

PVGA Membership Sets New Record at 1,008

For 2016, PVGA membership reached its highest level in recent history at 1,008 members, up from 993 in 2015. In 2011 PVGA reached its long-held goal of having 1,000 members. Membership reached 1,004 to be precise. In 2012, membership dropped to 986 and in 2013 it dropped again to 961. While the increases in the last three years are steps in the right direction, the Census of Agriculture indicates there are over 3,300 farms in Pennsylvania that grow an acre or more of vegetables. Thus, PVGA has a large potential membership as yet untapped.

The Directors have set a goal of retaining 90% of the previous year's members and recruiting 15% new members each year. Unfortunately for 2016 only 85% of last year's members rejoined although the goal of 15% new members was exceeded as 17% are new members – that is they were not members in 2015. Membership has increased over the previous year in five of the last ten years, increasing 10% in that time period from 917 in 2007.

PVGA is completing its 90th year as an association. The Directors are fully aware that membership goals can only be met and maintained by providing an adequate return to members for their dues investment.

As a result of the Vegetable Industry Strategic Planning Initiative which the Association and the Pennsylvania Vegetable Marketing and Research Program (PVMRP) undertook in early 2014, the Association and PVMRP applied for and received a

Specialty Crop Block Grant from the Department of Agriculture. The grant will allow PVGA and PVMRP to use \$30,000 to further develop both groups' abilities to better serve the growers of Pennsylvania.

Meanwhile, however, the Association strove to continue to provide a good return on members' dues investment in 2016 with the following ongoing activities and member services:

- PVGA helped sponsor the 2016 Mid-Atlantic Fruit and Vegetable Convention – the premier grower meeting of its kind on the east coast.
- PVGA published the *Pennsylvania Vegetable Growers News*, its own 28-plus-page monthly newsletter with pertinent information for the Pennsylvania vegetable, potato, berry or greenhouse vegetable grower.
- PVGA provided \$81,700 for vegetable and small fruit research in 2016 - bringing the Association's total for research contributions to \$941,900 over the last 28 years.
- PVGA represents the interests of the vegetable, potato and small fruit industries on legislative and regulatory issues through letters and meetings with public officials.
- PVGA cooperated with the Department of Agriculture and the Vegetable Marketing and Research Program to represent the Pennsylvania vegetable industry at various promotion events.

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Needed: Nominations for PVGA Directors

The terms of six members of the PVGA Board of Directors expire at the Annual Meeting scheduled for Wednesday, February 1, 2017, at the Mid-Atlantic Fruit and Vegetable Convention in Hershey. All are eligible for re-election under the 18-year term limits set by the Board. The Directors whose terms expires are:

Fred Dymond III – Dallas – first elected 2008
Christopher Harner – State College – first elected 2014
Kenneth Martin – New Berlin – first elected 2002
David Miller – York – first elected 2002
John Shenk – Lititz – first elected 2011
Jeff Stoltzfus – Atglen – first elected 2011

Like last year, the election will be conducted by a mail-in ballot that will be mailed to all members with the dues renewal notices in late November/early December. The Leadership and Recognition Committee will be seeking additional nominees to be included on the ballot. Members who want to nominate someone for Director, or who would like to be considered, should contact the PVGA office at 717-694-3596 or pvga@pvga.org or Robert Shenot, who as Past President serves as chair of the Committee at rshenot@consolidated.net.

2017 Mid-Atlantic Convention Opens January 31

The 2017 Mid-Atlantic Fruit and Vegetable Convention will be held February January 31 to February 2, 2017, at the Hershey Lodge and Convention Center in Hershey, Pennsylvania. Over 2,100 fruit, vegetable, and berry growers and other industry persons from throughout the mid-Atlantic region and beyond are expected to attend. This year's convention will again feature several pre-convention workshops, a farm market bus tour, and a trade show with over 160 exhibitors plus three full days of seven or more concurrent educational sessions.

The day before the main Convention opens, growers can chose between a bus tour of Pennsylvania farm markets or several different workshops. The workshops include FSMA Grower Training, Hands-On Fruit Tree Grafting, Hops Production, Greenhouse Vegetable Production, Recall Readiness, Vegetable Grafting and Pennsylvania Pesticide Applicator License Training.

The Mid-Atlantic Convention has been jointly sponsored by the State Horticultural Association of Pennsylvania, the Pennsylvania Vegetable Growers Association, the Maryland State Horticultural Society and the New Jersey State

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NEWS



Pennsylvania Vegetable Growers Association

*An association of
commercial vegetable,
potato and berry growers.*

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Executive Secretary
William Troxell
Richfield

2017 Mid-Atlantic... (continued from page 1)

Horticultural Society for the past 39 years. In 2014, the Virginia State Horticultural Society also began meeting at the Convention as well. The Pennsylvania State University, University of Maryland, Rutgers University Cooperative Extension and Virginia Tech University all assist in organizing the three days of educational sessions.

The Convention has become one of the premier grower meetings in the Northeast. The Great American Hall and the Aztec Room at the Hershey Lodge and Convention Center will host the Trade Show. Specialized horticultural equipment, farm market merchandise, and packaging will all be on display along with information on the latest seed varieties, fruit varieties, pesticides and other supplies and services for the commercial grower.

Many pesticide applicator update training credits will be available to Pennsylvania, Maryland, New Jersey and Virginia growers attending the sessions. The program covers nearly every aspect of fruit, vegetable, potato and berry production. Commercial growers should not pass up this terrific educational opportunity.

Seven or eight concurrent educational sessions will be offered on all three days of the Convention. Besides a combined session for the keynote address, the opening day will feature breakout sessions on Tree Fruit, Fall Ornamentals and Vine Crops, Organic Vegetables, Broccoli, Snap Beans, Asparagus, Crucifers, Winter Storage Crops, Hydroponics, Changing Climate, Market Trends, Wholesale Marketing and Labor/Farm Management.

On the second day, sessions on Marketing 101, Agritainment, Small Fruit, Tree Fruit, Stone Fruit, Sweet Corn, High Tunnels, Greenhouse Ornamentals, Wine Grapes, Cover Crops, Onions and General Vegetables will be offered. Also offered will be the session "Técnicas de Producción de Frutas y Hortalizas" especially for Spanish speaking workers in the fruit and vegetable industries. It will feature various relevant production presentations in Spanish.

The Convention will close on the third day with sessions on: Stone Fruit, Tree Fruit, Tomatoes, CSAs, Social Media and Advertising, High Tunnels, Small Fruit, Specialty Vegetables, Leafy Greens, Potatoes and Cut Flowers.

The eleventh annual Mid-Atlantic Cider Contest will be conducted during the Convention to determine the best tasting cider produced in the region. On January 31, fruit and vegetable growers will gather for the annual Fruit and Vegetable Growers Banquet which will include awards and recognitions. On February 1 there will be an Ice Cream Social in the evening.

Registration is required for all persons attending the Convention trade show or educational sessions. Registration with any of the five sponsoring organizations allows one to attend any of the sessions although there are additional charges for some workshops and meals. For further information, go to www.mafvc.org or call 717-694-3596.

PVGA Membership Sets... (continued from page 1)

- PVGA co-sponsored several regional twilight meetings or field days this summer and fall as grower educational opportunities plus a bus tour of New York farm markets.
- PVGA holds the trademark for the Pennsylvania Simply Sweet Onion to help develop a new profitable, branded crop for Pennsylvania growers.
- PVGA is especially proud of the volunteer effort put forth each year by PVGA members to run the Association's Food Booths at the Farm Show and Ag Progress Days. These efforts have enabled PVGA to donate over \$900,000 dollars towards research and promotion activities over the last 28 years. The Board of Directors has essentially devoted the profits from the Food Booths to fund the Association's research, promotion and donation budgets rather than any of the Association's general operations.

In 2016 PVGA members again received free subscriptions to the *American Vegetable Grower* magazine and the *Vegetable Growers News*.

Dues invoices for 2017 will be mailed in late November. We hope all members will renew your memberships for 2017 and that you will urge a neighboring grower to join as well. We want to see PVGA membership continue to increase. Increased membership allows the Association to better serve the vegetable, potato and berry growers of Pennsylvania – and that is our end purpose.

The Pennsylvania Vegetable Growers News is the official monthly publication of the Pennsylvania Vegetable Growers Association, Inc., 815 Middle Road, Richfield, PA 17086-9205 phone and fax - 717-694-3596, email - pvga@pvga.org website - www.pvga.org

Our Mission:

The Pennsylvania Vegetable Growers Association serves Pennsylvania's commercial vegetable, potato and berry growers through education, research, advocacy and promotion.

Our Vision:

The Pennsylvania Vegetable Growers Association will be the driving force in ensuring the future viability of the commercial vegetable, potato and berry industries in Pennsylvania.

