buyers) provide a framework for cost accounting for lettuce and tomatoes (and can be adopted to other crops). Key findings from the cost accounting work are summarized in the Knowledge Gain section.

Beyond the costs of production, CEA allows for market opportunities, such as the ability to produce fresh vegetables year-round. However, prior to this project there was a lack of

information on how consumers would value (price willing to pay for) greenhouse grown products as compared to field grown. For example, 20 years ago greenhouse tomatoes were viewed by some as tasteless water filled products (though much has changed in varieties and harvest practices since that time). The consumer willingness to pay studies found that consumers would potentially pay 18 and 30 percent more for in-state grown lettuce and tomatoes, respectively, as compared to out of state products. Subjects did not differentiate in value between greenhouse and field grown. The positive side of this is that our research suggests there are not negative connotations with greenhouse or hydroponically grown. Collectively, such knowledge may help CEA producers receive a higher value for their products increasing their profitability. Finally, our survey of commercial produce buyers indicate they are already purchasing hydroponically grown products and would purchase more if a greater variety and volume were available. Freshness was associated with these products and this may present labelling and market opportunities.

By project design, much of the changes in industry practice will be achieved outside of the 2-year project period (subsequent to the 2-day business planning workshop).

Change to Baseline Farm Data

The project culminated in a 2-day CEA Business Planning Workshop held on November 1 and 2, 2017 at Cornell University. The attendee list is included in attachments. There were 34 stakeholder attendees representing 34 individuals from 26 businesses. The stakeholder attendees were asked to complete a baseline survey on their current operation as well as their proposed/expanded CEA business activities. The raw data (confidential) are included in an Excel sheet in the attachments. To summarize key findings: The 26 stakeholder attendees are currently employing 287 full-time employees and 514 part-time/seasonal employees in their agricultural businesses. Currently, the stakeholders currently grow in 56.5 acres of greenhouses producing a wide range of products (floriculture, leafy greens, microgreens, cucumbers, tomatoes, mushrooms and fresh market vegetables). When asked about their proposed/expanded CEA enterprise in NYS that are planning, the group, is proposing to develop an additional 90 acres of greenhouse crops (including tomatoes, peppers, leafy greens, herbs, strawberries, mushrooms, and tilapia [fish]). If these plans come to fruition, they would employ an anticipated 359 additional full-time employees and 155 part-time/seasonal employees. Follow up online surveys are planned for June 2018, December 2018, December 2019 and December 2020 (6, 12, 24, and 36 months after project end). While this is past the scope of the experiment this will help evaluate the economic impact of realized CEA business development.

Profitability, Competitiveness, Sustainability Improvements

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By project design, much of the changes in industry practice will be achieved outside of the 2-year project period (subsequent to the 2-day business planning workshop). However, below are anecdotes of how research and outreach in the project is beginning to be used by CEA stakeholders:

November conference attendee, Wheatfield Gardens, traditionally grew tomatoes in an 11-acre greenhouse facility. However, they have found it difficult to compete with larger producers in the U.S. and Canada. They are therefore transitioning to leafy greens and industrial hemp. They have recently installed 33,000 square feet of deep water culture (raft/pond) hydroponic system for leafy greens with new LED supplemental lights. The cost accounting spreadsheets developed by this project helped guide this transitioning and demonstrating the potentially higher margins/net revenue from leafy greens over tomatoes. The November 2017 conference greenhouse tour as well as many subsequent conversations has led the operation to install new energy efficient LEDs above the greenhouse crop. We estimate this could save roughly $30,000 in electricity per year.

November conference attendee, Amos Zittel and Sons, a greenhouse floriculture and field vegetable producer in Eden New York, is in the early stages of using their greenhouse facilities in the off-season (especially fall) to produce organic cucumbers. They are using the tomato spreadsheet to adapt to greenhouse cucumber production to conduct a more detailed cost analysis to see if they can make cucumbers a more profitable crop and what are the pinch points toward profitability.

A similar example, Walkill View Farms, also attended the November conference (they also produce field vegetables as well as spring bedding plants) and are in the early stages of exploring the potential costs and revenue of using their greenhouse facilities for vegetables during times of the year when they are underutilized.

November attendee, Bright Waters Farms, has been growing greenhouse tomatoes and peppers at their Utica facility. They attended the conference to learn more about alternative crops with potentially higher margins such as leafy greens and herbs.

Ivy Acres, is a large floriculture producer based on Long Islands (with 40 acres under cover with 225 full-time employees). They are exploring the market for various greenhouse vegetable productions and are planning to transition 11 acres to hydroponic vegetables to allow for year-round production to more fully utilize production space and retain more employees year-round. Mattson will be visiting the facility on June 18 to hear about the business plan and provide suggestions.

November conference attendee, Indoor Organic Gardens of Poughkeepsie, NY (IOGP) currently has 3 FT and 3 PT employees and sells microgreens at retail (direct an distributor), schools, senior centers, and restaurants. Through interaction with this project, the operation has experimented extensively with varying lighting, temperature, humidity, water, air, soil regimes that have increased yields, decreased inputs, decreased growing time, enhanced nutrient density [producer did not supply specific metrics]. IOGP is now exploring a new business plan (beyond Certified Organic Microgreens) to develop a new product on the market: a nutraceutical organic broccoli microgreens powder using a low temperature proprietary process. They have received interest from several Formulators and Ingredients Companies. This example shows how CEA may enable new value-added products beyond fresh produce.

November attendee, ROC City Aquaponics, LLC has developed a business plan and applied for $500,000 in grant money from the Finger Lakes Regional Economical Council to fill their financing gap. Unfortunately they did not receive an award. This has led to a reevaluation of the business plan. They are now looking to downsize the initial facility, reducing the hydroponic and fish grow-out area somewhat and eliminating the hatchery (as suggested by Professor Timmons, Cornell aquaculture guru, that met with ROC City at the November conference). ROC City has revised their projections and business plan and are currently having discussions with our lenders in attempt to meet the funding gap.

Follow up surveys will indicate changes in baseline over the next 3 years. Research and outreach materials from the project will live on at the project website:
http://cea.cals.cornell.edu/research/marketing.html

Knowledge Gain

The first part of the project consisted of research (both on-campus and with a breadth of the supply chain) to further understand the economics (cost of production and market interest) in CEA vegetables. The second part of the project consisted of outreach efforts: individual talks, CEA stakeholder meetings, website, and a 2-day business planning conference to convey project findings and provide resources to guide new and transitioning producers to put together and refine business plans.

Regarding knowledge gain for the cost of production, our advisory board requested the two crops we focus on include lettuce and tomatoes. Interactive spreadsheets were developed that allow the user to input data on the fixed (ex: land, structure and environmental controls, hydroponic system, processing, storage, and delivery equipment) and variable (ex: labor, seeds, fertilizer, water, biological controls, packaging) costs of production. Discussions with producers, greenhouse and supply companies, and researchers were used to seed the spreadsheets with realistic values for central New York. (Ultimately, it would be very important for a producer to obtain quotes and input the spreadsheet with values given

their particular crop and production system). Total annual costs and profitability are calculated on per head, per square foot, per house and per acre basis. These results are based on the inputs provided by the user and they can change with the parameters provided. We added an Analysis spreadsheet which reflects profits under an alternative prices and yields. A user can conduct sensitivity analysis under different assumptions to compare alternative scenarios. For lettuce the spreadsheet allows the user to choose from the two most common production systems (deep water culture and nutrient film technique). For tomatoes, 2 operational methods are typically followed –production for about 8 months of the year and closing an operation for the winter months (reducing heating costs and avoiding costs for supplemental lighting) and more intensive production year-round. We have developed spreadsheets for both scenarios.

Using the example spreadsheets, for lettuce lettuce, labor (53%), packaging (17%), and utilities (10%) share the biggest costs in a greenhouse operation. For tomato, utilities (39%), labor (11%), production supplies (7%) and packaging (7%) are the biggest variable costs in a year round greenhouse operation. And in an 8-month tomato production scenario, utilities (26%), labor (14%) and production supplies (12%) are the biggest variable costs. Following the baseline scenarios in the spreadsheet, greenhouse lettuce production could potentially achieve a net profit of 18%. Profitability for greenhouse tomatoes appears to be more difficult (than lettuce) when sold at the wholesale market. Interestingly, when looking at these two different scenarios (and assuming wholesale market price of $1.35 per pound) strategy #1 (8-month) leads to a net profit of 6% while strategy #2 leads to a net loss of about 8%. This suggests that year-round production of tomatoes may be difficult unless one can further increase in size (to further increase efficiencies and reduce capital expenses) or gain a more advantageous market prices. These spreadsheets were shared with Cornell CEA board members for their review and feedback and then shared at the 2-day business planning conference.

Our second set of research objectives focused on consumer interest in CEA and locally grown products and a survey of commercial produce buyer needs.

Dyson school graduate student, Irin Ferdous Nishi, conducted 6 sessions comprising the willingness to pay study (WTP) for two vegetables: tomato and lettuce. These studies aimed at determining potential price advantages (or disadvantages) for year-round local vegetables grown in Controlled Environment Agriculture (CEA). The specific objective was to measure differences in consumer willingness to pay for tomatoes and lettuce with different origins (New York State vs. Out-of-State) and grown under different production systems (CEA vs. field-grown). In addition we examined whether further information about origin and production system affect consumer willingness to pay. In a lab setting (Cornell Lab for Experimental Economics and Decision Research), we manipulated information about the different production systems and origins of tomatoes and lettuce. In our experiments subjects bid for tomatoes and lettuce grown in different origins and grown production systems. A BDM auction was used to elicit consumers' maximum WTP. Subjects were presented 4 categories of tomatoes and 4 categories of lettuce (CEA-NYS, field-NYS, CEA-out-of-state and field-out-of-state). Next, they indicated their maximum WTP for 8 ounces of each tomato and 8 ounces of each lettuce type. For tomatoes, there were a total of 428 observations from 107 subjects and for lettuce there were 444 observations from 111 subjects. In the 6 experimental sessions, in sessions 1, 2 & 3: subjects were informed about the

production systems and origins of the tomatoes and lettuce; in sessions 4, 5 & 6: subjects received more information regarding the production systems and origins (availability, food miles and job opportunity) of tomatoes and lettuce. To summarize the findings, consumers are willing to pay 30% price premiums for New York State grown tomatoes and 18% price premium for New York State grown lettuce, consumers are indifferent about the production systems for both tomato and lettuce, providing detailed information about the production system/origin does not affect consumer WTP for both tomato and lettuce. The results suggests that it may be possible for NYS producers to receive a higher price for their produce vs. out-of-state. This could help alleviate some of the difficulties of CEA production (such as high operating costs and low margins).

Dr. Julie Stafford surveyed commercial produce buyers represented supermarkets, restaurants, and institutions. A slide set was prepared to summarize the findings (uploaded in the files area). All respondents offer at least some local products, with many offering hydroponic products. Reasons noted for purchasing/offering local products, include "supports the local economy, fresher produce, sustainable practices, reduces carbon footprint." Reasons noted for purchasing/offering hydroponic/CEA products include: "freshness, quick access/availability, less pesticides, better for environment, organic certification possible, improved food safety". Respondents indicated they would not refuse hydroponic/CEA produce as a matter of course, specific reasons for refusing or not offering include: "too expensive, customers wouldn't buy it, no suppliers in the region, store does not have relations with hydroponic farmers". The results were quite positive in that produce buyers are already buying some local, hydroponic products and would purchase more were a greater variety and quantity available that met their specifications.

Periodic meetings of the greenhouse advisory board and then the November 2017 2-day business planning workshop were major venues for dissemination of research results. Of the stakeholder attendees of the workshop (34 individuals from 26 businesses/associations), the evaluation suggests that information was gained and will be put to use in planning new and transitioning businesses. The attendees gave the following ranks (1=strongly disagree, 5=strongly agree) to the statements: I am leaving the conference with valuable concepts that will help me further develop my CEA business plan (4.4/5); I gained a greater understanding of the technical requirements and constraints for producing CEA products (4.1/5); I have a greater understanding of the values consumers and produce buyers have when making purchasing decisions (3.9/5); I'm more likely to implement my new/transitioning CEA business based on attending this conference (4.4/5).

Outreach

Provide details on efforts to disseminate information generated by or about the project to the broader industry. It is expected that you will provide a detailed accounting of all presentations, educational programs, lectures, field days, or any other venue in which information about the project was distributed. These must include the number of producers reached (estimates are ok). In addition, list all publications generated by the project, including articles, pamphlets, posters, videos, or any other media that communicated information about the project (please attach these). Information must be presented

in a specific, detailed, and organized format. General phrases such as “numerous presentations” or “several articles” are unacceptable. A spreadsheet of outreach efforts is suggested and can be attached.

One major effort was to convene periodic meetings of the CEA Advisory/Stakeholder group which pulled together a breadth of industry members including producers, producer buyers, financiers, greenhouse manufacturer’s and allied trade. Initially (ex: Dec. 2015, July 2016) these meetings were used to guide development of the project and as a forum for our stakeholders to advise on: the crops and production environment for the consumer Willingness to Pay studies, the crops to include for cost accounting spreadsheets, and the types of produce buyers and questions for the produce buyer survey. Later meetings (ex: April 2017, and Nov. 2017) were held to present results from this project’s studies, get advisory stakeholder feedback, and discuss future research goals.

Mattson, N.S., J. Stafford. 2015. Co-organized: CEA Stakeholder meeting, Dec. 8, 2015, 42 participants, length in hours=6.75, total contact hours=283.5. Topics specific to this project:

- Introduction to 2-year project: Business tools to stimulate growth of New York State’s Year-Round Greenhouse Vegetable Industry, Neil Mattson
- Discussion and feedback on 3 areas critical to the 2-year project
    - Understanding consumer willingness to pay for locally-produced vegetables, Miguel Gomez
    - Attributes produce buyers are looking for in locally grown, Julie Stafford
    - Developing expense planning tools for CEA businesses, Miguel Gomez
- Next Step: Collaborating across the supply chain, Julie Stafford and Neil Mattson

Mattson, N.S. and J. Stafford. 2016. Co-organized: CEA Stakeholder meeting. Cornell University, Ithaca, NY. July 21, 2016, 50 participants, length in hours=6.75, total contact hours=337.50. Topics specific to this project:

- Update: Consumer Willingness to Pay Study, Irin Nishi
- Round-Table Rotations: CEA Committee Feedback, Mattson and Stafford

Mattson, N.S. and J. Stafford. 2017. Co-organized: CEA Advisory Board/Stakeholder meeting. Cornell University, Ithaca, NY. April 4, 2017, 80 participants, length in hours=5.75, total contact hours=460. Topics specific to this project:

- Update on New Business Tool Development, Irin Nishi

Mattson, N.S. and J. Stafford. 2017. Co-organized: CEA Advisory Board/Stakeholder meeting. Cornell University, Ithaca, NY. November 3, 2017, 90 participants, length in hours=7, total contact hours=630. Topics specific to this project:

- Discussion on research, extension, and education priorities in food and agriculture in response to USDA National Institute of Food and Agriculture (NIFA) request for stakeholder input

Presentations at winter Greenhouse and Vegetable meetings:

Drs. Gomez and Mattson presented on this project in a session at the Empire State Producers Expo in Syracuse on January 18. The session was attended by 50 individuals:

Mattson, N.S. 2017. Empire State Producers Expo, Syracuse, NY, “Controlled environment agriculture for year-round vegetables: production systems, costs, and potential yield”, January 18, 2017, 51 participants, length in hours=0.67, total contact hours=34.

Gomez, M.I. and Nishi, I.F. 2017. Empire State Producers Expo, Syracuse, NY, “CEA vegetables: consumer willingness to pay and cost studies”, January 18, 2017, 51 participants, length in hours=0.5, total contact hours=25.5.

Dr. Stafford presented on CEA, its growth potential in NY, current barriers, and results from this Ag and Markets project, at the Dyson School's 2017 Economic Outlook for Agriculture.

