The Produce Pages

Serving the fruit and vegetable growers of Eastern New York

November 2017

Featured Farm

CHARLES BORNT, ENYCHP

Last year we started a new segment where we interviewed a local grower and featured them in in the Produce Pages. The ENYCHP team decided that because we encompass such a large and diverse area, that it would be great for all the growers in the program to meet and get to know as many of their peers in the region.

This month we interviewed Tim and Colleen Stanton and two of their children, Nick and Zack, of Stanton's Feura Farm. Stanton's is located in Albany County along the Onesquethaw Creek in Feura Bush. I have had the privilege of working with the Stanton's since the early 1990's as their farm was the host of the very first research trial I took part in as a summer technician all those years ago. I have seen the farm evolve over the years and watched their kids grow up. They have been and continue to be strong supporters of Cornell Cooperative Extension and have hosted numerous research and twilight meetings. Tim has also served on the grower advisory committee in various roles with the former Capital District Vegetable and Small Fruit Program and the Eastern NY Commercial Horticulture Program.

Photo: Tim and Colleen Stanton with their son Nick (other children not pictured Zack, Sam, Tommy, Kelly and Eric).

Cornell University
Cooperative Extension
Eastern New York Commercial Horticulture

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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 and our events, please visit our website at : http://enych.cce.cornell.edu/.

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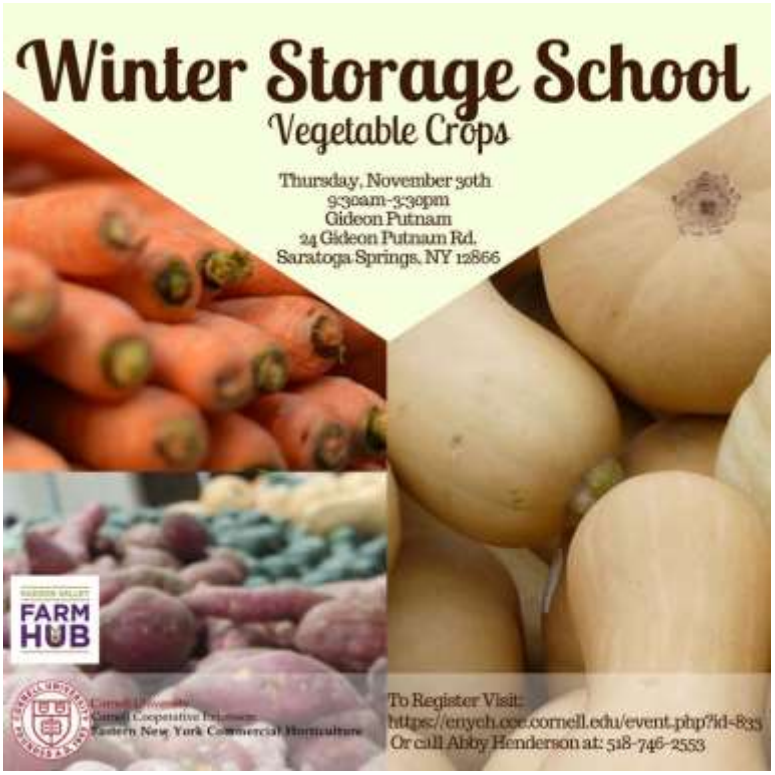

Serving the Educational and Research Needs of the Commercial Small Fruit, Vegetable and Tree Fruit Industries in Albany, Clinton, Columbia, Dutchess, Essex, Fulton, Greene, Montgomery, Orange, Putnam, Rensselaer, Saratoga, Schoharie, Schenectady, Ulster, Warren and Washington Counties

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Can you give me the history of your farm? Tim and Colleen purchased the farm located at 210 Onesquethaw Creek Road in 1986 after both graduating from Cornell University. They worked about 400 acres, mostly field corn and hay with about ½ acre of cantaloupes. In 1987 they added an acre of strawberries followed by their first greenhouse in 1988. Farming is not new to either Tim or Colleen as Colleen came from a mushroom farm in Catskill and Tim's family has been farming at the home farm in Greenville, NY since 1787 and has evolved over the years from a dairy and livestock to field crops and hay operation. Today Stanton's Feura Farm works over 600 acres of which 120 acres is mixed vegetables and fruit (small fruit and orchard) with 6 greenhouses, and 400 acres of hay and other field crops.

What crops do you grow? Stanton's Feura Farm grows many different crops with hay being number one in terms of acreage (30,000 – 35,000 small square bales per year) and sweet corn, pumpkins, strawberries, raspberries, bedding plants, apples and blueberries being a few of the other crops. Most recently they have added 42 Angus beef cows to their operation. Of these crops they are most known for their sweet corn and pick-your own strawberries, raspberries and pumpkins.

Above: new packing house with lots of room for staging product and improving on farm efficiencies.

Where and how do you market most of your produce? When the Stanton's first started marketing vegetables, they had a "self serve" wagon in front of the house with a majority of their produce going to the Menands Wholesale Market. Today they still have the one-self serve wagon but have added two retail stands; Our Family's Harvest located in Slingerlands and Stanton's Old Homestead Farm Market located at Tim's family's original operation in Greenville. They also do a fair amount of wholesale to smaller growers in the region and have added several direct store deliveries that include Honest Weight Food Co-Op and Niskayuna Food Co-Op. U-pick strawberries are offered in the spring on the farm and apples, raspberries and pumpkins in the fall. Their fall marketing also includes a fair amount of agri-entertainment, including hay rides and school trips.

What changes have you made to your operation over the last 5 years? The operation has seen many changes over the years with the most recent being the addition of 42 Angus beef cows whose meat is sold at their two retail outlets in Slingerlands and Greenville. Although their "pick your own" isn't necessarily "new", it has seen changes over the years and has become a larger part of the operation especially with the addition of a 10 acre orchard and blueberries (not u-picked but still new). They have also this year completed a new building that serves as their packing house and cooler area which has and will continue to allow them

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to expand further. Tim and Nick were also early adopters of reduced tillage systems for their vegetables and have really been experimenting with new cover crops such as tillage radish and brassicas. This led them to purchase a 15' John Deere no-till drill so they can seed cover crops directly into crop residues reducing the labor and cost associated with cover cropping and preserving and improving their soil health and structure.

What do you see as the greatest challenge your farm faces in the next couple years? As we sat around the table discussing the answers to the questions, it took Tim and Colleen no time and they almost spoke in unison about what their greatest challenge in the next couple years is: Labor and government regulations! The Stanton's hire 5 Guatemalans to help with fruit harvest and rely on local labor for other jobs on the farm like haying. Currently, two of their children, Nick and Zack are fulltime employees of the farm and several other siblings are available during the summer when home from college. The lack of local labor has somewhat revitalized the Stanton's u-pick operation which has its advantages and disadvantages as many of you know. They are concerned about the hike in minimum wage and food safety regulations. They are also concerned with more and more urban encroachment and development around their farm and have had to deal with more "community relations" lately than ever before.