Inquiries about membership, this publication or advertising rates should be directed to William Troxell, Executive Secretary, at the above addresses.

National News Briefs

Court Rules EPA Violated Farmer Privacy In Data Release

A United States Court of Appeals Ruled the Environmental Protection Agency violated the privacy of farm families in releasing data to several groups. The ruling by the United States Court of Appeals for the Eighth Circuit sides with the American Farm Bureau Federation and National Pork Producers Council in a lawsuit against the agency. AFBF and the pork producers took the EPA to court after the agency released a spreadsheet of personal information of farmers to three environmental groups in 2013. EPA officials released that information, which included names, addresses, GPS coordinates, telephone numbers and e-mail addresses, of livestock and poultry farmers in Pennsylvania and 28 other states. That information was requested by environmental groups through the federal Freedom of Information Act.

"This was an unwarranted invasion of personal privacy by a federal agency in violation of law," said AFBF General Counsel Ellen Steen. "The court's decision is a vindication of the right of farm families to control their own personal information. Farmers and ranchers have a strong privacy interest in their personal information, including their home address, even when they live and work on the farm."

In siding with Farm Bureau, the court noted that EPA's disclosure could result in unwanted harassment of farmers by the environmental groups or others. The EPA now has to "recall" all of the personal information unlawfully released, but the damage may already be done, Steen said.

"AFBF will continue to work to ensure that personal information about farmers and ranchers is not disclosed by EPA," she said.

From the Pennsylvania Agricultural Alliance Issues Update, Penna. Farm Bureau, October 2016.

Farm Bureau Already Discussing 2018 Farm Bill

The American Farm Bureau Federation is already providing input in the development of the 2018 Farm Bill. AFBF is looking to compile draft policy ideas in anticipation of testimony in front of the House and Senate Agriculture Committees as early as next spring. Pennsylvania Farm Bureau is playing a role in the process. AFBF has already identified areas to review, including the dairy safety net created in the 2014 Farm Bill. That included a voluntary margin protection program for dairy farmers, which helps participating producers when the difference between the price of milk and cost of production falls below a level selected by the farmer.

"We've heard from our cotton producers and our dairy folks that they don't think the new programs that were put into effect are working for them," said Mary Kay Thatcher, senior director of congressional relations for AFBF. "There's been fairly low participation in both programs and most folks are feeling like they just don't provide an adequate safety net."

However, the next Farm Bill will have to contend with the fiscal realities of the federal budget.

"We are going to have less money to write the Farm Bill than we had when we wrote the 2014 bill," Thatcher said. "Obviously, prices are going to be much lower than they were then. It's really a tough time and we need additional dollars. We are going to have to find a way to do it with fewer."

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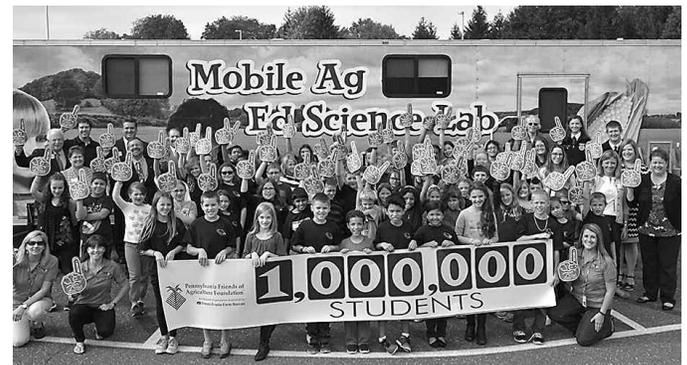
PVGA Young Grower Award Applications Being Accepted

The Board of Directors has voted to establish a "PVGA Young Grower" award that will be awarded each year by the Leadership and Recognition Committee. PVGA members are asked to nominate a young grower (someone they know or themselves) who meets the criteria for the Award. The criteria are as follows:

- is a PVGA Member who is 35 years old or younger;
- has been successfully growing vegetables, potatoes or berries for less than five years; and
- has contributed to advancing or promoting the Pennsylvania vegetable, potato or berry industry.

The prize for the winner will be free registration and lodging for the 2017 Mid-Atlantic Fruit and Vegetable Convention. To nominate someone or yourself, send a brief but comprehensive description of the farm operation and the nominee's qualifications to PVGA at pvga@pvga.org or 815 Middle Road, Richfield, PA 17086, by December 31, 2016.

Foundation Celebrates 1 Million Student Milestone



The Pennsylvania Friends of Agriculture Foundation reached a major milestone by welcoming the 1,000,000th student into a Mobile Ag Ed Science Lab. The foundation celebrated the achievement this week during an event in the Dover School District in York County. Since the program began in 2003, the program has grown from one lab serving a four-county region to a fleet of six that has been at schools in nearly every county in Pennsylvania. "One million students is a monumental accomplishment and a figure our farmers would have never imagined possible when they proposed the idea of bringing agriculture education to students through a mobile classroom," said PFB President Rick Ebert, who also serves as the foundation chairman. "Over the years, our Ag Lab teachers have helped youngsters gain a better grasp of where their food comes from and the critical role farmers play in providing food, clothing, fuel and other products to the public." Schools have also played a crucial role in the success of the program. The foundation has established long-standing relationships with school districts—some of which have been with the Ag Lab program since the beginning—and is constantly seeking new opportunities. Schools appreciate that the program offers hands-on science lessons for children, with age-appropriate lessons. "The hands-on experiments help students gain a better understanding of the scientific

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State News Briefs

PFB Weighs In On Deer Management Proposal

Pennsylvania Farm Bureau told members of the House State Government Committee that a deer management proposal will move wildlife decisions out of the hands of professional staff. PFB, testifying before committee members, said House Bill 2083, would take away significant ability and expertise away from the Pennsylvania Game Commission's Board of Commissioners and experts on staff.

HB 2083 calls for the creation of a special, politically-appointed Forest and Wildlife Advisory Council and a movement to county-based wildlife management units instead of the current regional system. In addition the bill, if adopted, would eliminate the Deer Management Assistance Program (DMAP) from public lands. PFB believes the movement to the wildlife council, away from the current Board of Commissioners would result in political, rather than science-based, decisions on wildlife management.

"The bill would require the commission to follow without question the will of a body of untrained individuals with special interests and predisposed agendas," Joel Rotz, PFB's senior director of State Government Affairs, said during testimony before the State Government Committee.

PFB believes that shift will greatly diminish the ability of farmers to control wildlife damage. The current system allows Game Commissioners to take in all aspects of wildlife management, including input from wildlife biologists, organizations and hunters. Quarterly meetings hosted by the Game Commission gives hunters and farmers the chance to provide input on Game Commission programs. PFB is also concerned that the elimination of DMAP on public lands could lead to the total elimination of the program — which is a vital tool farmers use to control crop damage on their farms.

"DMAP utilizes hunters to solve deer damage concerns and has been highly popular for hunters and landowners alike by opening thousands of acres on public and private lands to hunting where overpopulation of deer often exist," Rotz said. "House Bill 2083 would be a direct threat to the profitability of our farmers and increased deer damage to other landowners who provide the majority of free access to hunters on private lands each year."

HB 2083 was approved by the committee and now heads to the full House for consideration. PFB will continue to advocate our position on the bill.

*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna. Farm Bureau, October 2016.*

DEP, Conservation Districts, Begin Farm Visits

Pennsylvania's state and local agencies will begin a more concentrated program of farm inspections in the Chesapeake

Foundation Celebrates...

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ic process, while increasing awareness of agriculture's importance in their everyday lives," said Mobile Ag Ed Science Lab Program Director Tonya Wible. "The kids also have a lot of fun and show a real enthusiasm for learning during our Ag Lab visits." The Pennsylvania Friends of Agriculture Foundation is grateful for the donations that have sustained the program, and for the farm families who see the value in the program. PVGA annually contributes \$500 towards the Ag Lab program.

*From **Farm Bureau Express**, Penna. Farm Bureau, Oct. 7, 2017.*

Bay Watershed. Visits by the Department of Environmental Protection and conservation district staff will focus on verifying whether farms have developed and are following their plans for erosion and sedimentation control and manure management. DEP officials say they are planning on inspecting 10 percent of farms in the Bay watershed annually to ensure written plans are in place. Conservation districts participating in the program will inspect 50 farms per technician funded through the state's Chesapeake Bay program. Inspections are expected to start in October.