Stafford, J. 2017. Dyson School 2017 Economic Outlook for Agriculture, “Establishing New York as a Leader in Local, Year-Round Vegetable Production”, January 23, 2017, 40 participants, length in hours=0.5, total contact hours=20.

Mattson presented at Five Winter 2017 Greenhouse and Vegetable Schools, while this CEA project was not the only topic of the presentations, several slides were included at the beginning of the presentation to familiarize attendees with this Ag and Markets project and the products coming out of the work (consumer willingness to pay, interactive spreadsheets, and to be aware of the upcoming 2-day entrepreneur summit). These included:

Riverhead, NY, January 17, 2017, 90 attendees

Albany, NY, January 23, 2017, 70 attendees

Middletown, NY, January 24, 2017, 50 attendees

Kingston, NY, February 7, 2017, 40 attendees

Albany, NY, February 8, 2017, 55 attendees

CEA Business Planning Workshop

The project culminated in a 2-day CEA Business Planning Workshop held on November 1 and 2, 2017 at Cornell University. The attendee list is included in attachments. There were 34 stakeholder attendees representing 34 individuals from 26 businesses. In addition there were 20 attendees representing co-organizers, speakers, panels, and mentors.

Mattson, N.S. Stafford, J., Gomez, M.I., Biasillo, L. 2017. Organized, CEA Entrepreneur Conference, Cornell University, Ithaca, NY. November 1-2, 2017. 54 participants, length in hours=14, total contact hours=756.

Publications

A project website was developed which serves as a clearinghouse for the materials developed by this project at: http://cea.cals.cornell.edu/research/marketing.html

Spreadsheets: Three cost accounting spreadsheets were developed specifically during this project (these are available for download by producers at the project website, and are included in attachments)

- Hydroponic lettuce
- Greenhouse tomatoes with an 8 month production cycle
- Greenhouse tomatoes

Slide sets:

Several slide sets were developed and presented at CEA Advisory/Stakeholder meetings, winter 2017 Greenhouse and Vegetable conferences, the Empire State Producer's Expo, and the 2-day CEA Business Planning workshop. These presentations are available at the project website, and attached:

- Introduction to CEA, common crops, systems, and market trends, Neil Mattson
- Ten things you should know when starting a CEA business, Neil Mattson
- An overview of the interactive cost accounting spreadsheets for greenhouse lettuce and tomato production and key findings, Irin Nishi, Miguel Gomez, Neil Mattson
- A summary of the consumer willingness to pay study and key findings, Irin Nishi, Miguel Gomez, Neil Mattson
- Key insights among New York State produce buyers across diverse market channels, Julie Stafford

Master Thesis: The lettuce consumer WTP study conducted by Ms. Irin Nishi was written into her detailed M.S. thesis (available at the project website and attached):

Nishi, I.F. 2017. Consumer willingness to pay for local vegetables grown in a controlled environment: the case of lettuce. M.S. Thesis, Cornell University, 45 pp.

Media

A Cornell Chronicle on the November 2017 2-day entrepreneur conference, and subsequent 1-day broader CEA stakeholder meeting is available at http://news.cornell.edu/stories/2017/11/cornell-group-explores-future-indoor-farming

Industry Changes

By project design, much of the 2-year product period focuses on research and interaction with CEA industry members to develop a greater understanding of the factors influencing production costs and market acceptance/value of greenhouse vegetables. The major outreach effort of the project was then,

by design, held in the last quarter of the project. Therefore while knowledge was gained in several commercially relevant areas, industry adoption is still being assessed. (For example, attendees of the 2-day November 2017 conference have agreed to complete surveys on changes in baseline metrics 6, 12, 24, and 36 months after the project. Below are some of the major findings from our work, with a few examples of how they are already being utilized by industry.

Cost Accounting Spreadsheets

The cost-accounting spreadsheets, provided information to back up what we are observing to some degree in the industry. Greenhouse tomatoes appear to be a lower margin, more mature crop in the marketplace. (There are examples of huge greenhouse operations successfully growing tomatoes in Canada (Leamington), U.S. (ex: California), and Mexico (in less sophisticated greenhouses), and in NY (Intergrow produces about 70 acres of greenhouse tomatoes in two facilities). Our results indicate low return for small-scale producers of greenhouse tomatoes selling to a wholesale market. This suggests that an operation would need to expand to achieve economies of scale, or if staying small would need to focus on higher value markets (ex: direct to consumers or restaurants).

Examples of how this information is being put to practice:

November conference attendee, Wheatfield Gardens, traditionally grew tomatoes in an 11-acre greenhouse facility. However, they have found it difficult to compete with larger producers in the U.S. and Canada. They are therefore transitioning to leafy greens and industrial hemp. They have recently installed 33,000 square feet of deep water culture (raft/pond) hydroponic system for leafy greens with new LED supplemental lights. The cost accounting spreadsheets developed by this project helped guide this transitioning and demonstrating the potentially higher margins/net revenue from leafy greens over tomatoes. The November 2017 conference greenhouse tour as well as many subsequent conversations has led the operation to install new energy efficient LEDs above the greenhouse crop. We estimate this could save roughly $30,000 in electricity per year.

Besides, absolute data, we believe the cost-accounting spreadsheets.

November conference attendee, Amos Zittel and Sons, a greenhouse floriculture and field vegetable producer in Eden New York, is in the early stages of using their greenhouse facilities in the off-season (especially fall) to produce organic cucumbers. They are using the tomato spreadsheet to adapt to greenhouse cucumber production to conduct a more detailed cost analysis to see if they can make cucumbers a more profitable crop and what are the pinch points toward profitability.

A similar example, Walkill View Farms, also attended the November conference (they also produce field vegetables as well as spring bedding plants) and are in the early stages of exploring the potential costs and revenue of using their greenhouse facilities for vegetables during times of the year when they are underutilized.

November attendee, Bright Waters Farms, has been growing greenhouse tomatoes and peppers at their Utica facility. They attended the conference to learn more about alternative crops with potentially higher margins such as leafy greens and herbs.

Collectively the cost-accounting work conducted by the project provides a framework for new and transitioning CEA operations the potential costs and returns in New York State. This tool was particularly needed as there was no publically available production cost tools for New York / the Northeast.

This project also researched the possible market advantages of CEA. Interestingly, while consumers do not intend to pay a price premium for CEA vs. field produce they would pay a potential 18% and 30%

price premium for lettuce and tomatoes, respectively, produced in-state vs. out-of-state. This finding is positive for CEA as it 1) demonstrates that consumers don't hold negative connotations for CEA produce and 2) it demonstrates demand for in-state produce and CEA production methods allow for consistent winter production. They survey results demonstrate it may be possible for NYS CEA producers to obtain a higher price point for their produce than out-of-state produce if they can successfully label/market as in-state.

The survey of commercial produce buyers also demonstrates interest in locally-grown CEA products. The majority of produce buyers already buy some degree of hydroponic products and were purchase more if a greater volume and variety of products were available. A few key insights from the survey: Produce buyers have been focused on "local" for quite some time but continue to retain varied definitions (ex: 100 miles vs. in-state); Hydroponically-grown produce was perceived as clearly aligning "local" with "freshness"; local, year-round produce may allow for achieving a pricing upside (ex: 10%); Produce buyers perceive additional potential for a broader variety of local leafy greens, tomatoes and vegetables in general to be grown hydroponically. Example suggestions included: chard, spinach, kale, peppers, cucumbers, radishes, eggplant. Overall hydroponics is viewed as an enabler not a barrier.

A couple examples where both cost and market information has been used by November conference attendees:

Ivy Acres, is a large floriculture producer based on Long Islands (with 40 acres under cover with 225 full-time employees). They are exploring the market for various greenhouse vegetable productions and are planning to transition 11 acres to hydroponic vegetables to allow for year-round production to more fully utilize production space and retain more employees year-round. Mattson will be visiting the facility on June 18 to hear about the business plan and provide suggestions.

November conference attendee, Indoor Organic Gardens of Poughkeepsie, NY (IOGP) currently has 3 FT and 3 PT employees and sells microgreens at retail (direct an distributor), schools, senior centers, and restaurants. Through interaction with this project, the operation has experimented extensively with varying lighting, temperature, humidity, water, air, soil regimes that have increased yields, decreased inputs, decreased growing time, enhanced nutrient density [producer did not supply specific metrics]. IOGP is now exploring a new business plan (beyond Certified Organic Microgreens) to develop a new product on the market: a nutraceutical organic broccoli microgreens powder using a low temperature proprietary process. They have received interest from several Formulators and Ingredients Companies. This example shows how CEA may enable new value-added products beyond fresh produce.

November attendee, ROC City Aquaponics, LLC has developed a business plan and applied for $500,000 in grant money from the Finger Lakes Regional Economical Council to fill their financing gap. Unfortunately they did not receive an award. This has led to a reevaluation of the business plan. They are now looking to downsize the initial facility, reducing the hydroponic and fish grow-out area somewhat and eliminating the hatchery (as suggested by Professor Timmons, Cornell aquaculture guru, that met with ROC City at the November conference). ROC City has revised their projections and business plan and are currently having discussions with our lenders in attempt to meet the funding gap.

Farm Success Stories

We are currently in the process of developing 6 month post project survey. In the meantime below are three specific results that we are aware of:

November conference attendee, Wheatfield Gardens, is transitioning from tomatoes (a more mature, low margin CEA crop) to leafy greens and industrial hemp. They have recently installed 33,000 square feet of deep water culture hydroponic system for leafy greens with new LED supplemental lights. The cost accounting spreadsheets developed by this project helped guide this transitioning and demonstrating the potentially higher margins/net revenue from leafy greens over tomatoes. The November 2017 conference greenhouse tour as well as many subsequent conversations has led the operation to install new energy efficient LEDs above the greenhouse crop. We estimate this could save roughly $30,000 in electricity per year.

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November conference attendee, Indoor Organic Gardens of Poughkeepsie, NY (IOGP) currently has 3 FT and 3 PT employees and seels microgreens at retail (direct an distributor), schools, senior centers, and restaurants. Through interaction with this project, the operation has experimented extensively with varying lighting, temperature, humidity, water, air, soil regimes that have increased yields, decreased inputs, decreased growing time, enhanced nutrient density [producer did not supply specific metrics]. IOGP is now exploring a new business plan (beyond Certified Organic Microgreens) to develop a nutraceutical organic broccoli microgreens powder using a low temperature proprietary process that has tested a 51,600 IU/100g for Vitamin A, beta carotene. They have received interest from several Formulators and Ingredients Companies .

Summary

Controlled environment agriculture (CEA) is a growing sector in New York State to help meet consumer interest in year-round, locally grown vegetables and small fruits. A major barrier to more rapid development in this area is lack of cost and market value information as part of the business planning process. In collaboration with CEA producers, suppliers, and buyers a suite of tools were developed including: cost accounting spreadsheets which provide a framework for assessing capital and operating costs and making decisions regarding which crops and production systems make the most economic sense; consumer willingness to pay for CEA/in-state lettuce and tomatoes, in which we found consumers to not differentiate in price between CEA and field produce but may be willing to pay an 18% and 30% premium for in-state grown lettuce and tomatoes, respectively, as compared with out-of-state; and a survey of commercial produce buyers interest in hydroponically grown products. The project culminated in a 2-day business planning workshop with 36 attendees representing 24 new and transitioning businesses attending. Collectively this group has proposed projects to develop an additional 90 acres of greenhouse crops (including tomatoes, peppers, leafy greens, herbs, strawberries, mushrooms, and tilapia [fish]). If these plans come to fruition, they would employ an anticipated 359 additional full-time employees and 155 part-time/seasonal employees.

Goals and Outcomes Achieved:

The first part of the project consisted of research (both on-campus and with a breadth of the supply chain) to further understand the economics (cost of production and market interest) in CEA vegetables. The second part of the project consisted of outreach efforts: individual talks,

CEA stakeholder meetings, website, and a 2-day business planning conference to convey project findings and provide resources to guide new and transitioning producers to put together and refine business plans.

Regarding knowledge gain for the cost of production, our advisory board requested the two crops we focus on include lettuce and tomatoes. Interactive spreadsheets were developed that allow the user to input data on the fixed (ex: land, structure and environmental controls, hydroponic system, processing, storage, and delivery equipment) and variable (ex: labor, seeds, fertilizer, water, biological controls, packaging) costs of production. Discussions with producers, greenhouse and supply companies, and researchers were used to seed the spreadsheets with realistic values for central New York. (Ultimately, it would be very important for a producer to obtain quotes and input the spreadsheet with values given their particular crop and production system). Total annual costs and profitability are calculated on per head, per square foot, per house and per acre basis. These results are based on the inputs provided by the user and they can change with the parameters provided. We added an Analysis spreadsheet which reflects profits under an alternative prices and yields. A user can conduct sensitivity analysis under different assumptions to compare alternative scenarios. For lettuce the spreadsheet allows the user to choose from the two most common production systems (deep water culture and nutrient film technique). For tomatoes, 2 operational methods are typically followed – production for about 8 months of the year and closing an operation for the winter months (reducing heating costs and avoiding costs for supplemental lighting) and more intensive production year-round. We have developed spreadsheets for both scenarios.

Using the example spreadsheets, for lettuce, labor (53%), packaging (17%), and utilities (10%) share the biggest costs in a greenhouse operation. For tomato, utilities (39%), labor (11%), production supplies (7%) and packaging (7%) are the biggest variable costs in a year round greenhouse operation. And in an 8-month tomato production scenario, utilities (26%), labor (14%) and production supplies (12%) are the biggest variable costs. Following the baseline scenarios in the spreadsheet, greenhouse lettuce production could potentially achieve a net profit of 18%. Profitability for greenhouse tomatoes appears to be more difficult (than lettuce) when sold at the wholesale market. Interestingly, when looking at these two different scenarios (and assuming wholesale market price of $1.35 per pound) strategy #1 (8-month) leads to a net profit of 6% while strategy #2 leads to a net loss of about 8%. This suggests that year-round production of tomatoes may be difficult unless one can further increase in size (to further increase efficiencies and reduce capital expenses) or gain a more advantageous market prices. These spreadsheets were shared with Cornell CEA board members for their review and feedback and then shared at the 2-day business planning conference.

Our second set of research objectives focused on consumer interest in CEA and locally grown products and a survey of commercial produce buyer needs.

Dyson school graduate student, Irin Ferdous Nishi, conducted 6 sessions comprising the willingness to pay study (WTP) for two vegetables: tomato and lettuce. These studies aimed at determining potential price advantages (or disadvantages) for year-round local vegetables grown in Controlled Environment Agriculture (CEA). The specific objective was to measure differences in consumer willingness to pay for tomatoes and lettuce with different origins (New

York State vs. Out-of-State) and grown under different production systems (CEA vs. field-grown). In addition we examined whether further information about origin and production system affect consumer willingness to pay. In a lab setting (Cornell Lab for Experimental Economics and Decision Research), we manipulated information about the different production systems and origins of tomatoes and lettuce. In our experiments subjects bid for tomatoes and lettuce grown in different origins and grown production systems. A BDM auction was used to elicit consumers' maximum WTP. Subjects were presented 4 categories of tomatoes and 4 categories of lettuce (CEA-NYS, field-NYS, CEA-out-of-state and field-out-of-state). Next, they indicated their maximum WTP for 8 ounces of each tomato and 8 ounces of each lettuce type. For tomatoes, there were a total of 428 observations from 107 subjects and for lettuce there were 444 observations from 111 subjects. In the 6 experimental sessions, in sessions 1, 2 & 3: subjects were informed about the production systems and origins of the tomatoes and lettuce; in sessions 4, 5 & 6: subjects received more information regarding the production systems and origins (availability, food miles and job opportunity) of tomatoes and lettuce. To summarize the findings, consumers are willing to pay 30% price premiums for New York State grown tomatoes and 18% price premium for New York State grown lettuce, consumers are indifferent about the production systems for both tomato and lettuce, providing detailed information about the production system/origin does not affect consumer WTP for both tomato and lettuce. The results suggests that it may be possible for NYS producers to receive a higher price for their produce vs. out-of-state. This could help alleviate some of the difficulties of CEA production (such as high operating costs and low margins).

