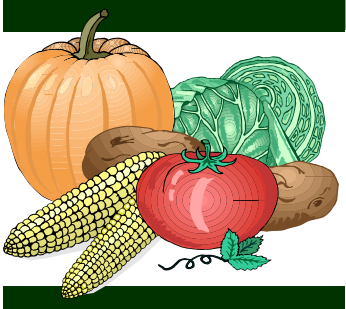

Cornell University
Cooperative Extension
Regional Vegetable Programs

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Veg Edge

Your Trusted Source for Research-Based Knowledge

Watch for the Tuber Necrotic Strain of Potato Virus Y (PVY)!

Carol MacNeil, Cornell Vegetable Program, with information from Virus Problems of Potatoes, 2005, Mary Burrows and Thomas Zitter, USDA-ARS and Cornell

The tuber necrotic strain of potato virus Y (PVYntn) was first discovered in Europe in the late 1970's, and appeared in the U.S. around 1993. It has been a concern of the potato industry, and especially the potato seed industry, ever since. PVYntn causes fewer foliar symptoms than its predecessor, PVY, but it causes large circular or semi-circular raised lesions on the surface of potato tubers, extending a short distance into the flesh. It does not cause decay.

PVYntn was discovered to be causing tuber symptoms recently on 5% of Yukon Golds during grading on a farm in Western New York. No other varieties on the farm have yet shown symptoms. This is not the first sighting of this disease in New York but it is thankfully not yet common. The Yukon Golds were from certified seed from Maine. Potato growers should be checking seed lots they receive carefully for this disease, as well as for many other diseases. Infected seed is the main way that PVYntn spreads. Aphid transmission (esp. green peach aphid), mechanical transmission, and Infected volunteers, are other methods.

All seed planted should be certified because it reduces the risk of planting virus/disease infected seed. Field and winter test inspections by independent third parties are key to the certification process. Growers should request the documentation that goes along with these inspections, such as in the North American Plant Health Certificate, which includes the results of the Winter/Florida Test. Each bag/box of seed should have a certification tag attached with proper identification. Growers can purchase Foundation seed or Certified seed. New York Certified Seed Potato Standards require that 100% of Foundation seed acreage be inspected and limit virus infection to no more than 0.5%, while Certified seed is limited to no more than 5.0%.

Photos: C. MacNeil, Cornell Vegetable Program

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This publication contains pesticide recommendations. Changes in pesticide regulations occur constantly and human errors are possible. Some materials may no longer be available and some uses may no longer be legal. All pesticides distributed, sold or applied in NYS must be registered with the NYS Dept of Environmental Conservation (DEC). Questions concerning the legality and/or registration status for pesticide usage in NYS should be directed to the appropriate Cornell Cooperative Extension (CCE) specialist or your regional DEC office.

CCE and its employees assume no liability for the effectiveness or results of any chemicals for pesticide usage. No endorsement of products or companies is made or implied. **READ THE LABEL BEFORE APPLYING ANY PESTICIDE.**

Veg Edge is a shared publication of two Cornell Cooperative Extension teams, the **Cornell Vegetable Program**, serving 12 counties in Western & Central NY, and the **Capital District Vegetable & Small Fruit Program**, serving 11 counties in the Capital Region of NY

Yukon Golds and other yellow flesh potatoes are especially susceptible to showing the tuber necrotic symptom, while many other varieties are not. Potato varieties without symptoms can act as hosts, harboring the virus, however. (Tomatoes, peppers, nightshade, ground cherry and hairy nightshade are also hosts.) Some varieties less susceptible to the tuber necrotic symptom are Eva, Dark Red Norland, Belrus, HiLite Russet, Kennebec, Monona, Norwis and Sebago (source: Missouri University Extension).

There were no noticeable virus symptoms on the Yukon Gold foliage during the recent growing season, which is not unusual. Virus expression is variable according to potato variety, viral isolate, weather conditions, and the length of the infection period. In addition, viral symptoms and severity are not necessarily link to the severity of yield depression, according to Stewart Gray, USDA ARS and Cornell, and Keith Perry, Cornell.

Potato growers should be checking seed lots they receive carefully. During the growing season PVY is primarily transmitted by aphids, but also mechanically on equipment. Controlling aphids does not control PVY spread, however, since transmission occurs so rapidly after aphid probing. The concern for the grower with the infected Yukon Golds is that volunteer tubers will carry the disease over winter and act as a reservoir for virus transmission by aphids next year. He will be rotating, hopefully far enough away.For more information on potato viruses go to: http://vegetablemdonline.ppath.cornell.edu/NewsArticles/Potato_Virus.htm ■

Agricultural Producers Security Law Protects Farmers

Agriculture News, NYS Dept. of Agriculture and Markets

NYS Agriculture Commissioner Darrel Aubertine reminds farmers to only sell to licensed farm product dealers. Article 20 of the New York State Agriculture and Markets Law, known as the Agricultural Producers Security Law, requires dealers to be licensed and contribute to a security fund to offer protection to farmers in the event of a defaulted payment. They must renew their license each year by May 1st.

In order to preserve a producer's eligibility for financial protections available under the Agricultural Producers Security Law, producers must:

1. Sell only to dealers licensed at the time of the transaction.
2. File claims within 120 days from the earliest unpaid transaction date of the sale of farm products between producer and dealer
3. Claims of nonpayment must be filed no later than 365 days after the sale and delivery of the farm products.

A producer can also take advantage of Article 20's trust provision, a legal mechanism that holds a dealer responsible for the full amount owed to a producer. The "Article 20 Trust" is established upon delivery of the producer's farm products to a dealer and ends once the amount due is fully paid. A producer must provide a written notice to the dealer within 60 days from the date when payment is due informing the dealer that the trust benefit has been chosen. The written notice must include the dealer's name, transaction date, product sold, quantity, price per unit, amount owed and date payment is due. Producers should consult with their attorney regarding their trust benefit.

For information about the law, or a list of licensed dealers, go to: http://www.agriculture.ny.gov/programs/apsf.html or call the Department at 800-554-4501. ■

Your Guide to Farm Loans

John Flocke, USDA-Farm Service Agency, Syracuse

The Farm Service Agency (FSA) is committed to providing clear and concise explanation of its farm loan process, and is pleased to announce the online publication titled "Your Guide to FSA Farm Loans." The guide is designed to serve as a resource to farmers and ranchers. The guide, written in "plain language", provides information about FSA's farm loans and loan servicing options. A list of additional resources is also included in the guide. The guide is available online at: https://www.fsa.usda.gov/dafl ■

Post-Harvest Garlic Trial - Year One

Crystal Stewart, Capital District Vegetable & Small Fruit Program

Ask five garlic growers about the best way to dry garlic and you are likely to receive five different answers. Some techniques are based on tradition, some are based on West Coast industry techniques, and some simply make use of the available resources, such as hay mows or even the occasional tobacco barn. There has been little information available on which of these techniques is the best for growers in New York, or in the northeast in general. With the support of a Northeast SARE Research and Education Grant, we set up on-farm trials in three locations to begin answering this question during the 2012 growing season.

TREATMENTS:

The following treatments were included, both separately and in combination: tops cut; roots cut; washed; high-tunnel dried; and open-air dried (Table 1). Each treatment was applied to either an eight foot section of the bed or to a ten pound sample of uncut green garlic, for an average of 46 heads per sample. All three sites used German White in this trial. All treatments were applied at all three sites, but the top trimming was done with a sickle-bar mower prior to harvest at one site and with pruning shears directly after harvest at another sites. The open-air structures also varied, with one farm using a hay mow, and two others using rain-resistant open-air sheds. Garlic was washed with a garden hose and a standard nozzle, not with a pressure washer. Roots were pruned using razor-blade anvil pruners or a knife. All treatments were applied within 3 hours of harvest. The high tunnels used at each site had one to two layers of shade cloth over sections where garlic was located (Image 1). Temperatures in the high tunnel only averaged 5°F warmer in the tunnel than outside due to liberal use of fans. The highest temperature recorded in the high tunnel was 102°F.

RESULTS:

High Tunnel vs. Open Air: Across the three trials, garlic in high tunnels dried an average of three days faster than in open air structures. Garlic dried in high tunnels had slightly better wrapper quality (tighter, less discoloration) at one site. Garlic dried in tunnels also had slightly lower disease incidence (*Aspergillus* and *Embellisia)* in two of the three sites, though disease was not severe in any site or treatment. No garlic treatments showed damage from being dried in the high tunnel.

Roots trimmed vs. roots untrimmed: No statistically significant differences were observed between these treatments in regards to bulb quality, weight, or disease incidence.

Tops trimmed vs. tops untrimmed: Trimming the tops mechanically in the field greatly increased the speed of harvest, and reduced the space needed for drying. Top trimming did not have a significant effect on disease incidence in cured bulbs, but there were differences in bulb weight at two of the farms, with un-cut bulbs being slightly heavier (Table 2). It is unclear if this difference is due to weight loss or to double bulbs, since the number of bulbs is greater in the treatments with lower average weights. Bulb quality was comparable between treatments.