The following county conservation districts are participating in the inspection program: Adams, Bedford, Berks, Blair, Cambria, Centre, Chester, Clearfield, Clinton, Columbia, Cumberland, Fulton, Huntingdon, Indiana (covered in agreement with Cambria), Juniata, Lackawanna, Lancaster, Lebanon, Lycoming, Mifflin, Montour, Potter, Schuylkill, Snyder, Sullivan, Susquehanna, Union and Wyoming counties. Nine county conservation districts decided not to participate and three others cover only a small portion of the watershed. Those counties will see inspections performed by DEP staff. The visits are part of a revised strategy by DEP for improvement of water quality in the Bay. Compliance of farms with state planning requirements has been part of the state's strategy for the bay cleanup since 2011.

PFB has serious concerns with the EPA's approach in cleaning the Chesapeake Bay Watershed, including a model used to determine the amount of nutrients reaching the bay. That's why Pennsylvania Farm Bureau partnered with Penn State on a best management practices survey, conducted this spring. Once those results are compiled, they will be shared with the appropriate state and federal agencies. PFB wants to make sure that the men and women of agriculture are not unduly burdened during the Chesapeake Bay cleanup. Some farmers may not have put the conservation plans and manure management plans they are following in a written document, as the law requires. Help is available for farmers who need to update or write their conservation plans. Contact your local conservation district, or National Resource Conservation Service, for more information.

*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna. Farm Bureau, October 2016.*

Open Enrollment for Health Care Coverage Starts Soon

The open enrollment period of finding health insurance starts this fall. And Pennsylvania Farm Bureau's Health Services Division is here to help with every question. Our Health Services Division can help you shop for the best plans and rates through a variety of insurance companies in Pennsylvania. The open enrollment period for individual coverage begins November 1, 2016 and runs until January 31, 2017. During these open enrollment periods, individuals may enroll in coverage, change carriers or change plan options.

Health Services works extensively reviewing Pennsylvania insurance carriers to obtain and present our members with the health insurance plans that offer the best mixture of premiums, comprehensive coverage and broad provider networks.

With decades of experience, the PFB Health Services team will take the time to understand your situation and explore the options that are best for you and your family.

PFB Health Services will be your advocate and help guide you through the complicated requirements of the law. Our
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Be a Keystone Member for 2017 and Invest in PVGA's Future

In 1994, the Association established a new membership class, the Keystone membership, and an endowment-type fund, the Keystone Fund. PVGA members who wish to support the vegetable, potato and berry industries in a special way pay dues above the regular rate, with the dues above the regular rate being placed in the Keystone Fund. The current balance in the Keystone Fund is about \$127,700 which is invested in money market accounts, two bond mutual funds and an index stock mutual fund.

The Board of Directors has approved the following uses for the annual interest earned by the Keystone Fund:

Two annual \$1,000 student scholarships that are awarded according to set criteria by a special committee. The committee has awarded a total of nine scholarships to date.

Half of any remaining interest is given to the Penn State Plant Pathology Department as a general research grant in support of the vegetable pathologist's ongoing research work.

The other half of any remaining interest is given to the Penn State Entomology Department as a general research grant in support of the vegetable entomologist's ongoing research work.

The special research grants from the Keystone Fund were designated for the Plant Pathology and Entomology Departments at this point in time rather than the Horticulture Department because the Association for five years was giving \$10,000 annually to partially support a vegetable research technician in the Horticulture Department. This support comes from the Association's General Fund.

Farm to Table Training Sessions Set

The Pennsylvania Departments of Education, in partnership with the Pennsylvania Department of Agriculture and Penn State University is pleased to announce "Farm to Table: Making the Connection" Training Sessions. Five half-day regional sessions will be offered in November. These sessions are designed to bring together school food service directors as well as sponsors of Summer Food Service Programs and Child and Adult Care Food Programs with farmers and distributors who are able to provide local food for school, summer food service, and child care food programs.

Topics to be discussed include an overview of Farm to Table, Good Agricultural Practices, and Local Procurement. Sessions will also feature a Farm to Table "Best Practices" panel and opportunities for networking.

There is no registration fee for these sessions. Registration is on a first-come, first-served basis. Registration will close when site capacity is reached or one week prior to each session, whichever comes first. Dates and locations are: November 7th: State College; November 10th: Lancaster; November 14th: Harrisburg; November 16th: New Kensington; November 18th: Malvern. Timeframe for each session is 8am-noon.

Registration is being conducted through the Project PA website: www.projectpa.org <<http://www.projectpa.org>> For questions about registration, send e-mail to registration@projectpa.org or call 814-865-3534.

Suggested Keystone dues are based on a member's gross income from vegetables, potatoes or berries instead of being a flat rate. However, any member who pays dues of \$75 or more is considered a Keystone member regardless of their gross income. The amount of Keystone dues paid by individual members is not published so as not to disclose their gross income. Keystone dues are added to the principal of the Keystone Fund, thus increasing the potential amount of interest available each year.

Keystone membership is open to all vegetable, potato and berry farm operations, processing firms and allied industry firms. Associate Keystone Members are additional family members or employees of Keystone Members.



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*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna. Farm Bureau, October 2016.*

Herbicide Selection for Row Crops May Impact Fall Cover Crops

Agricultural producers select herbicides for row crop production selecting products that minimize the risk of crop damage when different crops are planted the following season. Another criteria for herbicide selection is to choose products that do not persist in the soil late in the season which minimizes the risk of damage to fall seeded cover crops. Herbicide products with a 4 month or less rotation restriction before planting the next crop or close relative of that crop or a sensitive species such as clover will be generally acceptable for cover crop establishment. However, there are several common herbicides applied in corn and soybeans that may carry-over to the fall and damage plantings of cover crops. The Penn State Agronomy Guide provides guidance on herbicide selection to reduce the risk to fall seeded cover crops.

*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna. Farm Bureau, October 2016.*

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AFBF is aware that farmers are facing financial struggles and low commodity process, Thatcher said. Programs like crop insurance will get a close look because they typically cost less than commodity and conservation programs, Thatcher said. "We know that Farm Bills are always harder to write when you are facing difficult times," she said. "We have to protect farmers with an adequate safety net."

*From the **Pennsylvania Agricultural Alliance Issues Update**, Penna. Farm Bureau, October 2016.*

Water Resource Bill Passes U.S. House

The U.S. House of Representatives passed a Water Resource Development Act that will provide funding for harbors, locks, flood protection and the nation's inland waterway system. The Senate has already passed a similar bill. A conference committee of Representatives and Senators will meet to reconcile differences in the bills. The WRDA bill passed by the House authorizes infrastructure improvements proposed at the local level and then submitted to Congress for consideration. Those projects follow a new process for the approval of waterway projects that allows for Congressional review of U.S. Army Corps of Engineers projects. "The reforms Congress put in place in the 2014 water resources bill are working," said Rep. Bill Shuster, a Pennsylvania Republican who chairs the House Transportation and Infrastructure Committee. "Enacting a WRDA bill every two years is essential to maintaining an efficient transportation system, moving commerce effectively, and promoting economic growth throughout the country."

*From **Farm Bureau Express**, Penna. Farm Bureau, Oct. 7, 2017.*

Several Pennsylvania Counties Fall Under Drought Designation

Farmers in several Pennsylvania counties are eligible for disaster assistance through the U.S. Department of Agriculture due to drought conditions. The designation means that farms in designated or contiguous counties can receive special assistance from the Farm Service Agency, including emergency loans. Emergency loans are considered on a case-by-case basis and on its own merits. The application process takes into account the extent of production losses, along with the repayment ability of the farmer. Pennsylvania drought designated counties are: Blair, Bradford, Bucks, Cambria, Cameron, Centre, Clarion, Clearfield, Clinton, Columbia, Crawford, Delaware, Elk, Erie, Forest, Huntingdon, Indiana, Jefferson, Lycoming, McKean, Mifflin, Montour, Philadelphia, Potter, Sullivan, Susquehanna, Tioga, Union, Warren, and Wayne. Contact your local FSA office for more information about disaster programs.

*From **Farm Bureau Express**, Penna. Farm Bureau, Oct. 14, 2017.*

Penn State Finalizing Survey Results on Best Management Practices in Bay Watershed

Penn State is putting the final analysis on survey results, conducted earlier this year, to assess the extent of unreported best management practices used by farmers in the Chesapeake Bay Watershed. Penn State has shared initial results with the Agriculture Workgroup of the Chesapeake Bay Program—a group of agriculture and government officials that provide insight into bay cleanup policies and programs. That preliminary data suggests numerous farmers have widely adopted voluntary conservation practices. The survey was conducted to get an accurate picture of the number of best management practices used by farmers in the watershed and then share that data with the federal Environmental Protection Agency. EPA, in its model to determine agriculture's contribution to water quality, looked only at conservation practices paid by government cost-share dollars. Pennsylvania Farm Bureau hopes the EPA will use the Penn State survey data in the model to give a more accurate picture of agriculture's impact on water quality. PFB is hosting a seminar on the Penn State survey during our 66th Annual Meeting in Hershey. The seminar will be held from 3:30-4:45 p.m., Nov. 14 at the Hershey Lodge. All Annual Meeting seminars are free for Farm Bureau members, regardless of whether they are attending other Annual Meeting events.