How have you used Cornell Cooperative Extension? Since our program has been trapping insects like European Cornborer and newer pests like Spotted Wing Drosophila and Western Bean Cutworm for the NYS Integrated Pest Management Program (IPMP), the Stanton's have taken part and feel they use this trapping information routinely for making pesticide timing decisions. Because they are so diverse, knowing what's going on in their fields with these traps has improved not only the quality of their crops but also pesticide selection. Tim and Nick also credit CCE with helping them learn more about reduced tillage systems and most recently cover cropping techniques. I feel that it has been a really two-way street – the Stanton's learning from Extension and us learning from the Stanton's. The Stanton's have hosted numerous Extension trials including variety trials, new cultural production techniques and have hosted numerous twilight meetings.

What does the future look like for your operation? From my perspective the future looks very promising for Stanton's Feura Farm with another generation coming up on the farm that are eager to invest and expand the operation even though they do not have a "formal transition plan". They hope to keep about the same retail/wholesale balance and expand the u-pick and beef operation.

What would you like other growers to know about you and your operation? The Stanton's are quick to point out that what they have they have earned on their own without any government aid or money. They do not purchase nor do they plan on purchasing crop insurance as they figure their diversity in crops and marketing outlets is their best form of insurance. Secondly, they want you to know that they are a family operation and keeping it that way is very important to them. And to summarize Nicks comments, "every part of our operation works together to make it whole".

What advice would you give new growers?
The first piece of advice they offer is to maintain an open mind and don't get set in your ways – change is good. Second, buy a piece of property that won't limit your options – spend a little more upfront for good quality soils and they will repay you in the end. And lastly, mechanize where you can so that you don't have to rely on as much hand labor.

What is your favorite thing about farming? I let each one of the Stanton's in attendance chime in and this is what they had to say: "it's always changing – no day is the same and it's a great way to raise a family and

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work close to God" answered Tim. Along those same lines Colleen said "farming keeps the kids out of trouble and there are so many cool things that you see every day that you won't see anywhere but on a farm." And Nick replied with "my favorite thing about farming is being outside and to watch these little seeds or plants grow and be productive". And they all agree that their farm is a "great family business".

What is your least favorite thing about farming?

For this question Nick was the first to reply with "Spraying!" He knows that it is necessary and part of farming and that no grower he knows likes to spend not only their time, but money on spraying. It might also have to do with what I found out later from his father, that Nick doesn't enjoy getting up early in the morning that might also have something to do with Nicks least favorite part of farming!

I had a great time sitting down with the Stanton's and learn some things that I didn't know before even after working and knowing them for as long as I have. I really appreciate their honesty and openness with their answers and hope that you've enjoyed learning about them too. It is also great to see another generation of young farmers leading the way for this farm.

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Summarizing Three Years of Black Stem Boer Trap Catch Data in the Hudson Valley

DAN DONAHUE & SARAH ELONE, ENYCHP

The tiny ambrosia beetle has emerged from relative obscurity in recent years to take center stage as an emerging pest species in New York State apple orchards. The Black Stem Borer (BSB), *Xylosandrus germanus* adult measures 1-2 mm in length, with only the females being able to fly, and very weakly at that. BSB was an uninvited visitor to the United States, first identified in NYS on Long Island in 1932. The beetle is generally a forest-dweller, with 200+ species of trees capable of serving as host to this wood-boring insect. The beetle was observed infesting declining trees in western New York during the 2013 growing season. Further investigation by Cornell pest management specialists Debbie Breth, Kerik Cox and Art Agnello implicated the beetle as a primary causal factor in the death of apple trees in young orchards.

The adult female beetles emerge in the spring from a gallery dug deep into the trunk of the host tree. The body of the long-passed mother, used to plug the entrance to the gallery, is pushed out of the way and the beetles take flight in search of new host trees and the beginnings of the next generation. The beetles are thought to be attracted to unhealthy, or otherwise weak trees. However, researchers in WNY have noted infestations in trees that are "apparently healthy". The flying beetles are attracted to ethanol, a habit that is used as a lure to attract them to water traps placed on orchard perimeters near hedgerows and woodlots. Once a suitable host tree has been found, the beetle bores a tiny hole (1 mm) straight into the heartwood of the tree. Upon the excavation of a gallery, the female inoculates the interior with the ambrosia fungus, in a sense cultivating a food crop for the future larvae of the next generation. Eggs are laid, and with her role completed, the beetle dies at the entrance to the gallery, sealing her progeny inside,

Adult Female Black Stem Borer
Photo by Peter Jentsch

and the cycle is set to repeat. The weak tree appears unable to seal off the intruders and prevent the emergence of the next generation. The nature of the attack greatly complicates efforts to prevent infestation, and to protect the tree from the potential introduction of pathogenic fungi via the wound and activities of the beetle inside the tree. The adult beetle is potentially exposed to insecticides only during the brief time it is in flight, or present on the bark of the host tree as it begins its initial boring activities. Once past the cambium layer, and inside the trunk, it is generally safe from either systemic or contact insecticides.

The NYS Apple Research and Development Program has funded a statewide project for the last three seasons to investigate the biology and control of this new pest. The first step in the Hudson Valley was to determine if BSB could be found infesting apple trees in young Hudson Valley orchards, and if so, how extensive is the problem, and what can we learn about its life cycle here.

The traps were made from empty orange juice containers hung upside down with large windows cut into the sides for entry by the BSB. There were ethanol lures hung from the middle of the trap to attract the BSB. The traps were hung from a metal shepherds hooks and secured from moving with a wire tie. A mixture of water and unscented dish soap was used in the bottom of the trap which served to drown the BSB that flew into the trap.

There were two traps per location; one trap at the end of a row of trees closest to the hedgerow, and one trap 30m into the center of the block.

Traps were checked weekly, using *continued on next page*

a piece of mesh to strain out the water.

After three seasons of trapping and orchard observations, what can reasonably be said of the Black Stem Borer in the Hudson Valley is that:

- The distribution of the Black Stem Borer is widespread throughout the Hudson Valley.
- BSB has two full generations in the Hudson Valley, the flight of the first (overwintering) generation peaks around late May, the second (summer) generation flight peaks in early August.
- When found in Hudson Valley apple orchards, the infested trees appear "unthrifty" in appearance, but we suspect they have been in this weakened state for more than a single year.
- Put another way, we have not observed any "apparently healthy" trees infested with BSB, in contrast to observations in WNY.
- Traps located on the orchard border, adjacent to hedgerows, capture more BSB than traps placed 150' into the orchard, similar to observations elsewhere.
- The contribution, if any, of BSB directly to the observed decline of young apple trees in some Hudson Valley orchards has not been determined. At this point, we are considering BSB to be a secondary pest, perhaps a contributor, but likely not the primary cause of apple tree decline here.

What steps should a grower take to monitor and otherwise prevent BSB from infesting their orchards? Here are a few suggestions and comments:

- The most important step, or series of steps you can take is to plant only top-quality, virus-free nursery trees of at least 1/2" caliper on well-drained orchard sites (tiled or otherwise), with effective weed and nutrient management programs that maximize tree health. Irrigation could be useful in terms of mitigating drought stress on dry sites.
- Place traps on the border of the orchard, next to and downwind of the woods/hedgerow. The beetle is a weak flyer, and a 300' slog upwind is a difficult chore.