Dr. Julie Stafford surveyed commercial produce buyers represented supermarkets, restaurants, and institutions. A slide set was prepared to summarize the findings (uploaded in the files area). All respondents offer at least some local products, with many offering hydroponic products. Reasons noted for purchasing/offering local products, include "supports the local economy, fresher produce, sustainable practices, reduces carbon footprint." Reasons noted for purchasing/offering hydroponic/CEA products include: "freshness, quick access/availability, less pesticides, better for environment, organic certification possible, improved food safety". Respondents indicated they would not refuse hydroponic/CEA produce as a matter of course, specific reasons for refusing or not offering include: "too expensive, customers wouldn’t buy it, no suppliers in the region, store does not have relations with hydroponic farmers". The results were quite positive in that produce buyers are already buying some local, hydroponic products and would purchase more were a greater variety and quantity available that met their specifications.

Periodic meetings of the greenhouse advisory board and then the November 2017 2-day business planning workshop were major venues for dissemination of research results. Of the stakeholder attendees of the workshop (34 individuals from 26 businesses/associations), the evaluation suggests that information was gained and will be put to use in planning new and transitioning businesses. The attendees gave the following ranks (1=strongly disagree, 5=strongly agree) to the statements: I am leaving the conference with valuable concepts that will help me further develop my CEA business plan (4.4/5); I gained a greater understanding of the technical requirements and constraints for producing CEA products (4.1/5); I have a greater understanding of the values consumers and produce buyers have when making purchasing

decisions (3.9/5); I'm more likely to implement my new/transitioning CEA business based on attending this conference

Beneficiaries:

The primary target audience for our project is new NYS producers of Controlled Environment Agriculture (CEA) greenhouse vegetables. The production of locally grown vegetables in greenhouses located in NYS has the potential to further increase based on consumer preference shifting to locally grown produce. In 2012, there were 435 operations in NYS that grew greenhouse/high tunnel vegetables (Census of Agriculture, 2014). They used 114 acres of covered area to produce an annual wholesale value of $27.4 million, a 54% increase from 2007. NYS ranks second nationally in greenhouse/high tunnel vegetable production. Our second target audience is current field vegetable or greenhouse floriculture producers that want to expand/transition to develop a CEA greenhouse vegetable business. NYS ranks fifth among the nationally for the value of fresh market field vegetable production, with $450 million annual wholesale value (Census of Agriculture, 2014). The NYS floriculture industry is comprised of 1,124 production operations with 550 acres of greenhouse area producing $211 million annually in wholesale value (Census of Agriculture, 2014). Many floriculture producers are beginning to look at greenhouse vegetables as a new market opportunity as floriculture sales are in decline and as a way to keep their greenhouse and employed labor utilized year-round.

Lessons Learned:

By project design, much of the 2-year product period focuses on research and interaction with CEA industry members to develop a greater understanding of the factors influencing production costs and market acceptance/value of greenhouse vegetables. The major outreach effort of the project was then, by design, held in the last quarter of the project. Therefore while knowledge was gained in several commercially relevant areas, industry adoption is still being assessed. Below are some of the major findings from our work, with a few examples of how they are already being utilized by industry.

Cost Accounting Spreadsheets

The cost-accounting spreadsheets, provided information to back up what we are observing to some degree in the industry. Greenhouse tomatoes appear to be a lower margin, more mature crop in the marketplace. (There are examples of huge greenhouse operations successfully growing tomatoes in Canada (Leamington), U.S. (ex: California), and Mexico (in less sophisticated greenhouses), and in NY (Intergrow produces about 70 acres of greenhouse tomatoes in two facilities). Our results indicate low return for small-scale producers of greenhouse tomatoes selling to a wholesale market. This suggests that an operation would need to expand to achieve economies of scale, or if staying small would need to focus on higher value markets (ex: direct to consumers or restaurants).

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This project also researched the possible market advantages of CEA. Interestingly, while consumers do not intend to pay a price premium for CEA vs. field produce they would pay a potential 18% and 30% price premium for lettuce and tomatoes, respectively, produced in-state vs. out-of-state. This finding is positive for CEA as it 1) demonstrates that consumers don't hold negative connotations for CEA produce and 2) it demonstrates demand for in-state produce and CEA production methods allow for consistent winter production. They survey results demonstrate it may be possible for NYS CEA producers to obtain a higher price point for their produce than out-of-state produce if they can successfully label/market as in-state.

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insights from the survey: Produce buyers have been focused on “local” for quite some time but continue to retain varied definitions (ex: 100 miles vs. in-state); Hydroponically-grown produce was perceived as clearly aligning “local” with “freshness”; local, year-round produce may allow for achieving a pricing upside (ex: 10%); Produce buyers perceive additional potential for a broader variety of local leafy greens, tomatoes and vegetables in general to be grown hydroponically. Example suggestions included: chard, spinach, kale, peppers, cucumbers, radishes, eggplant. Overall hydroponics is viewed as an enabler not a barrier.

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Project 4 (Final)

Building the Profitability of the Table Beet Industry in New York State

Project Summary:

Weeds and diseases are significant factors affecting productivity and sustainability of the New York table beet industry. Herbicides applied both pre- and post- emergence are the dominant tactic used for weed control in conventional production. Recommendations for weed management using herbicides were optimized resulting in enhanced confidence in crop safety and season-long weed control. Findings also provided a better understanding of the weed spectrums controlled by individual herbicides in the program. Cercospora leaf spot (CLS) is the predominant fungal disease affecting foliar health. Healthy foliage is essential at the end of the season with minimal competition from weeds to enable mechanized harvest. Fungicide resistance was identified as a significant factor affecting the sustainability of CLS control. Best management practices to slow fungicide resistance were developed, and alternative products were identified. OMRI-registered products providing moderate control of CLS were also identified to support the expansion of the organic table beet industry.

Project Approach:

The development of resistance to conventional fungicides is the single biggest threat to the durability of the current management strategies for Cercospora leaf spot of table beet. The maintenance of healthy foliage is essential for mechanized harvesting of broadacre table beet crops. This project found that over 70% of *Cercospora beticola* isolates within a field are resistant to strobilurin fungicides (Fungicide Resistance Action Group [FRAC] 11). At the beginning of this project, producers relied upon FRAC 11 fungicides and hence incurred cost but did not obtain control of foliar disease. The project also identified some isolates were already highly resistant, and approximately 30% of isolates were moderately resistant to demethylation inhibitor fungicides (FRAC 3). In the absence of FRAC 11 fungicides, in the short-term, producers will become increasingly reliant upon FRAC 3 modes of action as these are the only single-site mode of action that is registered for foliar disease control in New York. This will consequently lead to a reliance upon this group selecting the pathogen population towards resistance to FRAC 3. This project therefore highlighted the need for adherence to best management practices to slow resistance development to FRAC group 3 in the short term, and the imperative to identify products in alternative FRAC groups in the medium term. One of these recommendations is mixing with a multi-site mode of action such as a copper-based product (FRAC M1). The small plot, replicated disease management trials conducted at Geneva identified a pre-mixed fungicide containing a FRAC group 7 mode of action with superior efficacy that could achieve season long disease control with only one application. This tactic

would reduce the need for repeated fungicide applications and hence slow the development of resistance to single-site mode of action products.

The efficacy of a broad range of OMRI-registered products for Cercospora leaf spot was evaluated to support the expansion of the organic table beet industry. These trials were conducted at Geneva and Ithaca, in small-plot replicated trials in each year of the project. Double Nickel + an OMRI-registered copper formulation, Cueva were identified as providing moderate and reproducible disease control equivalent to that of the industry standard FRAC 3 fungicide (Tilt). Double Nickel is a microbial biopesticide containing Bacillus amyloliquefaciens D747 strain and a member of FRAC group 44. It is therefore applicable for organic and conventional table beet production with rotational benefits to manage fungicide resistance.

Weed management is also critical to the ability to produce and harvest the table beet crop. In recent years, a number of table beet herbicides have been lost due to EPA review and/or manufacturers discontinuing products due to the reliance of the sugar beet industry on "Round-Up Ready" genetic material for weed control. About five years ago, New York was able to obtain a special local needs registration for the herbicides, Nortron and UpBeet. At the start of this project, growers expressed concern over the crop safety of using Nortron. There was also a need to better understand the strength of each herbicide alone and in combination for management of different weed species.

Goals and Outcomes Achieved

Disease Management

Producers gained directly applicable information on the status of fungicide resistance on their farms and hence the imperative to adhere to best management practices to improve the sustainability of conventional table beet production in the short-term,. The importance of strategies to minimize risk of disease such as adherence to a four-year rotation between table beet crops was also emphasized.

In three small plot, replicated trials conducted at Geneva, NY, and Ithaca, NY, the fungicide, Aprovia Top significantly reduced temporal disease progress by 86.7% to 97.3% compared with nontreated plots, and the mean survival time of leaves was significantly extended. The demethylation inhibitor, propiconazole also provided significant disease control in two trials in 2016. However, the presence of highly and moderately resistant isolates to propiconazole in table beet fields across New York threatens the durability of relying on this product for Cercospora leaf spot control. Efficacious fungicides significantly increased the dry weight of foliage but did not significantly affect the dry weight of roots, and root shoulder diameter. The enhanced longevity of leaves and increased dry weight of foliage may extend opportunities for

mechanized harvesting without deleteriously affecting root yield parameters which are strictly regulated for processing markets.

In two trials, an OMRI-registered copper (Cueva) + Double Nickel LC resulted in significantly improved disease control equivalent to conventional fungicides at both locations.

Evaluation of efficacy data from conventional fungicides and OMRI-listed products is included in the paper published in Plant Disease (2017), and Plant Disease Management Reports (2018). These publications are provided as attachments to this report.

Weed Management

In the small-plot replicated trials in Freeville, NY (2016) and Geneva, NY (2017) there was no crop injury when the maximum labeled rate (60 oz/acre) of Nortron herbicide was applied pre-emergence (PRE). Producers previously were concerned about the high rate and were using 30 oz/acre which was shown to be suboptimal for the management of some weed species.

All PRE-programs tested provided >91% weed control compared to the untreated. Dual Magnum alone provided complete control of large crabgrass early in the season, and season-long control of pigweed and hairy galinsoga. The addition of Nortron PRE added lambsquarter control and also improved control of hairy galinsoga, smartweed, shepherd's purse, and purslane.

The POST-emergence herbicide treatments did not significantly injure beets at the 2- or 4-leaf stage, with the exception of Spin-Aid at the 1.5 pt/acre rate (2-leaf stage beets). Spin-Aid at 0.5 pt/acre did not injure 4-leaf stage beets. Notably, the herbicide, Stinger provided control of ragweed and hairy nightshade that escaped the PRE treatments.

Increase in Producer Knowledge

At the conclusion of the project, five farms and two industry representatives were sent a project evaluation form. Participants were asked to rank the increase in knowledge they had gained from this project's outreach effort. There were seven questions based on the learning goals set by the project team. A scale of 0 (no increase in knowledge) to 5 (much knowledge gained) was used. All responses were in the 3 to 5 range, with the average (in parentheses) for each question below:

> Fungicide Resistance Groups (4.0)
>
> Resistance of C. beticola to Quadris fungicide (4.0) Resistance of C. beticola to Tilt fungicide (3.5) Effectiveness of currently registered fungicides (4.0)

Crop safety of Nortron herbicide pre-emergence (3.8) Safety of Post-emergence herbicides (3.5)

Effectiveness of beet herbicides on different weed species (4.3)

Beneficiaries:

The main beneficiaries are NY beet producers. The potential impact of a 10% increase in yield overall due to improved weed control and disease management could result in a potential industry impact of $500,000. New York has long been the second leading producer of table beets nationally, with roughly 3,000 acres of red beets grown and processed for the canning industry (Seneca Foods, Inc.). With a new generation of beet enthusiasts, processors are offering new types of beet products such as shelf stable snack packs of diced beets. Other NY businesses such as Farm Fresh First, LLC are procuring beets for the juice market. LoveBeets USA in collaboration with G's Fresh and Lidestri Foods has opened a new processing plant in the Eastman Business Park in Rochester, NY.

Lessons Learned:

It is critical to the success of beet production to continually use best management practices to control both weeds and diseases in beet fields. A thoughtful combination of pesticide/OMRI-registered product use and crop rotation will improve the sustainability of conventional/organic beet production. This is a lesson that we continually relearn as the efficacy of both herbicides and fungicides decrease with over-use.

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Project 5 (Final)

Increasing Yield by Controlling Leaf Mold in Tomato High Tunnel Production

Project Summary:

High tunnel tomato production is a rapidly growing area of vegetable production in New York. This technology can enable early and late-season tomato production but unfortunately tomato leaf mold, caused by the fungal pathogen Passalora fulva, is more severe in high tunnel production than in field production because of high humidity. This project focused on understanding the diversity of pathogen isolates in New York, and we determined that resistant tomato varieties are effective against all strains of the pathogen currently present in NY. We isolated the pathogen from over 100 samples, and used DNA sequencing to look at diversity. We provided growers with information on (and demonstrations of) resistant tomato varieties, and also information on cultural practices to reduce leaf mold in high tunnel production. We also tested the efficacy of six organic control products, and have provided growers with a selection of control options for this devastating pathogen. Finally, we have given talks to many grower groups to extend this information to the community.

Project Approach:

High tunnel tomato production is a rapidly growing area of vegetable production in New York. This technology can enable early and late-season tomato production and can reduce the occurrence of some diseases because the leaves of the plant stay relatively dry in a tunnel. Unfortunately tomato leave mold, caused by the fungal pathogen Passalora fulva, is actually more severe in high tunnel production than in field production. This is because the high humidity conditions present in the tunnel favor leaf mold development. Leaf mold can become so severe that yield is significantly impacted and plants can be defoliated. To address this issue, we will determine the diversity of the pathogen (races or strains present) in NY, work with growers to identify the best resistant tomato varieties for high tunnel production across the State, and determine the efficacy of commercially available disease control products that have not been previously tested. This information will be disseminated to high tunnel producers across NY and it is anticipated that there will be an increase of leaf mold resistant varieties grown based on increased knowledge of pathogen diversity (which varieties will be resistant to strains of the pathogen in NY) and on knowledge of horticultural traits including growth habit, fruit flavor, texture and yield. Growers will also have information about control product efficacy so that only effective products will be used to control leaf mold.

Goals and Outcomes Achieved:

Season extension, via unheated greenhouses or 'high tunnels', has become an important technology as NY farmers respond to increased demand for local product. NY is now the national leader in winter farmers markets, with high tunnels critical to this market growth (USDA AMS, Dec. 15, 2011). Based on the latest census, coupled with NRCS and CCE data the estimated number of NY farms with protected cultivation approaches 500, with a production value of over $6 million.

The fungal pathogen Passalora fulva causes tomato leaf mold which can be a devastating disease in high-tunnel tomato production. Growing tomatoes under high tunnel conditions can reduce the occurrence of some diseases such as late blight of tomato, tunnel production actually increases the occurrence of leaf mold. The disease is favored by high humidity, which is common in high tunnels, but does not need free water on the leaves (as many other pathogens do). Spores of the leaf mold pathogen can germinate when humidity is over 85% and at temperatures ranging from about 40F to over 90F. Leaf mold may not be observed in a new tunnel, but tends to appear within the first 5 years of production as spores of the fungus eventually blow into the tunnel from nearby epidemics. Once a tunnel has had leaf mold, it is difficult to eradicate as the spores can survive in plant debris and in the soil for over a year. Crop rotation away from tomato can help reduce leaf mold problems, but many produces do not have ample tunnels available for rotation. The best method for controlling leaf mold is the use of resistant varieties. While some growers are currently using resistant varieties, many are not. One limitation is lack of knowledge on which strains (or races) of the pathogen are present in NYS. There is currently no tomato variety that is resistant to all races of the pathogen, thus we need to understand the pathogen diversity in NY so that we can recommend appropriate varieties. Additionally, we need producers to assess the horticultural characteristics of resistant varieties under the diverse environmental conditions that exist from Long Island to Lake Erie. This information will enable extension educators and growers to make recommendations and decisions about which leaf mold-resistant tomato varieties would produce a high quality, marketable yield.