*From **Farm Bureau Express**, Penna. Farm Bureau, Oct. 14, 2017.*

PFB Offers Insight on Chesapeake Bay Strategies

Pennsylvania Farm Bureau encouraged state officials to evaluate and identify projects that will provide the biggest return on investment in cleaning up the Chesapeake Bay Watershed. Supporting projects and practices that provide the largest reduction of nutrient and sediment per dollar spent will go a long way to meeting cleanup goals, without significantly burdening taxpayers. Pennsylvania Farm Bureau made those observations during a joint hearing of the Pennsylvania Senate Environmental Resources and Energy Committee and Agriculture and Rural Affairs Committee. The hearing was held

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to get input on Chesapeake Bay cleanup goals and financing those nutrient reduction strategies.

PFB's major concern is the arbitrary deadlines being applied to the cleanup strategy, and the impact it will have on taxpayers and landowners. Nutrient reduction targets established by the federal Environmental Protection Agency lack any insight into whether states can meet those goals in a practical time frame-and afford to do so. An evaluation by Penn State estimates that Pennsylvanian will need to incur \$3.6 billion-or \$280 million annually-just to implement best management practices aimed at non-point sources like farms. However, the total state and federal funding available for Pennsylvania to spend on nutrient and sediment reduction statewide stands at \$146.6 million.

Recent studies by Penn State casts significant doubt at the viability of the EPA's one-size-fits all regulatory approach, and instead shows regional solutions are often more effective, Joel Rotz, PFB's senior director of state government affairs said during the hearing. "Farm Bureau believes it is important for Pennsylvania to complete a thorough evaluation of the costs needed in the Bay Watershed, and to develop a coordinated plan that will manage and direct funds at projects that provide a high level of environmental benefit for the dollars spent on them," Rotz said.

From Farm Bureau Express, Penna. Farm Bureau, Oct. 14, 2017.

New State-Federal Agreement Adds Another \$1 Million to Safeguard More PA Farms

An agreement between the federal Agricultural Conservation Easement Program (ACEP) and Pennsylvania's nation-leading farmland preservation program will again give the state access to millions of federal dollars to help preserve the state's best and most threatened farmland.

Pennsylvania has been without a cooperative agreement with the United States Department of Agriculture's (USDA's) Natural Resources Conservation Service (NRCS) since 2014 when the last Farm Bill became law, changing the terms of the federal program.

"Our commonwealth's farmland preservation program has served as a model for the nation, and this agreement is further proof of how we meet the needs of our producers and county preservation programs," said Agriculture Secretary Russell Redding. "When the new ACEP program was introduced, we immediately realized that the regulations were significantly different than the Federal Farm and Ranchlands Protection Program it replaced. We knew that it would take lots of work to find a common ground that met federal requirements without jeopardizing the integrity of our state-run program, but after two years, many conference calls and plenty of meetings, we have a final product that works for all involved."

Each change in federal program regulations requires a new agreement, as some aspects of the federal and state programs are otherwise incompatible. Conflicts with ACEP included differing subdivision requirements, permitted oil and gas activities, building envelope requirements, deed of merger language, and baseline documentation reports.

The Pennsylvania Agricultural Conservation Easement Purchase Program identifies properties and slows the loss of prime farmland to non-agricultural uses. It enables state, county and local governments to purchase conservation easements,

also called development rights, from owners of quality farmland. Since the program began in 1988, federal, state, county and local governments have invested more than \$1.3 billion to preserve 5,025 farms on 527,000 acres of prime Pennsylvania farmland – the most of any state in the nation.

The cooperative agreement also will allow seven farms and 651 acres to be preserved using \$1,033,550 from ACEP in the near future.

For more information on the state's farmland preservation program, visit www.agriculture.pa.gov, and click "Encourage," then "Farmland Preservation."



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GENERAL

Produce Brush Washer Study: Finding a Standard Sanitation Operating Procedure

Kelsi Harper and Amanda Kinchla

Proper routine cleaning and sanitizing are known best management practices to reduce food safety risks. Brush washers are commonly used in our region for the postharvest processing of produce to remove dirt, but are difficult to clean because of their design. This study investigated procedures to reduce microbial loads within these machines using approaches practical for a small farm.

Researchers at the UMass Crop and Animal Education Research Center in S. Deerfield, Massachusetts use an OESCO brush washer (Figure 1) to clean a variety of fruiting crops. To clean the machine, operators run it with over-head water spray from a few seconds to a minute. Noticeable dirt and debris remain inside the bristles after rinsing in this manner. As part of a food safety risk assessment, we performed environmental monitoring tests during both the 2014 & 2015 growing seasons to determine the microbial loads of various surfaces and pieces of equipment during normal operation. We found that microbial counts varied significantly throughout the production season (Lawton and Kinchla, 2016), and that the methods used for cleaning the brush washer in particular did not sufficiently reduce these counts during peak use. To improve sanitation practices at the farm, the UMass Food Science team investigated ways to reduce the microbial load within the brush washer. We first researched the effects of washing the machine with water alone—the standard protocol—and then by dousing the machine with four different concentrations of chlorine bleach solutions (ranging from 25ppm-200ppm).

Methods: The inside of the brush washing unit was first cleaned (to remove dirt and debris from the bristles) and sanitized. Ten gallons of 200ppm chlorine solution (Clorox Germicidal Bleach, 8.25%, EPA Reg. No. 5813-102, which yields 7.9% available chlorine) was prepared in two 5-gallon buckets. Concentration was confirmed with a chlorine test strip (LaMotte Chlorine Test Papers, Code 4250-BJ). The sanitizer solution was then transferred onto the surfaces of the brush washer using a plastic 1-quart pitcher. The solution was poured along the length of the rollers to minimize solution loss through gaps between the rollers (see Figure 2). After roller surfaces were covered, the machine was plugged in to rotate rollers, exposing the new surface area to apply the rest of the sanitizer. All of the 10 gallons was used to douse all surfaces of the brush washer. The machine was run for 30 seconds, and then allowed to dry. Once dried, the brush washing surfaces were inoculated on the rollers in the machine (Figure 3) with an average of 5.9 log CFU of nonpathogenic *E. coli* per third of each roller (a sampling area of 96cm²). We evaluated the sanitizing effect of different chlorine concentrations by pouring five gallons of 200, 100, 50, and 25ppm chlorine bleach solutions inside the chamber of the machine after running it with water for 30 seconds. After applying bacteria to the rollers and letting it dry, we doused the inside of the chamber with the specified chlorine concentra-

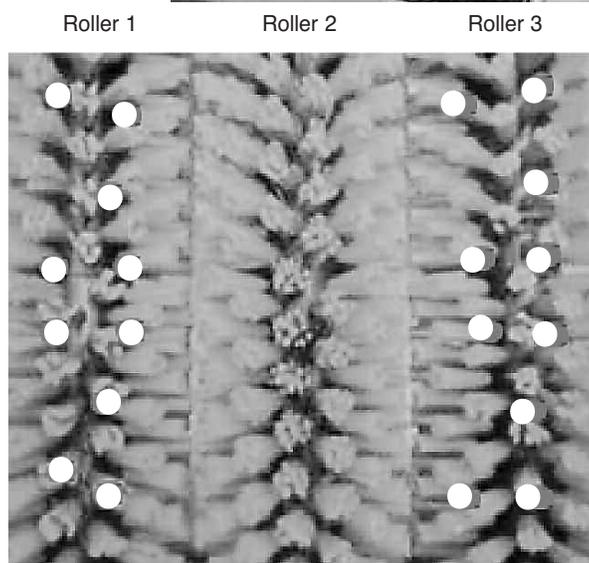


Fig. 1. OESCO Brush washer used at the UMass Student Farm.

Fig. 2. Inside the OESCO brush washer. A 1-quart plastic container was used to douse the entire internal unit with 200 ppm chlorine to decontaminate the machine prior to running the trial. Over-head water spouts spray water onto the chamber's rollers.



Fig. 3. Detail of inoculated brush rollers 1 and 3 (red dots show inoculation pattern), with roller 2 between them. The unit has 9 rollers in total.



tion, ran the machine for 30 seconds, and let it sit for two minutes—the recommended contact time for chlorine on a food contact surface (“Code of Federal Regulations,” 2015; McGlynn, 2014).

