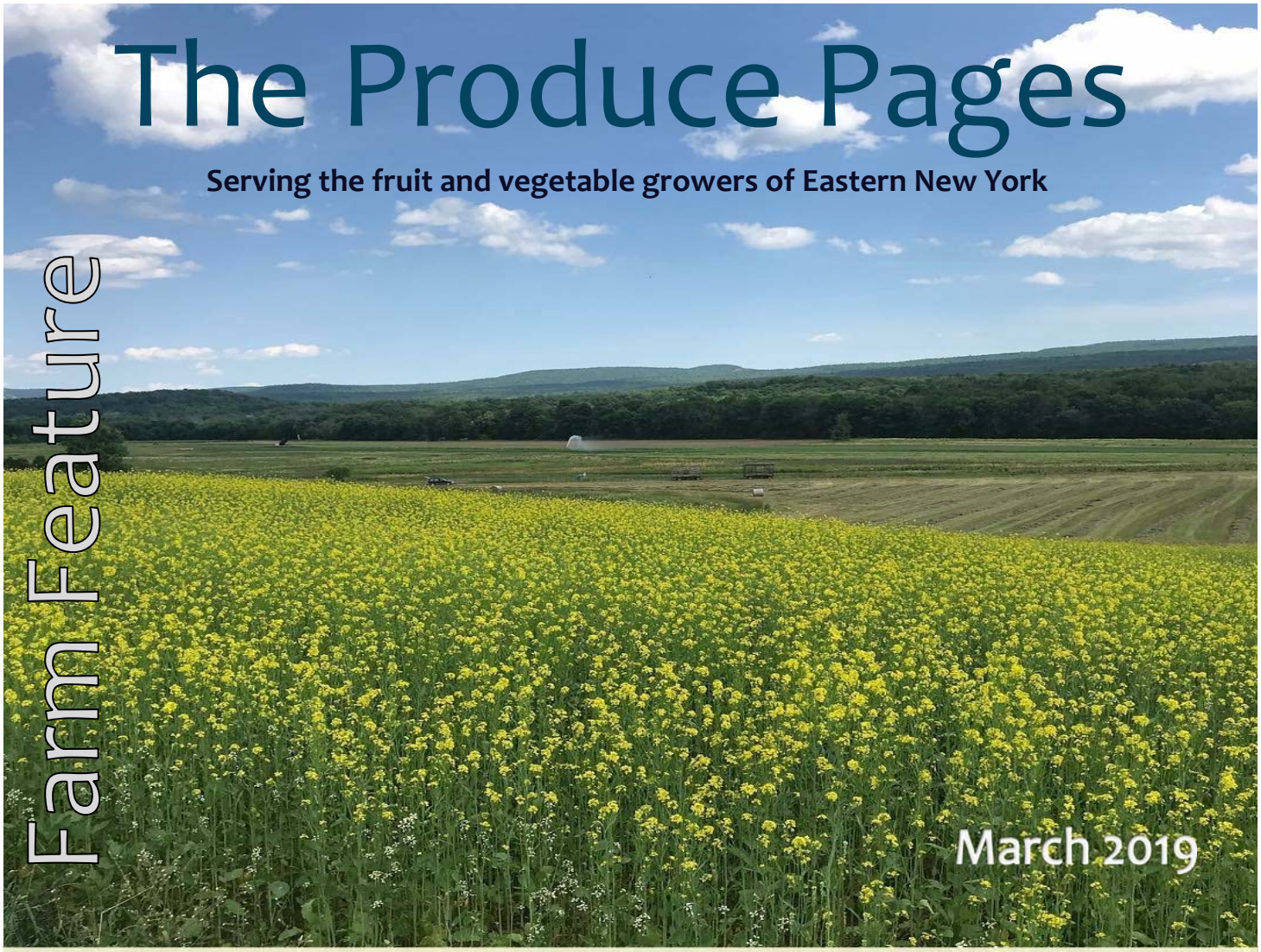

Next Generation on the Family Farm – Eastern New York Vegetable Farms Moving into their Third Generation (Continued).

An interview with John Ferrante of Wallkill View Farm and John Kelder of Kelder Farm.

Liz Higgins, ENYCHP

Keeping a family farm going for more than two generations is an accomplishment – Referred to as the "third generation curse" various studies have indicated that less than 16 percent make it to the third generation and only six percent make it to the fourth or higher. In the last issue of Produce Pages, we featured two fruit farms where the third (or higher) generation on the family farm was moving into a managerial role – ultimately with a goal of transitioning to ownership. This month we are featuring the upcoming generation on two vegetable farms, John Ferrante of Wallkill View Farm in New Paltz and John Kelder of Kelder's Farm in Kerhonkson.

What is your farm's history?

John Ferrante: **"**Wallkill View Farm a third-generation family owned and operated vegetable farm and farm market in New Paltz, NY. Peter and Carol Ferrante, my grandparents, purchased the land and began farming in New Paltz in 1960. The market was built in the 1970s. Four of their sons, including my dad, their wives and two of my cousins are actively involved in the family business."

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Cornell Cooperative Extension
Eastern NY Commercial Horticulture Program

The Produce Pages

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The *Produce Pages* is a monthly publication of the Eastern New York Commercial Horticulture Program. For more information about the program, please visit our website at http://enych.cce.cornell.edu/.

Cover Art: Photograph of Kelder Farm

Contents

2019 Eastern New York Fruit and Vegetable Conference

Serving the Educational and Research Needs of the Commercial Small Fruit, Vegetable and Tree Fruit Industries in Albany, Clinton, Columbia, Dutchess, Essex, Fulton, Greene, Montgomery, Orange, Putnam, Rensselaer, Saratoga, Schoharie, Schenectady, Ulster, Warren and Washington Counties

John Kelder: "Kelder farm is a bicentennial farm, in operation in the Rondout Valley since 1779. In order to stay in business, we have always had to evolve. In the last 100 years, our family has farmed chickens, pigs and dairy cattle. Today, we grow vegetables and berries and are the Rondout Valley's largest U-Pick farm, with over 100 acres of seasonal crops, open our doors to thousands of school children every year, and are a popular agri-tourism destination."


John Kelder

Why do you want to continue as the next generation on your family's farm?
John Ferrante : "Farming has always been a passion of mine. The family farm was a big part of my life growing up-- I've worked here since I was old enough to help and it's been a fulfilling job not just because I love the work but also because I get to work family who shares the same passion."

John Kelder: "It is a great opportunity for me to work in a field that I am passionate about. I can work for myself and can work with my family."

Do you have other siblings/relatives of your generation that are likely to join you in the business? How is this a challenge or an advantage?
John Ferrante: "I have two cousins who work full time at the farm. Having a next generation of family members is an advantage for daily tasks and daily management activities because we have grown up deeply connected to the farm and how it operates. Where it becomes difficult is thinking about the 5 to 10-year plan-- where is this business going to be? How will we best prepare ourselves for this future structure?"

John Kelder: "Currently, I do not have any siblings joining the business, but there are many different areas or avenues for additional siblings to contribute to a farm business."

Have you always known that you wanted to continue in the farm, or is this a new decision?
John Ferrante: "I always knew I was going to be in agriculture and that the family farm was at the top of my list."

John Kelder: "I grew up working on the farm and I have always been interested in agriculture. In college and after college, I worked a few years for other parts of the agricultural industry. It ultimately reaffirmed that I wanted to be a part of the family farm."