Finally, many growers are looking for organically-approved products to control leaf mold in high tunnel tomato production. We will test commercially available products and disseminate information on the level of leaf mold control to extension educators and growers. Prior to this study, there has been no effort to identify races of the leaf mold pathogen present in NY, and only very limited trails of resistant tomato varieties in high tunnel production. This proposal will determine the pathogen diversity and will also help establish demonstration trials, and disseminate information on resistant varieties and disease management strategies so that high tunnel tomato producers across the state can make informed decisions.

We collected over 100 isolates and now know that not all isolates in NY are identical. Based on our studies, it appears that the resistant tomato varieties commercially available are effective against the different isolates of the pathogen. This knowledge is critical to disease management. Our outreach efforts have focused on using resistant varieties, but monitoring

and scouting closely to identify any breakdown in tomato host resistance. Additionally, results from our organic efficacy trials are being used by growers to identify and use the most effective products for control of leaf mold in high tunnels. These data are included in the attachments.

Finally, we have provided growers with information on cultural control including increasing air movement in tunnels by increasing spacing between plants, pruning to reduce the amount of foliage per plant, and adding fans to tunnels to improve air movement and decrease leaf wetness.

Beneficiaries:

New York State vegetable growers raising tomatoes under the protection of plastic (high tunnel) are the primary audience. Producers are located in Northern, Central, Western NY, the Hudson valley and Long Island. The 2007 Census of Ag lists more than 200 operations and 3 million square feet of protected cultivation in NY. The Cornell Vegetable Program estimates the 2013 number of operations approaches 500.

Subgroups using this technology come from several sectors: direct marketers leveraging price differentials of early yields; certified organic growers controlling diseases; CSA farms using high tunnels for season extension; wholesale growers increasing earliness and product quality; urban farms, and growers from the plain sects growing for produce auctions. Today, 6 produce auctions in NYS conduct more than $10 million dollars in annual sales.

The number of beneficiaries is over 100 high tunnel tomato farmers (approximately 118) that we have directly interacted with and other unknown farmers via newsletters. These farmers benefitted through at least one of three activities. 1) working with extension educators (co-PIs) and submitting tomato leaf mold samples from their farms (21 farmers). 2) attending twilight and winter education meetings (at least 158 farmers although we know that some of the same farmers attended multiple sessions). 3) gaining insight from newsletters that included information about tomato leaf mold and varieties that were found to be resistant to leaf mold based on our research.

Lessons Learned:

We learned that the fungal pathogen (Passalora fulva) that causes tomato leaf mold is common across the entire state of NY, and there is some diversity in the pathogen population. Fortunately, tomato varieties that are known to be resistant to leaf mold remain resistant to all pathogen strains we currently have in NY. We also learned that some (but not all) products approved for control of leaf mold in organic production are effective in controlling the disease.

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Project 6 (Final)

Measuring and Extending the Benefits of More Accurate Honeycrisp Harvest Predictions

Project Summary:

Honeycrisp (HC) is the number one sought-after variety by consumers in the US. Growers of this variety in Washington State are planting massive volumes. In addition, WA and Nova Scotia have successfully stored HC in controlled-atmosphere (CA) storage, extending the shelf-life and marketing window significantly. The Northeastern US has not had success with HC in CA. At present, most of the fruit is sold before Christmas. Lessons from some workshops and interactions with successful HC growers in WA and NS have pointed NY growers in the right direction. Correct site selection and soil fertility are paramount in determining if problems will show up later. Nutrient management has proved to be so important. Successful growers are starting with good planting sites and managing crop load early to concentrate on growing the tree. Frequent soil, leaf, and fruit mineral analysis is being performed to determine if there is a balance between key nutrients. However, there is still low packout. Clearly, NY and the Northeast need to significantly increase target fruit size and yield, and decrease disorders, which are so prevalent in HC both pre and postharvest. This project is a continuation of two previously funded ones, but it differs in that it targets only HC and focuses more on precision nutrient and harvest management. In at least 75 HC blocks statewide, mineral analysis and dry matter analysis will be performed. Harvest will be completed over 4 weeks with the help of a new harvest tool, the DA meter. Data analysis from current projects will help determine the direction.

Project Approach:

Data analysis from last year's related study wrapped up in May 2016. It was disappointing that there were no strong trends between cultural and maturity indicators and eating quality and number of disorders on fruit after storage and sensory analysis. Therefore, after much discussion that included a conference call with most of the project cooperators and producer input, it was decided that the project is going into a different direction. To preserve fruit quality fro sensory analysis after storage and to reduce bruising, the total number of blocks statewide has been reduced to 60. Growers have been contacted, and the blocks analyzed for return bloom and fruit set/crop potential. There are several new techniques that will be employed to evaluate nutritional status of fruit, leaves, and trees. In mid-July, fruitlets will be harvested and analyzed for mineral content. Leaf samples will also be taken at this timing, and a new sap technique will give and instantaneous picture of the Ca status of the trees. Following additional fruit mineral analysis about 1 week before harvest, comparisons with the mid-July timing should be able to tell us if fruit are at risk for storage disorders such as bitter pit. Evaluation after storage should confirm this. In addition, crop load measurements will be taken prior to harvest, to determine the average crop load in the sampled trees. In addition, dry matter analysis at the first harvest should correlate to the crop load measurements.

In July, all study blocks from the past Precision Orchard Management projects were visited. Blocks were reduced to a more manageable number with regards to harvest sampling and data analysis. More details are in the document submitted entitled "Request for Change of Scope for Work on 8-28-16". Growers that owned the blocks were contacted, trees were selected and flagged. Following thinning, fruit counts were made and trunk circumferences measured to determine crop load in August. Sampling for mineral analysis took place in late/August early September. Weekly harvest began in September. Samples were picked up and/or delivered to the NYSAES in Geneva for processing and storage.

Harvest for this season concluded in all areas of the state by early October. All samples were delivered to the NYSAES in Geneva. Processing at harvest included dry matter (first harvest only), harvest maturity indices (firmness, total soluble solids, and starch pattern index), 1-MCP treatment, and storage of 20 apples (per harvest, per block) at 38F until analysis in late winter or early spring.

Statistical analysis is currently underway for all peel and flesh mineral samples, leaf samples, and dry matter samples. Fruit that has been stored since harvest has been removed and will be sampled (sensory analysis) by cooperators on March 30 5 31. Fruit were pulled from storage in late March. External evaluation was performed just prior to sensory analysis. On March 30-31, several producers who have Honeycrisp blocks in this project attended the sensory analysis, along with several collaborators. Fruit were rated for external appearance (size, color, defects) before taste testing, where they were rated for texture and flavor, which were averaged together to give the overall rating. Data was entered, and 2 graduate students are currently performing statistical analysis. During full bloom, return bloom potential was rated (light, medium, heavy, or snowball) on each block in the study. Trees were also re-flagged for 2017. Following return bloom analysis and re-flagging of trees, 5 random test trees from each of the 60 block statewide in the study were chosen for crop load measurements. Trunk diameters were measured and fruit counts were performed. Is with the 2016 crop, the crop loads will be calculated in quarter 8 to determine trunk cross sectional Areas, and if trees are under-cropped, over-cropped, or in the range of ideal crop loads. As a reminder, prior to harvest in 2017, all cooperators were again contacted to so as to leave several flagged trees in 1-2 rows unharvested for our study. In late July, leaf samples were taken for nutrient analysis, and sent of to Cornell Nutrient Analysis Lab.

Fruit was harvested for peel and flesh mineral analysis, and dried and frozen for later analysis. Weekly sequential harvest started in September for all 3 regions. 30 harvest per block were picked and shipped or delivered to NYSAES. Harvest maturity was performed on 10 apples per sample, and the remaining 20 apples were treated with 1-MCP and put in 38F cold storage for evaluation in late winter. Harvest of the last 1-2 sequential harvests from the latest-maturing region (Champlain Valley) took place in early October. Harvest maturity was performed on all 60 orchard blocks within 1 day of harvest. In addition, samples for storage were all treated with 1-MCP, and conditioned for 7 days at 50F before being placed in cold storage at 38F. These storage samples will be evaluated for internal and external disorders, and a taste test/sensory analysis will be performed, in which all growers will be invited, as in past seasons.

Trunk circumference measurements plus fruit count numbers were taken for all orchard blocks, and crop loads for 2017 are currently being calculated. Data from 2016 and 2017 so far show that most (>50% statewide) blocks are not in the proper range for crop load. There is variation by region and individual blocks, but overall, more blocks are either under-cropped or over-cropped than in the currently recommended range of 4 fruit per trunk cross sectional area (cm3). Under-cropped Honeycrisp may never color properly, and the sizes are not in the premium category. Over-cropped Honeycrisp tend to have excessive size, leading to more disorders, especially Bitter Pit. Samples for leaf analysis (mineral sap, wet ash, and full nitrogen) are processed at Cornell Nutrient Analysis Lab. Fruit samples for full mineral analysis (peel and flesh) were dried and processed, and are about to be send to a commercial laboratory.

The leaf and fruit analysis data from the past 2-4 years, plus the sensory analysis from the same time period will be evaluated. The leaf, fruit (mineral, lab) along with the storage (defects plus sensory) is fully analyzed along with the crop load and dry matter data in the late spring.

It is our hope that some trends will be seen that can lead to some recommendations on nutrition, crop load, and harvest maturity timing that will lead to increased packout of Extra Fancy Honeycrisp by at least 5%.

Goals and Outcomes Achieved:

Unfortunately, there have to date been no measurable, meaningful impacts as a direct result of this project. .Over 10,000 points of data from the 60 orchard blocks over the 2 year period have been analyzed using sophisticated statistical methods without yielding any clear trends.

However, there has been some reinforcement of info that was already considered "common knowledge" but through this research project and others, along with observations in grower orchards, it is not being followed. The first is proper crop load adjustment in Honeycrisp. Terence Robinson, Mario Miranda Sazo, and others have been advising growers for several years that this variety, above all others, needs a final crop load adjusted to ~4 fruit per square centimeter of trunk cross-sectional area. Crop loads were measured in all 60 statewide blocks in 2016 and 2017. Only ~20% of the blocks were within 15% of the recommended crop load, while nearly 50% were under-cropped, and over 30% were over-cropped. In addition, an astounding 60% were off the target fruit number by 50% or more. When Honeycrisp are under-cropped, fruit size is excessive, and the risk of bitter pit is very high. If fruit are over-cropped, final fruit size is under ideal, and the fruit often fail to color properly and develop full varietal flavor. Part of the problem is the biennial nature of Honeycrisp. If not thinned properly early in the life of the tree, it is extremely difficult to break the biennial bearing cycle. This means the block will nearly always have a very heavy crop followed by a light one. In addition, in a heavy fruit setting season, growers need to completely hand-thin (after chemical thinning) early - by late July to really get the benefit if proper sizing of the remaining fruit. In light setting years, the risk of bitter pit can be very high in blocks with a history of this disorder.

Beneficiaries:

If Honeycrisp packout is able to be significantly increased, there will be a multiplier effect throughout the Western NY fruit industry and into retail businesses. If growers can maintain or increase the high returns, they can afford the high cost of production of this variety. In turn, packers, retailers and the economy benefit as consumers are willing to pay between $2.99-$3.99 a pound for high quality Honeycrisp.

Lessons Learned:

This project reinforced the fact that if growers would follow “common knowledge” management practices, they could improve quality and quantity of the packout of Honeycrisp and resultant profit per block. Unfortunately the statistical evidence yielded no clear trends that to provide new directions and practices that would substantially improve quality and quantity of Honeycrisp.

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Project 7 (Final)

Specialty Crop Banquets

Project Summary:

In conversations with many of New York's agricultural producers and associations, both at functions such as trade shows and in gathering scopes of work for previously budgeted programs, it was uncovered that one of the main impediments to small farmers increasing their presence in the marketplace was simply the lack of market connections and/or information on opportunities and resources available. Specialty Crop Banquets were devised to both facilitate regional grower-buyer connections, as well as provide information on grant and marketing opportunities available to help farmers find new and expanded markets. Department staff decided that bringing a wide variety of these resources to multiple regional, face-to-face events would generate longer-lasting impressions by forging a "meeting of the minds" rather than providing information in a vacuum. By introducing buyers to small farm producers, it was presumed that contact information could be exchanged and discussion about market conditions would allow agricultural entities on all fronts to provide valuable perspective on supply and demand of New York specialty crops. Additionally, Department staff would have opportunities to inform small farms of economic development and promotional programs and funding that may be available to further help them proper.

This project implemented a series of events throughout New York state that combined specialty crop-focused dinners and day tours of local farms, through which community agricultural producers, academic personnel, government staff and local chefs could inform food buyers (both as consumers and retailers) of available specialty crops in New York. Educational materials, discussions, and meetings held at these events illustrated to the public the health benefits and culinary usage of these crops to hundreds of attendees from diverse agricultural backgrounds. These functions aimed to increase awareness of New York's specialty crops and encourage buyer/seller connections, thus enhancing their competitiveness and profitability.

Project Approach:

This project coordinated the talents of New York's regional specialty crop producers, distributors, chefs, and culinary staff to provide attendees with hands-on demonstrations of how integral specialty crops are to New York's communities. The concept sought to increase local community knowledge of the availability, production and use of specialty crops, thereby increasing interest and sales, both during the events and beyond.

3 events were held in the Summer of 2017. Project partners organized and implemented functions, providing necessary equipment, event space, produce and staff. Venues for these events were selected based on proximity to large numbers of farmers, producers and retailers in distinct regions of the State with the intention of showcasing one or more specialty crops from that region. Venues organized and

staffed functions while specialty crop industry groups worked with local specialty crop farms to provide ingredients for the dinners, setup produce displays, and allow for day tours of farm operations. Regions sought for the events, based on specialty crops unique to the area, included:

- Southern Tier (Cooperstown, NY)
- Western New York (Hilton, NY)
- Hudson Valley (Highland, NY)

Dinner banquets were accompanied by local produce displays, featuring specialty crops used in dinner preparation and grown by local producers. In conjunction with specialty crop commodity groups (e.g. – the New York Vegetable Growers Association, the New York Apple Association, New York Wine and Grape Foundation, etc.) events were announced to as many farmers, distributors, retailers, academic personnel and agricultural staff as possible. To maximize buyer/seller connections, and since table seating was limited, the events were promoted selectively to the above-mentioned personnel and then widened to optimize attendance.

The strategy of marketing and enhancing the profitability of specialty crops worked in 3 distinct ways:
1.) Directly showcasing local farms and specialty crops through the dinner events and day tours;
2.) Connecting commercial retailers and consumers to local producers through targeted outreach;
3.) Exposing specialty crop producers who are not registered in New York's "Grown and Certified" labeling program and/or "Taste NY" marketing to the benefits of enrolling.

The 2017 season of New York specialty crop banquets was successful in providing a platform to promote regional crops to retailers and allow for discussion of issues surrounding specialty crop marketing. 3 dinner events were staged. New York State Department of Agriculture and Markets (the "Department") staff planned these events at strategic locations across the State to spread the benefit to different regions and maximize each event's impact. Events took place in Cooperstown, NY (Mohawk Valley region); Hilton, NY (Western / Finger Lakes region, near Rochester) and Highland, NY (Hudson Valley region, midway between Albany and New York City). Invitees for these well-attended events spanned multiple specialty crop industries and provided important exposure of local New York farms to retailers and industry personnel from across the State, as well as those from other States in the Northeast. The interactions between small farmers and retailers (both large and small), knowledgeable catering staff informing guests of specialty crop nutrition and sourcing, and support provided by governmental and academic personnel, provided important perspective on New York's agricultural community.