Rollers were swabbed at pre-process, post-inoculation, post-30 second water rinse, and post-process decontamination (10 gallons of 200ppm chlorine) to quantify any *E. coli* remaining on the machine. Swabs were taken of a third of each roller sampled, and reported as log CFU/96cm² (the swabbed surface area). Each trial was repeated three times for statistical validity.

Results: Treating the rollers with chlorine bleach sanitizer solutions resulted in significant reductions of *E. coli* in all trials. The levels of *E. coli* on rollers throughout the experiment are shown in Figure 4. All chlorine treatments were more effective at lowering *E. coli* levels than a 30-second water rinse alone. *E. coli* reductions after 200ppm, 100ppm, 50ppm, and 25ppm chlorine treatments were 4.31, 3.53, 2.68, and 1.78 log CFU per third of roller, respectively. Therefore, higher chlorine concentrations showed greater reductions of *E. coli*. This suggests that using 200ppm chlorine to sanitize a machine like this brush washer would be best for sanitation practices.

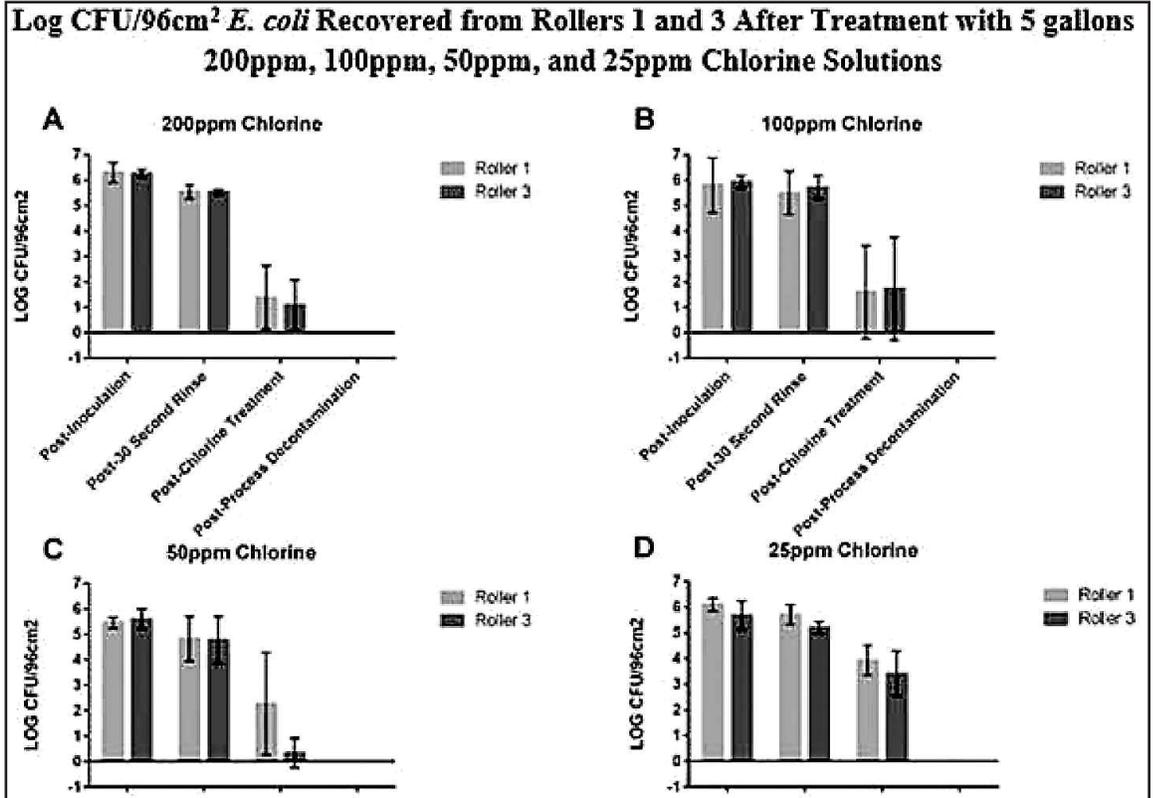
Even after five minutes of running the machine with water alone, only an average of 1.4 log CFU/96cm² reduction of *E. coli* was achieved (Gensler and Kinchla, 2016), indicating that running the machine with water alone is not an effective approach for reducing bacterial populations in the brush wash-

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GENERAL

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Fig. 4. Log CFU/96cm² *E. coli* recovered from Rollers 1 and 3 during A: 200ppm Chlorine treatment, B: 100ppm Chlorine treatment, C: 50ppm Chlorine treatment, D: 25ppm Chlorine treatment. Tested sanitizer concentrations' effect on *E. coli* populations on brush washer Rollers 1 and 3. Time points of Post-Inoculation, Post-30 Second Rinse, Post-Chlorine Treatment, and Post-Process Decontamination show decreasing levels of *E. coli*. Error bars indicate standard deviation among the three trials of each concentration. Data was collected from a sampling section of a third of each roller.



(continued on page 12)

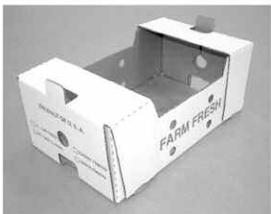
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GENERAL

Produce Brush Washer... (continued from page 11)

er. Higher concentrations of chlorine were more effective in reducing bacterial populations. All chlorine treatments were much more effective at sanitizing the machine than running with water alone. The data makes a compelling case for the use of chlorine sanitizer to reduce bacterial populations on machines like this brush washer.

What This Means for Farmers:

As debris and microorganisms accumulate in a machine used for washing produce, so does the food safety risk. To combat this, machines with food contact surfaces should be physically cleaned frequently with gloves and food-grade brushes to reduce the buildup of dirt and debris. The use of sanitizers such as 200 ppm chlorine bleach should be considered when implementing a standard sanitation operating procedure for produce washers, equipment, and other food contact surfaces.

Chlorine concentrations higher than 200ppm should not be used for food contact surfaces without rinsing with potable water afterward.

Things to remember when cleaning and sanitizing equipment include:

- Remove dirt and debris first, by wiping and/or rinsing
- Follow the manufacturer's directions for the sanitizer, prepare the correct concentration of an approved sanitizer, and confirm the sanitizer concentration before use. In this study a LaMotte Free Chlorine Test Paper was used (<http://www.lamotte.com/en/food-beverage/test-papers/4250-bj.html>). Please note that test strips are specific to the sanitizer type.
- Apply the sanitizer evenly and broadly to the target area, and allowing it to dry in order to evaporate any remaining chlorine or sanitizer. Note that some products or applications require a final rinse step—again, follow the directions on the sanitizer label.

The use of sanitizers can be a great way to improve your postharvest practices to minimize food safety risks on-farm.

A sample SSOP for the OESCO produce brush washer, which can be used as a model for sanitizing this and similar machines, is given below.

Sanitation Standard Operating Procedure for OESCO Produce Brush Washer

UMass Crop and Animal Education Research Center,
South Deerfield, MA

Objective: To sanitize the produce brush washer unit in order to minimize cross-contamination and foodborne illness.

Responsibility: The operators will complete this procedure after each day of use of the machine and between batches of different produce.

Materials:

- Food-grade brushes
- 5-gallon bucket
- 1-quart pitcher
- mL-syringe or mL-measuring cup to measure 50mL
 - Clorox Concentrated Germicidal Bleach 8.25% sodium hypochlorite
- Gloves
- Paddle or other instrument for mixing
- Potable water

Procedure:

1. Once finished using the machine for produce washing, unplug it and turn off the water valve.

2. Use clean food-grade brushes to remove dirt and debris from bristles, input and output chutes.
3. Turn on the water valve and plug in the machine for 30 seconds.
4. Turn the water valve off and unplug the machine.
5. Prepare sanitizing solution:
 - a. Fill a 5-gallon bucket with potable water
 - b. Add 50 mL of bleach to the bucket (use gloves when handling bleach)
 - c. Mix the solution with a paddle
 - d. Use chlorine test strips (LaMotte or other brand which has a 200 ppm color swatch on the bottle) to confirm 200 ppm concentration.
 - e. Report the concentration value on the brush washer SSOP data log.
6. If the concentration is not 200 ppm, add more water or sanitizer in small increments. Mix with paddle and retest. Repeat until test strip reads 200ppm. Report any corrective action in the brush washer SSOP data log.
7. Slowly pour about half of the solution in batches using a pitcher from the bucket over the inside chamber of the machine. Focus on rollers, input and output chutes, and walls. Uniformly cover these areas, making sure not to miss any areas.
8. After pouring half the solution onto the machine, rotate rollers by plugging the machine in for just a second to expose the other sides of the rollers for even application.
9. Pour the remainder of the solution onto the same areas.
10. Once all contact surfaces have been covered by the sanitizer solution, plug in the machine for 30 seconds.
11. Unplug the machine and let sit for 2 minutes.
12. Record date, time, if the solution is 200ppm chlorine, and your initials on the Brush Washer Sanitation Document.
13. Before next use, turn the machine and water valve on to rinse the chamber with water for 30 seconds.