What are you optimistic about?
John Ferrante: "I am optimistic about the general trend of consumers wanting local food from a trusted food system whether that be conventional or organic agriculture. I believe there is a lot of opportunity for agriculture in NY and our next generation of farms are willing to be quick to adapt."

John Kelder: "I'm optimistic about the opportunities for agriculture in the Hudson Valley."

What are you worried about?
John Ferrante: "I'm not worried about reaching our end goal while continuing to be a successfully run family business. I'm worried about how long it is going to take to accomplish that goal."

John Kelder: "I'm worried about the rising costs of doing business in New York State relating to labor, taxes, regulations, etc. "

What has your family done to help with the transition?
John Ferrante: "Communication must be part of the process. Even still we don't communicate enough but we know of its importance. We have used and continue to use Farmnet as a resource for this."

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Would you bet the farm on red?

Natural disaster can strike at any time!

Don't leave your farm's financial future to chance...

If you suffer a loss this year, would you be able to plant next year? Crop insurance can help protect you and your family from losses caused by bad weather and volatile prices.

Be sure you don't miss the following sales deadlines!

March 15: Barley (spring), Beans (dry, green), Cabbage, Corn, Forage Seeding (spring), Grain Sorghum, Green Peas, Oats (spring), Potatoes, Soybeans, Sweet Corn, Tomatoes (processing), Whole Farm Revenue (early fiscal filer)

May 1: Nursery (field, container)

July 31: Forage Seeding (fall)

Sep. 30: Barley (winter), Forage Prod., Wheat (winter)

Nov. 15: Apiculture, Pasture Ranchland Forage (PRF)

Nov. 20: Apples, Grapes, Peaches, Tart Cherries, Whole Farm Revenue (late fiscal filer)

Monthly: Dairy, Swine (Livestock Gross Margin)

Daily: Milk (Dairy Revenue Protection)

To locate an RMA agent visit: **http: //cli.re/gzPVWy**

To learn how you can apply crop insurance to your risk management strategy and about crop insurance products available to New York farmers visit:
https://agriskmanagement.cornell.edu

Cornell CALS
College of Agriculture and Life Sciences

USDA
U.S. Department of Agriculture
Risk Management Agency

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John Kelder: "My family has provided me with an opportunity to have responsibilities and allow me to incorporate my ideas into the farm."

What are you doing to prepare yourself?
John Ferrante: "I take all of the extended learning opportunities I can and continue to tell myself to communicate."

John Kelder: "We continue to try to be forward thinking, keeping up with change and be prepared for the future."

Is there some need that young next-gen farmers have that is not being addressed in our region?
John Ferrante: "Cornell Cooperative Extension has done a great job with their educational resources over the last couple of years. They are relevant to the needs of the farmers and have even helped sparked an interest in new production. I do think some sort of next generation farmer networking event or group could be advantageous. I personally think many of us know *of* each other but don't *know* each another. There's so much value in learning from each other so anything that can help facilitate this will be beneficial."

John Kelder: "Networking and information is always important and there is always opportunities for more."

2018 Eastern NY Potato Variety Trials:

Chuck Bornt, CCE ENYCHP

I am happy to announce the results of the 2018 fresh market potato variety trials. I know that many of you have already completed your seed orders, but I hope you might consider trying something new in 2019. I wish that I could have had this information to you sooner, but the 2018 harvest season proved difficult for all, including us! I would also like to thank our seed suppliers for their contributions to this trial: Ralph Child, Childstock Farms, Inc., Dr. Greg Porter, University of Maine Potato Breeding Program and Dr. Walter De Jong, Cornell University Potato Breeding Program.

Trial information: Two trials with the same 34 fresh market and specialty potato varieties (Table 1) of various flesh and skin colors were planted in the spring of 2018:

Trial 1: The organic trial was located at Morningstar Farm in Copake and was planted on May 11, 2018. Emergence and stands were excellent at this location, but late summer/fall rains made finding a harvest window difficult and as a result, this site was not harvested.

Trial 2: The conventional system trial was located at Barber Farms in Schoharie County and planted on May 17, 2018. The row spacing used was 40" on center between rows and 9" in-row spacing. Broadcast fertilizer was added to achieve 130 pounds of actual nitrogen, 50 pounds actual phosphorous and 240 pounds of actual potassium per acre. Herbicides, insecticide, fungicides and all other cultural activities (i.e.: hilling) were completed by the cooperator. Stands and emergence were also excellent at this location and plots were harvested on November 26, 2018 and stored until grading on January 4, 2019.

Data: Because this trial is large with so much data, the yield and size distribution tables can be found on our website at https://rvpadmin.cce.cornell.edu/uploads/doc_730.pdf. You can also call or email Chuck Bornt for a copy of the tables at 518-859-6213 or cdb13@cornell.edu. Also posted on the website is a slide show of all the varieties for you to view at https://rvpadmin.cce.cornell.edu/uploads/doc_728.pdf More data including culinary/eating quality will be uploaded upon completion of evaluating for this data.

Summary and Discussion: There are so many potato varieties out there and one thing that I have

noted over the years is that potato growers become very attached to certain varieties (including this author). However, I would really encourage you to try at least 1 new one and compare it to your standard – you never know what you might find!

I was very pleased with some of the yellow fleshed lines that we evaluated this year. Yellow fleshed lines such as Yukon Gold have become harder to grow over the last few years due to Potato Virus Y. One new variety from the NY breeding program called NY 149 I think has some potential to be a replacement for Yukon – not only does it have a nice yellow flesh, but many of the tubers retain the pink-eye trait that Yukon is also noted for and fewer internal defects. However, it is a bit smaller compared to Yukon. If you are familiar with Red Gold, you might be interested in 6049, as it is a red skinned, yellow fleshed potato that was excellent looking (external and internal) and is one that I would certainly not hesitate to grow. 6049 yields better, has better overall quality and size compared to Red Gold. We also liked Natascha and AF5225-1 for yellow fleshed lines. Lehigh is also a high quality variety with probably some of the best size, early and overall yields but flesh color is very pale in comparison to the ones mentioned above.

We had quite a few blue/purple skinned/fleshed lines this year as well. If you are looking for a blue fingerling, Purple Majesty, US Blue and Fleure Bleue are ones that provided us with decent overall yields and good quality tubers. US Blue and Fleure Bleue had a dark purple skin but a very beautiful "starburst" interior (not solid purple but with flashes of white). One of our favorites this year was AF5414-1, which is a purple/rose skin and a beautiful pink/rose colored flesh. It's shape, size added to the overall appeal of this variety along with outstanding overall yields (447 cwt, highest in trial).

We evaluated 8 red skinned/white fleshed varieties this season as well and noted a few nice additions. NADF113484B1 had some of the prettiest tubers in this class, but low overall yields. I liked the shape and size of Fenway Red (sorry Yankee fans) but the color was a bit lite, more like a pink. NY 164 also had good size, shape, uniformity, decent color and very good yields compared to our standards (Chieftain and Norland). AF4831-2 I think also has some potential as a commercial red-skinned variety. And I already talked about 6049 which is a red skinned but yellow fleshed variety that we liked a lot (see yellow fleshed lines).

For white skinned/white fleshed it has to be something unique or remarkable. In this group, Joli was a bright, very smooth, white skinned oblong round tuber that really stood out both when digging and grading. Eva, a standard for many growers also did very well this year compared to other years. The best newcomer I think was NY 151, which provided us with the highest yields of nicely shaped round-round, smooth, good sized tubers.