Table 1. Post-harvest treatments at all sites

F+E	F+D	A+E	A+D
A+E+C	A+D+C	A+E+B	A+D+B
A+E+C+B	A+D+C+B	B+E	B+D
B+C+D	C+E	C+D	B+C+E

Treatments:
A = Trim roots flush with basal plate
B= Trim tops to 6" long
C = Wash
D = Cure in high tunnel
E = Cure in open-air structure
F = Leave roots and tops un-cut

Image 1. Garlic with tops trimmed, curing in the high tunnel.

Washed vs. unwashed: Washed garlic looked very good initially, but became more discolored than the unwashed garlic during the drying and curing process. Most discoloration could be removed by removing 1-3 wrapper leaves, but this extra step is time consuming (Image 2).

Disease incidence, particularly *Aspergillus* and *Embellisia,* was slightly higher in washed garlic.

Table 2. Average weight of topped and un-topped bulbs at three farms.

Farm	Average Weight/Bulb Tops Cut	No. of bulbs in sample	Average Weight/Bulb Tops Uncut	Number of bulbs in sample
1	0.11	386	0.15	375
2	0.11	346	0.1	365
3	0.12	304	0.14	232

Discussion: Drying garlic in the 2012 season was relatively simple regardless of the method due to the hot, dry weather our region experienced during July. Thus, nearly all treatments yielded moderately high-quality garlic. This year's trials were nonetheless very valuable because they allowed us to demonstrate the effects of relatively high drying temperatures, of top pruning, of root pruning, and of washing. The absence of damage or increased disease incidence in these treatments is encouraging, and each will be further examined during the 2013 growing season. By the end of next year, we will have recommended best practices for garlic drying in the Northeast, and will then focus on best practices for longer-term storage.

Image 2. Garlic immediately after washing (far left) and after curing with no wrapper leaves removed (0), one wrapper leaf removed (1) and two wrapper leaves removed (2).

During the next growing season we will extend top pruning to include a 2 inch trim, and we will increase the temperature in the high tunnel to 110 degrees Fahrenheit. We will be purchasing relative humidity monitors for the drying structures to further examine differences between the high tunnel and the open air structure. The complete year 1 report, including pictures of treatments, is available on our website: cdvsfp.cce.cornell.edu ■

It's January: Did You Update Your Work Agreement/Pay Notice?

Sandy Buxton, CCE Capital Area Agriculture and Horticulture Program

Paperwork is the bane of any small business and especially difficult for farm businesses. At the Labor Issues for Ag Employers seminar in December, Christina Marzello, NYS Dept. of Labor's Immigrant Policies and Affairs group, talked about some of the paperwork employers really need to update regularly. One of the forms is a work agreement/pay notice which documents work details like employer name and address, employee name and address, hours of work, skills and work expectations of employer, pay rate, pay day and what is being provided in non-cash pay. Both employer and employee must sign and date the agreement. Each party should receive a copy. This is a legal document and should be kept in your files. Additionally, if there is a change in the pay rate due to a raise or job change, the employer should generate a new work agreement and have it re-signed.

NYS passed the Wage Theft Prevention Act which took effect April 9, 2011, and the annual work agreement/pay notice notification must include:

- Rate or rates of pay, including overtime rate of pay (if it applies)
- How the employee is paid: by the hour, shift, day, week, commission, etc.
- Regular payday
- Official name of the employer and any other names used for business (DBA)
- Address and phone number of the employer's main office or principal location
- Allowances taken as part of the minimum wage (tips, meal and lodging deductions)

The notice must be provided in English and the employee's first language to all new hires and again between January and February 1 of each year. For more details about these forms and to view sample forms which are available in several languages, please visit: http://www.labor.ny.gov/workerprotection/laborstandards/employer/wage-theft-prevention-act.shtm Scroll down for the forms in different languages. ■

2012 Ag Census Countdown Begins for New York's Farmers

USDA, National Ag Statistics Service - New York Office

Farmers and ranchers in New York will soon have the opportunity to take part in the 2012 Census of Agriculture. Conducted every five years by the U.S. Department of Agriculture's (USDA) National Agricultural Statistics Service (NASS), the Census is a complete count of all U.S. farms, ranches and those who operate them. NASS will mail out Census forms in late December, to collect data for the 2012 calendar year. Completed forms are due by February 4, 2013. Producers can fill out the Census online via a secure website: www.agcensus.usda.gov or return their form by mail. Federal law requires all agricultural producers to participate in the Census and requires NASS to keep all individual information confidential. For more information, visit www.agcensus.usda.gov ■

Cornell Faculty & Extension Staff Team Up Against Spotted Wing Drosophila

Greg Loeb, NYSAES Geneva - Cornell

Spotted wing drosophila (SWD), an invasive fruit fly originating in Asia, can destroy intact berries, cherries, and possibly peaches, some grape varieties and cherry tomatoes (unconfirmed). It first appeared in the northeastern U.S. in 2011 and by 2012 was widely distributed over the region. Populations in NY exploded in early August, forcing many berry growers to close their fields and abandon the crop. The insect is similar in appearance to common vinegar flies, except SWD females lay eggs in unripe fruit and larvae may be found in fruit that is just ripening. Significant problems occurred where populations went undetected and untreated. The pest is poorly understood, a fact that a new consortium, led by Cornell faculty and Extension educators, is hoping to change.

This consortium, The Northeast Spotted Wing Drosophila IPM Working Group, sponsored by the Northeastern Integrated Pest Management Center, met in Geneva, NY, November 1, 2012. The 50-member working group includes research scientists, extension educators, industry consultants, and growers from ten states in the northeastern U.S. and from three Canadian provinces. "We were gratified by the level of interest in attending our first meeting, but not surprised, given the economic threat posed by this new pest" commented Greg Loeb, entomology professor, Cornell, and co-organizer.

The Highbush Blueberry Council which surveyed growers say the loss of product and jobs may exceed one billion dollars this year and could grow if effective means for managing the pest are not developed and adopted. Dennis Doyle, representing the U.S. Highbush Blueberry Council, was emphatic in his plea to researchers to "find a solution to this problem." Doyle stated that in his more than 30 years in the blueberry business this is the worst problem he has seen for growers. Dale Ila Riggs, President of the NY State Berry Growers' Association, stated that this problem desperately requires financial support for research.

During the meeting, attendees reported on details of their insect monitoring protocol, levels of SWD infestation, crops affected, merit of control strategies, and on-going research. Rich Cowles (Connecticut Agricultural Experiment Station), Cesar Rodriquez-Saona (Rutgers University), and Greg Loeb (Cornell University) presented summaries of their ongoing SWD research in the Northeast. Hannah Burrack, North Carolina State University, and Peter Shearer, Oregon State University, shared research findings from states that have been dealing with SWD for several years.

Through these updates, the Working Group gained a better understanding of SWD biology, potential methods of control, and gaps in knowledge and education. This set the stage for the Working Group to develop and rank research, education, regulatory, and extension priorities for dealing with this invasive fruit fly—published at www.northeastipm.org/working-groups/spotted-wing-drosophila/priorities/ The Northeast IPM Spotted Wing Drosophila Working Group has taken a first step toward finding sustainable and effective IPM strategies against SWD—a step that is critical for the future of the berry industry. ■

2013 Farm Food Safety Trainings

Craig Kahlke and Robert Hadad, Cornell Cooperative Extension

These workshops are for farmers who are being required by buyers to provide third party verification of their food safety practices and for farmers thinking about moving in this direction. With the Food Safety Modernization Act draft FDA regulations to be released in the very near future, the timing of these workshops is paramount. Although the 2-day workshops will cover the vast majority of what most 3rd-party audit companies require, it will be geared towards the new Harmonized GAPs standards which Wegmans and many other retailers are requiring. A third day of training will be an on-farm mock inspection at a date to be announced.

Cost: $60 per person, includes lunch; $10 more for each additional farm member. Laptops are required for the second day of each workshop. If you need a loaner laptop for the second day, indicate your need for one on your registration form. For a calendar of upcoming GAPs trainings, see: http://www.gaps.cornell.edu/eventscalendar.html For general info about the trainings, contact Craig Kahlke at: cjk37@cornell.edu or 585-735-5448.

GAPs Farm Food Safety Trainings:

January 15-16, Geneva, 8:30 am – 3:30 pm, Food Science Room 251, NYS Ag Experiment Station, 630 W. North St, Geneva. The focus of this training is on berries, but all fresh produce growers are invited. **Pre-register by January 9, 2013.** Mail the GAPs flyer and registration form in with your payment, or register and pay online at http://cvp.cce.cornell.edu/event.php?id=65. Contact Angela Parr at 585-394-3977 x426 for more information on registering for this event.

January 30-31, Mt. Morris - The focus is on potatoes but all produce growers are invited.

February 7-8, Batavia - General GAPs training for all produce growers.