The project's benefits have been gauged through attendee surveys containing questions before and after the event and personal interaction. Targeted feedback was requested from each guest along with an opportunity to voice additional comments. Each event garnered different levels of feedback, but the response overall has been extremely positive. Through survey responses and personal interaction, Department staff have determined these events sparked better relations between local retailers and growers and have potential to expand market opportunities for smaller New York specialty crop farms. With such diverse attendees meeting and discussing specialty crop issues in person, valuable business

relationships are being forged and our Department is able to provide guidance and resources as needed (e.g. – explain grant opportunities, FSMA compliance issues, land stewardship resources, etc.)

Event #1 – Cooperstown, NY (6/13/17)

Department staff coordinated its first event within close proximity of the National Association of State Departments of Agriculture (NASDA) annual gathering; this year conveniently located in Cooperstown, NY. Cooperstown is located in the "Southern Tier" region of the State, comprised of counties close to its southern border with Pennsylvania. The region has experienced some of the State's highest economic decline in the past few years, with its agricultural industries being no exception. The decision was made to stage the first banquet where an impact on the local economy could be made and close to where some of the great agricultural leaders of the northeast would already be congregating. This year's NASDA conference brought together government agency personnel from multiple states, specialty crop producers and industry advocates to discuss the current state of agriculture in the northeastern United States. By tapping into the NASDA event's esteemed guests, nearly 100 attendees signed on for the Department's specialty crop banquet. Attendance consisted of: specialty crop growers and producers from across New York State; State Department of Agriculture representatives from Northeastern States; members of multiple New York State produce growers' associations; Cornell agricultural staff; and more.

The venue, Brewery Ommegang, was selected based on its ability to stage a 100-person, multi-course, specialty crop-focused dinner, but to also highlight the growing and selection of New York hops. Nearly all guests attended a walking tour that provided a firsthand glimpse of hop and brewing operations. To note, Specialty Crop Block Grant (SCBG) funds were not used for the purchase of beer at this event, but rather a tour of the hop processing facility and hop fields, as New York hops are a vital specialty crop in the state's economy. After an introduction made by our Department's Commissioner Richard Ball to commend the efforts of New York growers, the dinner commenced and proudly showcased New York-grown vegetables (farm origin undisclosed to guests to avoid unfair promotion) and allowed producers to converse with retail and industry leaders across the Northeast.

Feedback provided via 41 returned surveys was that the event positively influenced the outlook of guests on the importance and diversity of specialty crops in New York. Surveys also indicate that a majority of guests were influenced to purchase more locally grown produce as a result of the event. Both retailers and growers praised the ability to discuss bringing more local produce to market.

Event #2 – Hilton, NY

The event was held at a newly established cidery owned by Green Acre / West Wind Fruit Farms. The catering was staged by Farmhouse Table, whose staff prides itself on exclusively serving local farm-grown produce and promoting Western New York's agricultural community. They not only served a locally-grown, specialty crop-centered meal, but were more than happy to explain the nutritional

aspects and the pairing of flavors and textures in their dishes. Prior to the dinner, the Department's Commissioner, Richard Ball, commended growers on their diligent efforts and spoke on the importance of specialty crops on New York's economy.

2 farm tours were conducted prior to the dinner which allowed attendees from various agricultural sectors to view two distinct operations. The first occurred at Piedimonte Farms in Holley, NY and the second took place at Bolton Farms in Hilton, NY. The Piedimonte Farms tour offered a view of FSMA-compliant packing house operations and green bean harvesting. The Bolton Farms tour provided insight into an organic and sustainable, year-round hydroponics farm that yields extremely healthy greens and herbs. Both tours included Q&A's between farm staff and visitors, as well as discussions led by Cornell staff on Good Agricultural Practices (GAP) certification. The Department's Commissioner was on hand at both tours to commend farmers and stress the importance of specialty crops to New York's economy.

Out of 146 invitees, 79 attended the Department's 2nd event. About half of the attendees consisted of producers, growers and specialty crop association personnel from the Western New York region. The other half consisted of personnel from major retail outlets (Tops and Wegmans grocery store representatives), food hub and farm market staff (Headwater Food Hub, Kirby's Farm Market), academia (Cornell, Cooperative Extensions, Institute for Food Safety), local soil and water conservation district staff, union and government representatives (including staff from NY State Senator Joseph Robach's office). Multiple specialty crop advocates and leaders from apple, potato, grape and various vegetable industries, showed their support and engaged in productive conversations with large produce distributors and retailers, as well as academic and governmental personnel. Many commented following the event that this opportunity was truly beneficial and provided a unique opportunity not previously available to increase small farm visibility.

36 returned surveys indicated positive and constructive feedback, including that: the event increased attendees' likelihood of specialty crop purchase; guests requested more time to be spent on the farm tours and praising that farm tours provide better understanding of agricultural techniques/ food safety requirements; the local food and venue were spectacular; guests indicated they want more of these events and for the Department to include more of the general public as guests.

Event #3 – Highland, NY

The final event held in 2017 took place in Highland, NY, which is located midway between the Albany area and New York City. An abundance of specialty crop farms are located in this area known as the Mid-Hudson region. A relatively new cidery known as Bad Seed Cider Company was selected as the dinner venue and Hudson River Fruit Distributors in Milton, NY was the location of the event's day tour.

The day tour of Hudson River Fruit Distributors offered approximately 30 attendees (from a wide range of agricultural personnel) a view of one of Upstate New York's higher-volume, GAP-certified, independent fruit distributors. Hudson River has its own 400-acre growing operation and represents over 50 local growers, providing both marketing and delivery support. Hudson River staff presented

attendees a view of the spectrum of daily operations, including incoming delivery of produce from farms, cleaning, packing, industrial cold storage and preparation for shipment. In contrast to previous event day tours, this tour showcased pivotal aspects of the supply-chain between farms and consumers. Staff from Cornell discussed with attendees the importance of GAP certification for farms and consumers, while Department staff discussed the importance of land stewardship through Agricultural Environmental Management (AEM) programs offered by Soil and Water Conservation Districts. The Department's commissioner was present to view operations and validate the importance of quality produce distribution.

Out of 105 invitees, nearly 60 guests attended the dinner portion of the event. About half of attendees were specialty crop producers and produce growers' association staff, while the other half included representation from major produce retailers (Price Chopper and Hannaford representatives), Soil and Water Conservation Districts, Cornell, food hubs and State government. After an address by the Department's Commissioner on the state of specialty crops in New York, guests were treated to a delicious specialty crop-focused meal and lively discussion between growers, retailers and staff knowledgeable on specialty crop issues. Guests were able to acquire information on funding resources from Department staff (e.g. – Specialty Crop Block Grant availability), exchange important contact information, and discuss what benefits and issues exist in marketing local specialty crops.

From the 29 surveys returned, it is evident that guests found value in the event. Responses indicated: an increased willingness of attendees to purchase specialty crops, appreciation from specialty crop growers for the opportunity to speak to retailers, enjoyment in learning more about produce distribution chains and praise for the venue and local caterers.

Goals and Outcomes Achieved:

Goal: Enhance the overall competitiveness of New York's specialty crops through increased marketing of local produce via promotional events.

Objective: Facilitate consumer, retailer and distributor connections to increase interest in purchasing and/or selling local Specialty Crops.

Tasks:

1.) Directly showcase locally produced specialty crops through dinner events and day tours of local farms to increase knowledge of production techniques and effort to bring to market;

2.) Connecting commercial retailers and consumers to local producers through targeted outreach;

3). Survey attendees to gauge interest

4.) Exposing specialty crop producers who are not registered in either New York's "Grown and Certified" labeling program and/or "Taste NY" marketing program to the marketing benefits of enrolling, as well as inform attendees of grant funding available for marketing endeavors.

Outcomes (relative to Tasks outlined above):

1). 3 dinner events, 2 farm tours and 1 tour of a fruit distribution facility were conducted to engage retailers, producers, academic staff and agricultural experts in discussions surrounding the economic viability of New York specialty crops. This included presentations on GAP certification, addresses by the Commissioner of NYSDAM

2). Approx. 350 invitees were selected as a balance between retailers, producers and other essential agricultural staff across the state to facilitate marketing connections (240 or nearly 70% of those invited attended the 3 events).

3). 106 surveys returned out of 240 guests (approx. 44% of total surveys returned).

4). Guests engaged in conversation with Department staff regarding available funding and marketing programs operated by the Department.

Beneficiaries:

Direct beneficiaries included the nearly 240 event guests (including retailers, agricultural producers, academic personnel, consumers, governmental representation, soil and water conservation district/ county staff, etc.) who were able to personally exchange contact and resource information, as well as provide insight into the accomplishments and barriers of marketing local produce, thereby expanding market opportunities for New York's various specialty crop industries.

These networking events aimed to shine the spotlight not only on guests, but on the thousands of specialty crop producers in the selected regions by informing local retailers (big and small). As the events took place in Western NY, Central NY and the Hudson Valley, it is estimated that the surrounding populations (2.8 million, 1.18 million and 1.17M respectively) will benefit from keeping their dollars invested locally when purchasing from a wider array of local producers. The more money that stays within a region, the more economic prosperity a region can experience.

Lessons Learned:

Staff learned that providing a first-hand experience can leave a more indelible impression on a target audience. The farm tours and dinner presentations garnered very positive feedback from retailers in gaining insight on various production methods, preparation of specialty crops and the prominence of local producers; all of which give retailers a firmer grasp on the importance of local specialty crops. The farm tours seemed to spark just as much conversation and interest as the dinners themselves.

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Project 8 (Final)

New York Farm to School Specialty Crop Implementation

PART A: Rennselaer County Farm-to-School Project

Project Summary

The Rensselaer County Farm-to-School program was meant to bridge the gap between local farm-fresh products and two Rensselaer County schools, with the intention of serving them, while determining whether Capital Roots was organizationally suited to serving other schools within our service area. The program identified common barriers to developing a Farm-to-School program, such as price, procurement policy, mandates and food safety regulations as well as the divergence of the academic calendar year from the local growing season and then tried to remove these barriers. They took slightly different approaches with the two districts. With Berlin Capital Roots spent more time on staff training and aiding in grant writing, as their barriers included a staff that was less comfortable handling farm fresh ingredients and a lack of infrastructure needed to successfully store and serve them. East Greenbush had more staffing and infrastructure resources. There they spent more time explaining procurement and adapting their existing local food distribution service to suit their needs. Capital Roots felt its online marketplace, the Virtual Veggie Mobile®, could be a useful tool to connect food service directors with dozens of local farms. They created an ordering system within this marketplace specifically for food service directors, to provide a direct link to locally grown products, allowing them to compare prices and availability of local foods in comparison to internationally sourced foods from their traditional vendors. Capital Roots had moderate success in reaching our short-term goals but have done much to change the long-term outlook for Farm-to- School in Rensselaer County.

Project Approach

The objectives of the Rensselaer County Farm-to-School Project include educating food service staff in two school districts to work with producers in the county to procure locally grown specialty crop products and training the staff in the procurement and preparation of the procured products.

- The objectives of the project were accomplished through the partnership between Rensselaer County and established food hub Capital Roots.
- Farm to School Coordinator hired to conduct outreach to farmers and to train food service staff in three districts (Berlin, East Greenbush and Rensselaer City SD's) about procurement of locally produced specialty crops and how to prepare them for school lunch programs.
- Capital Roots has received GAP/GHP certification.
- Capital Roots is evaluating their wholesale virtual veggie marketplace as a potential model to help local growers sell and deliver their specialty crops to School Districts.
- Held training for Food Service Directors on Capital Roots' ordering system and provided recipes and additional resources for ordering local produce. Also, provided a list of GAP certified farmers in the Capital District and a seasonal produce availability guide.

- Capital Roots applied for and received approval as a vendor for the USDA Pilot Project for Unprocessed Fruits and Vegetables.

Saint Peters Health Partners assisted in building relationships with other Rensselaer County School Districts by inviting the Capital Roots Farm to School Coordinators to the Wellness Committee meetings for Rensselaer City School District and Lansingburgh Central School District.

New York State Education Department met with Capital Roots to discuss the challenges that Food Service Directors face when navigating procurement. Throughout the program, in our research and in discussions with Food Service Directors, the need for clarification and support on the issue of procurement was a recurring theme. After the meeting the New York State Education Department, Farm to School team created two procurement documents available to Food Service Directors on their website: http://www.cn.nysed.gov/farmtoschool. The available documents outline the various procurement requirements and procedures. Capital Roots has been distributing this document to Food Service Directors at the two Farm to Institution Roundtables hosted by Capital Roots.

Goals and Outcomes Achieved

- Capital Roots gathered and developed recipes utilizing specialty crops, which were distributed along with additional information on the procurement, handling, and storage of locally grown produce, to the Food Service Directors of Berlin Central School District and the East Greenbush School District.
- Capital Roots conducted training sessions using the online farmers' marketplace to purchase local produce with the Food Service Directors of Berlin Central School District and the East Greenbush School District. Additionally, a training session was held with the entire Berlin Central School District on the handling, storage, and recipes development using locally grown produce.
- Capital Roots Assisted in the coordination of delivery of over 600lbs of locally grown produce to East Greenbush Central School District during the 2017-2018 school year.
- Surveys for the 2017-2018 school year were sent to the Food Service Directors for Berlin Central School District and East Greenbush School District.

Capital Roots will continue to maintain a relationship with Rennselaer County Schools, offering full ordering and delivery privileges on our online farmer's market, The Virtual Veggie Mobile. As a recently certified vendor for the Pilot Project for Unprocessed Fruits and vegetables, Capital Roots can provide Rennselaer County School Districts with an opportunity to purchase a larger variety of locally grown fruits and vegetables with their programmatic funds and work towards a greater percentage of specialty crops used in the school's lunch program. Capital Roots' newest Farm to School Coordinator, Monica Wells, has reached out to Whitson's Culinary Group (the company that manages the food service contract for the city of Troy, and village of Lansingburgh) to become vendors that supply local product and product available for purchase through the Pilot Project for Unprocessed Fruits and Vegetables. Additionally, Monica is coordinating a 36-week fresh taste–testing program with Rennselaer City School District for the 2018-2019 school year.

The work of the Farm to School Coordinators in cooperation with other programs within Capital Roots has allowed them to educate dozens of local farms on keys to successful business relationships with schools and other educational customers and has drawn the attention of numerous districts around the region that are interested in pursuing farm to school. Capital Roots has three farms capable of supplying a wide variety of produce signed on as vendors through the Produce Pilot and have identified a half

dozen more they can easily add in response to school demand. Sales of local product to local schools have indicated further gaps in our internal systems as well as systemic barriers we otherwise would not have recognized without this experience. Capital Roots is now actively engaged in increasing its distribution of local produce to local schools in the 2018-2019 school year and is in regular contact with food service directors and food service contractors serving a half dozen districts in Rensselaer County and beyond.

Beneficiaries

Students- Students benefitted from intervention either through direct consumption of local food, or training that made it easier and less expensive to prepare whole foods in an appetizing way. Students in several other regional schools also had access to local foods, because their directors became aware of the Rensselaer program and approached Capital Roots. Therefore, they are hopeful their work with the State Education Department and creation of a webinar for food service directors explaining farm to school and its barriers and opportunities can help provide students from across the State with greater access to local foods.
Farmers- Direct sales through this grant impacted only a handful of local farms, but the farm to school coordinators work will have a long-term impact on local farms. Through outreach to Capital Roots' farm network, direct connections were made between several farms and educational institutions and local farms were given useful information for connecting with their own local districts. Becoming a Produce Pilot Vendor allows Capital Roots to open a significant new market to area farms and gives schools and food service providers a more familiar mechanism to use for funding local farm purchases, thereby building the local economy.

Lessons Learned

Building trust and relationships is crucial when starting a Farm to School program, as is trying to work across several levels of the school hierarchy. Food service directors often feel constrained in their authority and providing them support from above, as well as student/parent engagement can help them as they attempt to change long-entrenched systems and modes of behavior. Each district will have particular needs and a one-size all approach will not be successful, be prepared to adapt to the needs and personalities of each district you serve.