Black Stem Borer frass tube.

BSB trap in an orchard. Photo by Dan Donahue

- Inspect your nursery tree shipments for the 1 mm borer holes in the trunks. If you find an infestation inside a newly set orchard well away (particularly upwind) from the woods, unless the beetle had the flying skills of Amelia Earnhardt, it's unlikely the intrepid flyer was a member of the local population.
- Scout declining trees for the tiny entrance holes. While we term it a 'trunk' boring insect, it can also be found infesting root stocks from the graft union to just slightly below the soil surface. Sometimes you can find a frass tube at the site of a new excavation, but they are fleeting and unlikely to survive a good rain or wind storm. Entry holes have been observed as high as 5' above ground.

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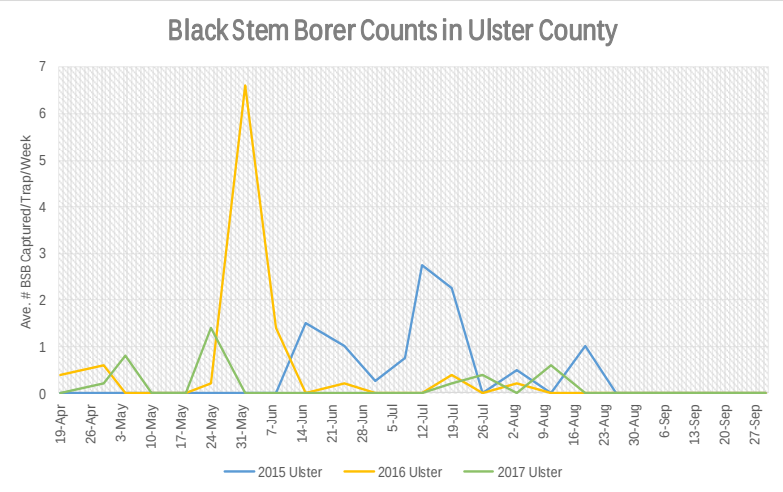

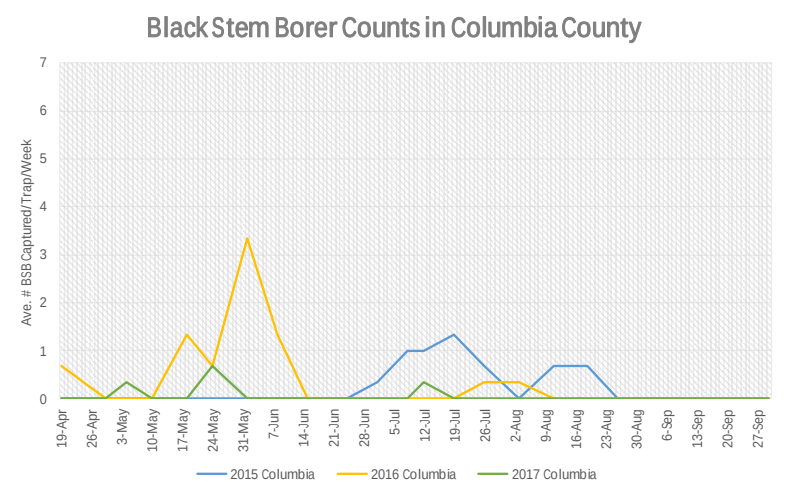

when a BSB infestation has also been observed, timing a chlorpyrifos trunk spray during May will help control some of those emerging beetles from the overwintering generation. Keep in mind that a dogwood borer mating disruption program will not have any effect on the local BSB population. Since the beetle can attack from just under the soil line, a high volume application that also drenches the rootstock should improve efficacy. On the downside, the beetle can also attack the trunk high into the tree, above the legal application height of a chlorpyrifos trunk spray.

Research is continuing on methods to both control and repel the Black Stem Borer, and better understand it's biology in apple orchards. Of particular interest are the development of techniques to discourage the movement of the pest from the woods into orchards, and understanding what actually attracts the insect to the weakened tree. Study of this new pest is also being conducted in the context of understanding the broader issue of apple tree decline. In the meantime, continue to scout your orchards for entry holes, and take the appropriate actions as outlined in the steps above. Most importantly, manage newly set orchards to a very high standard to maintain tree health.

- Insecticide controls are being evaluated, but so far effective options are elusive. Since Dogwood Borer is a serious and persistent threat to young high-density orchards in the Hudson Valley,

VEGETABLES

Wireworm Project Progress Report-Fall 2017

TERESA RUSINEK, ENYCHP

Wireworms are an increasing problem in root crop production. There appears to be a trend of higher incidence of wireworms in fields with small grain or grass cover crops in preceding years, or where grass weeds were poorly controlled. As much as 60% damage has been observed in a sweet potato field that had been in a grass mix cover crop and 40% damage in potato crop. At that level of damage, root crops are not worth harvesting, and storing crops with even moderate wireworm damage will lead to further losses.

Wireworms have a fairly large host range which includes, but is not limited to: seeds of bean, corn, cucurbits, and of course various root crops such as potato, carrots, beets, and garlic. The adult form of the wireworm is the click beetle. Female click beetles prefer to

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lay eggs in grassy fields. After hatch, wireworms may remain in the larval stage in the soil in the same field for several years where they will feed on plant roots. The attraction to lay eggs into grassy fields is an important part of the ecology of this pest and its management. It is suggested growers with wireworm issues do not use grass cover crops. However, many growers use grass cover crop mixes and small grain rotations as part of their soil health building and overall sustainable farming system. So while growers are being mindful stewards of the land by cover cropping and rotating crops, they may be inadvertently creating a perfect habitat for click beetles to inhabit for years to come.

Professor Elson Shields of Cornell University applies entomopathogenic nematodes to the sweet potato plots.

Cornell intern Cameron Fuhr takes soil core samples to determine if nematodes have established in experimental plots.