Table 1: Name, Seed Source and Quick Description of 34 Fresh Market Potato Varieties Grown at Barber's Farm, Middleburgh, NY

Variety Name	Seed Source	Skin Type	Flesh Type	Variety Name	Seed Source	Skin Type	Flesh Type
747	Childstock Farm	white	white	Fenway Red	Childstock Farm	red	white
6049	Childstock Farm	red	yellow	Fleure Bleue	Childstock Farm	purple	purple/ white
AF3362-1	University of Maine	brown	white	Joli	Childstock Farm	white	white
AF4648-2	University of Maine	white	white	Lehigh	Cornell University	white	yellow
AF4831-2	University of Maine	red	white	M12-3	Cornell University	purple	purple/ white
AF5225-1	University of Maine	white	cream	Natascha	Childstock Farm	white	yellow
AF5245-1	University of Maine	purple	white	NDAF113484B-1	University of Maine	red	white
AF5312-1	University of Maine	brown	white	Norland	Cornell University	red	white
AF5412-3	University of Maine	purple	purple	NY136	Cornell University	red	white
AF5414-1	University of Maine	red	red	NY149	Cornell University	white	yellow
AF5682-3	University of Maine	white	white	NY151	Cornell University	white	white
AF5682-5	University of Maine	white	yellow	NY161	Cornell University	white	yellow
Belmonda	Childstock Farm	white	yellow	NY164	Cornell University	red	white
Butterfly	Childstock Farm	white	yellow	Purple Majesty	Childstock Farm	purple	purple
Chieftan	Cornell University	red	white	Soraya	Childstock Farm	white	yellow
Dakota Ruby	Childstock Farm	red	white	US Blue	Childstock Farm	blue	blue
Eva	Cornell University	white	white	Yukon Gold	Cornell University	white	yellow

Familiarize yourself with FSMA: Now is the time to learn about the Produce Safety Rule

Elisabeth Hodgdon, CCE ENYCHP

As winter trudges on, snow lingers in the fields and we pore over our seed catalogs, making plans for the upcoming growing season. 'Tis the season for grower meetings and conferences as well. It's the time of year to catch up with neighbors around the region and hear about the latest in fruit and vegetable research. It's also a great time to think about food safety training before the growing season gets busy. Have you taken the FSMA grower course yet? If not, it's time to think about it. Spring 2019 brings the official start of audits for the largest farms subject to the Produce Safety Rule.

The Food and Drug Administration's Food Safety Modernization Act (FSMA) was passed in 2011. Within FSMA, the Produce Safety Rule was the first measure on a federal level to outline standards for farms growing and storing fresh fruits and vegetables, specifically those that are commonly eaten raw. Within the rule, standards for activities such as worker hygiene, manure application practices, water testing, and pack house sanitization are established to avoid contamination of produce with human pathogens such as *E. coli* and *Salmonella* to avoid foodborne illness.

The rule has taken a few years to take effect to allow time for growers to make changes to their operations, and for auditing procedures to be formalized. Official start dates for enforcement depend on farm size, with the largest farms needing to comply by 2018, and the smallest farms by 2020.

Why take the course?

- Ultimately, one person from each farm subject to the rule is required to attend a grower course. § 112.22(c) of the rule specifies that '*at least one supervisor or responsible party for your farm must have successfully completed food safety training at least equivalent to that received under standardized curriculum recognized as adequate by the Food and Drug Administration.'*
- Find out IF your farm is subjected to the Produce Safety Rule and WHEN you may need to comply
- Learn about key themes covered in the rule, such as worker hygiene, manure application practices, water testing, and pack house sanitization
- Talk with other growers over coffee to hear about how they are preparing for the rule
- Figure out how FSMA compliance and GAP practices differ
- Take advantage of the opportunity to chat with Produce Safety Alliance (PSA) and Department of Agriculture and Markets staff
- You only need to take the course ONCE! Your certificate does not expire
- The certificate stays with you, no matter which farm you work on

When and where can I take the course?

Upcoming opportunities for grower courses are listed on Cornell's PSA website (https://producesafetyalliance.cornell.edu). The PSA organizes courses all over the world, for both growers and extension personnel. Their standardized curriculum is recognized by the FDA. The length of the courses vary. All courses include information presented in seven modules on the Produce Safety Rule. Two day courses allow time for growers to work on writing a farm food safety plan on the second day.

Upcoming courses in New York:

North Bangor, March 7 & 8
St. Lawrence Valley Produce Auction
58 Martin Rd, North Bangor, NY 12966
Contact: Lindsey Pashow (518-569-3073)
In-state cost: $25

Oneonta, March 9 & 10
Otsego County Chamber of Commerce
189 Main Street, Oneonta, NY 13820
Contact: Margaret Kaiser (847-987-4565)
Cost: $35-50;

Binghamton, March 11 & 12
Cornell Cooperative Extension Broome County
840 Upper Front St #2, Binghamton, NY 13905
Contact: Craig Kahlke (585-735-5448)
In-state cost: $150 per farm (up to 2 personnel)

Newark, March 21
Cornell Cooperative Extension Wayne County
1581 NY-88, Newark, NY 14513
Contact: Craig Kahlke (585-735-5448)
In-state cost: TBD

Upcoming courses in neighboring regions:

East Haddam, CT, March 13-14
UCONN Extension Middlesex County
1066 Saybrook Rd, Haddam, CT 06438
Contact: Diane Hirsch (203-407-3163)
Out-of-state cost: $150

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Stockbridge, MA, March 14
Stockbridge Chamber of Commerce
50 Main St.,Stockbridge, MA 01262
Contact: Lisa McKeag (413-545-1051)
Out-of-state cost: $40

Middlebury, VT, March 19
University of Vermont (UVM) Extension Middlebury
23 Pond Lane, Suite 300 Middlebury, VT 05754-1189
Contact: Dana Ruppert (1-802-257-7967)
Call for Out-of-state cost:

Who can I contact with questions about compliance? For assistance with production practices, contact your local extension educators. Some questions specifically relating to the audit process or wording and interpretation of the law may require expertise from the New York Department of Agriculture and Markets or a lawyer.

Source: Agricultural News, Volume 103 • Number 2 • February 2019

New Tools for Managing Basil Downy Mildew

Margaret Tuttle McGrath
Plant Pathology and Plant-Microbe Biology Section, SIPS, Cornell University
Long Island Horticultural Research and Extension Center

Downy mildew continues to be the most important disease of basil on Long Island and throughout most of the USA, affecting plants grown outdoors at farms and in gardens as well as in greenhouses every year. Only states with no confirmed occurrences to date are Arizona, Idaho, Nevada, South Dakota, Utah, and Wyoming. Widespread regular occurrence of this devastating disease every year on LI since 2008 has clearly documented management is needed to ensure a marketable crop.

New resistant varieties exhibited good to complete suppression of downy mildew with no fungicides applied compared to susceptible Martina in a variety evaluation conducted in the field at LIHREC last summer. Some downy mildew developed on Devotion, Obsession, Passion, and Thunderstruck which are the first varieties developed at Rutgers University through a USDA-funded project that included evaluations at LIHREC of the preceding experimental lines. Excellent control is expected with these varieties treated with fungicides, likely even starting after first symptoms which will be tested this summer. These varieties are available from VanDrunen Specialty Seeds. In the variety evaluation no symptoms were found on plants of Prospera, an Israeli variety being marketed by Johnny's Selected Seeds (in the on-line catalogue), and Amazel, a Proven Winners variety being sold as cuttings for retail sale because its seed are sterile. Immunity (no disease development) is not the usual situation with disease resistance and often is associated with race-specific resistance which pathogens tend to be able to evolve to overcome. A report on this evaluation, photographs of the plants, and quality evaluations made by LI growers are posted at http://blogs.cornell.edu/livegpath/research/basil-downy-mildew/. These and additional new varieties will be evaluated this summer. Growers are welcome to come see them.