Allium School

Organic and Conventional Production

Thursday, January 24, 2013

at the

Empire State Producers Expo

Oncenter Convention Center
Room: Ballroom West
800 South State St., Syracuse, NY

Garlic Leeks and Shallots School

8:30 am - 11:00 am

Break for lunch and visit trade show
11:00 am - 1:00 pm

Small-Scale Onion Production School

1:00 pm - 4:30 pm

Topics covered by Cornell, CCE, and industry reps:

- Allium physiology – know your plants
- Seed selection and planting considerations including plant spacing, mulches and fertility
- Pest management including diseases, insects and weed management
- Harvest and post-harvest considerations

Grower experiences featuring:

Fred Forsburg - Honeyhill Farm, Livonia, NY
Ed Fraser -Fraser Garlic Farm, Churchville, NY
Jeff Stoltzfus - Simply Sweet Program, New Holland, PA
Nelson Hoover - Evergreen Farm, Penn Yan, NY

Wrap-up Q & As and grower to grower interaction

Register for the Allium School at the Expo:

- Allium school only - $45 per day ($60 at the door); may attend one or both sessions (same price)
- 2 or more days at Expo (may include Allium school) - $95 ($125 at the door)

To register and for a complete program, visit www.nysvga.org

For more information:

Contact Christy Hoepting, cah59@cornell.edu; 585-721-6953

Upcoming Meetings

Northeast Beginning Farmers Online Courses
5 – 7 week courses for growers in their first 10 years. Cost is $200 each. Go to: http://nebeginningfarmers.org/online-courses/

January
BF 104: Financial Records – Setting up Systems to Track Your Profitability
BF 121: Veggie Farming – From Season-Long Care to Market
BF 203: Holistic Financial Planning – Building Profit into the Picture

March
BF 103: Taking Care of Business – Understanding the Business, Regulatory, and Tax Implications of Your Farm
BF 105: Machinery and Equipment – Evaluating What's Right for Your Operation

Marketing for Profit: Market Assessment and Customer Assessment Webinars
These webinars were designed to provide critical marketing insights for farmers and farm marketers. The webinars are free, 90 minutes long, and easy to access. The winter season, 2012-13, will focus on Market Assessment and Customer Assessment. To register or for more info go to: http://www.nyfarmersmarket.com/work-shop-programs/webinars/program.html Scroll down and click on Full Three Year Curriculum or Register for Webinars. Or contact Diane Eggert at: deggert@nyfarmersmarket.com
Sponsored by the Farmers Market Federation of NY, the NY Farm Viability Institute, and USDA Northeast SARE

Building the Marketing Plan - January 8, 11:00 am - 12:30 pm; or January 9, 6:00 - 7:30 pm

Coming to Understand the Customer - January 15, 11:00 am–12:30 pm; or January 16, 6:00 - 7:30 pm

Promoting the Product - January 29, 11:00 am–12:30 pm; or January 30, 6:00 - 7:30 pm

Market Assessment & Analysis - February 12, 11:00 am–12:30 pm; or February 13, 6:00 - 7:30 pm

National No-Tillage Conference

January 9 - 12

Hyatt Regency Indianapolis
Indianapolis, IN 46204

Presentations by experienced growers, educators and researchers - featuring cover crops and reduced tillage. Roundtables lead by growers. Donn Branton, LeRoy, will outline how he determines what crops to no-till and which to strip-till or zone till.

Go to: http://www.no-tillfarmer.com/pages/NNTC---National-No-Tillage-Conference-Home-Page.php, (866) 839-8455 or email: info@lesspub.com

NYS Ag Society 181st Forum - ***Perception is Reality: Understanding How Consumers Perceive Agriculture***

Thursday, January 10

8:30 am - 8:30 pm

Holiday Inn, 441 Electronics Pkwy,
Syracuse/Liverpool

Consumer views and how farms can help promote agriculture to the public. Keynote speaker: Larry Kaagan, a polling, trend-analysis and strategy-consulting firm for agriculture and food industries. NYS Ag Commissioner, Darrel Aubertine, will present the State of the State's Agriculture Address. Details at: www.nysagsociety.org *Co-sponsored by the NYS Dept. of Ag and Markets*

Basic Farm Business Management Planning
The fee is $25/person. Call ahead to register: 518-765-3500 or 518-380-1498 or sab22@cornell.edu

January 12 - 9:30 am to noon at CCE-Washington Co., 415 Lower Main St, Hudson Falls, NY.

February 7 - 6:00-8:30 pm at CCE-Washington Co., 415 Lower Main St, Hudson Falls, NY.

Success in Growing for Auction in NY

Wednesday, January 16

10:00 am - 3:00 pm

Finger Lakes Produce Auction
3691 NYS Route 14A, Penn Yan

Topics: pest ID and management, varieties, marketing of vegetables and strawberries; inter-row cover crops; and attributes of successful auctions. 2 DEC credits.

FREE. Lunch onsite for a nominal fee.

Questions? Contact Judson Reid: 585-313-8912 or jer11@cornell.edu

Empire State Producers Expo *(formerly the Empire State Fruit & Vegetable Expo)* and Becker Forum

January 21 - 24, 2013

The OnCenter, Syracuse, and Doubletree Hotel - Thruway

January 21

2013 Becker Forum: "Managing Human Resources in Agriculture: Creative Steps when Public Policy Fails"

Doubletree Hotel, East Syracuse, NY, just off I-90 exit 35

Navigating the new political landscape, addressing current H2A and human resources challenges, E-verify, new Health Care Law, labor shortages.

January 22 - 24

Educational sessions: The 2013 Expo is three full days of labor, tree fruit, berries, flowers, marketing, vine crops, potatoes, many vegetable sessions, direct marketing, etc. sessions. Jim Prevor, "The Perishable Pundit" will be this year's keynote speaker. The Expo offers both DEC and Certified Crop Adviser credits.

The Expo Trade Show: Stop by the trade show Tuesday afternoon for a little "Taste of Syracuse." On Wednesday, don't miss the afternoon Ice Cream Social.

Doubletree Hotel Shuttle to Oncenter - January 22 - 24

- 8:00 am - 11:00 am - Continuous loop between and Doubletree Hotel and the Oncenter
- 3:00 pm-6:00 pm - Continuous loop between and Doubletree Hotel and the Oncenter

To see the full Expo schedule or to register online, visit www.nysvga.org

Organized by: NYSVGA, Cornell Cooperative Extension, Empire State Potato Growers Inc., NYS Berry Growers Association, NYS Flower Industries, Inc., NYS Horticultural Society, Farmers' Direct Marketing Committee, and Cornell University.

Conservation Easements for Farms and Rural Land

Thursday, January 24

7:00 - 8:30 pm

CCE Ontario County, 480 N Main St, Canandaigua 14424

The workshop will cover legal considerations with conservation easements, pitfalls of this approach to land preservation, the role of estate planning, tax implications, and where to obtain additional information.

$15 per family. Pre-registration is required by calling Nancy Anderson at 585-394-3977 x427 or email your full contact information to nea8@cornell.edu.

2013 NOFA-NY Organic Farming & Gardening Conference – *Resilience*

January 25 - 27, 2013

Saratoga Hilton & City Center Saratoga Springs, NY

The Northeast Organic Farming Association of New York's 31st annual three day winter conference hosts workshops on all aspects of farming and gardening—from vegetable production for advanced and beginning farmers to livestock, field crops, fruit, and more.

See events, fees, and registration (online, email or mail) by checking out: https://www.nofany.org/events/winter-conference

To register, contact Charlene Burke, Registration Coordinator (585) 271-1979 ext. 515 or register@nofany.org. For general info (585) 271-1979.

Safe Tractor & Machinery Operation Program

January 26 and weekly

Completing and passing this training program qualifies youth ages 14 and 15 years of age to be certified to operate farm equipment for hire. It includes 32 hours of intensive instruction, a knowledge test, and Skills and Driving tests.

Registration: Contact CCE - Genesee County at 585-343-3040 x101 or genesee4h@cornell.edu

Upcoming Meetings…continued

CDL Commercial Truck Training for Ag Producers

February 7, 12, and 13

7:30 pm

CCE Genesee Co., 420 E. Main St., Batavia

This training program is designed for producers and farm employees who have some experience with commercial truck operation.
February 7 - Informational meeting; pick up training materials and medical forms.
February 12 and 13 - Classroom training

Cost: Class A - $625; Class B - $475. Register by February 6: Contact Jan Beglinger at 585-343-3040 x132 or jmb374@cornell.edu. *Offered by CCE of Genesee County, in collaboration with Genesee Valley Educational Partnership*

Drip Irrigation: Systems, Techniques, and Tips for Small Farms

Tuesday, February 12

8:30 am - 3:00 pm

CCE Ontario County, 480 N Main St, Canandaigua 14424

After a dry season, growers realize climate change might change their needs for water. Drip irrigation is the most efficient use of water, but only if the system is set up right. Cornell Cooperative Extension of Ontario County and the Cornell Vegetable Program are offering this in-depth intro to drip irrigation. Penn State specialist Bill Lamont will present strategies for designing an irrigation/fertilization system. Includes water sources and food safety considerations.

Registration - $40, **before January 31**; $50, after January 31. Includes lunch. Register and pay online at http://cvp.cce.cornell.edu/event.php?id=64. **Payment for this event must be received in advance.**

Questions? Contact Nancy Anderson at (585) 394-3977 x427 or nea8@cornell.edu.