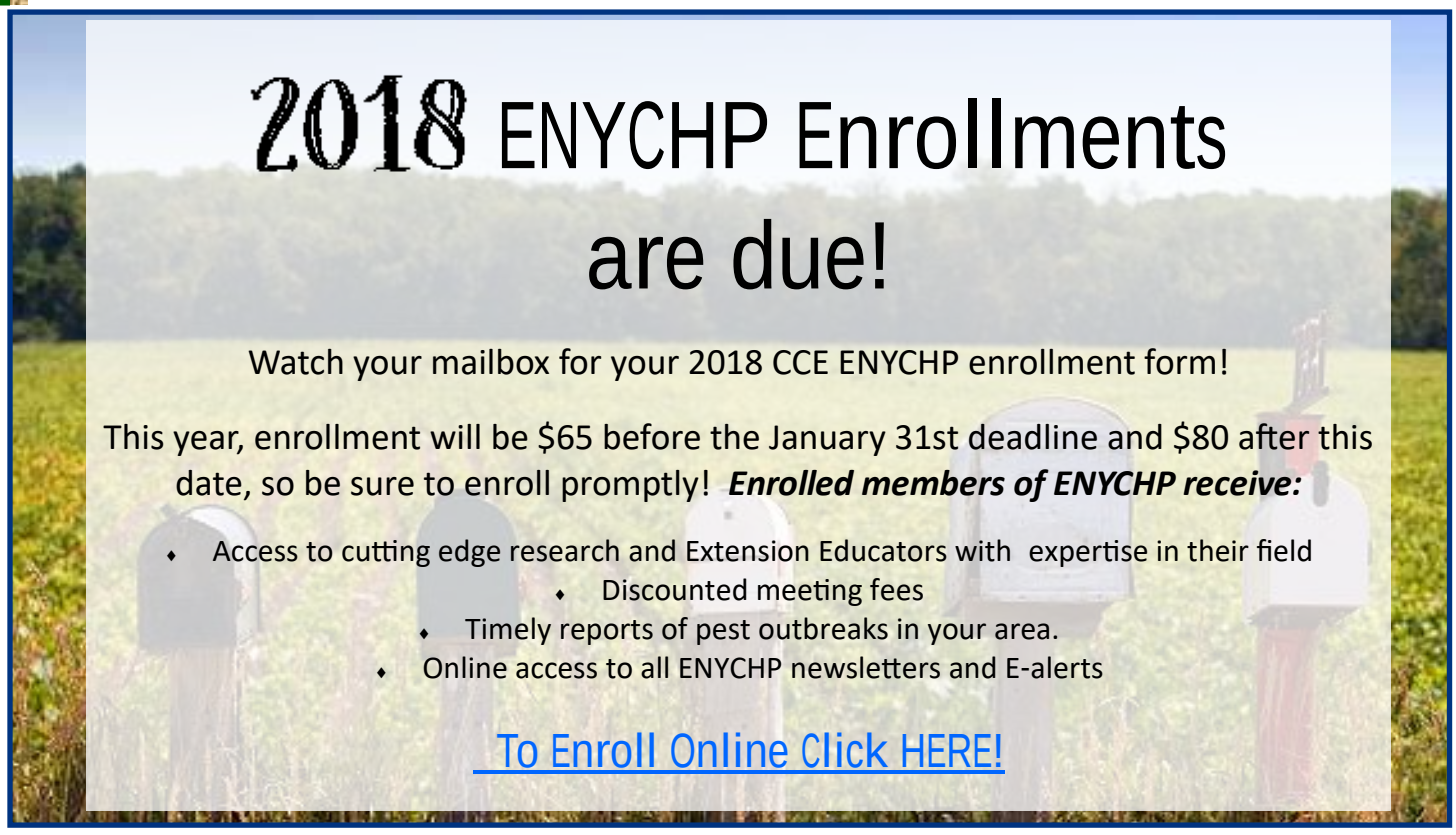
Chemical and non- chemical management options for controlling wireworms are limited and efficacy is often poor. Studies have been conducted showing some efficacy suppressing wireworm with entomopathogenic nematodes (EPNs) however, the reliability and level of control must be demonstrated before growers will adopt the use of this bio-control. EPNs are microscopic beneficial roundworms used to control a variety of soil dwelling pests such as grubs, weevils, and fungus gnat larvae. The EPNs seek out and parasitize their host and infect it with a deadly bacteria. There are over 75 known species of EPNs. Host preference as well as their ability to adapt and persist in any particular environment will vary among these species. Dr. Elson Shields and research specialist Tony Testa from Cornell University have isolated a complex of NY native ENPs that inhabit shallow and deep profiles of the soil, are cold tolerant, and persist for years. They have developed an application method proven successful for limiting the highly-destructive alfalfa snout beetle (ASB). Shields' success with nematodes to control ASB is being applied elsewhere in New York State in trials to control pests in apple orchards (plum curculio) and grape vineyards. We've developed a research plan with Shields and Testa to determine if the NY native EPNs have the potential to control wireworm in Hudson Valley vegetable fields. We hope to build on the success NY native nematodes have demonstrated in controlling ASB and plum curculio and offer growers sustainable, long -term control of wireworms.

The ENYCHP has partnered with the Hudson Valley Farm Hub to trial the NY native EPNs. This applied research project began in May of 2017 at the Farm Hub, where we established twelve plots in a field where wireworms were found in large numbers in 2016. Four control plots had no nematodes applied, four plots were treated with both Steinernema carpocapsae (Sc) and Steinernema feltiae (Sf) nematodes, and the final four plots were treated with Sf and Heterohabditis bacteriophora (Hb) nematodes. In early June of 2017, sweet potato crops were planted into the twelve plots. Each

strain of nematode occupies a different depth in the soil and has a different mode of action. We are determining which nematodes are best adapted to establish in these soils as well as which combination of nematodes is most effective at preventing wireworm damage in the sweet potatoes. In mid-June (30 days after application of the nematodes), we collected one hundred soil samples from each of the twelve plots to assess the level of nematode establishment at both 2'' and 8'' deep. Results from this sampling indicate that establishment levels of the nematodes are very good (~30 %) in the plots treated with nematodes. Sf is the dominate nematode established, followed by Sc. Soil samples were taken before the lab reared entomapthogenic nematodes were applied to determine natural presence of entomapthogenic nematodes. Naturally, occurring Sc was found at a low rate of 1.3 % of the soil samples tested. At this point it does not look like Hb has established in any of the plots. We evaluated the presence of wireworms in the plots in early July by placing potato baited bags in each plot. 11 out of the 30 bags (37%) were infested with wireworms.

Sweet potatoes (200 from each plot were harvested) on Sept. 26 and will be evaluated for wireworm damage end of October. A fall soil core sampling for nematode establishment will be taken in mid-October and again in the Spring of 2018. Sweet potatoes will be planted into the established plots at the Farm Hub and evaluated for wireworm damage again in 2018.

Entomopathogenic nematodes are reared in wax worm hosts and strained into a solution that is applied to the soil.



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This year, enrollment will be $65 before the January 31st deadline and $80 after this date, so be sure to enroll promptly! ***Enrolled members of ENYCHP receive:***

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INSURING GRAPES

NY, 2018

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Dr. Strangelove II or: How I learned to Stop Worrying and Love the Drone

JIM MEYERS, ENYCHP

I recently acquired a new hammer, in the form of an aerial drone, and have been out hovering over vineyards looking for nails. I have found many and will describe some here after first deconstructing the colloquial use of the term 'drone' to clarify the key concepts involved and to compare strengths and weakness of aerial drones versus other types of equipment.

I, Drone: Separation of concerns. In the past twenty years the word 'drone' has become synonymous with two types of devices: 1) multimillion dollar remotely piloted war machines equipped with spy cameras and explosives, and; 2) tiny four-propellered toy helicopters equipped with spy cameras piloted around your property by the neighbor's kids. Although many people think of a drone as either an unmanned airplane or helicopter, it is the lack of an on-board human pilot that defines the term, not the act of flying. A tank, for example, could also be a drone. Yes, they do exist. Kalashnikov, the namesake company of the AK-47 rifle, sells semi-autonomous mini-tanks. Good times.