If you grow any of these new resistant varieties, I would greatly appreciate hearing what you think of their quality and ability to suppress downy mildew. And if you see symptoms on Prospera or Amazel I would like samples to test the pathogen.

Segovis (FRAC Code U15) is a new fungicide registered in NY for managing downy mildew in basil grown as transplants for sale to residential consumers. Other fungicides to use in rotation with Segovis for managing fungicide resistance are Subdue MAXX, Micora, Heritage (these three only for plants for retail sale), Ranman, Revus, and phosphorous acid (phosphanate) fungicides. Last three plus Quadris are labeled for field crops.

More information about basil downy mildew and the management practice listed here are posted at a LIHREC web page (http://blogs.cornell.edu/livegpath/extension/basil-downy-mildew/) and at VegetableMD online (http://vegetablemdonline.ppath.cornell.edu/NewsArticles/BasilDowny.html).

Please Note: The specific directions on fungicide labels must be adhered to -- they supersede these recommendations, if there is a conflict. Any reference to commercial products, trade or brand names is for information only; no endorsement is intended.

Drip Irrigation for Tree Fruit Orchards in Pennsylvania

Dr. Long He, Penn State University

Irrigation is the application of controlled amounts of water to plants at needed intervals. Irrigation helps grow agricultural crops, maintain landscapes, and revegetate disturbed soils in dry areas and during periods of inadequate rainfall. Precipitation in Pennsylvania averages about 37 inches each year. About 13 inches of this precipitation runs off the land into streams, while 24 inches infiltrates into the soil, where it can be used by crops. While uneven precipitation can cause plant stress during critical growth periods, which will affect both crop productivity and produce quality, most horticultural crops require supplemental irrigation to minimize plant stress. Proper timing of water applications during appropriate periods can increase the yield and quality of most horticultural crops in Pennsylvania in most years. Critical periods for the irrigation of apples are during flower formation, early fruit set, and during final fruit swell (Penn State Extension, 2017: Irrigation for fruit and vegetable production (https://extension.psu.edu/irrigation-for-fruit-and-vegetable-production).

For high-density apple orchards, water relations are even more important. Irrigation is essential for ensuring optimum growth of newly planted and young apple orchards and also to obtain the desired fruit size. For high-density orchards, the economic success really depends on obtaining significant yields in the third, fourth, and fifth years to repay the establishment costs. To obtain the expected high yields requires excellent tree growth during the first three years after planting. However, one of the biggest problems we see with new high-density orchards is inadequate tree growth during the first three years. It is estimated that when poor tree growth in the early years delays cropping of a new orchard, peak investment is delayed by 20% and the total profits are reduced by 66% over the 20-year life of the orchard (Robinson et al., 2013: Precision irrigation management in apples). Much of the problem of poor tree growth can be traced to inadequate water supply during the first three years. Therefore, it is very important to have a precision irrigation system for high-density apple orchards.

Irrigation Systems for Tree Fruit Orchards

Typically, there are three major irrigation systems in tree fruit orchards, namely, drip irrigation, under tree sprinkler, and overhead sprinkler. In humid climate regions, drip irrigation is primarily used. Therefore, in our project, we used a drip irrigation system for the test apple orchard.

Drip irrigation system

Drip irrigation is a type of micro-irrigation system that has the potential to save water and nutrients by allowing water to drip slowly to the roots of the plants, either above the soil surface or buried below the surface. Drip is the most efficient way to irrigate. It is usually about 90% efficient compared to about 70% for sprinkler and often 50% for surface irrigation. Besides the high water use efficiency (90%-95%), drip irrigation also reduces the risk of plant diseases that thrive in wet conditions. A typical drip irrigation system includes a water source (e.g., well water, river water), pump, a pressure regulating system, valves, pipeline, emitters, and other accessories. Figure 3 illustrates a simplified drip irrigation schematic diagram. Drip irrigation is suitable to all soil types because of its extremely slow application rate and the high degree of control over timing and amounts (Peters, 2015: Drip irrigation for agricultural producers).

For the details of drip system components, installation and operation, growers can refer to the Drip Irrigation Handbook (https://www.netafim.com/499749/globalassets/products/drippers-and-dripperlines/drip-irrigation-system-handbook.pdf).

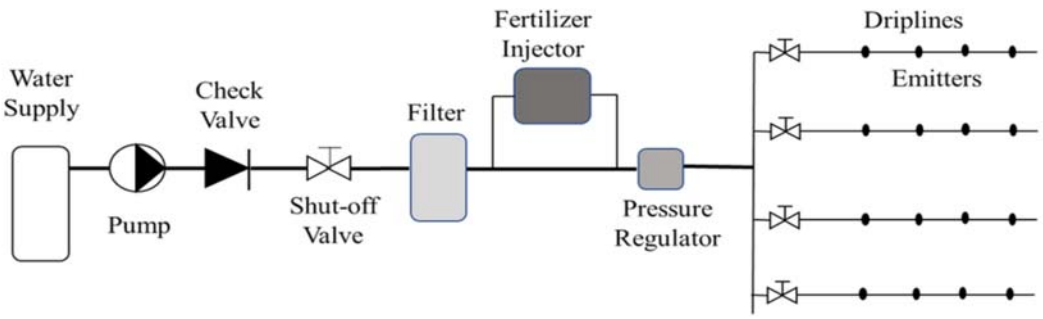

Figure 3. Simplified drip irrigation schematic diagram

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Irrigation application rate calculation

As described in Peters, 2015 (Drip irrigation for agricultural producers), water movement capability varies in different soil types, e.g., sandy soil (1-1.5 ft radius); loam soil (1.5-2.5 ft radius); and clay soil (2.5-3.5 ft radius). These are important for setting the lateral distance between the emitters. Meanwhile, a smaller root zone is more sensitive to water and nutrient stress because crop roots have no motivation to and will not grow into dry soil. Therefore, a larger root zone can be encouraged by running the drip system for longer amounts of time. In order to calculate the application rate of the drip irrigation system, the emitter flow rate, the emitter spacing among the tubing, and the distance between drip lines must be known. The calculation equation is as follows:

$$ApRt = 231.1 \frac{EmitterFlow}{RowSpc \times EmitterSpc}$$

Where: ApRt is the application rate in inches per hour, EmitterFlow is the emitter flow rate in gallons per hour, RowSpc is the spacing between rows in inches, and EmitterSpc is the spacing between emitters in inches.

Irrigation Scheduling Strategies

Conventional irrigation

Conventionally, irrigation is applied based on grower experience/ simple observations, or by scheduling a regular time for irrigation, for example, irrigation every day or certain days of the week for certain durations at each time. This may lead to the waste of over-irrigation or the ineffectiveness of under-irrigation. The improper water supply for the crops also may cause nutrient leaking or insufficient nutrient uptake. When correctly employed, appropriate irrigation scheduling methods may reduce water usage and increase profitability and sustainability. Therefore, sensor-based irrigation is essential for precise irrigation in terms of saving water and obtaining maximum production.