Frequency: This procedure will be completed after each use of the brush washer or as needed.

Approval Signatures: _____

Job Title: _____

Note the date the procedure was written and when any revisions made.

Create a chart with the following four columns to record each cleaning:

Date
Time
Test strip reads 200ppm Chlorine?
Initials

Create a second chart with the following three columns to record changes to the SSOP:

Date
Change
Initials

This sample SSOP can also be found at https://ag.umass.edu/sites/ag.umass.edu/files/brush_washer_ssop_and_log.pdf

*Ms. Harper and Ms. Kinchla, are with the Univ. of Massachusetts Food Science program. From -by Kelsi Harper and Amanda Kinchla, UMass Food Science. From **Vegetable***

Notes for Vegetable Farmers in Massachusetts, Univ. of Mass., Vol. 28, Issue 21, September 1, 2016.

Safety Data Sheet Use

James Harvey

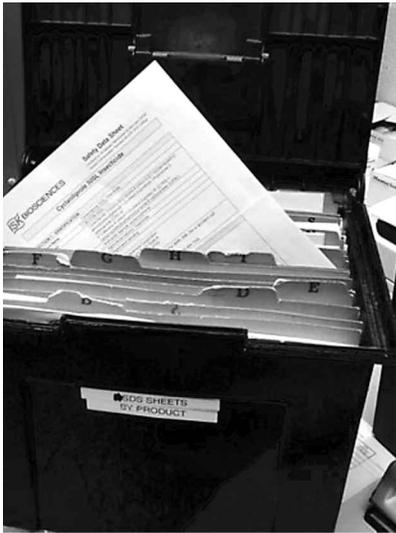
The purpose of safety data sheets (SDS) is to provide detailed information about all chemicals and pesticides including the chemical properties, various hazards (e.g., physical, health, environmental, etc.), protective measures, and safety precautions (e.g., handling, storing, and transporting).

It is a safety and health best management practice to have safety data sheets (SDS) for all chemicals and pesticides used in a grower's operation. In regards to the Worker Protection Standard (WPS), producers that employ at least one or more non-family relatives are required to have SDSs for all pesticides used in their operation.

If an operation has 11 or more non-family employees (at any one time during a given year), SDSs are required under the Occupational Safety and Health Administration (OSHA) for all chemicals.

Examples of chemicals that require SDSs include fuels, lubricants, sanitizers and disinfectants, and paints.

For both WPS and OSHA, the SDS is informational and must be accessible by employees. It is recommended that growers keep the SDS and the pesticide label together. In the event of an emergency, the SDS and pesticide label should be taken to the medical facility with the person who was exposed to the pesticide.



In regards to training, the WPS requires that workers and handlers be trained, in a manner that they understand, about the purpose of SDSs and where they are located. For operations that employ 11 or more people and therefore are under OSHA, the minimum training requires employers to train on the following:

- Label elements (product identifier, signal word, pictogram, hazard statement(s), precautionary statement(s), and contact information for chemical manufacturer, distributor or importer)
- Employer use of labels in the workplace (ensure proper storage and first aid information)
- General understanding of the elements on the label (multiple hazards of a chemical, pictograms, and precautionary statements)
- Training on the SDS format (standardized 16-section format and specifically Section 8 - Exposure Controls/Personal Protection)
- Relationship between the information on the label and how it relates to the SDS

Training resources, English and Spanish, can be found at the OSHA Hazard Communication website, under "Safety Data Sheets." <https://www.osha.gov/dsg/hazcom/index.html>.

For more information about complying with the Worker Protection Standard revisions or to schedule a visit, contact Jim Harvey, Rural Health Farm Worker Protection Safety Specialist, via email: jdh18@psu.edu or phone: 814-863-8565.

(continued on page 14)

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GENERAL

On the Road—Furmano's and Earl Lake Farm: Tomato Harvesting

Elsa Sanchez and Thomas Butzler

Tomato harvest was in full swing during a recent visit to Earl Lake's Farm. Earlier this year we visited with Scott Hoffman, Field Manager with Furmano's at Earl Lake's farm in Pennsylvania Furnace to see processing tomato transplants being planted (see June newsletter). This morning (August 30, 2016) we headed back to the farm to see the tomato harvest.

Before seeing the harvester, Scott reflected on the growing season. It was dry which resulted in running the irrigation system 6 times. Even using the irrigation system, the average ton of tomatoes harvested per acre was down from an average of 38 to 40 tons to 33 to 34 tons. Scott said, "We can't do with irrigation what Mother Nature can do." In terms of irrigation systems, Scott prefers drip the best because moisture levels in the plant canopy are not affected which minimizes disease pressure. Center pivot overhead systems result in increased diseases compared to drip and traveling guns cause water to splash more which spreads diseases.

High temperatures also affected plant growth and development. For harvesting, the goal is to have a certain ratio of red, breaker, mature green and immature green tomatoes. Etherol is sprayed on the plants 10 to 14 days before harvest so the green tomatoes will mature. This increases the amount of tomatoes that can be processed. Ideally tomatoes taken to the processing plant will have peelable skins. This allows the most flexibility as they can be processed on the peeling or crushing lines. At a certain point tomato skins can become too soft and can only be used in crushing



Tomato plants ready for harvest. More weeds were seen in the field than usual. Photo: Tom Butzler

lines. The harvesting process itself can soften up the fruit, which is another factor. High day temperatures, above 85°F, and/or high night temperatures, above 70°F, can result in reduced fruit set (see <http://edis.ifas.ufl.edu/hs1195>).

This year, Scott has been seeing "separated sets" and "split sets". For both, the ratio of red, breaker, mature green, and immature green tomatoes is off. This makes deciding when to harvest trickier, if Scott waits too long for the immature greens to mature, the reds may be over-mature and not good for processing. On the other hand, if he doesn't wait long enough more green fruit is left in the field.



Pik Rite 190 tomato harvester loading tomatoes into a trailer bed. Photo: Tom Butzler

We also talked about how the combination of hot and dry weather affected weed pressure. It took longer for the tomato plants to become large enough to "close the rows" or grow between rows. Once rows are closed, weed pressure is less. Additionally, Scott is seeing more pressure from herbicide resistant pigweed and lambsquarters. As a result, there were more weeds in the field than usual. Scott wasn't concerned with the amount of weeds in the field though. The etherol spray speeds up dying of the tomato plants and the weeds in the field shaded the tomato fruit, helping to avoid sunscald.

Harvest started on August 24th, 2016 and will continue for about another week. So far, about 22 acres had been harvested at the farm using a Pik Rite 190 harvester. Furmano's has a fleet of 5. Their fleet also includes the 240 and HC290 models. The 190 model can harvest 12 to 15 loads on a 45 ton/acre crop in one day. For a video of the harvesting operation, go to <http://extension.psu.edu/plants/vegetable-fruit/news/2016/on-the-road2014furmano2019s-and-earl-lake-farm-tomato-harvesting>.

The coordination of trucks and incoming loads to the processing plants is a complicated job overseen by a central dis-

Safety Data... (continued from page 13)

References/Resources:

OSHA Fact Sheet: [December 1st, 2013 training requirements for the revised hazard communication standard](#). (2013) United States Department of Labor Occupational Safety and Health Administration.
<https://www.osha.gov/Publications/OSHA3642.pdf>

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Safety Data Sheet Use

This publication is available in alternative media on request.

Mr. Harvey is an educational program specialist with Penn State Extension at University Park. From the **Vegetable, Small Fruit and Mushroom Production News**, Penn State Extension, extension.psu.edu/plants/vegetable-fruit/news, September 30, 2016.

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On the Road... (continued from page 14)

patcher. As an example, if a harvester is broken down on one farm, the dispatcher will coordinate with another farm to bring in more loads of tomatoes to the processing plant so that it is continuously running. Scott said that there is "a lot of gray hair this time of year."

The harvester first cuts plants about 1 to 1 1/2 inches below the soil line. Plants run through two big shakers with large plastic pegs that separate fruit from the plants. Plants are thrown back in the field. A fan blows out leaf material left behind and tomatoes move to a conveyor belt where two people remove large debris – mostly large rocks. At this point the tomatoes are a mix of green and red. They then are moved through an "electric eye" or color sorter that removes the green ones. This is

(continued on page 16)



Tomato plants are cut below the soil line with large discs.
Photo: Tom Butzler

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GENERAL

On the Road... (continued from page 15)



Plants with tomatoes run up a conveyor belt. Photo: Tom Butzler



Vines are separated from the fruit and discarded back to the field. Photo: Tom Butzler



Workers on the final sort of the red tomatoes. Photo: Tom Butzler



Sorted tomatoes being loaded into a trailer bed. Photo: Tom Butzler



Field after harvest. A cover crop of oats will be planted. Photo: Tom Butzler

Back in the fields, plant residue is tilled into the soil and a cover crop of oats or winter rye is planted in the fields, depending on when tomato harvest is completed.