Part B: Buffalo City School District Harvest of the Month Program

Project Summary

The Buffalo Public Schools (BPS) Farm to School (F2S project built upon a track record of success that the BPS F2S Coordinating Committee (F2SCC) had already achieved following the award of a 2014 USDA F2S planning grant. Included as a deliverable of the USDA planning grant project was a three-month Harvest

of the Month (HOTM) pilot program, that was executed in 12 of the district's 78 schools. The HOTM program featured a different New York State (NYS) grown specialty crop monthly, with the following support activities incorporated each month: new recipe development, marketing materials, nutrition education, and program evaluation (these collective HOTM activities hereafter are referred to as "HOTM campaigns").

The primary goals of the current project, were to (1) to develop 10 new HOTM campaigns, ensuring enough to feature a different campaign monthly during the academic year, (2) provide nutrition and agricultural education to students and their families, and (3) provide training to the food service workers specific to the preparation of locally grown produce.

The F2S program has undergone two expansions since this grant was awarded. First, the HOTM program was expanded to include 10 new campaigns, bringing the total number to 13. Following the development of those new campaigns, the HOTM program was implemented in the original 12 pilot schools, which served as a representative sample of the district at large, during every academic month of the 2016-17 school year. Armed with best practices in hand, with F2SCC moved forward with district-wide expansion of the HOTM program in September 2017.

Food Service staff from the 12 pilot schools meet monthly to receive training involving the preparation for the Harvest of the Month recipes and to review/resolve past concerns or challenges with preparing/serving NYS produce items for school lunch. While training for the new harvest recipes, the staff is also evaluating the previous recipes and making changes for the future based upon student acceptability and ease of preparation.

200 students and staff were able have been to farms in the spring and fall. Pre-and post-surveys were given to students to evaluate this experience. 60% of the students reported learning something new about farming and produce growing in New York State.

Goals and Outcomes Achieved

- 10 new HOTM items selected: spring greens, dried beans, asparagus, apples/pears, cabbage, tomatoes, root vegetables, cauliflower/broccoli, corn, and winter squash
- Convened wellness teams in pilot schools to re-introduce the program and tweaked the program to better meet their needs at the individual school level.
- Met with the school food service department and teachers to obtain feedback from the pilot and incorporated it into the program.
- Attended two grower meetings hosted by CCE Erie to establish relationships with new growers. Participation exceeded 30 at each meeting.
- 10 HOTM campaigns developed, one for each item listed above, to include: 20 new recipes (two per HOTM item), 13 food systems newsletters, 13 food system infographics, 10 trivia sheets, and 10 HOTM marketing posters.
- Purchased 1,048,195lbs of NYS grown specialty crops to service 34,000 students.

- Spent $640,330 on NYS grown specialty crops during the grant timeline to service 34,000 students.
- Hosted a Chef's competition in October of 2016 and 2017 in which local chefs partnered up with teams of BPS students to create a school meal utilizing NYS beef and root vegetables. Engagement from attendees exceeded 100+ each year.
- Trained 450 food service staff to learn new HOTM menu items
- D'Youville College administered food system lessons specific to HOTM items to 1,330 middle-schoolers during the grant timeline (785 in 2016, 545 in 2017). Their findings demonstrated an increase in knowledge with regard to produce locally grown in NYS and the value of eating locally sourced produce.
- 450 students toured 10 partner farms during the two-year grant. Pre and post surveys indicated agricultural knowledge gains and a deep appreciation of the farm tours. In addition to touring the farms, the students were able to pick produce, such as strawberries and pears, and bring the fruit back to their families

Beneficiaries

Students

- 6,210 students benefited from the F2S HOTM program during the 2015-16 school year as both recipients of healthy locally sourced menu items and through a broad-based nutrition education campaign
- 34,000 students benefited from the F2S program during the 2016-17 school year, as recipients of healthy locally sourced menu items.
- 450 students participated in farm field trips, where they engaged in experiential learning opportunities
- 1,330 students were the recipients of targeted nutrition education via D'Youville College
- 30 students received culinary skills training and were able to partner with a local Chef in the F2S Chef Competition
- Families of the students were impacted by the program at varying levels. For example, the families of the 30 students who participated in the F2S Chef Challenge, numerous families received newsletters with HOTM Information and school gardens engaged families.

Administrators, Teachers and staff

- Approximately, 48 administrators, 660 teachers and 170 aides were involved in the 12-pilot school F2S program. Effective September 2017 when all 78 schools were introduced to the program, these numbers totaled over 4,550 faculty and staff.
- 64 teachers were involved with agriculture and nutrition education via D'Youville College

Farmers

- 10-15 farmers benefited from the purchase of 942,873 lbs. of NYS grown specialty crops[1]
- $640,330 were spent on NYS agricultural crops during the grant timeline.

Food Service Workers

- Over 100 Food Service workers including, managers and cooks in the pilot schools, received training
- 30 food service staff in the commissary received training. These employees prepared the food items for the schools without kitchens.
- For the district-wide roll out that occurred in September 2017, all 450 food service employees received training from the original 130 workers.

Lessons Learned

- To implement a F2S program in a large urban school district, it requires a great deal of time for planning and finding opportunities for reciprocal communication and education. School environments can vary among school buildings within a large district. The individual needs of the school may require adjustments to the program. Building relationships with the school staff has resulted in successful program implementation within shorter time frames.
- Partnering with community organizations who support this initiative is essential for obtaining resources and expertise to share with the school community. Our partners provide expertise in connecting with farmers, providing educational materials and working with the youth.
- Patience is required as well. This work must be reinforced, encouraged and re-considered at times. However, there are F2S champions emerging, food service staff is following the menu and the students are receiving locally grown produce each and every month.

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Project 9 (Final)

New York Specialty Crops at Trade Shows

Project Summary:

The Department received feedback from the Special Crop Advisory Board that exhibiting at the larger trade shows in the country would increase New York specialty crop producers' competitive ability to sell to domestic and international wholesalers, retailers, restauranteurs, etc.

Exhibiting at the major trade shows provide New York with the opportunity to showcase specialty crop producers as key players in the produce industry due to our proximity to major markets and having consistent production of high quality fruits, vegetables, maple products, etc.

Project Approach:

2016 New York Produce Show and Conference

New York State Department of Agriculture and Markets exhibited at the **2016 New York Produce Show and Conference** (an event hosted by the Eastern Produce Council) held at the Jacob K. Javits Center (NY) from December 5-7, 2016. It is estimated that 5,000 attendees were present through the course of the event.

There were six (6) booths at the show which highlighted New York's diverse selection of fruits and vegetables. Three (3) of the booths promoted the specialty crops that are available in New York State which included a display of products sourced from Greenmarket Co, a program of GrowNYC. Greenmarket Co., supports numerous regional food producers by making their products available to wholesale buyers throughout the city. There was also a sampling of RubyFrost®, one of the two (the other being SnapDragon®) newest apples that were 10 years in the making and developed by Cornell University's apple breeding program. Two (2) of the booths provided the opportunity for the New York State Maple Producers Association to sample various maple products and for the Christmas Tree Farmers Association of New York to display live trees and promote their availability at the greenmarkets throughout New York City. At the final booth, Centerplate Inc., the concessionaire at the Jacob K. Javits Center, provided a sampling of a salad made with specialty crops and a tasting of New York Wine, Hard Cider and Alcohol Free Cider, to promote the grape and apple industry. In addition to Staff at the exhibit, the Department enlisted the support of the New York State Vegetable Growers Association for first hand discussions with the show attendees.

2017 New York Produce Show and Conference

The **2017 New York Produce Show and Conference** was held from December 5-7, 2017, at the Jacob K. Javits Center (NY). The department had three (3) booths which prominently featured New York's diverse selection of fruits and vegetables. Three (3) booths across the aisle featured the New York Maple Association (sampling and literature), the New York Wine & Grape Foundation (sampling wine, and concord grape juice) and Centerplate, Inc., the concessionaire at the Jacob K. Javits Center, provided a sampling of a salad made with specialty crops and a tasting of New York Wine, Hard Cider and Alcohol-Free Cider, to promote the grape and apple industry. In addition to Staff at the exhibit, the Department

enlisted the support of the New York State Vegetable Growers Association for first hand discussions with the show attendees.

National Restaurant Association's Restaurant, Hotel-Motel Show / American Food Fair

In 2018, the Department planned to exhibit at the **National Restaurant Association's Restaurant, Hotel-Motel Show** from March 19-22, 2018, at the McCormick Place, 2301 S King Dr, Chicago, IL. Scheduled to staff the exhibit were representatives from the New York Wine & Grape Foundation and concord grape producers/wineries.

Unfortunately, the department was not able to exhibit at the show. Two days prior to the opening of the show, the department was notified that the two (2) pallets containing product for sampling, marketing and promotional materials and display fixtures were inadvertently shipped to Las Vegas, Nevada. The pallets were not located until three (3) weeks later.

The National Association of State Departments of Agriculture (NASDA) and USDA's Foreign Agricultural Service (FAS) are partners with the National Restaurant Association (NRA) to provide U.S. food and beverage exporters greater value in the American Food Fair Pavilion at the NRA Show. NASDA launched the American Food Fair in conjunction with the NRA Show to give U.S. food and beverage exporters an excellent opportunity to join the 2,100 exhibiting companies and 60,000+ registrants of NRA's event. The American Food Fair is comprised of U.S. based companies that produce a food and/or beverage product in the U.S. and are looking to break into the export market or expand their global reach.

American Food Fair is a four-day event that offers networking opportunities and business-to-business contacts all under one roof. Businesses who are interested in direct sales or forming relationships with suppliers and distributors, the foodservice professionals that exhibit at this event can assist companies reach new markets efficiently. In addition, it attracts international attendees from every continent in the world.

MIDA (Puerto Rico Chamber of Food Marketing, Industry and Food Distribution) Conference and Food Show 2018

The Department exhibited at the MIDA (Puerto Rico Chamber of Food Marketing, Industry and Food Distribution Chamber of Puerto Rico) Conference and Food Show from June 28-June 30, 2018, in the Convention Center of Puerto Rico. The MIDA is the most important event of the Food Industry in Puerto Rico. (This trade show is the equivalent to the FMI/United Fresh Trade Show in the United States).

This food show was an ideal platform for New York State to market and promote the high-quality specialty crops and food products that the State grows, produces and processes to the top leaders of the local and international food industry. There were 246 exhibitors and it was estimated there were 10,000 attendees.

Goals and Outcomes Achieved:

Goal: In the competitive environment that exists in the produce industry it is necessary for New York State to exhibit on a consistent basis at the trade shows held across the country to promote the specialty crops grown and the availability of those products to the major buyers and to the major buying regions.

Objective: To increase the exposure of the specialty crops that NYS grows as well as an increase their sales to increase the specialty crop producers' competitive ability to sell to domestic and international wholesalers, retailers, restauranteurs, etc.

Tasks: To meet and interact with the industry's finest produce suppliers as well as the industry's leading service providers and representatives of the food and beverage industry.

Outcomes (relative to Task outlined above):

2016 and 2017 New York Produce Show and Conference - Participation at these shows enhanced the exposure of New York's various specialty crops to the public and reinforced with consumers their value to New York's economy, their delicious flavor and their nutritional benefit. There was an estimate of 5,000 people who attended each show (a total of approx. 10,000 people) of which 40% were reported to be buyers. It was an ideal venue to reach a wider audience and have more impact than most trade show events.

MIDA (Puerto Rico Chamber of Food Marketing, Industry and Food Distribution) Conference and Food Show 2018 - The conference and trade show was an opportunity to establish business relationships with key account managers and to educate the show attendees and consumers of the diverse and high-quality specialty crops New York grows, produces and processes.

The consumer is demanding fresh, high quality products, the producer is providing the product and the wholesalers, etc., are making it available to the end user – the consumer. Staff made several connections with retailers, buyers and wholesalers. As is the case with most marketing programs, it is difficult to measure whether there was an increase of demand and sales because the project markets the entire state and not individual businesses.

Beneficiaries: The following 11 associations, working to promote New York specialty crops on behalf of thousands of growers, benefitted from the sampling and displaying of specialty crop products and information: New York Apple Association, NYS Berry Growers Association, Christmas Tree Farmers Association of New York, Farmers Market Federation of New York, NYS Flower Industries, Empire State Honey Producers Association, NYS Maple Producers Association, NYS Nursery and Landscape Association, Empire State Potato Growers, Inc., NYS Vegetable Growers Association, New York Wine &

Grape Foundation, etc. The promotional efforts Additionally, the approx. 12,000 attendees of events participated in, including buyers, distributors and consumers, benefitted from the connections made with specialty crop representatives and sampling fresh product.

Lessons Learned:

With a continued presence at these shows and additional marketing opportunities that fall under the USDA guidelines, we will continue to increase consumer awareness and brand loyalty for specialty crop products.

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Project 10 (Final)

Expanding First Time GAP Audits and Preparing Producers for Food Safety Regulations

Project Summary

Fresh and minimally processed, ready-to-eat fruit and vegetable production is a multi-billion dollar industry in the United States. In recent years, food safety has become a major concern in the production of fresh produce in the United States and globally. Many major international and domestic retailers, wholesale buyers, foodservice companies, restaurants and schools now require their suppliers to provide certification from a third-party to verify adherence to Good Agricultural Practices (GAP); and/or Good Handling Practices (GHP). In order to assist New York's specialty crop producers and handlers of fresh produce address these growing demands and remain competitive in the marketplace, the New York State Department of Agriculture & Markets (NYSDAM), using funds from the 2014 Specialty Crop Block Grant Program-Farm Bill (SCBGP-FB), implemented a multi-faceted food safety program to educate growers about GAP/GHP requirements as well as to assist growers, producers and handlers in paying the costs associated with first time audits, informational assessments and costs of water testing to comply with GAP/GHP.

GAP education and certification-reimbursement programs have been funded by New York's Specialty Crop Block Grant allocation prior to the 2014 award cycle. Prior to 2014, New York funded a "GAP Certification Assistance Program" using 2011 SCBG funds. Due to overwhelming feedback from farmers on the importance of providing this financial assistance, the project was once again funded in 2014. Producer response to the current program indicates the decision to continue previous efforts was worthwhile. Participation of growers, packers and handlers in GAP & GHP audits in New York has increased during this project as compared to the previous project. In the previous project, funded with 2014 SCBG funds, NYSDAM conducted 665 audits with 195 of them receiving reimbursement, while at the end of fiscal year 2017-18, NYSDAM conducted 241 audits, with 36 of them receiving reimbursement for certification.

Project Approach

NYSDAM developed a *Good Agricultural Practices Certification Assistance Program* whereby growers and handlers could receive financial assistance in paying up to $1000 of costs associated with third party GAP/GHP audits. This reimbursement approach was taken in order to provide a significant incentive for producers who were not familiar with the GAP/GHP certification process and may therefore be hesitant to have an audit performed or could otherwise not afford it. The audits were performed by NYSDAM or private companies and funds were distributed on a first-come, first-served basis. An informational brochure, marketing materials and associated program applications/forms were developed and made accessible both in hard copy and on the Department's website.

In order to effectively and efficiently target producers/growers/handlers, outreach and education was conducted at venues throughout the State including farm/trade shows, county fairs, food safety conferences, etc. In addition, Cornell Cooperative Extensions (CCEs) conducted twelve GAP workshops throughout the State in partnership with Cornell University staff and NYSDAM. During these two-day

GAP workshops, CCE staff put on presentations for farmers to inform on GAP requirements and were provided assistance in developing their food safety plans.

In order to meet the increased need and demand for certifications, SCBG funds were used for training auditors and to maintain necessary certification of USDA auditor qualifications.