ET-based irrigation

Weather-based irrigation is also called evapotranspiration (ET)-based irrigation. The ET rate equals the total loss of water by evaporation from the soil surface, plus the transpiration from plants, over a given area in 24 hours, in inches per day. With ET-based irrigation, the application rate of an irrigation system would be the total ET rate subtracted from the precipitation rate. ET-based irrigation requires a complete set of weather parameters from a nearby weather station to calculate the ET rate. The ET rate can be calculated using the Penman-Monteith equation. Of course, crop itself and planting situation are also effects for calculating ET. The ET is an estimated value which may not be very accurate, and also modeling irrigation needs from ET data can be a challenge for an inexperienced grower.

Plant-based irrigation

Canopy temperature has been shown to be an indicator of plant water stress. Plant-based thermal optimum approaches scheduling irrigation based on plant infrared thermal response to water status. Crop water stress index (CWSI) can be used to indicate the status of the crop. The index is based on the difference between canopy temperature and air temperature normalized for the vapor pressure deficit of the air. The index can be used to determine when to irrigate based on the stress level of the plant. Meanwhile, the climate data will also be taken into consideration.

Soil moisture-based irrigation

Soil moisture measurements acquired in the field adjacent to the crops being irrigated are one of the best and simplest ways to support water management decisions. Soil water content and soil water potential are two indicators of plant-available water used by soil-based irrigation systems. There is a wide range of measuring instruments for measuring soil moisture, including neutron probes, time-domain reflectometry/ transmissivity (TDR) sensors, capacitance sensors, tensiometers, and granular matrix sensors. These devices range from inexpensive gypsum blocks to costly TDR sensors. Variable soil texture and structure, as well as the difficulty of accurately locating the root zone, are two challenges for soil moisture-based irrigation technology. Despite these difficulties, soil sensors report conditions directly from the field and can be polled locally or remotely to control irrigation.

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In the 2018 growing season, we conducted irrigation research in a Fuji apple research block at the Fruit Research and Extension Center with using different sensors. The detailed results will be presented in the March 2019 issue of the Fruit Times newsletter.

This article was reprinted with permission, originally appearing in the January 2019 issue of the Penn State Fruit Times. The original article can be found online here (https://extension.psu.edu/drip-irrigation-for-tree-fruit-orchards-in-pennsylvania).

Technology Prevails in US Strawberry Production

Laura McDermott, CCE ENYCHP

The 2019 North American Strawberry Growers Conference coincided with the Ninth North American Strawberry Symposium this past February in Orlando, Florida. The Strawberry Symposium convenes every four years and attracts growers, researchers and venture capitalists from across the globe. This conference focused on technology in strawberry production, and it was fascinating!

Agriculture has experienced waves of innovation starting with mechanization at the turn of the 20th century. Tractors and all types of machinery moved agriculture forward in terms of efficiency and productivity. Following that was the advent of agricultural chemicals; pesticides and synthetic fertilizers fueled the Green Revolution. We are currently in the genomic phase where biotechnology and plant gene manipulation may circumvent negative aspects of chemical inputs while also improving yield. Information and digital technology is providing our latest leap forward as we can now see concrete advancements in the field.

An Answer to Harvest Labor Problems?

The most exciting automation innovations are in the area of harvest assistance technology. Demand for fresh strawberries continues to increase in the U.S. where sales were $3.5 billion in 2017 from 3.2 billion pounds of production. Virtually 100% of these berries were hand harvested to the tune of $750 million for the human labor to do it. This situation may not be sustainable. Labor continues to be more difficult to find. Existing H2A labor programs are a short-term solution to a long-term problem, especially as birth rates fall in Mexico and Central American countries, the historic source of strawberry harvest labor.

Beyond availability of labor, hand harvesting is not without problems. A 2016 California study showed that human pickers retrieved only 67.5% of marketable fruit leaving about 1/3 of marketable fruit in the field. Labor regulation means increasing cost associated with overtime and weekend pay. Fruit picked in the heat of the day takes significant energy to cool and does not have the shelf life enjoyed by fruit harvested during cool night hours.

Photo 1. Thorvald modular robot displayed at University of Florida research station near Plant City, FL. This robot can be fitted with modules allowing growers robotic harvesting, UV light treatment, transporting of flats, runner cutting etc.

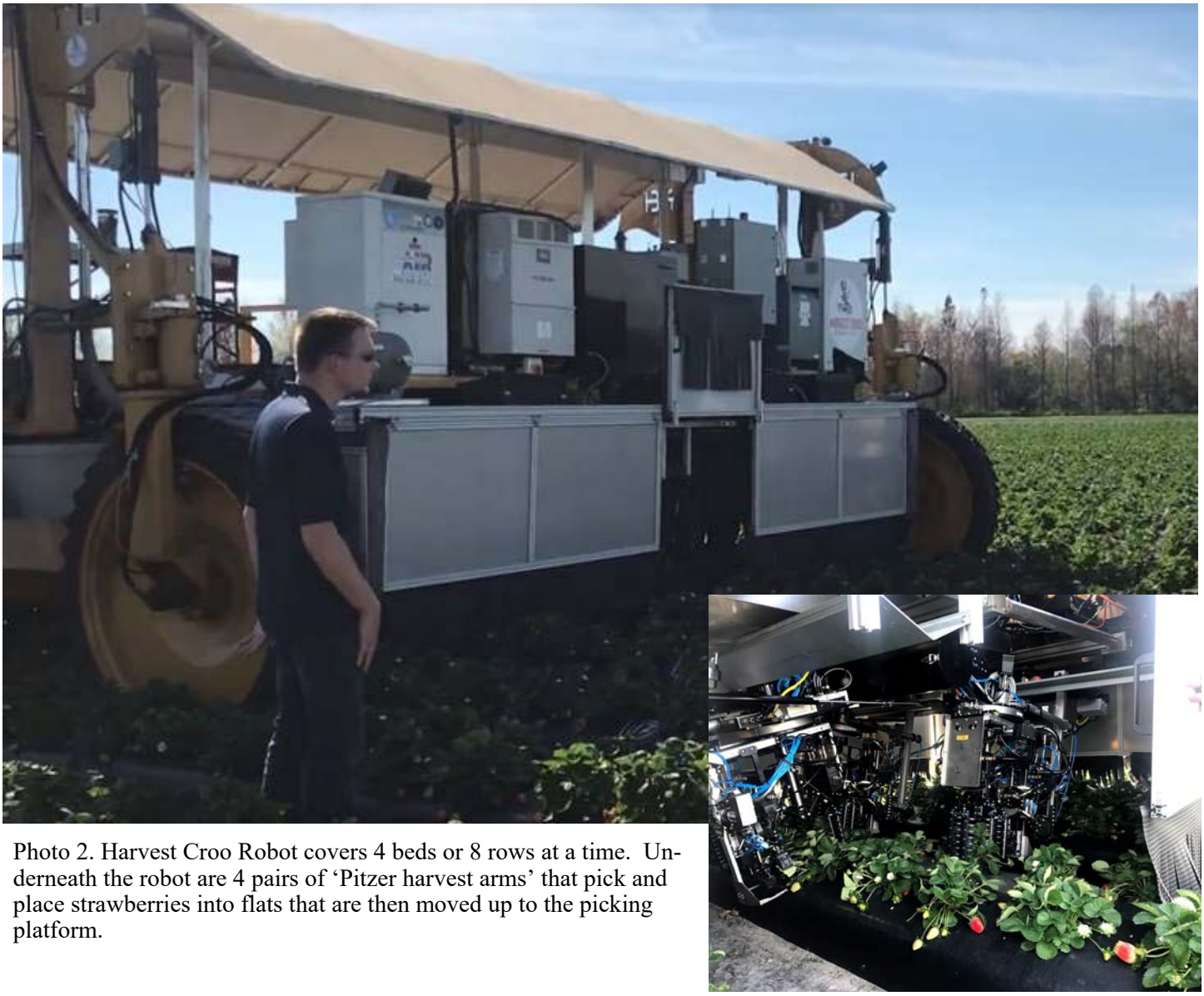

Photo 2. Harvest Croo Robot covers 4 beds or 8 rows at a time. Underneath the robot are 4 pairs of 'Pitzer harvest arms' that pick and place strawberries into flats that are then moved up to the picking platform.