Farm to Restaurant Workshop

Monday, February 18

9:00 am - 12:30 pm

Cibi Deliziosi, 3894 Rush Mendon Rd, Mendon 14506

Build relationships with chefs to sell the produce chefs need. Chefs will be invited to share their experiences and to meet farmers. Farmers are encouraged to set a small table display, highlighting their farms.

For info and pre-registration, contact Robert Hadad at rgh26@cornell.edu or 585-739-4065

Farmers Market Manager Training Conference: The Science of Farmers Markets

March 5 - 7

La Tourelle Resort and August Moon Spa, Ithaca

Topics: food safety, crisis management, working with volunteers, understanding consumers, and working with a board of directors. Includes a discussion with experienced managers.

Registration: http://www.nyfarmersmarket.com/work-shop-programs/annual-conference-ditto-with-the-annual-conference/registration.html

Conference agenda, hotels: http://www.nyfarmersmarket.com/work-shop-programs/annual-conference-ditto-with-the-annual-conference/program.html

Questions? Contact the Federation office at 315-637-4690; deggert@nyfarmersmarket.com. *Hosted by the Ithaca Farmers Market*

Identification, Assessment & Management of Soilborne Plant Pathogens in Vegetables

Wednesday, March 20

8:30 am - 4:15 pm

NYS Ag Experiment Station, Jordan Hall, 630 W. North St., Geneva

Topics: Understanding pathogen biology; How to identify soilborne diseases on vegetable crops in the Northeast; Methods for assessing soil pathogen levels and crop loss; and, Disease management.

Cost: $20, includes lunch

4.5 DEC credits and CCA credits will be available

Pre-registration required by March 12. Contact Angela Parr, Cornell Vegetable Program: aep63@cornell.edu or (585) 394 – 3977 x426. Make checks payable to: *Cornell Vegetable Program,* memo: "3/20 Veg Disease Workshop".
Or register and pay online at: http://cvp.cce.cornell.edu/event.php?id=63

Growing Onions in a Minimum Tillage System - Protection from Wind Damage & Erosion

Christy Hoepting, Cornell Vegetable Program

Growing onions in a minimum tillage system would drastically reduce the negative economic and environmental consequences of erosion and subsidence, while sustaining long-term production of onions grown on muck soils. Following are results and experiences from our first attempts at growing direct seeded onions in a minimum tillage system in muck soil. Although our system requires some fine-tuning, growing onions in a minimum tillage system can be done simply and successfully with comparable yield and net return to onions grown conventionally. The most valuable benefit is the superior protection against wind erosion in the early spring when onion seedlings in the loop to flag leaf stage are quite vulnerable to wind damage despite traditional wind protection methods. Preliminary results also suggest that fertilizer rates may be dropped in a minimum tillage system, an area that deserves further investigation. We do not recommend that growers convert all of their acreage to minimum tillage, but it may be very valuable in certain fields or portions of fields that are prone to wind damage. The grower cooperator for this project plans to alternate direct seeded minimum tillage onions with early transplants in a 30 acre field.

ONIONS GROW BEST IN MUCK SOIL: By definition, muck or organic soil contains a minimum of 20% organic matter. High quality muck in New York averages 45 to 55% organic matter. Muck soils are non-renewable resources that were developed underwater in glacial lakes by many generations of plants that were preserved under anaerobic conditions. It takes nature about 500 years to accumulate one foot of muck soil. Onions grown on muck soils can be of superior quality and yield compared to those grown on mineral soils, because of the muck's higher water holding capacity and provision of a steady water supply via tiling and irrigation, the soil's very dark color and high organic matter allowing for an early planting advantage for this long season crop, and the high sulfur content of muck which improves onion flavor, cooking quality and storability.

MUCK SOILS ARE ERODING AWAY AT A HIGH PRICE TO GROWERS AND THE ENVIRONMENT: Unfortunately, muck soils are prone to subsidence, which is the permanent lowering of the surface elevation, a phenomenon resulting from the oxidation of soil organic matter by aerobic microorganisms, and by wind and water erosion. An estimated rate of soil subsidence on intensively cropped muck soil is one foot every 10 years. As much as one inch of muck can be eroded during a severe wind storm when dry muck soil is exposed to the elements. Onion seedlings can be decapitated, severely damaged, uprooted or buried during high winds. For example, in spring of 2009, despite traditional wind erosion prevention techniques (i.e. willow windbreaks and barley nurse crops) three high wind events resulted in at least 600 acres of the 3000 acres of onions grown on the Elba muck land having to be replanted at an expense of $700 to $800 per acre. Additionally, several of these later planted fields never reached their full yield potential and were of inferior quality, costing growers additional hundreds of dollars per acre in lost yields and quality. Waterways are certain to be polluted when spring wind storms erode freshly fertilized muck into drainage ditches.

GROWING ONIONS IN A MINIMUM TILLAGE SYSTEM WILL REDUCE EROSION OF MUCK SOILS: It is scientifically proven that erosion and subsidence decrease as ground cover increases and cultivation decreases. Therefore, growing onions in a minimum tillage system would drastically reduce the negative economic and environmental consequences of erosion, while sustaining long-term production of onions on muck soils. In these studies, minimum tillage systems using winter-killed and spring killed cover crops, winter wheat, and spring oats and barley, respectively, were compared to conventionally grown onions in large-scale 30 acre field trials in the Elba muck land in 2007-2008 and in 2010-2011. These projects were conducted by onion grower, Matt Mortellaro, Elba, NY, and Cornell Vegetable Program Onion Specialist, Christy Hoepting, with funding from NESARE Partnership grants.

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HOW TO GROW ONIONS IN A MINIMUM TILLAGE SYSTEM

Establish a cover crop in rows in the fall, plant onions between cover crop rows.

In many reduced tillage systems, the crop is drilled into a field that has a lot of residue and trash on the surface from the previous crop or a cover crop and the tillage strips can be five or more inches wide. Minimum tillage in onions is inherently challenging, because onions have very small seeds that are planted very shallow (0.5 to 0.75 inch), a smooth seed bed is very important for stand establishment, and surface trash could easily interfere with this. Onions are grown with relatively narrow row spacing of 10 to 20 inches, which leaves little space for non-tilled zones, almost defeating the purpose.

To overcome these issues, cereal cover crops were planted into rows and then the onions were planted in between the cover crop rows. This avoided the need to create a tillage zone for planting onions in the spring. The only modification that the onion grower made to his regular seeder was to add wavy coulters ahead of the press wheels in front of the planter shoes. After harvesting onions, the cover crops, winter wheat (2008 & 2011), spring oats (2008) and spring barley (2011) were planted into 10.5 inch rows in mid-September at 50 lb, 50 lb and 75 lb per acre, respectively. In 2008, less than 50 lb/A of spring oats was actually seeded and it did not result in enough ground cover the following spring (10%) to provide sufficient protection from erosion. In 2011, a higher rate of 75 lb/A of spring barley was seeded. The following spring, the winter wheat cover crops were killed with Roundup in early April and then onions were seeded in between the cover crop rows at least 14 days later in mid-April. Auto-steering and global positioning system (GPS) technology were used to plant the cover crops in the fall and to plant the onions precisely between the cover crop rows in the spring, which worked extremely well.

In the conventionally grown onions, a spring barley cover crop was planted in the fall, which winter-killed. Then, in the spring, the field was disked and cultimulched, onions seeded and a barley nurse crop seeded between the onion rows for wind protection. The barley nurse crop was killed when the onions were at the flag to first true leaf stage. Table 1 describes the establishment of the different tillage systems in 2011.

Table 1. Establishment of minimum tillage cover crop systems compared to conventional for direct seeded onions: large-scale field demonstration, Elba, NY, 2011.

Date (crop stage)	Tillage System		
	Conventional	**Minimum Tillage Winter Wheat**	**Minimum Tillage Spring Barley**
September 14, 2010	Plow and fit		
September 15, 2010	Left fallow in trial, normally, barley 50 lb/A cover crop would be planted	Planted cover crop: Drilled 50 lb/A winter wheat in 10.5 inch rows	Planted cover crop: Drilled 75 lb/A spring barley in 10.5 inch rows
April 4, 2011		Kill winter wheat when 6-8 inch tall with Roundup 1.5 pt/A	
April 12, 2011	Collected composite soil sample from entire field for complete nutrient analysis		
April 15, 2011	Applied 480 lb 16-31-11 NPK broadcast (P and K according to soil test) = 76.8 lb N + 149 lb P + 53 lb K		
	Incorporated NPK 4 inches deep using a culti-mulcher	Incorporated NPK 4 inches deep between cover crop rows using a multivator	Incorporated NPK 1-2 inches deep between cover crop rows using a multivator
April 16, 2011	Nurse barley crop planted in 10.5 inch rows at 65 lb/A		
April 17, 2011	***Safrane*** variety planted, all tillage systems Onions were direct-seeded using a Monosem seeder with wavy coulters mounted on the front before the first press wheel, and Autosteer and GPS to plant the onions precisely in between the 10.5 inch rows of cover crop at 7 seeds per foot. ***Nutrient input:*** 5 gal 6-24-6 NPK in-furrow (=3 lb N + 13 lb P + 3 lb K)		
April 24, 2011	***Festival*** variety planted, all tillage systems Planting same as for Safrane		
May 20, 2011 (1 leaf)	Nurse barley crop killed with Select 1 pt/A		
July 12, 2011 (5 leaf)	100 lb/A of urea (46-0-0 NPK) applied broadcast to all tillage systems = 46 lb N		
Total Nutrient Input*	**N:** 126 lb/A **P:** 162 lb/A **K:** 56 lb/A		

* Preliminary results indicate that fertilizer rates can be reduced in minimum tillage systems.