Perspective and freedom of motion. When collecting data via remote sensing, aerial vehicles have the advantage of altitude which gives cameras or other sensors a very wide field of view. This enables them to inspect large acreages in very short timeframes. Compare this to ground based vehicles which must navigate obstructions and painstakingly zig-zag between crop rows to cover the same area. But small aerial platforms are disadvantaged by short fuel supplies. If an aerial drone is used to perform a task at low altitude, it can no longer use a wide field of view to reduce task duration and will require refueling more frequently than a ground based platform.

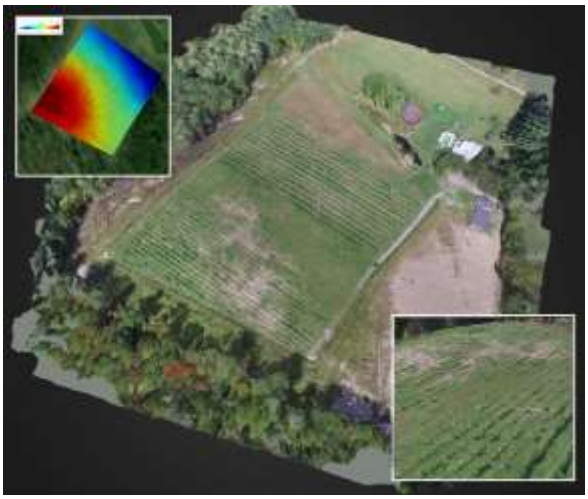

Photo One: Overlapping images used to create interactive 3D models that allow the vineyard to be viewed from different perspectives.

Who is really in control? It is often assumed that drones are always piloted by a human via remote control but this is not always true. While usually under the control of a human, drones are also always under the control of at least one computer and sometimes completely beyond the reach of human influence. When planning a routine vineyard mapping mission I use software on an iPad to define flight parameters such as the vineyard boundaries, flight altitude, preferred compass headings, camera settings, and photograph frequency. When the mission is flown, the iPad is attached to the drone's remote controller and the iPad does the actual flying. I only get involved when the software makes a mistake or evasive action is required.

That might be surprising to some readers, but the level of autonomy runs even deeper. When a human manually pilots a drone, living fingers guide joysticks on the remote controller to actively direct the vehicle. But when a computer operates the remote controller, it has options

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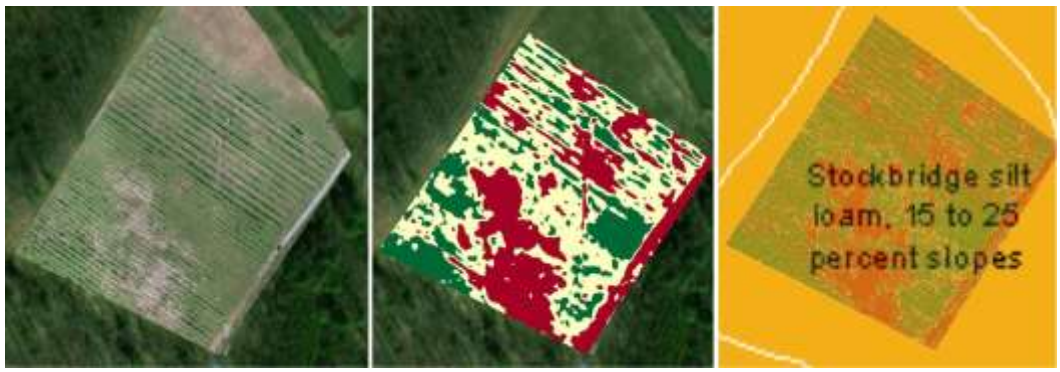

Photo Two: Aerial view of variable vineyard (left); NDVI-based vigor map (center); NRCS soil survey map (right).

unavailable to humans. Sure, the iPad could mimic human joystick movements to fly the drone from point A to point B, but it could also just tell the drone's on-board flight computer to find its own way to point A. This assumes that the drone is smart enough to do that, which is often the case. Once at point A, the iPad can issue the next instruction telling the drone to find its own way to point B.

The actual messaging between the iPad, remote controller, and on-board flight computer is more complicated than that, but you get the picture. If everything is going smoothly, the drone is doing most of the thinking, the remote controller is sending messages to the drone that have little to do with joysticks, the iPad is intermittently barking orders at the remote controller, and the human pilot is standing around eating a ham sandwich. This layering of control is not so different from commercial air travel but at a vastly smaller scale in vehicle size, complexity, cost, and special meal requests. The highest level of drone autonomy occurs when the communication between the drone and the remote controller is lost. Choosing to abort the mission, the drone does its best to return to the initial launch location and land on its own while the defunct human pilot can only wait, hope, and chew.

Freedom and consequence. Compared to ground vehicles, an autonomous aerial drone can claim the advantage of open space. When flying 400ft above a vineyard, a five-foot lateral deviation from the intended route has no consequence. That same deviation in a GPS driven tractor will quickly wreck both vineyard and tractor. On the other hand, autonomous aerial vehicles require, both by law and common sense, constant human oversight. This prevents the human pilot from focusing on other tasks while the drone is working. Ground based agricultural drones also have the advantage of being able to simply shutdown in the event of an error without falling out of the sky.

Drone. What is it good for? To many, drones are considered to be most useful for photographing things and blowing them up -- sometimes both and not always in that order. This may be somewhat true for aerial drones but they are also capable of carrying sensors other than cameras, and there are a few commercial examples of aerial drones equipped with small sprayers. Meanwhile a drone field tractor being guided by GPS can perform many tasks typically handled by human operators. Ground based vehicles clearly have the overwhelming advantage for most day to day field operations.

Aerial Drones in Viticulture: An Emerging Case Study. An Eastern NY grower recently asked for a site inspection of a four-year-old block that is performing inconsistently and losing vines. Touring the five-acre block on an ATV provided a sense of broad inconsistency punctuated by areas of missing vines, soil erosion, and low vigor. Each area of the block appeared to have different causes for the low vigor but with some overlap. Organizing all that information from the ground to formulate an action plan can be tricky, so we flew the drone to make some maps.

The drone is equipped with two interchangeable cameras. One camera is an off-the-shelf red/green/blue (RGB) camera which records photos and videos in the same format as a smartphone or point-and-shoot camera. The second camera has been modified to replace the blue light normally captured by a typical camera with near infrared (NIR) light. This is the camera used to create normalized difference vegetation index (NDVI) maps which measure plant vigor.

Visual inspection and vigor mapping with two dimensional maps. The RGB camera was flown first and produced the map shown in Photo 1 (left). Viewed from above, large variability zones can be clearly identified in both the vineyard floor health and vine size. We plan to use this information to direct an intensive soil sampling investigation, starting by isolating soil samples in the large low-vigor feature in the lower portion of the block.