Existing mechanical harvesters include harvest aids like recumbent platforms that help gain efficiencies while providing a physically less stressful work environment. Trunk and canopy shakers are used on crops not prone to bruising. Agronomic crops and some specialty crops like green beans etc. use entire-crop harvesters. Robots are the newest form of crop harvester and offer the closest replication of human skill as of yet.

The challenges of developing robots for strawberry harvest are formidable. Like most crops, strawberry cultivars do not grow precisely the same from plant to plant, from field to field, from year to year. The fruit ripens gradually throughout the season and is extremely delicate. The fruit detaches from the plant with some difficulty and considerations exist in terms of harvest scheduling, pest management, crop management etc.

Researchers at the Universities of Florida and Central Florida view smart farming as a process of harnessing the 'big' agricultural data gathered into useful applications for farmers. Harvest automation is sought by large farms seeking to remain competitive in a global market, but over time, smaller farms will see scale appropriate automation.

The Advent of Robots

Robotic harvesters work well in controlled or protected agriculture, like table-top or trough greenhouse systems that force the fruit to hang off the side of the bed. Strawberries in the U.S. are primarily field grown in raised bed plasticulture systems; transitioning to protected production systems would be an enormous and likely prohibitive investment.

Two different robots designed for field harvest of strawberries were introduced at the Orlando meeting. First was the Thorvald Agricultural Robot, Photo 1.

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This autonomous strawberry harvester is a modular robot that can operate in different production systems including polytunnels, open fields and greenhouses. The modular nature of the robot allows the owner to make many different adaptations so that the robot fits the specific requirements of the farm operation. In addition to harvesting, the robot can apply UV light for disease control and can be configured to help move crates of strawberries. It requires internet connections for the software programs and charging stations for refueling.

Gary Wishnatzki of Wish Farms, a 1600 acre strawberry farm in Plant City, Florida introduced the second robot, Photo 2. Gary is also CEO of Harvest Croo, the firm developing the robot. The key to this harvester is improved speed due to the 'Pitzer Wheel', a robotic arm that allows rapid picking because the spin of the arm actually replicates the way a human being picks the fruit. The spin also allows the stem to be snapped, very similarly to the way human beings pick strawberry fruit. Most other robots use a scissors tool to cut the stem, which takes more time. In addition to harvesting berries the machine can be programmed to assist with pest scouting, yield forecasting and perform runner cutting and pruning.

Wish Farms harvests over 625 acres of strawberries continually for about 4.5 months. They employ over 200 pickers. One Harvest Croo robot will replace 30 pickers. The units are still very expensive, possibly well over $500,000 to purchase outright, so the current plan is to contract the units to farms for seasonal picking. This may help them avoid the scenario that accompanied the mechanization of tomato harvesting in California in the mid-1970's. Then, the harvesters expense required more land to make a profit. In the first five years after the machine's release, there was an 82 percent consolidation in the industry and an estimated 32,000 farm workers lost their jobs.

The professed hope for robotic harvest automation is that harvest cost will decrease, yield and quality will increase resulting in improved farm viability.

Innovations Extend Beyond Harvest Automation

In addition to harvest automation, robots and information technology will help automate pest scouting and disease detection. Drones can deliver pest predators to detected hot spots and high-resolution imagery can help with yield modeling and target fertilizer applications.

Novel plant disease management techniques were highlighted throughout the conference. Dr. David Gadoury of Cornell and several other researchers discussed work on controlling strawberry pathogens using UV light treatments, Photo 3. Steam treatments for plants, pallets and other equipment are being introduced onto commercial farms and nurseries. Particularly intriguing work by Dr. Bryan Berger at the University of Virginia, described the development of a biofungicide effective against *Botrytis cinerea.* This 'biofungicide' development is based on work with enzymes in human medicine to help control biofilm in hospitals. Field applications pre-harvest and fruit applications post-harvest show phenomenal disease control for strawberries and wine grapes.

Precision herbicide applications using delivery methods through the hole punch process in plasticulture systems or through the transplant shoe have been shown to reduce herbicide used by 88-91% with nearly 100% accuracy with no impact on the crop.

Relatively low-tech innovations like the use of striped mulch – metallic stipes on the shoulders of the black mulch - helps move yield forward. The mulch doesn't impact plant canopy but does help flower development which may allow farms to continue using dormant crowns that are cheaper than plugs. Plugs historically provide a jump in production, but grown on striped mulch the dormant crowns catch up. This mulch is a huge help for Florida growers and might provide NY growers with some advantages.

Improvements in strawberry cultivars will help align the plants with the needs of technological advancements. This includes improved harvestability where taller plants with longer stems and only one fruit per stem are desired. Earlier yield particularly for the Florida industry is a huge concern in order for the state to compete with Mexico. Improved fruit quality and plant disease resistance are more traditional goals that remain priorities.

Our work alongside Dr. Elson Shields at Cornell using native entomopathogenic nematodes to control strawberry root weevils on NY farms was very well received. If you have questions about this technology please contact me at lgm4@cornell.edu. I'd also be happy to talk with you about all the exciting innovations I saw at this conference. For more information about Harvest Croo, visit https://harvestcroo.com/.

Lastly, I would encourage strawberry growers to consider joining the North American Strawberry Growers Association. The conferences, tours and opportunities to network with other growers are informative and help you stretch your abilities beyond

current practices in the northeast. Information about the association can be found at: https://www.nasga.org/.

Photo 3. Dr. David Gadoury, with experimental UV light treatment unit behind him, describes to growers the mode of action of UV light and how it controls plant pathogens.

Source: Agricultural News, Volume 103 • Number 2 • February 2019

Long Island Heat Tolerant Broccoli Variety Trial

Sandra Menasha, Vegetable/Potato Specialist, Cornell Cooperative Extension of Suffolk County

Broccoli production on Long Island occurs mainly in the fall with some growers producing a spring crop as well. Cool-season crops like broccoli cannot thrive under prolonged periods of warm weather so there is typically a lapse in production during the summer months. Common heat and weather induced broccoli head disorders include bract development or the development of small green leaves in the head, uneven head development, bolting and brown bead. All reduce head quality and yield significantly. However, market demand for broccoli is as high during the warmer months of summer as they are during the cooler months of spring and fall. Plant breeders have recently released several new broccoli varieties with improved heat tolerance over the more traditional varieties being grown. Identifying heat tolerant varieties that perform well during the warm, summer months on Long Island will provide many growers access to new markets, increase farm profitability and improve current crop quality under adverse weather patterns.