MINIMUM TILLAGE PROVIDES SUPERIOR PROTECTION FROM WIND EROSION: In the spring just prior to planting, the conventional ground was bare, while the minimum tillage wheat system had 60% and 50% ground cover in 2008 and 2011, respectively. In both studies, ground cover dropped to about 30% late in the season. The minimum tillage oats system had only 10% ground cover in 2008, which was reduced to 0.5% by July 31. In 2011, the higher seeding rate with spring barley gave 30% ground cover in mid-April and this system still had 5% ground cover remaining at harvest on September 13, which although it provided adequate wind protection, 50% ground cover in the spring would be even better. The key advantage to growing onions in a minimum tillage system is that the soil is protected from erosion from the time that the cover crop is established in the fall until harvest, with the most critical 4-6 week period of protection being from early April until late May when onion seedlings are at the loop to flag

leaf stages and vulnerable to wind erosion despite willow wind breaks and barley nurse crops. Figure 1 shows the ground cover prior to planting in the three systems in 2011. Figure 2 shows ground cover in mid-July in the minimum tillage systems in 2011.

Apply fertilizer in the spring: In the first year of study (2008), in the minimum tillage systems, the full rates of required phosphorous (P) and potassium (K) according to a soil test, and 56 lb/A of nitrogen (N) were applied in the fall and incorporated prior to planting the cover crops. In the spring, 5 gal/A of 6-24-6 NPK pop-up fertilizer was applied in the furrow at seeding and 100 lb/A of sulfur coated urea (46-0-0) was broadcast at the first and fourth leaf onion stages for a total of 151 lb/A of applied N. Sulfur-coated urea was used to minimize loss of N until it could be rained in naturally, as the grower cooperator did not have the ability to irrigate.

Prior to planting in the spring, soil test results showed that levels of P were low in the minimum tillage systems, which suggested that 35 to 47% of the P applied in the fall was lost over winter. Soil levels of available N were low or very low throughout the spring. Even on June 19 at the 4 leaf stage, just 6 days after the second side-dress application of N, the minimum tillage oat and wheat systems had one-third and one-half, respectively, of the available N in the conventional system (74 lb/A N). Soil tests were not taken later than June 19 in this study. Leaf tissue analysis on July 22 showed that the level of nitrogen in the onions grown in the minimum tillage wheat system was high indicating that nitrogen in the soil did not remain low throughout the growing season. However, tissue levels of N in the onions in the minimum tillage oats system were lower and the onion plants were visibly lighter green than those grown in the conventional and minimum tillage wheat systems.

To improve the efficiency of fertilizer use in the minimum tillage systems, in the second study (2011), in the spring, the full rates of required P and K according to a spring soil test and 75 lb/A N were applied broadcast and incorporated 1-2 inches deep using a multivator precisely between the cover crop rows, one day before the onions were seeded (Table 1). Again, 5 gal/A of 6-24-6 NPK pop-up fertilizer was applied in-furrow at planting and a side dress application of 100 lb of urea was made at the 5 leaf stage for a total of 126 lb/A N. In this trial, the same rates of fertilizer were applied to both the conventional and minimum tillage systems.

In this study, levels of N and P were sig-

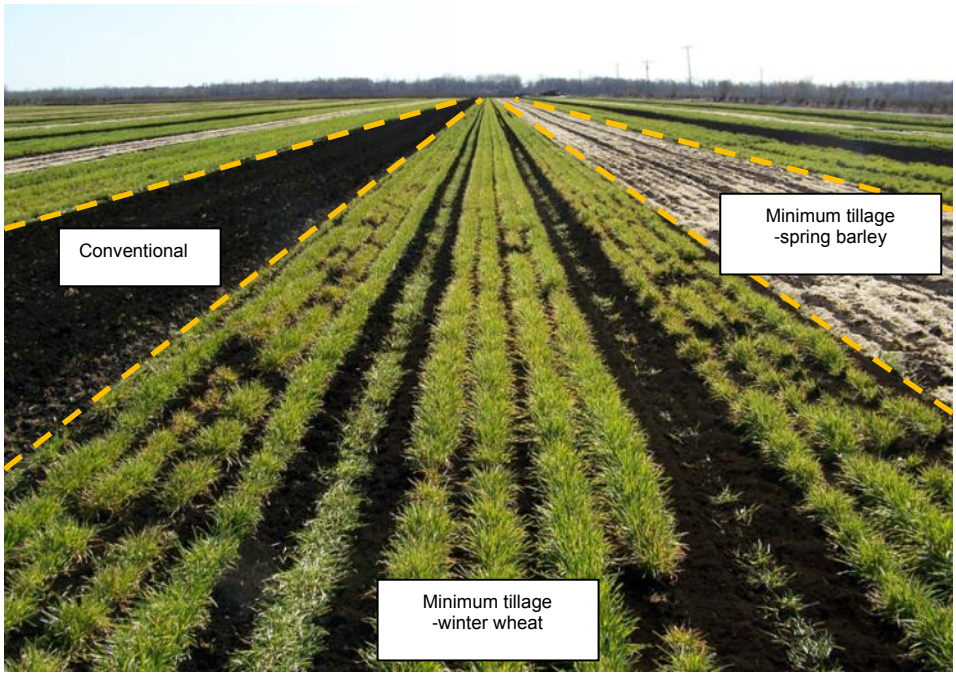

Figure 1. Minimum tillage systems in the spring prior to direct seeding onions on April 15, 2011, Elba, NY. Left – conventional strip; Center – minimum tillage with winter wheat; Right – minimum tillage with barley (winter killed). Minimum tillage systems provide excellent protection from wind erosion from early April until late-May when onion seedlings in the loop to flag leaf stage are especially vulnerable, despite willow wind breaks and barley nurse crops.

Figure 2. Cover crop residue from winter-killed spring barley (left side) and spring-killed winter wheat (right side) in minimum tillage onions, July 8, 2011.

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nificantly higher in the minimum tillage systems compared to the conventional (Table 2). The levels of P and N in the conventional system were lower in 2011 than they were in 2008, which may have been due to issues associated with the very cool and wet spring. In the minimum tillage systems, applying P and N in the spring resulted in sufficient levels of these nutrients, which were double the levels achieved in the 2008 study. Clearly, applying the full rate of NPK in the spring broadcast and shallowly cultivating it in precisely between the onion rows was an effective and efficient strategy for applying NPK to onions grown in a minimum tillage system.

NUTRIENT DYNAMICS IN MINIMUM TILLAGE SYSTEMS: It was estimated based on the amount of cover crop residue in the minimum tillage systems in mid-May that the decomposition of the cover crop residues provided 20 to 25 lb/A of N to the soil, some of which could be taken up by the onion crop. Because the soil levels of P were also significantly higher in the minimum tillage systems than the conventional in 2011, despite all systems receiving the same amount of NPK at the same time, this suggested that either P was mineralized from the decomposing cover crops, or that the cover crops in the minimum tillage systems retained the P better than the conventional during the cool and wet May and June, or that there was a difference between fertilizer application techniques. Perhaps there is greater nutrient uptake in the minimum tillage systems, because the nutrients were concentrated in a shallower layer due to the interrow NPK incorporation with cultivation to 1-2 inches compared to the conventional systems where cultivation was to 4 inches. To further support this theory, soil levels of P tended to mimic those of N. Alternatively, when N and P are mineralized via decomposition of cover crops, they behave very differently in the soil. Further research is warranted to understand these types of nutrient dynamics in a minimum tillage system.

POTENTIAL TO REDUCE FERTILIZER RATES: There appears to be potential to reduce fertilizer rates when onions are grown in a minimum tillage system. Starting in mid-July, soil and tissue levels of N were quite high, especially in the minimum tillage systems, which was a good indication that the rates of nitrogen and possibly other nutrients can be reduced without having any effect on yield. Several recent Cornell studies have demonstrated that rates of nitrogen fertilizer can be reduced down to 75 to 90 lb/A without having any significant reductions in yield or bulb size.

Interestingly, in 2008, the minimum tillage oat system, which had low levels of available nitrogen and visibly lighter green foliage than the conventional and minimum tillage wheat system, also had one-third to one-fourth as many onion thrips per plant. Since this study, other Cornell studies have demonstrated that high levels of applied and available soil nitrogen result in higher levels of onion thrips and also bacterial diseases in onions. With the higher levels of nutrients in the minimum tillage systems in 2011, there were no consistent trends with respect to pest pressure. Differences in disease, insect or weed pressure should continue to be monitored so that any differences may be predicted and managed accordingly.