The flight was repeated with the NDVI camera and produced the three-zone vigor map shown in Photo 1 (center). The zoned NDVI map helps in identifying areas of variability less visible with standard photography. Using this map,
we can identify several additional smaller locations to sample in isolation. At this point, you may be wondering what the USDA Natural Resources Conservation Service Soils Survey says about this block. Maybe it straddles

continued on next page

multiple soil types? That is easy to check because the aerial drone data automatically includes GPS information. A quick import into ArcGIS and an overlay of the soils survey data produced Photo 1. According to this map, there is only one soil type in the mix but if the block did straddle soil types, the spatial relationships between vigor and soil maps would be easy to reconcile.

Photo Three: Low-altitude three-dimensional model of canopy created with overlapping drone images.

Interactive three-dimensional inspection. One of the useful features of aerial mapping is the ability to create an interactive 3D model of the vineyard. When mapping, the drone flies a programmed flight path over the vineyard, taking many overlapping pictures, which are later stitched together into a large and detailed map. Overlapping images capture each point in the vineyard from multiple angles which allows for a 3D reconstruction. Anyone who has tried the View-Master stereoscopic toy has experienced the simplest form of 3D photography.

Larger sets of multiple-perspective images enable models like that shown in Photo 2. The main image in photo 2 shows the spatial extent of the model.

The lower inset shows a different view of the block captured by rotating the model in multiple axes and zooming in for detail. The upper inset illustrates an elevation map of the model.

To save flight time and processing time, this model was captured from an altitude of 350 feet with a minimal number of overlapping photos. That level of detail was high enough to interactively scout the block for the types of variables necessary for the inspection, but image and model detail can be substantially increased by flying at a lower altitude and increasing the image count. Photo 3 demonstrates a higher level of detail provided by a model captured using the same drone and camera at an altitude of 75 feet over a block of Pinot Noir in California's Central Valley.

Getting started. If you decide that an agricultural aerial drone is for you, be aware that the FAA recently declared strict rules governing their use in commerce. While children are still free to annoy their neighbors with very few restrictions, adults looking to use aerial drones for productive purposes are required to obtain an Unmanned Aircraft Systems (UAS) pilot certificate from the FAA and adhere to strict airspace rules and restrictions. Preparing for the exam requires a little determination but there are some excellent study tools available that will ensure your readiness. A good place to start is here (https://www.faa.gov/uas/getting_started/). Feel free to contact me if you are interested in obtaining a license and/or have questions about the process.

The Newest Oldest Crop

MAIRE ULLRICH, ENYCHP

The 2014 Farm Bill changed hemp production in the US. The Farm Bill defined hemp as *Cannabis sativa* with a THC (Tetrahydrocannabinol) content of 0.3% or less. This effectively differentiated it from marijuana, medical or recreational, because at that THC content, there is no psychoactivity. The Farm Bill opened the door for each state to have a permitting program for agencies and farmers to grow on an experimental basis. In 2014, the New York State Legislature passed

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Are you interested in growing hemp in 2018? Apply for a permit now. Applications close 11/22. See the NYSDAM website at: https://www.agriculture.ny.gov/PI/PIHome.html. There you will find the guidelines and application for 2018 production

legislation allowing the Department of Agriculture and Markets (DAM) in 2015 to develop a permitting process. Initially, the permits were limited to 10 applicants and to institutions of higher education. In 2016, Cornell, on campus, and SUNY Morrisville, with JD Farms in Madison County, planted the first crops totaling a little over 35 acres. In 2017, permitting became more accessible with written agreements with Cornell and other schools for research projects and the 10 spots filled. Then the Legislature opened the permitting process for an unlimited number of applicants. In 2017, 15 applicants planted hemp on ~1700 acres, including the original 10. At last count, there are 30 other states with legislation approving and/or active research programs.

Seed acquisition has been one of the biggest hurdles in the process. Seed transport across state lines and into the US from other countries is overseen by the Federal Drug Enforcement Agency. Buying and transporting seed requires a DEA permit. It is a long process and is essentially restricted to universities and departments of agriculture. The New York State Department of Agriculture and Markets recently received a DEA registration number and will be able to facilitate seed imports for the 2018 growing season.

Because seed acquisition was a special situation in 2017, almost all of the acreage grown was one cultivar, 'Anka', bred for dual-purpose use (for grain or fiber). In almost all cases, also, the seed was planted much later than recommended. Usually one would plant hemp by the end of May, after threat of frost, but this year even the earliest did not get planted until early July and some as late as early August. Many of the fields across the state suffered poor stands or just reduced growth/production. But some fields are yielding good experimental data and harvestable grain and fiber. Farmers are reporting on details such as the planting equipment they used, types and amounts of fertilizer, any pests sighted or creating damage or loss, harvest equipment utilized, troubleshooting and production levels across a range of soil types.

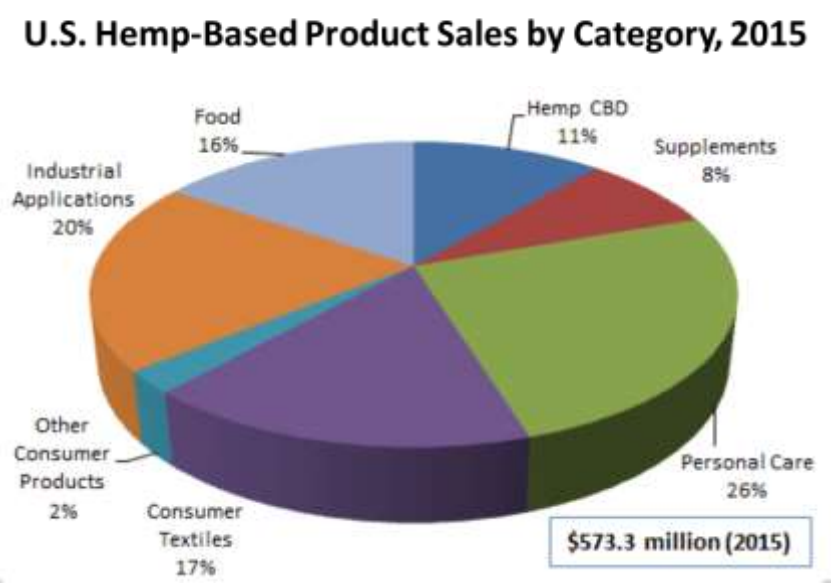
Pest identification and management are of particular interest since the crop has not been grown as an agronomic crop in some 80+ years it is hard to know what the issues might be. And because it has not been included in research trials for such a long time, we have no data for pesticide labeling or use, even if we were to identify problems.

Why Hemp?

Hemp is an old crop that has been legal again in many countries where marijuana is illegal for recreational or medicinal use. Similar to the US regulations, other countries differentiate based on varieties and THC content. We mostly know of hemp as a source of fiber for cloth, paper, and most notably rope. It makes a very strong fiber that is quite durable and seemingly impervious to rots, which is why its utilization for as rope, particularly in maritime uses, was common. In its history of human cultivation, those uses precede the psychoactive traits for medicine, religion, or recreation. As humans developed the plant for the uses they wanted from it, either fibers lengthened or THC levels increased. The divergence of the crop based on its uses has a somewhat geographic trend in that cannabis types developed near the equator, tended to be more for psychoactive qualities, while those developed much north or south of the equator tended to be more for fiber production. Grain as a valued part of the crop as feed for humans or animals, has only become popular in the past couple of hundred years and is a fairly new development in the history of the crop. Similar to the fiber, the grain has many uses from animal feeds to oil for humans or food-grade lubricants. Most recently, use of hemp fiber as a replacement for wood in super durable fiberboards and concretes, known as hempcrete, (a carbon-negative building material) has become a new boon for uses of the plant.