A trial was established at the Long Island Horticulture Research and Extension Center in Riverhead, NY in a Haven loam soil. Eleven heat tolerant broccoli varieties were grown during the summer months and were evaluated for yield and crop quality. The experiment was arranged as a randomized complete block design with four replications. Broccoli transplants were started in the greenhouse on May 11 and were seeded into 128 cell trays. Transplants were fertigated weekly as soon as the first true leaves appeared. Transplants were field planted by hand on June 13. Treatment plots were 1 row wide by 20 feet long. Rows were spaced on 34" centers and plants were spaced 18" apart within the row. Fertilizer was broadcast applied and incorporated prior to field planting at a rate of 1200 lbs/A using an 11-11-15 commercial fertilizer blend in which 75% of the total N was in the form of controlled release fertilizer as ESN (44-0-0). Weeds and insects were managed according to Cornell Guidelines. Fungicides were not used. Overhead irrigation was used to supplement rainfall amounts to equal 1" of water per week. Plots were harvested 4 times; August 9, 15, 20 and 24. Data on yield and crop quality were recorded and analyzed.

Unmarketable heads were mainly due to heat induced disorders and disease. The months of July and August were both very warm and wet leading to increased levels of disease, head rot and heat induced stress disorders.

Marketable yields were greatest in Eastern Crown, Millennium and Imperial. Eastern Crown, Eastern Magic and Emerald Crown produced the largest, heaviest heads at 2 lbs, 2 lbs, and 1.7 lbs/head, respectively. Eastern Magic produced heads with the best domed quality which rated 9 out of 9 followed by Eastern Crown, Emerald Crown and Millennium

Eastern Magic

T9 Imerial

which all rated 8 out of 9. Overall crop quality was superior in Eastern Crown and Eastern Magic and poorest in the variety Diplomat. Warm, wet weather coupled with the lack of any disease management strategies led to an increased level of Alternaria and soft rot developing in the trial which in turn led to a greater proportion of unmarketable heads per plot. Heat induced head disorders were common in all varieties.

The top rated varieties for summer production on Long Island in regard to yield and quality based on this past season were:

1. Eastern Magic
2. Imperial
3. Eastern Crown

Eastern Crown

Other Variety Notes:

- Bellstar – O.k. quality. Flat, slighty unevern heads. Light green to yellow coloration.
- Burney – Very uneven heads and purple/brown beading.
- Diplomat – Tall, stalky heads, uneven heads, no dome.
- Eastern Crown – Big, heavy, nicely domed heads with a thick stalk. Leaves in the heads.
- Eastern Magic – Dense, heavy heads. Nice. Some Alternaria.
- Emerald Crown – Nicely domed, bigger head. Many leaves in the head.
- Green Magic – Stalky plants with uneven heads. Bolting, slightly purple-brown beading.
- Hancock – Tall, stalky plants, slightly uneven heads. Some yellowing and Alternaria.
- Imperial – O.k. heads, slightly uneven but nice and tight.
- Lieutenant – Big, uneven heads with slight brown beading. Some leaves in heads. O.k.
- Millennium – Nice, large heads. Slightly uneven, some purple beads. Rot and Alternaria.

Respirator Fit Test Dates

The **New York Center for Agricultural Medicine and Health (NYCAMH) and HealthWorks** is pleased to provide respirator fit testing clinics in your region in 2019.

During the clinics NYCAMH will provide **medical evaluations**; **respirator fit tests**; and **WPS compliant trainings** on how to properly inspect, put on, take off, fit, seal check, use, clean, maintain, and store respirators.

Clinic appointments are **one hour long**, and groups of **4 workers** can be seen at a time. Medical evaluations, fit tests, and trainings are available in both **English and Spanish**.

If you are unable to attend the clinic in your area you may schedule an appointment at another clinic location.

Capital District

March 27-28: CCE Rensselaer County, 61 State Street, Troy, NY 12180; scheduling appointments: February 18 - March 22

Hudson Valley

March 12-14: CCE Ulster County, 232 Plaza Road, Kingston, NY 12401; scheduling appointments: February 4-March 8

May 7-9: Alamo Migrant Clinic, 888 Pulaski Highway, Goshen, NY 10924; scheduling appointments: April 1-May 3

Northern NY

April 15-16: CCE Warren County, 377 Schroon River Road, Warrensburg, NY 12885; scheduling appointments: March 18-April 12

April 17-18: CCE Clinton County, 6064 State Route 22, Plattsburgh, NY 12901; scheduling appointments:

To schedule an appointment please call the NYCAMH office during the **date range listed above** and ask to speak with farm respirator clinic scheduler. Appointments are schedules on a first-come, first-served basis.

We can be reached at **607-547-7014** or toll-free **800-343-7527**, Monday-Friday, 8:00 AM-4:30 PM

When calling to schedule an appointment please have the following information available:

- *Total number of people attending from your farm*
- *Name of each person being scheduled*
- *Language spoken by each attendee*
- *Make and model of each respirator to be tested*

A respirator fit test ensures that a particular make, model, and size of respirator fits the wearer's face and will meet the wearer's needs. A fit test is specific to the make, model, and size of respirator.

If a worker wears more than one style of respirator, including filtering facepieces, they must be fit tested for each one. Please keep in mind while determining who will come to the clinic that a clean-shaven face is a necessity for masks to be effective and for fit testing to be possible.

Bassett Healthcare Network
New York Center for Agricultural Medicine and Health

Bassett Healthcare Network
HealthWorks

Source: VegEdge, Volume 15, Issue 2, February 15, 2019

Mid-winter High Tunnel Nitrogen and Cover Crop Update

Judson Reid, CCE Cornell Vegetable Program

Vegetable farming with high tunnels in the Northeast can be divided into cold season and warm season crops. In both situations there are varied approaches to managing nitrogen. The Cornell Vegetable Program is working with cooperating farmers and the ENY Commercial Horticulture team to develop improved practices.

The question of how much nitrogen to apply to winter grown spinach and in what form is particularly poorly understood. Anecdotally, the project team has reports from farmers of applications from 200-600 lbs of N per acre in winter high tunnels. Is this too much?!

To begin to answer this question we grew spinach with two transplant dates (Sep 20 and Oct 6 2017) in a 22'x48' tunnel with one layer of plastic and no supplemental heat. There were 4 treatments and 4 replications of each treatment at the two planting dates.

Treatments:

- Urea (46-0-0) – 65 lbs pre-plant incorporated then 65 lbs side-dressed March 4
- Blood Meal (12-0-0) – same rate and timing as urea
- Alfalfa Meal (2.5-0.5-2.0) –applied 130 lbs N pre-plant
- Control – no nitrogen applied

We compared the nitrogen uptake in leaf tissue and the yield between the 4 treatments. Our results from that first year trial were surprising.

- The lowest yields were in the alfalfa and control treatments.
- The highest yields were in the blood meal and urea treatments.

In the early planting:

- Urea had a 29% **greater** yield than the control.
- Blood meal had a 24% **greater** yield than the control.
- Alfalfa had a 2% **lower** yield than the control.

In the late planting:

- Urea had a 17% **greater** yield than the control.
- Blood meal had an 11% **greater** yield than the control.
- Alfalfa had a 12% **lower** yield than the control.

However, our analysis does not show consistent differences between unfertilized plots and 130 lb applications of alfalfa-based nitrogen! Initial impressions are that alfalfa meal may not be the ideal nitrogen source, and higher rates of preplant N unjustified. This winter we are looking at yields under different rates of N.