BE AWARE OF CROP INHIBITION FROM WINTER WHEAT COVER CROP: In 2008 and in one variety in 2011 (2 out of 3 trials), there was a significant 50% stand reduction in the minimum tillage wheat system compared to the conventional and minimum tillage oats/barley. At first, it was thought that the stand reduction in the minimum tillage wheat system was due to the heavy cover crop residue creating a cooler and wetter soil environment, which in turn was favorable for damping off pathogens. In 2011, the grower increased his fungicide treatment against damping off pathogens in the entire field. Also, a small-plot trial was set up in a section of minimum tillage wheat within the field, where we evaluated commercially available seed treatment and in-furrow fungicide combinations for control of damping off. We are convinced that damping off did not cause stand reduction in the minimum tillage wheat system for the following reasons: 1) In the small-plot trial, no significant differences in stand occurred among nine different active ingredients belonging to five different chemical classes, most of which are known to have activity against damping off pathogens; 2) the stand in the minimum tillage wheat system within the rest of the field was similar to the stand in the small-plot trial, while stands in the conventional and minimum tillage barley systems were higher; and; 3) in the field-scale study, the soil in all of the tillage systems was very cool and wet due to the very cool and wet spring, thus seemingly equally as favorable for damping off, but still, the stand in the minimum tillage wheat system was significantly lower than in the other systems.

Table 2. Soil nutrient dynamics in minimum tillage systems compared to conventional for direct seeded onions grown on muck soil, cv. Festival, Elba, NY, 2011.

Tillage System	Available Nitrate-Nitrogen (NO3-N) (lb/A)			Phosphorous (lb/A)
Crop stage:	2 leaf	5 leaf	9 leaf	4 leaf
Date:	Jun 14	Jul 8	Aug 5	Jun 30
Conventional	4 b[1]	21 c	30 b	88 b
Minimum Tillage – Spring Barley	28 a	50 a	51 a	120 a
Minimum Tillage – Winter Wheat	25 a	33 b	40 ab	106 a

[1] Numbers in a column followed by the same letter are not significantly different, Fisher's Protected LSD test, $p<0.05$.

Therefore, the winter wheat cover crop either had allelopathic properties or otherwise somehow caused crop inhibition of the onions. Allelopathy is the inhibition of growth of one species of plant by chemicals produced by another species. Alternatively, the onion crop may have been weakened by a proliferation of soil microbes that were stimulated to grow because of the winter wheat cover crop, which in turn reduced onion stand. Whether the stand reduction of onions by the winter wheat cover crop was caused by allelopathy or another form of crop inhibition is unknown. If it was caused by soil microbes, unfortunately, our studies showed that there are no fungicides that onion growers can use to combat them, because none of nine different fungicides that were tested improved stand.

ONIONS GROWN IN MINIMUM TILLAGE SYSTEM HAD COMPARABLE YIELD TO CONVENTIONAL: In both years of study, the onions grown in the minimum tillage barley/oats system yielded statistically the same or better than the conventional by 56 cwt/A (8% higher) in 2008, 94 cwt (23% higher) in the Festival variety in 2011, and by 82 cwt/A (20% higher) in the Safrane variety in 2011 for total marketable yield. In all cases, the weight of the higher-priced jumbo-sized bulbs in the minimum tillage oats/barley system was double compared to the conventional. When the cost of establishing each tillage system was taken into consideration, which was least for the minimum tillage oats/barley, because it required the fewest passes across the field, the minimum tillage oats/barley system had a net return that was 10% ($982/A), 35% ($1997/A) and 43% ($2,695/A) higher than the conventional in 2008, the Festival variety in 2011 and the Safrane variety in 2011, respectively. Table 3 shows the yield, bulb size distribution and net return from the 2008 study.

Despite a 50% stand reduction in the minimum tillage wheat system, it had 5x and 8x higher jumbo-sized bulb weight than the minimum tillage oats and conventional systems, respectively in 2008, which made its total marketable yield and net return 95% and 106%, respectively, of the conventional system. In 2011, in the variety that had a 50% stand reduction in the minimum tillage wheat system, the total marketable yield was significantly 64 cwt/A (15%) lower than the conventional, but the jumbo-sized bulb weight was 3x higher, which made the net return 104% of the conventional. In the 2011 study, there was some unexplained stunting that occurred in the conventional system. Effort was made to select sub-plots for data collection from the best stands possible, but unfortunately, the mysterious stunting confounded our results. Therefore, we weigh the 2008 results for yield much heavier.

To be conservative, using winter wheat in a minimum tillage wheat system for direct seeded onions grown in muck soil is recommended with a caution signal, due to the high risk (67% probability) of stand reduction. However, if protection from wind erosion is of high importance, winter wheat did perform better for this purpose than spring oats or barley, and yields and economic return were certainly comparable to those of onions grown conventionally, because what the crop lost in bulb number was made up for in bulb size.

For more information: The final reports complete with data tables and photos are available at Cornell Vegetable Program website in the onion section: http://cvp.cce.cornell.edu/ ■

Table 3. Comparison of yield, bulb size distribution and net return for growing direct seeded onions in minimum tillage and conventional systems, cv. Milestone, Elba, NY, 2008.

Tillage System	Total Marketable Yield (cwt/A)	Bulb Size Distribution (cwt/A)			Cost of Establishing Tillage System ($/A)[1]	Net Return ($/A)[2]
		Small (1-2")	Medium (2-3")	Jumbo (>3")		
Conventional	707 ab[3]	33 a	632 a	42 b	$168	$11,114
Minimum Tillage – Spring Oats	763 a	30 a	664 a	70 b	$105	$12,219
Minimum Tillage – Winter Wheat	671 b	9 b	331 b	329 a	$129	$11,831

[1] Cost of establishing tillage system using 2011 methods includes cost of seed and seeding fall cover crops and barley nurse crop, and cost of killing winter wheat and barley nurse crop including fuel and labor for each pass across the field. All other inputs are considered equal.
[2] Net return: price for small - $10/cwt; medium - $16/cwt; jumbo - $20/cwt, minus cost of establishing tillage system.
[3] Numbers in a column followed by the same letter are not significantly different, Fisher's Protected LSD test, p<0.05.

Figure 3. Onion stand in conventional (left), minimum tillage oats (middle – note light green foliage) and minimum tillage wheat (right – note thin stands and big bulbs) systems, July 31, 2008.

Spring Application of Winter Rye Grain for Weed Control in Summer Vegetables

Judson Reid and Kathryn Klotzbach, Cornell Vegetable Program

Introduction - In 2012 the Cornell Vegetable Program was awarded a NESARE grant to evaluate a new use of cover crops, by sowing winter rye between plastic-mulched beds of tomatoes and onions on two cooperating farms. Both farms provided cultivation and herbicide treatments to enable us to compare weed control, yield and pest and disease impacts. Although we documented weed control comparable to herbicides or cultivation, we also came across unanticipated challenges, which may have been specific to 2012's abnormal growing season. We worked with cooperating growers on two farms, one growing onions and the other tomatoes. After fitting the soil and laying plastic, but before transplanting, both farms sowed winter rye at 3 bushels per acre between plastic as well as establishing herbicide and cultivation plots. Conventional fertilization and drip irrigation was carried out per each grower's standards. We then collected data on plant height, weed biomass, insects, disease and yield between the plots. A detailed version of our Materials and Methods is available on the Cornell Vegetable Program's webpage <cvp.cce.cornell.edu>

Our onion crop was impacted by the rye mulch. Onions plots with rye middles were significantly the tallest on 3 out of 4 dates, but had the fewest number of leaves (Table 1). While there were no differences in leaf disease, there was a difference in pest pressure. On June 12, there were significantly less onion thrips in the herbicide plots than in the rye and cultivated plots, with the cultivated plots having the most thrips (Table 1).

The big story with onions was yield, particularly bulb size. Cultivation and herbicide plots were significantly the highest yielding by weight, with 84.26 and 83.5 pounds per 10 feet of bed (Table 2). These plots had twice as many colossal sized onions than the rye plots (Chart 1).