Currently, hemp products are *continued on next page*

about an $688 million industry in the US alone. The products imported range from health and beauty to cloth and paper. And, for the most part, all of these products are imported from other countries such as China and Romania, Hungary, India, and other European countries for fiber products and Canada for seed and oil for human consumption/applications.



But it's Not Marijuana

As mentioned above, hemp and marijuana are both *Cannabis sativa* but are genetically diverse in their THC content levels. In the animal world, both a Rottweiler and a Chihuahua are both *Cannis familiaris*, they have very different physical and personality traits bred into them. And, for dogs, most of that change has only occurred the last few centuries of human selection for traits. Similarly, hemp and marijuana have distinctly different chemical traits but visually, the difference would be more like that of 2 varieties of zucchini or of tomato. To the untrained eye, and particularly before flower, it is VERY difficult to differentiate hence the current increased security with hemp production. It would be difficult for law enforcement to identify illicit marijuana from a field from hemp.

Other than THC

In the US, there are several types of Cannabis production:

- Hemp (low/no THC) – for fiber or seed, generally grown like a field crop.
- Hemp (low/no THC) – for Cannabidiol/ CBD. It is one of the many non-psychoactive chemical compounds that have medicinal properties. These plants are grown more like a specialty crop and usually harvested before seed set because CBDs are highest in the flower before pollination.
- Medical Marijuana (THC above 0.3%) – grown in approved facilities in the 29 states where it is legal for medicinal use as prescribed by that state's regulations and then is dispensed according to that state's requirements. In New York it is greenhouse grown, under significant security, prescribed by a practitioner who has been granted permission to do so by NYSDOH and for only a certain list of ailments. Patients must also be registered with the DOH. Medical marijuana in NY is sold in approved forms which include liquids, capsules and oil for vaporization through dispensaries owned and operated by the growing/processing company. The state also requires certain ratios of THC:CBD be offered, one with equal and one high CBD. The other ratios are for the discretion of the processing facility. There are a limitation to the numbers of growing/processing facilities and dispensaries in NY. Production, processing and sale of this crop is seen more as pharmaceutical than agricultural and is still illegal under federal law as marijuana is classified as a schedule 1 narcotic.
- Recreational Marijuana (THC above 0.3% to >20%) – Seven states have recreational use legalized. All have their own restrictions on sales and where it may be consumed.
- Illicit Marijuana (THC above 0.3% to >20%) – Any production, use or sale outside of the legal permitting processes listed above.

As you can see from above, hemp and marijuana have cross-over interests for medicinal uses. Since there are so many compounds that plant produces that may have medical benefits (much of which has yet to be discovered/fully studied) there is often confusion about which plant and which chemical is the focus of attention. Currently, as this is an emerging area of discovery,

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there is much confusion and consternation. Two of the permit holders in NYS to grow hemp in 2017 are researching such differences. Both the Center for Discovery on Sullivan County and SUNY Binghamton School of Pharmacology are evaluating varieties and plant compounds, cannabinoids, for medicinal uses in the absence of THC.

How Does it Grow?

Hemp really does grow like a weed. The crop planted here in Orange County, on the muck, even though it was planted late managed to reach heights of 6-9 ft. tall. Each plant had several buds on it and pollination and seed production seemed healthy. Other plantings however, due to the lateness of planting, flowered while the crop was still quite small, since it is triggered by longer nights, resulting in a few small flowers on small plants.

This cultivar, 'Anka', as a monoecious variety, has both male and female flowers on the same plant (and, oddly enough, some male plants too), something desirable in a plant that you are trying to produce seed. Cannabis is sort of an odd plant, in that some of the varieties are monoecious and some are dioecious. This is how producers who want an un-pollinated female flower for illicit or medical use can obtain this. They plant dioecious varieties and cull out the males before pollen can be transferred to the flower.

We did identify some pest including:

- Aphids - although we are not sure they did damage but they were certainly present on the plant.
- Serpentine leafminer – damage was minimal on leaves but noted
- Sclerotinia Rot – a fungal disease that causes white fur on stems and leaves. Heavy infection can cause weakening of the stem and lodging of the plant. It is a well-known hemp pest and did occur in NYS plantings.
- Deer – damage to plants from browsing was noted in some fields.

In the fields where growth was sufficient, it did an excellent job of excluding weeds. Cultivation was practiced on one of the fields and proved to be very efficient.

Harvest and Sales

Planting seemed tricky in July and now harvest seems to be problematic in October. Because the plant fibers are so stringy and long, it is likely that they will bind up parts that spin if they get where they do not belong. Specialized harvesters collect seed and cut fibers simultaneously but, of course, these are rare and expensive for the trials we are practicing on. Farmers and Cornell have been conversing with producers in other areas to talk through the strengths and weaknesses of various models of combines and what kinds of mowing equipment would be best for the different harvest timings and needs.

Future Seeds

Cornell University has embarked on a multi-pronged approach with more than a dozen faculty working on hemp in 2017. One of the main foci is to evaluate varieties for suitability in New York. Two large trials were conducted on campus of many varieties, and Cornell faculty are initiating a hemp breeding program using "wild" hemp and other licensed parents to develop NY cultivars in the future. Currently, all cultivars

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Fun Facts:

1. The first of the two copies Declaration of Independence was written on hemp-based paper
2. Thomas Jefferson and other founding fathers grew hemp on their farms. Benjamin Franklin started the first hemp processing plant in the US with a paper mill.
3. In 1938 Popular Mechanics proposed 25,000 uses for the hemp plant from cloth to cellophane and dynamite
4. Beer hops (Humulus genus) are a close cousin of genus Cannabis, both of which fall under family Cannabaceae. The sticky resin of the hop flowers is also used in herbal medicine for its calming and other medicinal effects.
5. In 1941 the Ford Motor company built a car, partially made of hemp fibers, that also ran on plant-based fuel as a car of the future.

other countries, from seed companies who have developed them. Because they are proprietary, seed for planting comes with a non-propagation agreement – farmers can't keep seed the plant next year's crop. Now, that's OK for now since it is not legal for a farm to hold seed without a DEA permit. Optimal production of hemp seed for planting requires careful management of male and female plants, as well as control of pollination, since hemp pollen can blow in the wind as far as 5 miles. Production of certified seed in New York State would help overcome some key barriers to scale-up.