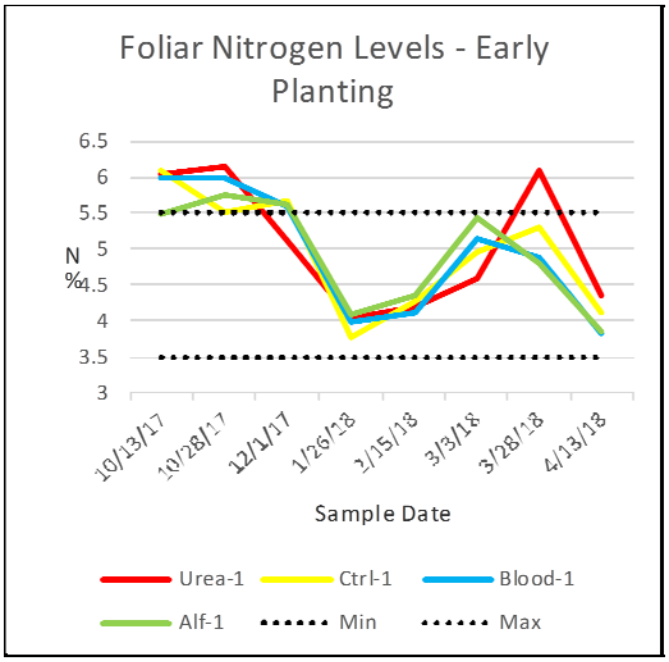

Figure 1. Nutrient Levels Over Time in Winter Spinach Plantings. Sidedressing of urea and bloodmeal on March 5. Horizontal dotted lines show minimum and maximum levels of %N. At no time did any of the treatments drop below recommended levels.

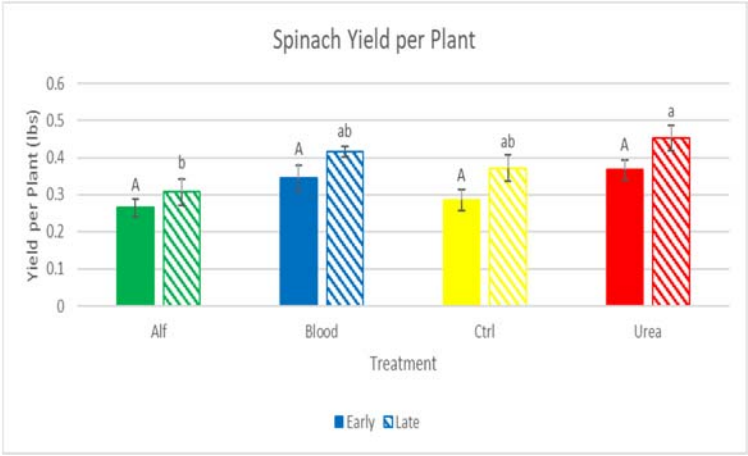

Figure 2. Yields were similar across nitrogen sources.

Our parallel approach is to improve productivity and quality of warm season crops, specifically tomatoes, is through research of winter cover crops. We seek to explore species selection and timing of planting, and the subsequent nitrogen contribution provided to the soil. Integration of winter cover crops into high tunnel systems could decrease nitrogen demand of the

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summer crop, leading farmers to apply less fertilizers and/or compost. This winter we have plots of triticale, triticale and Austrian winter peas, and fallow plots; with and without row cover; sown on two dates. It is too early to make any conclusions on the cover crop portion of this work, but we do note considerable visible increase in biomass from earlier plantings. With our recent cold temperatures, the value of row covers is being put to the test! We'll have more updates soon.

This work includes contributions from several farmers and Amy Ivy, Andy Galimberti, Elisabeth Hodgdon, Ethan Grundberg (all ENY Commercial Hort), with funding provided by Federal Capacity Funds, NNYADP and NESARE.

Figure 3. Early planted spinach responds to 3 sources of nitrogen and none at all (control).

Figure 4. CVP technician Caitlin Vore in cooperating high tunnel being fitted for cover crop trial.

Figure 5. Judson Reid with high tunnel cover crop trial. Photo- C. Vore.

Figure 6. Triticale and Austrian winter peas still thriving under row cover after a -10F night.

Calendar of Events

See the Website to register for many of these programs

http://enych.cce.cornell.edu/events.php

March 5- 6 , 2019	**Ag Labor Management 2-day workshop in Eastern, NY.** Wallace Center, FDR Presidential Library and Museum, 4079 Albany Post Road, Hyde Park, NY 11040 Cost: $50.00 Regular Registration (includes lunches both days, additional attendee $50.00 ea.)This program will be for owners and farm managers who want to improve their skills in HR Management. For more information visit: https://enych.cce.cornell.edu/event.php?id=1125
March 5, 2019	**2019 Orange County Onion School -** Pine Island Fire Department, 684 County Road 1, Pine Island, NY 10969- Come join us at the Pine Island Fire Department for our annual onion school! Approved for 4.0 DEC re-certification credits. Cost: $60.00 CCE ENYCHP Enrolled Members, $85.00 Non-Enrolled, At the Door $90.00 For more information visit: https://enych.cce.cornell.edu/event.php?id=1090
March 18 & March 20, 2019	**2019 Hudson Valley Pesticide Applicator Pre-Exam Training,** Hudson Valley Research Lab, 3357 US 9W, Highland, NY 12528. CCE ENYCHP Agriculture Specialists will be offering a training to review core concepts and commodity specific items in preparation for the exam. Cost: $50.00 For more information visit: https://enych.cce.cornell.edu/event.php?id=1140
March 25, 2019	**Last Monday Grant Webinar for Fruit and Vegetable Growers -** These webinars are to help disseminate information on grants availae to NY Growers. There is a possibility of webinars related to grants for experimental crops (i.e. hops and hemp) if it is likely that fruit and vegetable growers would be interested. To register for the webinars, visit: https://cornell.zoom.us/webinar/register/WN_uMV-Yb_FTt-C2VXblrqjRA For more information visit: https://enych.cce.cornell.edu/event.php?id=1109
March 26, 2019	**How to Obtain a Pesticide Applicator License -** CCE Washington County Office, Annex 2, 411 Lower Main Street, Hudson Falls, NY 12839. Receive an overview of the pesticide applicator certification process and some of the key concepts of the exam materials needed to obtain a private or commercial NYSDEC pesticide applicator license. Cost$15.00 Workshop Cost for ENYCHP enrollees, $25.00 Workshop Cost if NOT an ENYCHP enrollee. For more information visit: https://enych.cce.cornell.edu/event.php?id=1117
March 27, 2019	**Preparing for a Juice HACCP Inspection -** CCE Saratoga County, 50 West High Street, Ballston Spa, NY 12020. Cost: $15.00 per farm if enrolled in ENYCHP, $25.00 per farm if NOT an ENYCHP enrollee. For more information visit: https://enych.cce.cornell.edu/event.php?id=1138
April 3, 2019	**An Intro to Tree Fruit IPM -** CCE Clinton County, 6064 Route 22, Suite 5, Plattsburgh, NY 12901. Cost: $15.00 ENYCHP enrollees, $25.00 Workshop Cost if NOT an ENYCHP enrollee. For more information visit: https://enych.cce.cornell.edu/event.php?id=1161
April 4, 2019	**Hudson Valley Special Permit Training -** Contact Dan Donahue for more information (djd13@cornell.edu)