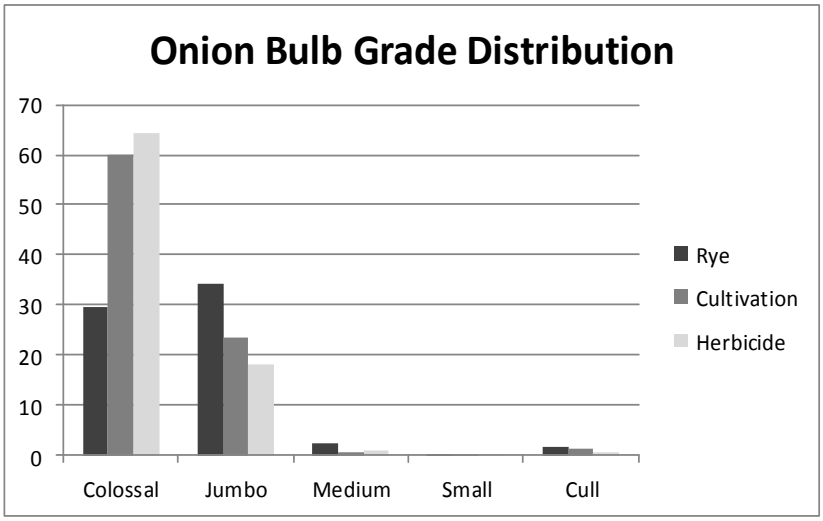
Table 1. Onion plant growth and pest pressure

ONION	Plant Height (cm)				Number of Leaves				Pest Pressure June 12	
	May 22	*June 12*	*July 3*	*July 24*	*May 22*	*June 12*	*July 3*	*July 24*	*No. BLB Lesions/Leaf*	*No. Onion Thrips/Plant*
Rye	21.3 a	57.8	76.6 a	71.9 a	4.1	7.0 b	8.8 b	7.6 b	2.92	4.22 ab
Cultivation	19.3 b	56.4	71.1 b	68.2 b	4.3	7.6 a	9.0 b	8.4 a	2.92	5.07 a
Herbicide	20.5 ab	57.7	73.1 b	72.8 a	4.1	7.4 a	9.6 a	8.5 a	2.42	3.01 b
pValue	*0.0488*	*NS*	*0.0009*	*0.0108*	*NS*	*0.0071*	*0.0124*	*0.0032*	*NS*	*0.0342*

Table 2. Onion yield in pounds per 10 feet of bed

ONION	Colossal	Jumbo	Medium	Small	Cull	Cull-Rot	Total Marketable
Rye	29.49 b	34.28 a	2.29 a	0.14	1.71	1.63	66.19 b
Cultivation	60.11 a	23.45 b	0.66 b	0.04	1.15	0.46	84.26 a
Herbicide	64.38 a	18.13 b	0.96 ab	0.04	0.61	0.00	83.50 a
pValue	*0.0008*	*0.0261*	*NS*	*NS*	*NS*	*NS*	*0.0001*

Chart 1. Size of onions as affected by treatment. Rye (left), Cultivated (middle), Herbicide (right)



The rye plots had the lowest amount of weeds as measured by fresh weight(g). There were not statistical significant differences on any of the three collection dates. Cultivated and herbicide plots had similar weed levels (Table 3 and Figure 1).

Foliar nutrient levels of onions did differ between the treatments (Table 4). Nitrogen and Potassium were lower in rye treated plots on both sample dates than cultivated and herbicide treated.

Figure 1. Herbicide (left), rye (middle), and cultivated (right)

Table 3. Onions and Tomatoes: Weed Biomass taken from row middles in grams

	Onions			Tomatoes		
	May 22	*June 12*	*July 3*	*July 3*	*Sept 13*	*Oct 1*
Rye	0.03	1.28	0.00	0.00	28.3	83.5
Cultivation	1.75	1.15	3.35	3.35	127.6	86.0
Herbicide	0.68	20.6	1.45	1.45	28.2	40.0
pValue	*NS*	*NS*	*NS*	*NS*	*NS*	*NS*

Table 4. Onion foliar nutrient levels

	Onions: July 3, 2012			*Onions: July 24, 2012*		
	Rye	**Cultivated**	**Herbicide**	**Rye**	**Cultivated**	**Herbicide**
Nitrogen	2.65%	3.21%	3.29%	2.64%	2.92%	2.75%
Phosphorus	0.47%	0.45%	0.35%	0.35%	0.25%	0.23%
Potassium	3.38%	3.96%	3.82%	3.35%	4.16%	4.09%
Magnesium	0.30%	0.23%	0.29%	0.42%	0.33%	0.33%
Calcium	1.79%	1.22%	1.82%	3.59%	3.30%	3.13%
Sulfur	0.73%	0.97%	0.89%	0.67%	0.85%	0.79%
Boron	27 ppm	27 ppm	25 ppm	31 ppm	33 ppm	32 ppm
Zinc	13 ppm	15 ppm	15 ppm	13 ppm	13 ppm	10 ppm
Manganese	54 ppm	69 ppm	71 ppm	75 ppm	109 ppm	118 ppm
Iron	81 ppm	101 ppm	116 ppm	117 ppm	146 ppm	144 ppm
Copper	6 ppm	6 ppm	6 ppm	15 ppm	7 ppm	6 ppm

KEY:

Deficient

Low

Sufficient

High

Excessive

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Tomatoes also showed differences between treatments. Herbicide treated plots were significantly the tallest plants measured on July 17 and Sept 4 (Table 5). The field was visibly free of disease until early September when Early Blight developed. On Sept 13 there were significant differences in disease ratings (Table 5). Herbicide plots had the most disease with an ordinal rating of 7.1, followed by the rye and cultivation plots with 6.3 and 5.9, respectively. Although no qualitative data was collected on pest populations, the grower observed slug and armyworm feeding differences between the treatments. Approximate percentage of fruit grade as affected by pest damage from a single harvest was made on August 30. Culls were the highest in the rye blocks and lowest in the herbicide treatments (Chart 2).

Table 5. Tomato height, disease and yield data

TOMATO	Plant Height (cm)				Disease Pressure *Early Blight Rating (0-9)*				Harvest Yield		
	July 17	*Aug 14*	*Sept 4*	*Sept 25*	*July 3*	*Aug 8*	*Sept 4*	*Sept 13*	*Mean Fruit per Plant*	*Mean Fruit Weight (lbs)*	*Yield (lbs/plant)*
Rye	94.3 b	74.6	71.5 b	69.7	0.0	0.0	3.9	6.3 b	38.7 b	0.62	23.97 b
Cultivation	103.6 a	76.3	71.4 b	65.3	0.0	0.0	4.9	5.9 b	49.2 a	0.62	30.37 a
Herbicide	105.0 a	81.0	79.3 a	69.5	0.0	0.0	2.8	7.1 a	48.9 a	0.67	32.55 a
pValue	*0.0009*	*NS*	*0.0177*	*NS*	*NS*	*NS*	*NS*	*0.0056*	*0.0354*	*NS*	*0.0018*

Foliar samples were taken on three dates from each of the treatments (Table 6). Potassium was lower in the rye plots on all three dates and highest in the cultivated plots. Calcium was higher in the rye plots on all three dates.

Similar to onions, tomatoes showed a yield loss in the rye plots. The herbicide plots were significantly the highest yielding with 32.55 pounds per plant, followed by cultivation plots with 30.37, both in the same statistical grouping (Table 5). Rye plots yielded 23.97 pounds per plant.

Chart 2. Pest damage increase culls in rye treatments. Herbicide (top) Cultivation (middle), Rye (bottom).

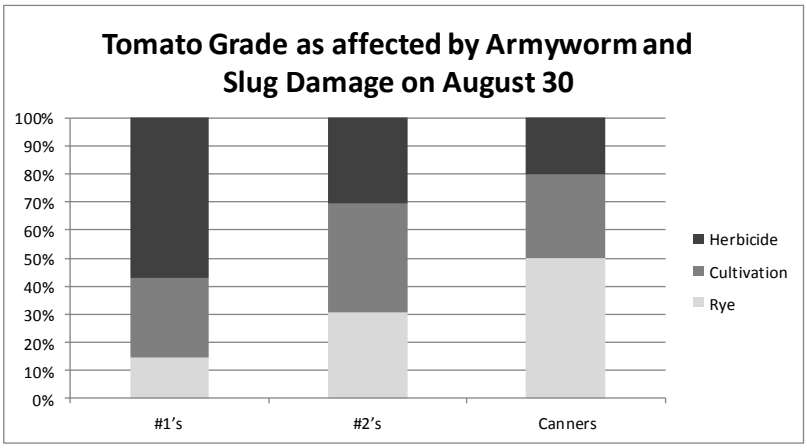

Table 6. Foliar nutrient levels of tomatoes over time

	Tomatoes: July 3, 2012			*Tomatoes: August 8, 2012*			*Tomatoes: September 4, 2012*		
	Rye	**Cultivated**	**Herbicide**	**Rye**	**Cultivated**	**Herbicide**	**Rye**	**Cultivated**	**Herbicide**
Nitrogen	3.93%	4.41%	4.30%	3.44%	3.65%	3.68%	3.63%	4.04%	3.13%
Phosphorus	0.33%	0.47%	0.39%	0.28%	0.26%	0.24%	0.29%	0.31%	0.29%
Potassium	3.50%	4.54%	3.91%	1.99%	3.13%	2.84%	3.10%	4.09%	4.13%
Magnesium	0.58%	0.46%	0.48%	0.66%	0.48%	0.48%	0.73%	0.64%	0.58%
Calcium	4.01%	2.97%	3.46%	7.15%	5.36%	5.30%	6.23%	5.09%	5.27%
Sulfur	0.82%	0.85%	0.89%	1.43%	1.19%	0.98%	1.37%	1.00%	1.20%
Boron	36 ppm	35 ppm	41 ppm	52 ppm	47 ppm	40 ppm	62 ppm	53 ppm	57 ppm
Zinc	26 ppm	31 ppm	24 ppm	23 ppm	28 ppm	28 ppm	34 ppm	48 ppm	45 ppm
Manganese	47 ppm	55 ppm	41 ppm	61 ppm	61 ppm	62 ppm	80 ppm	89 ppm	85 ppm
Iron	173 ppm	169 ppm	145 ppm	97 ppm	78 ppm	88 ppm	137 ppm	141 ppm	158 ppm
Copper	14 ppm	23 ppm	25 ppm	9 ppm	10 ppm	10 ppm	13 ppm	27 ppm	18 ppm

Results and discussion - Rye as an inter-row cover crop presented challenges in this project. The primary effect observed was loss of yield, as measured by fresh weight of product. In tomatoes we lost over 8.5 pounds of marketable fruit per plant, a value of nearly $13/plant, assuming an average price of $1.50/lb, compared to the herbicide treatment. In onions the loss was over 18 lbs per 10 linear feet of row when compared to cultivation, the highest yielding treatment. Calculating onion economics is difficult as there are price differentials related to grade (bulb size) and market. However, rye treated plots yielded less than half than number of colossal bulbs (≥ 4" diameter) of herbicide and cultivation plots. The value of these bulbs is often $ 0.40 more than the next class, representing a loss of over $21 per 10 linear feet of bed.