With all this going on, Scott is also already preparing for the 2017 growing season. He's talking with growers interested in producing processing tomatoes and taking soil tests to help in developing nutrient management plans for next year's crops.

Thank you to Scott for the time spent and information shared with us and to Earl for allowing us to visit his farm. It was a great visit!

*Dr. Sanchez is with the Department of Plant Science at Penn State Univ. Mr. Butzler is with Penn State Extension in Clinton Co. From the **Vegetable, Small Fruit and Mushroom Production News**, Penn State Extension, extension.psu.edu/plants/vegetable-fruit/news, September 15, 2016.*

really effective, but some reds are sorted out with the green ones. Between this and fruit left on the plant about 10-15% of fruit that could be processed is left in the field.

The red tomatoes continue down the conveyor belt where 6 more workers sort out any remaining debris or bad tomatoes. From there, one last ride on a conveyor belt moves the tomatoes to a truck bed for transportation to the processing plant.

Broad Mite Infestations Have Growers Considering Biocontrols

Thomas Ford

Broad mites are being observed more frequently on a variety of vegetable crops in the field, high tunnel, and greenhouse.

Broad mites are very tiny and range in size from .1 mm to .3 mm in length. They can move through the plant canopy by crawling, but they will also hitch-hike on winged insects like white fly and aphids. Broad mites can attack over 60 families of plants, including vegetable stalwarts like beet, beans, cucumber, eggplant, pepper, potato, and tomato. As the broad mite feeds it releases a toxin that has growth regulator effects on plant tissues. Very low densities of this pest can cause significant plant and fruit injury.

Symptoms of broad mite infestations can include leaf distortion, shortening of internodes, leaf discoloration, leaf blistering and shriveling, fruit russetting, fruit deformity, and fruit splitting. Damage from broad mites can continue to appear in the field, high tunnel, or greenhouse for several weeks after this pest has been controlled because of the growth regulating effects of the broad mite toxin.

Broad mite management is made more complex because of their relatively small size and the



Broad mite damage. Photo: Tom Ford



Young blackberry with broad mites.

Photo: T. Gleason

availability of miticides with unique MOAs that effectively target this pest. Growers have been encouraged to rotate products with different modes of action to delay resistance. Unfortunately, the available miticides/insecticide arsenal continues to shrink and products with new modes of action are not entering the market with any regularity. As a result, many growers are moving as fast as they can towards the implementation of biocontrol agents in their operations to combat broad mites and other pests.

The transition from managing pests with chemical miticides or insecticides to using biocontrols exclusively is difficult at best. Most growers have a rescue mentality in respect to pests so implementing biocontrols proactively may require a completely new skill set.

In an effort to equip our growers and farmers with the knowledge and skill to employ biocontrol agents in the field and greenhouse successfully Penn State Extension will be holding a 2-day Advanced Biocontrol School on November 3rd and November 4th at the

(continued on page 18)

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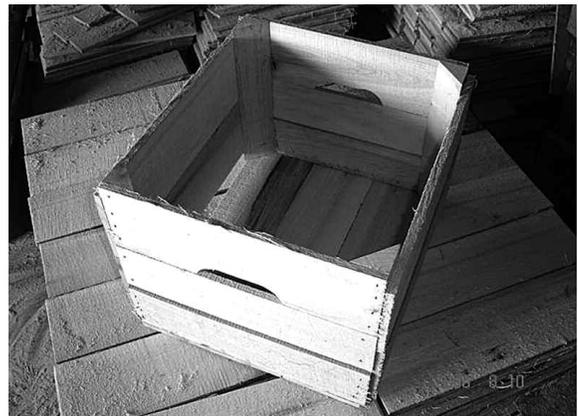
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VEGETABLE PRODUCTION

Soil Acidity, pH, and Liming – Fall is the Best Time to Lime

Adding lime in the fall will allow time for it to react in the soil and prepare your fields for spring planting. If you haven't already, take a soil test to determine the pH of your soil, and the amount of lime you may need to reach your target. One of the most important aspects of nutrient management is maintaining proper soil pH, which is a measure of soil acidity. A pH of 7.0 is neutral, less than 7.0 is acidic, and greater than 7.0 is alkaline. Most New England [and Pennsylvania] soils are naturally acidic and need to be limed periodically to keep the pH in the range of 6.5 to 6.8 desired by most vegetable crops.

Scab-susceptible potato varieties are an exception but, even here, some lime may be needed to maintain the recommended pH of 5.0 to 5.2. When the soil is acidic, the availability of nitrogen (N), phosphorus (P), and potassium (K) is reduced and there are usually low amounts of calcium (Ca) and magnesium (Mg) in the soil. Under acidic conditions, most micronutrients are more soluble and are therefore more available to plants. Under very acidic conditions aluminum (Al), iron (Fe), and manganese (Mn) may be so soluble they can reach toxic levels. Soil acidity also influences soil microbes. For example, when soil pH is low (below 6.0), bacterial activity is reduced and fungal activity increases. Acidic soil conditions also reduce the effectiveness of some pesticides.

The most effective way to manage soil acidity is to apply agricultural limestone. The quantity of lime required is determined by the target pH (based on crops to be grown) and the soil's buffering capacity. Buffering capacity refers to a soil's tendency to resist change in pH. Soil pH is only a measure of active acidity, the concentration of hydrogen ions (H⁺) in soil solution. It is an indicator of current soil condition. When lime is added to a soil, active acidity is neutralized by chemical reactions that remove hydrogen ions from the soil solution. However, there are also acidic cations (H⁺ and Al⁺) adsorbed on soil colloids (the cation exchange capacity, or CEC) which can be released into the soil solution to replace those neutralized by the lime. This is called reserve acidity. Soils such as clays or those high in organic matter have a high CEC and a potential for large amounts of reserve acidity. These soils are said to be well buffered. To effectively raise the soil pH, both active and reserve

acidity must be neutralized. Soil test labs determine buffering capacity and lime requirement by measuring or estimating the reserve acidity. This is typically accomplished by equilibrating the soil with a buffered solution and measuring pH (buffer pH). Some laboratories calculate lime requirement from pH and soil texture (estimated CEC and base saturation) while others make this determination based on extractable aluminum levels.

The neutralizing power of lime is determined by its calcium carbonate equivalence. Recommendations are based on an assumed calcium carbonate equivalence of 100. If your lime is lower than 100, you will need to apply more than the recommended amount, and if it is higher, you will need less. To determine the amount of lime to apply, divide the recommended amount by the percent calcium carbonate equivalence of your lime and multiply by 100. Your supplier can tell you the calcium carbonate equivalence of the lime you are purchasing. Wood ash is another amendment that may be used to manage soil acidity. The calcium carbonate equivalence of wood ash is typically around 50%, but it can vary widely. If purchasing wood ash from a supplier, they will provide a recent analysis. Otherwise the wood ash should be submitted to a lab offering lime analysis to determine the calcium carbonate equivalence.

The speed with which lime reacts in the soil is dependent on particle size and distribution in the soil. To determine fineness, lime particles are passed through sieves of various mesh sizes. A US Standard 10-mesh sieve has 100 openings per square inch while a 100-mesh sieve has 10,000 openings per square inch. Lime particles that pass through a 100-mesh sieve are very fine and will dissolve and react rapidly (within a few weeks). Coarser material in the 20- to 30-mesh range will react over a longer period, such as one to two years or more. Agricultural ground limestone contains both coarse and fine particles. About half of a typical ground limestone consists of particles fine enough to react within a few months, but to be certain you should obtain a physical analysis from your supplier. Super fine or pulverized lime is sometimes used for a "quick fix" because all of the particles are fine enough to react rapidly.

Lime will react most rapidly if it is thoroughly incorporated to achieve intimate contact with soil particles. This is best accomplished when lime is applied to a fairly dry soil and disked in (preferably twice). When spread on a damp soil, lime tends to cake up and doesn't mix well. A moldboard plow has little mixing action, therefore, disking is preferred.

Besides neutralizing acidity and raising soil pH, lime is also an important source of Ca and Mg for crop nutrition. It is important to select liming materials based on Ca and Mg soil content with the aim of achieving sufficient levels of each for crop nutrition. If the Mg level is low, a dolomitic lime (high magnesium lime) should be used; if Ca is below optimum a calcitic (low magnesium lime) should be used. If soil pH is high and Ca is needed, small amounts can be applied as calcium nitrate fertilizer (15% N, 19% Ca). Ca can also be supplied without affecting pH by applying calcium sulfate (gypsum) which contains 22% Ca or superphosphate (14% to 20% Ca).