Furthermore, in partnership with Cornell University and the New York State Food Laboratory, a portion of the SCBGP-FB funds were used to create a water quality database to minimize microbial food safety hazards to fresh and minimally processed fruits and vegetables posed by surface water irrigation. These commodities often are irrigated with surface water throughout the U.S. (1). While there is concern with all sources of water for pre-harvest use, relative to food safety, surface water is more likely to be exposed to fecal contamination than ground water and is expected to pose a greater risk to human health than irrigation with water from deep aquifers with properly constructed and protected wells. In most cases, the sanitary quality of surface water used for irrigation is not known because it is not regularly tested.

Previous studies of irrigation waters have been concerned primarily with chemical rather than microbiological water-quality parameters (2). As a result, there is a nationwide knowledge gap regarding sanitary quality of irrigation waters. Public attention to recent outbreaks of food borne illness has led the industry sectors to self-mandate irrigation water sampling and set quality standards based on the United States Environmental Protection Agency's Bacterial Water Quality Standards (USEPABWQS) for fresh water (3). Recreational-water criteria may not be appropriate for direct application to irrigation water; however, in the absence of a publicly available database based on water testing, this standard has been adopted. In addition to industry adoption of standards, in December 2009, the United States Food and Drug Administration publicly announced their intention to develop a Produce Safety Regulation for fresh produce.

Preliminary research data gathered prior to the beginning of this project from surface water sources used to overhead irrigate fresh produce crops indicated that if growers were forced to adopt the USEPABWQS, they would either have to discontinue use of some of their water sources or implement mitigation strategies to reduce the microbiological load because surface water quality can vary over the season (Bihn, unpublished data). These mitigation strategies could represent a significant financial investment and directly impact farm viability. Both food safety and the importance of water as a natural resource are being managed on the farm and understanding current water quality will allow farmers to make informed decisions about surface water use.

Goals and Outcomes Achieved

Grower/packers/handlers participation in GAP & GHP audits in New York has increased during this project as compared to the previous project. In the previous project, funded with 2014 Specialty Crop Block Grant funds, NYSDAM had conducted 665 audits in total, with 195 of them receiving reimbursement, while at the end of the 2015 grant cycle, NYSDAM conducted 241 audits, with 36 of them receiving reimbursement for certification.

NYSDAM provided and/or participated in 4 outreach and educational venues over the course of the year, directly reaching approximately 357 growers/packers/handlers.

During fiscal Year ending 9/29/18 all NYS auditors attended 20 hours of mandatory training, ~~each year~~, to meet continued professional education requirement of the auditor license. Eight auditors attended new auditor training. Currently, NY State has 17 USDA licensed GAP auditors.

Grower outreach and education was conducted at the following venues:

Date	**Event-Location**	**No. of Attendees**
1/17/18 and 1/18/18	SRC Arena, Empire State Produce Expo, Syracuse	150
1/31/18	Cornell Cooperative Extension, Lockport	12
3/6/18	Cornell Cooperative Extension, Binghamton.	20
8/7/18 – 8/8/18	Empire Farm Day, Seneca Falls,	175

Project Activity	**Who performed the work?**	**When was the activity accomplished?**
GAP Workshops: Workshops were organized in cooperation with Cornel Cooperative Extension focused on Presentation of GAP/GHP Audit Programs and helped growers prepare their Food Safety Plans.	T. Tubbs L. Reiter E. Wallace	*1/31/18* *3/6/18*
GAP Outreach: Direct interaction with growers, at Empire Expo & Empire Farm day, to provide them information about GAP audits and reimbursement programs, and to answer their concerns and questions about checklist questions.	M. Farrell *S. Hall* *W. Ingersoll* *T. Tubbs* *M. Santoro*	1/17/18 - 1/18/18 8/7/18 – 8/9/18
Auditor Training: Auditors receive annual mandatory training as a requirement of USDA continued professional development, (CPD) to keep their licenses.	E. Freeman T. Tubbs G. Spohn M. Arno E. Wallace V. Costa J. Moseley W. Ingersoll S. Smith M. Farrell	Various dates

	L. Wason	
New Auditor Training: New auditors receive various 'New Auditor Training' sessions, offered by USDA, to become licensed GAP auditors. Select new auditors also attended Produce Safety Alliance (PSR) trainings.	N. Hance L. Reiter S. Friedman J. Bucholtz J. Gutenmann C. Schiralli S. Hall F. Shenouda	*12/18/17* *4/3/18 – 4/6/18* 4/24/18 – 4/27/18

GAP promotional activities

To bolster the program's success, promotional video was shot, edited and production was completed through the assistance and funding provided by another NYS agency known as Empire State Development (ESD). As ESD provided this financial assistance toward promotion, SCBG project funds were better aimed at outreach, trainings and additional GAP certification reimbursements.

The ESD-funded video was released when the NYSDAM GAP website was launched in February 2016, along with a new brochure, which has the same look and feel as the website. The decision was made to launch and release simultaneously during the off season, which appears to have had a significant impact on this project in the subsequent 2016 growing season. During 2016, the greatest number of GAP reimbursement requests occurred for this project (151), likely due to the timing of the video release and website launch. Below are links to the promotional materials that helped to facilitate the many

Link to the brochure:

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjoqdvyv5vYAhVBQCYKHaH9BMAQFggpMAA&url=https%3A%2F%2Fwww.agriculture.ny.gov%2Fgap%2Fwp-content%2Fuploads%2F2016%2F11%2FNYSGC-GAP-Brochure-final_20161116.pdf&usg=AOvVaw2Llk_lfJQyfE8XrFr5mGPf

Link to the NYSDAM GAP website:

https://www.agriculture.ny.gov/gap/

Link to video:

https://www.agriculture.ny.gov/gap/overview-video/

Beneficiaries

Direct beneficiaries were the numerous New York State growers and handlers that participated in the various workshops and educational outreach sessions, and/or had a GAP/GHP audit performed for their operation. More than 300 growers, packers and handlers directly benefitted from the events outlined above, which informed farmers on GAP requirements and the potential for certification reimbursement through this program. Included were: 4 venues in 2017-18 reaching more than 350 individuals. NYSDAM performed 241 GAP audits during this project timeframe and reimbursed 36 individual farms for their GAP certification costs.

A secondary group of beneficiaries were the various levels of major international and domestic retailers, wholesale buyers, foodservice companies, restaurants and schools that participated in educational outreach venues and/or had their produce suppliers participate in this program and became more aware of the benefits of GAP/GHP.

A third group of beneficiaries are the millions of consumers of locally produced fresh fruits and vegetables who benefitted from improved food safety practices on farms and at handling facilities.

Lessons Learned

This project demonstrated that providing financial assistance to growers/handlers for first-time third party GAP/GHP certification is an effective way to encourage participation in implementing and documenting effective food safety practices. Coupling that assistance with broad-based educational outreach and comprehensive technical assistance throughout the certification process significantly extended the impact of the grant funds and resulted in grower/handler implementation and satisfaction.

Many producers who participated in this program realized that they were already implementing many of the recommended food safety practices, but just weren't documenting it within the context of a food safety plan. As a result, the perceived costs associated with potential changes to improve food safety practices were not as significant as some growers/handlers feared. At the same time, this project demonstrated that as producers/growers/handlers become more aware of food safety issues and incorporate changes in their practices into a farm food safety plan, the benefits of GAP certification become increasingly recognized throughout the industry.

Another lesson learned is that the diversity of the fresh and minimally processed produce industry needs to be considered on many levels throughout the development of a food safety education and implementation program. New York State's specialty crop industry is particularly diverse and complex, consisting of farms with a wide range of commodities, sizes and shapes. As a result, developing a program, educating the industry and implementing GAP procedures on individual farms is challenging and requires cooperation and working partnerships among various segments of the industry, including farmers, buyers, commodity organizations, educators, and government agencies.

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Additional Information

New York water testing laboratory information collected as part of this project is posted at the National GAPs Program website at www.gaps.cornell.edu.

Citations

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Project 11 (Final)

Growing Farm to Foodservice Linkages, Usage, and Education of New York State Apples and Apple Products.

Project Summary

New York State is the second largest producer of fresh apples in the United States. Yet many of our schools and state institutions have relied on apple surpluses from states as far away as Washington state, in addition to out-of-country apples from Chile and New Zealand. When apples are as close as our backyard, we need to assist our schools and state agencies' foodservice professionals in determining means of sourcing New York apples and apple products that adhere to the USDA dietary requirements for school and institutional meals. Furthermore, we need to assist our growers in identifying potential buyers and becoming approved vendors, either directly or through foodservice distributors.

As "buy local" becomes an increasingly popular movement, it is imperative that we assist growers in opening market channels. Without providing linkages between apple growers, manufacturers, school foodservice directors and state agency procurement professionals, the threat of out-of-state and out-of-country importation of apples will thwart possible successes for the New York apple growers. Furthermore, it is our responsibility to motivate consumption based on great taste and nutritional value, and to educate students about where their food comes from.

During this project, we were able to get a solid grasp of what information and connections are missing for schools and other state government agencies to be able to source New York apples. The project assisted in assessing the food system in New York (specifically how schools and other government agencies source New York products), identifying disconnects in schools' and government agencies' procurement activities, and working to assist schools and other government agencies in determining where they can source quantities needed.

The focus of this project is to motivate buyers to increase purchases of nutritious New York apples and apple products in schools and government agencies, such as correctional facilities. The project also aimed to open procurement and distribution channels within boundaries of the recent Food Safety Modernization Act legislation. For schools to increase purchases, they need to know where they can source the product and have a basic understanding of all players involved in the procurement process. This project is timely as the demand for local food continues to gain popularity and acceptance.

This project was not on built on previously funded projects; however, this project compliments previously completed work that industry and public agencies have been chipping away at for years. The United States has one of the safest and most efficient food systems in the world, meaning it is quite possible to source apples from New York if we foster relationships between the players. Creating these linkages is an absolute necessity to the continued successful expansion of marketing and distribution of locally sourced apples.

Project Approach

The New York Apple Association's (NYAA) "Growing Farm to Foodservice Linkages, Usage, and Education of Apples and Apple Products," included the following activities and successes:

- New York Apple Association created and printed 10,000 educational kits for distribution to foodservice industries such as schools for the benefit of increasing awareness that New York is a large producer of fresh, nutritious apples and apple products. It was our hope to reach at least 60% of the 780 school districts in New York; however, we were successful in distributing the educational kits to 694 school districts throughout the state, reaching a total 89% districts instead.
- NYAA developed partnerships with New York Department of Agriculture and FarmOn! Foundation to encourage consumption of New York apples with schools and others by promoting the New York Big Apple Crunch event. The partnership was successful in motivating 2.3 million students and others to bite simultaneously into New York apples. We were successful in increasing participation by 11.5% over the previous year. We utilized Public Relations Director, NYAA for social media to bring attention to the New York Apple Association partnership in the Big Apple Crunch promotion resulting national exposure for the program. We were also successful in utilizing our new Public Relations Manager to get the word out to media and provide 780 school districts with a press release toolkit to help spread the word about the 2018 promotion.
- NYAA's goal was to reach out to at least 15 foodservice distributors. Contractor contacted 17 foodservice distributors and provided NY apple shipper information to begin forming procurement linkages. One hundred percent of the 17 foodservice distributors indicated they have an interest in sourcing New York apples. Sixty five percent (11) of the 17 foodservice distributors indicated an interested in conducting a New York apple promotion for the 2018 crop year. Through a series of in-person calls, obtaining foodservice distributor information from a survey conducted with school foodservice directors, and doing a search, 44 foodservice distributors were identified and informed of the upcoming apple season and NY Big Apple Crunch promotion. We also acquired the names and physical addresses of other foodservice distributors bringing our total to 54 establishments.
- New York Apple Association participated in three Farm to School/Meet the Buyer/Meet the Foodservice Director events (one more than targeted) and participated in an informational meeting.
  - One event took place on Sept. 11 at Foodlink. The event was an opportunity to inform school foodservice directors on how to source New York apples. Association provided handouts along with directory of New York apple growers/shippers. Foodlink provided a tour to attendees to demonstrate the processing of New York sliced apples. Twenty-five school districts attended the event.
  - NYAA Consultant, along with Dutchess Schools, participated in a Harvest of the Month program. The program included providing farm-based learning opportunities for 60 school nutrition staff members to connect with local farms. Consultant provided lists of apple growers and contact information to foodservice directors.

- Consultant participated in the Poughkeepsie Farm Project and provided NY apples and NYAA marketing materials such as posters and a handout of apple growers and shippers available to provide New York schools with apples.
- Consultant provided a listing of 50 apple growers/shippers during the Farm to School meeting at SUNY Cobleskill on Jan. 4, which included 60 school nutrition staff members.

- NYAA created a survey instrument and circulated it to school foodservice directors and staff during the New York School Nutrition Association conference and four regional meetings. Our goal was to secure 78 completed surveys (10% of 780 school districts) and we were successful in acquiring a total of 113 surveys. Surveys captured apple procurement practices, foodservice distributor listings, and willingness to participate in promotions that educate and motivate New York apple consumption. Information gathered included contact information, number of schools in the district, varieties of apples purchased, apple case usage and whether the schools specify New York, itemization of New York apple suppliers, whether NY apples, applesauce, and fresh slices are featured on school menus, and listings of suppliers for each. Additionally, we queried whether the schools participate in farm-to-school promotions, the Big Apple Crunch promotion, and whether they are interested in New York apple promotions.
- NYAA attended the New York School Nutrition Association Conference in addition to four regional meetings not originally scheduled for the benefit of acquiring additional completed surveys and contacts with school foodservice directors at the following locations and dates:
    - Long Island, Nov. 28
    - Fish Kill, Nov. 29
    - Rochester, Dec. 5
    - Saratoga, Dec. 6

  Contractor researched and compiled a listing of 50 apple producers that indicated an interest in a direct-to-school program and provided information along with apple shipper directories at the conference and regional meetings.
- Consultant met with BOCES regarding specifications for schools and NY apples. Apples used were Ginger Gold 120 ct., Red Delicious 120 ct., and bulk box 120-150 ct.
- NYAA contacted 780 school districts—encouraging them to source at least 10% local and to source New York apples from apple growers, shippers and foodservice distributors. Our original goal was to reach out to 10% of the 780 school districts, but instead reached out to 100% of the school districts.
- NYAA informed apple growers and apple shippers regarding upcoming Food Safety Modernization Act training workshops through Core Report, a grower monthly publication reaching over 1,000 growers and industry in addition to email blasts.
- NYAA developed and coordinated a pilot volume sales contest with Ginsberg Foodservice. Initial goal was to promote one apple variety and was successful in getting the company to promote four varieties: McIntosh (113 and 120 count) and NY Red Delicious (100 ct), Fuji (80 ct), and Honeycrisp apples (88 ct). The promotion took place from November 13, 2017 through December 30, 2017. The promotion had three tiers: a first, second, and third place cash prize was awarded to the top 3 inside sales reps and four cash prizes for the top 4 District Sales Reps and cash prizes for the top 4 District Sales Reps. Thirty-eight individuals participated in the sales contest. Thirty-four of the salespersons participating in the promotion acquired new customers utilizing the

promotion. Apple sales during the promotion was 1756 cases, a 35% increase compared to sales from the same time last year (1295 cases). The promotion led to this foodservice distributor attracting a total of 85 new customers.

- Contractor met with state agency regarding procurement for correction facilities and secured where the State encourages this from vendors.
- Originally linked 10% of school districts to ag fun facts and trivia; however, we were successful in reaching out to 780 school districts resulting in reaching out to 100% of school districts.
- Contractor reached out to the following individuals in the Farm to School initiative to identify future Meet the Buyer events and serve as an initial working advisor:

    - Jennifer Martin, NYSNA
    - Glenda Neff, NYS Farmland Trust
    - Mark Bordeaux, Broom Tioga BOCES, Farm to School Coordinator
    - Regina Tillman, CCE Schoharie County
    - Andrea Spencer, NYSDAM
    - Ehle Shacter, NYSDAM-NYC
    - Kimberly LaMendola, Southern Tier Regional Planning Director
    - Cheryl Thayer, CCE Erie County, Harvest NY

Several foodservice distributors recommended that we team up with an already existing network of individuals Farm to School Coordinating Committee, of which, involves many stakeholders throughout the state. President of NYAA now serves on that committee. 12 apple shippers reported sales of $3,617,595, providing a baseline for future.