What is causing this yield loss is not completely understood. Mid-summer rainfall at both farms was scarce, and thus water competition is a possibility. Nutrient competition is also possible, with nitrogen and potassium at times lower in the rye plots, although trends are not clear. Allelopathy from the rye has also been suggested, even though rye roots did not extend underneath the plastic mulch when examined. Pest pressure in the tomato crop did negatively affect yield as common armyworm and slug feeding lead to many unmarketable fruit. The armyworm infestation was a regional phenomenon at abnormally high levels in 2012.

Rye provided very good weed control at both farms. At our onion site it performed as well or better than herbicides and cultivation until harvest. At our tomato site late season weed pressure increased in the rye plots. There was an unexpected disease in the rye, leaf rust, caused by *Puccinia recondita tritici* (Figure 2) at both sites. Although this disease did not impact the vegetable crop it reduced rye stands. For the shorter season crop of onions this did not present a problem. With tomato harvest extending into October the diminished rye stand had diminished capacity to suppress fall weed growth. Labor associated with managing rye vigor was minimal as both cooperators reported mowing 1 time mid-season.

An inter-row cover crop of rye successfully reduced the environmental impact of vegetable farming in this study by reducing erosion and replacing herbicides. On the cooperating onion farm eliminating an application of pendamethalin reduces the field Environmental Impact Quotient (EIQ) by 33.9 points per acre. At our tomato farm the replacement of 4 herbicides resulted in an EIQ reduction of 90 points/acre. However, with the increased pest damage in the rye treated plots, some farms may have applied additional insecticides, reducing or eliminating environmental gains made by replacing herbicides.

Conclusions - The Cornell Vegetable Program is not promoting this system, but rather researching it. We hope to refine our methods to develop a system that will be ready for adoption at a later date. Although the weed control of winter rye is very promising, the yield loss, particularly as caused by pest feeding in tomatoes, prevents promotion of the system at this time. Given the unique pest population in 2012, and dry growing season, these may be less in future seasons. We hope to look at other living mulches such as wheat and barley in the coming years, to work out the yield loss. A detailed version of this report is available online at <cvp.cce.cornell.edu>.

The authors express their gratitude to the cooperating farmers and NE SARE for their support. ■

Pesticide Training and Recertification Classes

Pesticide Training and Recertification Series

Mondays, February 4, 11, 18, 25
7:00 - 9:30 pm

Exam: Monday, March 4
7:00 - 11:00 pm

CCE Ontario County, 480 N Main St, Canandaigua 14424

Anyone interested in obtaining pesticide certification and meeting the DEC (Department of Environmental Conservation) experience / education requirements **OR** current applicators seeking pesticide recertification credits should attend. 2.5 recertification core credits will be available for each class.

$140 for certification which includes the training manuals and all 4 classes. Does not include the $100.00 exam fee. Recertification is $75.00 for all 4 classes or $20.00 per class.

For more information and the registration form, go to http://www.cceontario.org/temp2.asp?id=pesticide-education. Or, contact CCE Ontario County, 585-394-3977 x427 or x436 or email nea8@cornell.edu or rw43@cornell.edu

"Pack 'N Cool" Mobile Produce Refrigeration Solution

Plants for Human Health Institute, NC State University (from Muck and Mineral, CCE, Orange Co, 12/12)

North Carolina State University's Plants for Human Health Institute (PHHI) has developed a new mobile cooling unit for farmers. The five-by-eight-ft. refrigerated trailer – called the "Pack 'N Cool" – is designed to keep fruits and vegetables at ideal temperatures during transport to and from farmers markets or as they're harvested in farm fields. The Pack 'N Cool is the program's latest postharvest quality and food safety project geared toward helping farmers.

Dr. Penelope Perkins-Veazie, professor and postharvest physiologist with PHHI, coordinated the effort to develop a mobile refrigeration unit that agricultural producers can use as a model for building their own versions. The Pack 'N Cool unit combines the mobility of a cargo trailer with the refrigeration capabilities of a commercial cooler. With construction spearheaded by Louis Wojciechowski, a lab technician with Perkins-Veazie's research team, the model unit cost around $3,400 to construct, including a new cargo trailer priced at $1,500 (a preowned trailer can reduce costs).

As a scientist that studies fresh produce after it's harvested, Perkins-Veazie recommends that many fruits and vegetables be stored at 32 to 41 degrees Fahrenheit. This includes most fruits (apple, blackberry, strawberry), leafy greens, cabbage, broccoli, and sweet corn, which lose quality and may break down in heat.

Photo: NC State Plants for Human Health Institute

(Editor's note: Other vegetables are best held at temperatures no greater than 45 or 50 degrees F, though a day or so at lower temps is okay. Don't load these vegetables where the coldest air from the refrigeration unit will blow on them. These include: snap beans, cukes and summer squash, eggplant, honeydew melons, peppers, tomatoes, and fall vegetables like pumpkins, winter squash and sweet potatoes. C. MacNeil, CVP)

"Based on my experience, farmers know that it's important to keep certain fruits and vegetables at cool temperatures to remove field heat and hold fresh-grown quality, but it's often challenging to purchase or maintain the equipment needed to ensure those ideal temps," said Perkins-Veazie. "The Pack 'N Cool model provides farmers with a mobile, cost-efficient alternative to commercial cooling units." She adds that keeping fresh-picked fruits and vegetables cooler for longer preserves quality and extends the shelf life of the produce, a benefit for farmers hauling food to and from

multiple markets each week. “Highly perishable fruits like blackberries that sit at 80 degrees at market will last only a day compared to a week if kept at 40 degrees,” said Perkins-Veazie. “That makes a big difference to farmers.”

The Pack ’N Cool utilizes CoolBot temperature technology to maximize the output of a basic window air conditioner unit. *(Study the info and directions carefully on the CoolBot website at: www.storeitcold.com, C. MacNeil, CVP)* The CoolBot adapter interfaces with the AC unit, which typically bottoms out at 60°F, to generate temperatures as low as the 30s in the trailer. Wojciechowski added, “if the AC ever fails, a new unit can be bought at a home improvement store for $300 and hooked up the same day without the need for a refrigeration service call. It’s simple and energy-efficient.” An electrical extension cord (110V) or a generator powers the unit.

Construction guidelines, step-by-step photos and a sample budget are available on the Plants for Human Health Institute website at: http://plantsforhumanhealth.ncsu.edu/2012/08/20/pack-n-cool/

Air conditioner with CoolBot adapter.
Photo: NC State Plants for Human Health Institute

Disclaimer

The use of brand names and any mention or listing of commercial products or services does not imply endorsement by North Carolina State University nor discrimination against similar products or services not mentioned. Individuals who use construction materials are responsible for ensuring that the intended use complies with current regulations and conforms to the product’s intended purpose. Be sure to obtain current information about structural integrity and consult the retailer with questions about the strength of the equipment or compatible hardware. ■

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If you have questions or comments about this publication or the Capital District Program in general, please contact your county's grower advisory member or the Agricultural Program leader of your local Cornell Cooperative Extension office.

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SUCCESS FACTORS IN FARMING

giving you the long-term edge with wisdom from your fellow farmers

Theresa Mycek of Colchester Farm CSA in Georgetown, MD believes that even on a small farm with only a few employees, **success is the natural result of people being treated well.** One success factor she noted during a recent farm tour is how you manage your employees:

> "I put my focus on the people who do the farm work, more so than on the crop. They are my eyes and ears in the field, and I try to make their work enjoyable work. They go to classes with me to break up the isolation and develop better networks in the community. We are the only ones on the farm who can learn from our mistakes."

The family members and employees on a vegetable farm are your express lane to success. By involving more people in decisions, and allowing them to participate actively in farm management, you can create a more loyal, dedicated workforce that will go the extra mile in return for your attentiveness.

For more information about Colchester Farm CSA, see their website at www.colchesterfarm.org

Success Factors in Farming provides tips and advice from the vast collective knowledge found among farmers in our area. These thought-provoking commentaries have been collected by Extension agent Jim Ochterski, and are presented exclusively in the Cornell Vegetable Programs award-winning newsletter, *Veg Edge* to offer real-life insights about sustainability and long-term success in agriculture.