Sources: *Vote Hemp https://www.votehemp.com/;* ***Hemp as an Agricultural Commodity****, Congressional Research Service, 2013. https://fas.org/sgp/crs/misc/RL32725.pdf (where chart came from); Hemp Industries Association: https://www.thehia.org/; Cannabis, A Complete Guide by Earnest Small, CRC Press 2017*

Since 2009, Restaurant Prices Have Generally Risen Faster than Grocery Store Prices

ANNEMARIE KUHNS AND SARAH REHKAMP, USDA

Food price analysis often focuses on foods purchased from grocery stores and other retailers for preparation at home (food at home). However, according to the Bureau of Labor Statistics' 2015 Consumer Expenditure Survey, nearly half (43 percent) of the average American's food expenditures is spent on food prepared by sit-down restaurants, fast food establishments, sandwich shops, and other eating places (food away from home).

In general, food-away-from-home prices rise more consistently year to year than food-at-home prices. A price index that compares prices for a set "basket" of goods to a base period can be used to show the average change in prices over time. Charting the Consumer Price Indexes (CPI) for food away from home and for food at home since the base period, 1982-84, shows that over time, prices for food away from home and food at home trended upward at a fairly consistent rate until 2009. From 1984 to 2008, prices for both sectors rose at an average rate of 3.1 percent per year.

More recently, however, food-away-from-home prices have been rising faster than food-at-home prices. Food-away-from-home prices grew at an average annual rate of 2.5 percent between 2009 and 2016, versus food-at-home prices, which rose at an average rate of 1.4 percent per year over the same time period.

Food-at-home prices tend to be more volatile than food-away-from-home prices, and this was true during 2009 to 2016. Over this period, food-away-from-home prices rose between 1.3 and 3.5 percent per year. By contrast, food-at-home price changes during this time were more irregular, ranging from a 4.8-percent increase in 2011 to a decrease of 1.3 percent in 2016. The year 2016 was a particularly interesting year. While food-away-from-home prices rose 2.6 percent on average, food-at-home prices declined 1.3 percent. This is the first time food-at-home prices have deflated since 1967. This means that food from grocery stores became less expensive, while food at restaurants continued rising in price.

ERS's Food Dollar Series Highlights Differing Cost Structures for Food at Home and Away

While it may seem that prices for food—whether purchased at a grocery store or restaurant—should move in the same direction, differences in the services provided by the two food sectors can, in part, explain the divergence in 2016. ERS's Food Dollar Series apportions total annual expenditures by U.S. consumers on domestically produced food and beverages to 12 industry groups based on the value added by each industry. This division into industry groups highlights the differing cost contributions of industries involved in producing food at home and food away from home.

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The largest two cost components of the at-home food and beverage dollar are food processing/packaging and wholesaling/retailing. Together these four industries accounted for 69.4 percent of a typical dollar spent on food and beverages in a grocery store in 2015. That is, for each dollar Americans spent at a grocery store in 2015, just over 69 cents was value added by the processing/packaging and wholesaling/retailing industries. Costs in these industries are driven by a combination of labor (processing plant workers and store managers and clerks), rental space (land or storefronts), and machinery maintenance.

In 2015, the value added by agribusiness and farm production accounted for 13.8 cents of the at-home food and beverage dollar, compared with 3.2 cents of the away-from-home food and beverage dollar. Thus, grocery store prices are more closely connected to farm-level prices than restaurant prices.

Gasoline or diesel fuel used for transporting food and fueling machinery throughout the food system is represented in the energy industry component of the food dollar. Energy accounted for a larger proportion of costs for food and beverages at home (4.2 percent) than for away-from-home food and beverages (3.5 percent) in 2015.

In contrast, the largest share of the away-from-home food dollar—72.3 cents in 2015—was spent on the services provided by foodservice establishments. The majority of the value added by foodservice establishments is in the form of salaries and benefits (including customer tips) of cooks, wait staff, dishwashers, and other employees involved in food preparation, meal service, or clean-up after the meal is finished. Salaries and benefits for the foodservice industry in the food-away-from-home market have been steadily increasing, from $193.7 billion in 2009 to $269.2 billion in 2015.

Falling Prices for Energy and Farm Products Helped Drive Down Food-At-Home Prices in 2016

Cost structures of at-home and away-from-home food and beverage dollars differ

Source: USDA, Economic Research Service Food Dollar Series, 2015.

Lower farm commodity prices and lower energy costs contributed to lower at-home food prices in 2016; the Producer Price Index (PPI) for farm products declined 9.8 percent in 2016, and the PPI for diesel was 20.9 percent lower. The PPIs for processed foods and processing meats have also been trending downward in recent years.

Rising prices in the food-away-from-home sector, on the other hand, reflect the steady increase in costs associated with food service, most importantly in wages and employee benefits, as shown by the Employment Cost Index for Service Occupations, which grew by 13.1 percent from 2009 to 2016. These trends help explain the divergent paths of grocery store and restaurant prices in 2016, supported by the food and beverage dollar data.

Upcoming Events

November 7, 2017 – *Growing Better Brassicas* – Hotel Gideon Putnam, Saratoga Springs, NY 9:30-3:30, 3 DEC Credits available

Speakers Include:
Paul Betz- *High Mowing Seeds*
Thomas Bjorkman- *Cornell University*
Jean-Paul Courtens- *Hudson Valley Farm Hub & Roxbury Farm*
Amy Dolley- *Johnny's Selected Seeds*
Dan Kent- *Kent Family Grower; Lisbon NY*
David Marchant- *River Berry Farm; Fairfax, VT*
Susan Scheufele- *University of Massachusetts*
Jan van der Heide- *Bejo Seeds*

Register at:
https://enych.cce.cornell.edu/event.php?id=832

November 30, 2017 – *Winter Storage for Vegetable Crops* – Hotel Gideon Putnam, Saratoga Springs, NY 9:30-3:30 with Chris Callahan from UVM. Register at: https://enych.cce.cornell.edu/event.php?id=833

December 5-7, 2017 – *Great Lakes Expo*. Devos Place Conference Center and The Amway Grand Plaza Hotel, Grand Rapids, MI. Registration opens September 25, 2017. Go to http://glexpo.com for more details on program and registration.

December 12-14, 2017 – *New England Vegetable & Fruit Conference*. See the website for program and registration information as it becomes available. Go to https://newenglandvfc.org.

January 16-18, 2018 - *The 2018 Empire State Producers Expo*. SRC Arena in Syracuse, NY. The Becker Forum will be January 15th. Information and registration at: http://nysvga.org/expo/information/

Improving Ag Labor Management

November 29 and December 13 (new dates!)

Registration Deadline 11/26

Your employees are your most valuable resource. Wages, salaries, and contract labor expenses represent more than 40 percent of the cost of production in labor intensive crops like fruits, vegetables, and nursery products. Can you afford to not improve your skills in managing employees effectively?

Cornell Cooperative Extension is offering four workshops on Human Resource Management on the Farm. Sign up for the full series of workshops at the Whallonsburg Grange in Essex, NY at a discounted price of only $15 each for all 4 workshops or $25/ea for individual workshops. Contact Abby at (518) 746-2553 for assistance with registration or aef225@cornell.edu.

Grants are available to participants for one on one technical assistance through the Cornell Small Farms Program!

January 30-February, 2018 – *Mid-Atlantic Fruit and Vegetable Conference*. Hershey Lodge and Convention Center, Hershey, PA. For more information visit: http://www.mafvc.org/