Goals and Outcomes Achieved

Big Apple Crunch Project

- NYAA worked with creative consultant (Masons Marketing) to develop and print 10,000 educational kit materials such as posters, NY apple variety guides, A-Z posters, and A-Z apple brochures and had them completed in time for the New York School Nutrition Assn. conference and to distribute throughout the current school year and the next. These materials were also handed out at 4 regional foodservice meetings and shipped to 694 school districts across NY.
- NYAA staff confirmed graphics and wording for Big Apple Crunch promotional materials.
    - NYAA confirmed partnerships on the New York Big Apple Crunch project, to include New York Apple Association, FarmOn! and New York Department of Agriculture and provided a press release template to 780 school districts. NYAA reached out to Ag in the Classroom to confirm interest in sourcing informational poster kits for classrooms.
    - NYAA staff prepared school foodservice director list provided by the State in preparation for direct mailing of education kits/posters.
    - Utilized NYAA staff to prepare educational posters for distribution at the NY School Nutrition Conference and four NY School Nutrition Regional Conferences we had not previously identified.
    - Distributed education kits (offerings of posters, A-Z guides, variety guides)

    - During the second quarter, 2,500 education kits (offerings of posters, A-Z guides, variety guides) were distributed to 112 school districts – a 30% increase over the goal of 78 school districts.
    - During the third and fourth quarters, the Association finished sending posters to schools, resulting in 694 school districts receiving posters. Original goal was 10% of 780 school districts but surpassed that goal by reaching 89% of the school districts in the state, as well as Ag in the Classroom representatives (5), FarmOn! Foundation, and distributors (11) and to the largest school districts including Buffalo, Rochester, Syracuse, Albany, and New York City.
- Utilized NYAA Public Relations Director, NYAA for social media to bring attention to the New York Apple Association partnership in the Big Apple Crunch promotion resulting in national exposure for the program. Partnered with FarmOn to gain favorable media coverage for event such as: https://ilovetheupperwestside.com/big-apple-crunch-2017/, http://www.cn.nysed.gov/content/big-apple-crunch-2017-0, https://patch.com/new-york/smithtown/smithtown-students-participate-big-apple-crunch
- Utilized NYAA Public Relations Manager to bring attention to the New York Apple Association partnership in the Big Apple Crunch promotion by informing our NY apple growers and industry through Core Report.
- Provided FarmOn! with a $1,000 scholarship to be provided to a school for a Victory Garden resulting in breaking the 2016 participation record. Participants who posted a tagged video of the Big Apple Crunch on social media were entered to win the scholarship. NYAA funded the scholarship out of their own funds to support the edible garden and related school educational opportunities for 2018.
- NYAA staff emailed 780 school districts encouraging them to source New York apples and sharing an opportunity to order additional Big Apple Crunch posters and any remaining posters.
- New York Apple Association Public Relations Manager and Assistant Account Manager emailed school foodservice directors a press release template to be used for the Big Apple Crunch promotion, so schools can also promote the event through their local media.

Distributor Outreach

- NYAA Consultant developed a contact list of eight NYS Food Service Distributor school specialists. NYAA's goal was to reach out to at least 15 foodservice distributors and was successful in reaching out to 17 foodservice distributors and providing NY apple shipper information to form procurement linkages. One hundred percent of the 17 foodservice distributors indicated an interest in sourcing New York apples. Sixty five percent (11) of the 17 Foodservice Distributors indicated an interest in conducting a New York apple promotion for the 2018 crop year. Through a series of in-person calls, obtaining foodservice distributor information from a survey conducted with school foodservice directors, and doing a search, 44 foodservice distributors were contacted to inform them of the apple season and the NY Big Apple Crunch promotion. We also acquired the names and of physical addresses of other foodservice distributors bringing our total to 54 establishments.
- NYAA Consultant met with Renzi Foodservice to review NY apples in the schools they supply. Consultant met with the school sales specialist and director of produce.

- NYAA collaborated with Ginsberg Foodservice to coordinate and sponsor a pilot volume sales contest that resulted in a 35% increase in apple sales and the acquisition of 85 new customers.

Nutrition Outreach

- Secured state agencies' (correctional facilities') contract language stating that New York apples are being sourced.
- Partnered with USApple on a contest for Apples4Ed campaign with School Nutrition Association and NASDA for New York State. The promotion encouraged students, families—anyone connected to a school—to submit their healthy snacking idea for a $10,000 grant. Promotion included posters and postcards.
- New York Apple Association hosted a Farm to School/Meet the Buyer/Meet the Foodservice Director event on Sept. 11 at Foodlink informing school foodservice directors on how to source New York apples. Association provided handouts along with directory of New York apple growers/shippers. Foodlink provided a tour to attendees to demonstrate the processing of New York sliced apples. Twenty-five school districts attended the event.
- Consultant provided a listing of 50 local/regional NY apple growers and farm markets from NYAA public database for schools to contact for purchasing apples during the Farm to School meeting at SUNY Cobleskill on Jan. 4, which included 60 school nutrition staff members.
- Consultant met with Carthage CSD Foodservice Director to review purchasing process for NY apples.
- Consultant met with Poughkeepsie Farm Project committee and reviewed purchasing of NY apples and NYAA marketing materials and posters.
- Consultant, along with Dutchess Schools, participated in the Harvest of the Month program. The program included providing farm-based learning opportunities for 60 school nutrition staff members to connect with local farms. Consultant provided lists of apple growers and contact information.
- Consultant met with BOCES regarding specifications for schools and NY apples. The following participated in acquiring New York apples: Adirondack Central, Carthage Central School, Lowville Central & Academy, General Brown Central, Sackets Harbor Central, Watertown City School, Alexandria Bay Central, Indian River Central, LaFargeville Central, Thousand Islands Central, Clifton-Fine Central, Edwards-Knox Central, Govererneur Central, Harrisville Central School, Hermon-DeKalb Central, Canton Central, Morristown Central, Brasher Falls Central, Massena Central, Norwood-Norfolk Central, Potsdam Central, Brushton-Moira Central, Colton-Pierrepont Central, Parishville-Hopkinton Central, Salmon River Central, St. Regis Mohawk Central, St. Regis Mohawk Central, St. Regis Falls Central, Saranac Central, AuSable Valley Central, Peru Central, Plattsburgh City School, Willsboro Central School, Crown Point Central provided by Renzi Foodservice. Apples used were Ginger Gold 120 ct., Red Delicious 120 ct., and bulk box 120-150 ct.
- In Quarter 1, NYAA prepared call to action for New York schools to source New York apples for next apple crop. Target was 10% of school districts, but reestablished new target of 77%. In Quarter 4, NYAA staff emailed 780 school districts regarding the 10% buy local pledge, New York apple crop, linkage to apple fun facts and trivia, reaching 100% of NY school districts.

Grower and Shipper Outreach

- NYAA informed apple growers and apple shippers regarding upcoming Food Safety Modernization Act training workshops through Core Report, a monthly publication that goes to 1,000 growers and industry and email blasts

School and Foodservice Distributor Surveys

- Contractor and NYAA staff developed survey instrument. The original goal was to secure 78 surveys; however, we were successful in securing 113 surveys, 145% of our goal.
- Completed data entry of 113 surveys. Gathered information included contact information, number of schools in the district, varieties of apples purchased, apple case usage and whether the schools specify New York, and itemization of New York apple suppliers, whether NY apples are featured on school menus, in addition to applesauce and fresh slice usage and listing of suppliers for each was entered into an excel spreadsheet. Other information acquired included whether the schools participate in farm-to-school promotions, Big Apple Crunch promotion, and whether they are interested in New York apple promotions.

Beneficiaries

Apple growers – ranging from large growers who are already in commercial markets to very small farmers who are considering entering the commercial market – are the main beneficiaries of the project. There are over 670 apple growers in New York. Since this project promoted both fresh apples and apple products derived from New York apples, the beneficiary rate reached at the very least 10% of 24 apple shippers resulting in at least $3,617,595 in sales as indicated by apple shippers. We provided education posters to 694 of the 780 public school districts and sent posters specifically to New York City, a school district that reaches more than 1.1 million students. We reached out to 44 foodservice distributors directly and encouraged them to source New York apples, and communicated through mailing of educational information to another ten beneficiaries.

Foodlink, an emergency food distribution operation in the Rochester area, was a beneficiary of this project as they operate an apple slicing process that sources only New York apples. Schools have an interest in apple slices, but it is difficult for them to request apples from New York when apple slicing companies source from multiple states. Foodlink provides a solution to this need. NYAA's research among foodservice directors yielded a list of schools interested in procuring apple products, including apple slices. This information will improve Foodlink's ability to identify and meet regional and statewide demand for local sliced apples.

Lessons Learned

One of the most important lessons of this project is the realization that there is a lack of awareness about not only where our food comes from, but how our food gets from field to table. New York is the second-largest producer of fresh apples, but despite this noteworthy statistic, many schools and foodservice institutions are not aware of how to source locally-grown apples.

In our conversations with school stakeholders, NYAA recognized a recurring misconception that to source local apples, one would need to buy them from apple growers down the road. Stakeholders do not realize that most small apple growers deliver their unwashed, unsized, ungraded product to one or few central packing house operations where fruit is then washed, sorted, graded according to USDA grading standards, and then shipped to foodservice distributors. This system is efficient, whereas many

of the small growers would not have the financial means to independently secure the facility, equipment and labor necessary to accomplish these tasks. There also seems to be a belief that locally-grown must be associated with small-sized operations, when in fact, this is a myth. Overall, the recognition and correction of these misconceptions was one of the greatest discoveries of this project—for those conducting the project as well as the beneficiaries.

Schools are receptive to sourcing New York apples. However, there are concerns regarding the price compared to what a school would pay for apples from larger apple-producing states like Washington State. Many of the schools did not understand that they need to ask their foodservice distributor to give them prices for New York apples. Future communication is needed to reinforce among foodservice directors that by simply requesting NY apples, they can swing the pendulum and increase availability of NY apples in their school food contracts. If foodservice directors don't ask, their distributors will not know that the schools have an interest in locally-produced apples.

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Project 12 (Final)

Concord Grape Marketing Initiative- Identifying Best Practices Toward Stabilizing New York's Grape Market

Project Summary

New York is the nation's second largest Concord grape producer, and the Lake Erie Concord Belt is the oldest and largest Concord grape growing region in the world. About 30,000 acres of grape vineyards sit along the belt; with the majority located in New York State. However, a combination of changing consumer preferences and oversupply has depressed grape juice prices leading grape farmers to break-even or experience losses over the past four years. The market for juice grapes in the U.S. is drying up as consumers preferences are straying from carbohydrate-rich drinks. This concerns Western NY grape farmers as they expect a fourth straight year of low prices for Concord grape after the 2017 harvest. And, the successive years of large national crops has only added to inventories of juice concentrate that continue to languish in storage, keeping prices low for growers bringing grapes to the processor. The growth of the wine industry is keeping some market prices at sustainable levels, while the juice and jelly market struggles.

Western NY growers have had two strong years of production at significantly greater than average yields, which has led to an oversupply that has put downward pressure on grape prices. Concord cash market prices have plunged by as much as $200 per ton in the last four years, and it is estimated that WNY growers will now be paid between $120 and $200 per ton. Since 2013, the average farm gate value of Concord grapes has fallen from $290 per ton to $212 in 2015.

As a result, several Western NY juice processors have closed or reduced production. In 2015, ConAgra Foods closed two Carriage House juice and jelly making plants. Cott Co., a beverage maker in Dunkirk, NY, has also reduced the amount of grower contracts by 25%.

These conditions have left Concord growers in a precarious position, needing to find a way to expand markets or diversify production to remain profitable. To enhance the competitiveness of New York's grape industry, this project brought key industry members, researchers and growers together to identify barriers in promoting and expanding the market for NY Concord grapes, and start work on initiatives that will help growers remain profitable.

Project Approach

The project sought to bring together key industry, grower, economic development agencies, researchers, and marketers for the "Concord Grape Summit" to determine a strategy to address the current crisis in the juice grape market. All pre- summit activities were successfully completed, including creating a robust invitation list of 405 people, of which 175 attended. Additional activities outside the

workplan included producing a video about the State of the Grape Industry, which was shown at the beginning of the Summit. The event was held April 12th, 2018 at the Grape Discovery Center, in the heart of Concord Grape country- Chautauqua County, NY. Speakers addressed the group, and NY Dept. of Agriculture and Markets Commissioner Richard Ball led a roundtable discussion. The result of the Summit were 6 initiatives that 100% of stakeholders felt would set a path toward increasing demand for Concord products, developing new Concord-based products, and ensuring the economic profitability of grape growers and associated industries. The 6 initiatives were:

1. Conduct denaturing research to create a neutral blending juice.

2. Expand Export markets for Concord Grape Products

3. Support vineyard diversification by funding a Vine Replacement Program that helps growers remove Concord vineyards and replace with in-demand grape varieties.

4. Concord Grape Marketing Campaign

5. Create a NYS Governor's Cup Brandy Competition

6. Encourage Concord product innovation

This project allowed staff to collaborate with partners to implement the remaining 5 initiatives in subsequent years and have begun making progress on all initiatives. The first initiative selected to immediately move forward was a Concord Grape Marketing Campaign.

Funds remaining after the summit were used to begin work on the marketing campaign. Additional state funds were leveraged to complement SCBG funding for work on these initiatives. One unanticipated development was that we received a 2019 FSMIP grant that will allow us to expand this work.

Goals and Outcomes Achieved

While the over-arching goal of this project will be measured long term, the immediate objective of this project, to convene a group of industry stakeholders to determine strategies to increase demand for Concord grapes was achieved. The following measurable outcomes include:

- 405 invitations to the Concord Summit were issued from Commissioner Ball's office to growers, legislators, viticulture researchers, and industry representatives.
- 175 individuals attended the Concord Summit on April 12, 2018 at the Grape Discovery Center in Portland, NY.
- As a result of the Summit, 6 strategies to increase market demand and profitability for growers were agreed upon.
- A Concord juice and wine Buyers Guide, pull-up banner and tradeshow backdrop were

produced for use at tradeshows. A 'Grape Day at the Great NYS Fair" and table top stands for grape product vendors were produced for the first annual Grape Day at the NYS Fair, August 23, 2018.

- The First Grape Day at the Fair included an open Pavilion devoted to the Grape Industry and a vendor area of Concord grape products and exposed over 80,000 consumers to information about the industry and a variety of Concord food and beverages.

Beneficiaries

The main beneficiaries of this project are the 300+ Concord grape growers in the Western part of NYS. The six initiatives identified by the summit will support economic improvement for these farm operations through the Vineyard Improvement Program and development of market opportunities. This project also lays the groundwork for manufacturers of Concord based products to benefit from incentives to create new products using Concord grapes.

Lessons Learned

Project staff engaged with growers, researchers and industry representatives in advance of the Summit. This allowed Department staff to have a good idea of the challenges and potential solutions going into the summit and keep the conversation focused on the major issues and substantial solutions.

The overall lesson learned is that an issue as vast as the Concord crisis requires multiple fields of thought to bring about solutions. The inclusion of personnel from various agricultural communities allowed a great deal of information and ideas to be exchanged.

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Project 13

*Specialty Crop Advertising and Promotion Program**

*As described in an email from our Department to USDA AMS staff on 12/6/18, this project was terminated and did not utilize 2015 SCBG funding. While Letters of Allocation were initiated between the Department and specialty crop producers/ retailers, vendors were unable to implement activities timely and/or submit claims significant enough to warrant the expenditure of 2015 SCBG funding. Therefore, this project was not utilized

Despite the delay in implementation, the program is deemed viable and has ramped up significantly beyond the 2015 SCBG grant expiration date of 9/29/18. As outlined in our Department's 2018 SCBG application, this program will be carried out under "Project 8" titled "Advertising and promotion of New York Specialty Crops"; specifically outlined as "Objective 3".