*From the 2016-17 New England Vegetable Management Guide as reprinted in the **Vegetable Notes for Vegetable Farmers in Massachusetts**, Univ. of Mass. Extension, Vol. 28, Issue 23, October 6, 2016.*

Broad Mite... (continued from page 17)

Lancaster Farm and Home Center in Lancaster, PA. This year's program features an exciting array of topics presented by leading University researchers and bio-control practitioners from across the USA and Canada.

This year we are offering the traditional 2-day face-to-face conference and trade show at the Lancaster Farm and Home Center and a virtual live streaming option that affords you the opportunity to catch every session live from the comfort of your own office or living room via live conference streaming.

All program registrants will also be given a code that will allow them unlimited access to the conference recordings from our Penn State website in early January. If you miss the live streaming option, you will be able to view the recording for a fee. Information on how to access these recordings will be available this winter.

*Mr. Ford is with Penn State Extension in Cambria County. From the **Vegetable, Small Fruit and Mushroom Production News**, Penn State Extension, extension.psu.edu/plants/vegetable-fruit/news, October 20, 2016.*

Sweet Potato Harvest and Storage

Sweet potato acreage is steadily increasing in New England as it becomes clear that this crop can yield well, store well, and has a strong market. The sweet potato's harvest and storage needs differ from other common New England root crops. Once harvest is completed—generally by early to mid-October—curing and storage issues continue to be important.

Sweet potato roots continue to grow until the leaves are killed by frost or until soil temperatures fall consistently below 65°F, whichever comes first. Time of harvest is often determined by digging up a few representative plants and determining the percentage of roots in different size classes. The crop can be harvested whenever the majority of the roots are the desired size. When tops of the plants turn black after the first frost, it is imperative to harvest as quickly as possible regardless of root size. Chilling injury can occur in the soil, if soil temperatures drop to 55°F or below. It is also important to avoid holding sweet potatoes in saturated, low-oxygen soil conditions prior to harvest, because this promotes rapid decay in storage.

Sweet potatoes are very susceptible to damage at harvest. Sweet potato roots do not have a thick protective outer layer of cells such as that on white potato tubers. Abrasions and wounds can lead to rots in storage. Curing immediately after harvest is recommended when sweet potatoes will be held in storage for retail or wholesale sales.

Curing minimizes damage and loss during storage by healing harvest wounds. To cure, maintain roots in temperatures between 80°F to 86°F and a high relative humidity (85-95% RH) for 4 to 7 days. Respiration rate is high during curing, so ventilation is important to remove CO₂ and replenish O₂. This forms

a corky periderm layer below the damaged areas which limits microbial invasion and water loss. A greenhouse can provide good curing conditions.

A freshly harvested sweet potato is more starchy than it is sweet. During curing and storage, starches in the sweet potato are converted to sugars, improving flavor. The change in sugars is measurable within one week, but it is recommended to wait at least three weeks after harvest before consuming sweet potatoes to permit the starches to convert to sugars for maximum eating quality.

Sweet potatoes can maintain excellent quality for up to a year in proper storage conditions. The ideal storage conditions for sweet potato are the same as for winter squash; moderately warm (55-60°F) at 60-75% relative humidity. Like winter squash, sweet potato suffers chilling injury at temperatures below 55 F and grows more severe at lower temperatures or longer periods of exposure. Signs of chilling injury include shriveling, sunken, dark areas on the tuber surface, and blackening of tubers when cut open. 'Hardcore' is a physiological disorder cause by chilling, in which areas of the tuber become hard – but this condition only appears after cooking. Because chilling injury is irreversible and makes tubers unmarketable, growers should take particular care to avoid field, curing or storage conditions that dip below 55°F.

Yield studies were conducted for several years by Becky Sideman at University of New Hampshire. Best yields were found in Beaugard, Covington and O'Henry (a white-fleshed variety). A good yield was 2.5 lbs per plant; equivalent to >65 lbs

(continued on page 20)

HEALTHY PREDATORS, PARASITES ON PATROL

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VEGETABLE PRODUCTION

The Insidious Disease: Phytophthora Blight

John Esslinger

Phytophthora is on the move and it continues to infect new farms every year.

If you are not familiar with *Phytophthora* blight, it is a soil borne oomycete disease that affects many vegetable crops but primarily pepper and crops in the cucurbit family like pumpkins, winter squash, and melons. It may be the worst disease vegetable growers can encounter. It can be bad enough that some growers consider selling their *Phytophthora* infested farms and moving to a “clean” farm. One grower who had losses resulting from *Phytophthora* for the first time recently lamented “we had a good reputation with buyers at the auction before this. Now several of them are asking for their money back”.

Why is this disease so bad?

Phytophthora has the ability to stay in your soil for seven or more years because it produces survival structures enabling it

Sweet Potato... (continued from page 19)

per 20 row-feet, assuming 9 inch spacing between plants in a single row.

Tuber damage from wireworms can occur during the growing season and reduce marketability. More work needs to be done to understand which species is causing the damage, but likely candidates are corn wireworm (*Malanotus communis*) or wheat wireworm (*Agriotes mancus*). Both feed on roots, stems, stolons and tubers and are pests of potato, sweet potato, other non-root vegetable crops, and grains such as wheat and oat as well as sod and grassy cover crops such as Sudangrass. Adults are most active in spring (April-June). Eggs are laid in soil and larvae feed and develop for 2, 3 or 4 years. They can survive periods without food—essentially waiting for new crops to come along. Corn wireworm adults may be especially attracted to grassy cover crops such as Sudan thus keeping fields free of those during peak egg laying is advisable. It is difficult to trace the history and cause of wireworm damage, because it is often 2-4 years after eggs are laid before the damage becomes noticeable or serious. Damage is likely to be worst when larvae are nearly full grown. There are baiting methods to sample for larvae before planting. Corn wireworm larvae are also favored by wet soil conditions thus damage may be heavier in wet areas.

Voles love sweet potatoes and can take up residence in the sweet potato field, causing significant damage. Voles may be deterred by a clean cultivated border around the planting, and keeping nearby areas weed-free or well mowed to minimize good hiding areas. Timely harvest may reduce the level of damage. Watch storage for vole activity after harvest.

Reports on Becky Sideman’s sweet potato work can be found at <http://www.mofga.org/Publications/MaineOrganicFarmerGardener/Spring2009/SweetPotatoes/tabid/1081/Default.aspx> and in the related fact sheet, Growing Sweet Potatoes in New Hampshire.

Adapted by Ruth Hazzard from the Sweet Potato section of the **New England Vegetable Management Guide**, [nevegetable.org](http://www.nevegetable.org); articles by Becky Sideman, UNH Cooperative Extension; wireworm information from J. Capinera **Handbook of Vegetable Pests** as reprinted in the **Vegetable Notes for Vegetable Farmers in Massachusetts**, Univ. of Mass. Extension, Vol. 28, Issue 23, October 6, 2016.



Phytophthora infected pumpkin

(http://extension.psu.edu/plants/vegetable-fruit/news/2016/the-insidious-disease-phytophthora-blight/image_galleryzoom)

to survive even when peppers and cucurbit crops are not planted. It waits “dormant” in the soil until a susceptible crop is planted and the soil moisture conditions are right. Even if you have *Phytophthora* in your soils, in a dry year, you might not experience any losses, however when the soil moisture becomes excessive at any point in the season, *Phytophthora* goes to work.

In pumpkin and winter squash fields the first symptom you may notice is your plants are starting to wilt, especially in the low areas of your field. You will then see fruit that is touching the soil start to rot. The rot will start where the fruit touches the soil and slowly move up the fruit. The rot is soft, giving a water-soaked appearance, and the fruit will then collapse. You may also notice a white growth on the rotting fruit. These are the reproductive structures (or spores) of *Phytophthora* that help it spread in the field especially when it is wet.

There are several soil borne diseases that affect vegetable crops but *Phytophthora* is the only one that has the white mold on the rotting fruit. It often looks like a dense coating of powder sugar on the fruit surface. The symptoms in pepper fields are similar but you will probably see the white mold growing on the stem close to the soil line of wilted plants before you will see the fruit rot. Infected fruit often breaks down quickly when stored in bins.

If that is not bad enough, *Phytophthora* has the ability to live in water including irrigation water. If water runs from an infected field it will carry the *Phytophthora* spores with it. If that water ends up in a pond used for irrigation the spores can be distributed to all of the fields being irrigated from that pond. It also moves with soil. I’ve seen *Phytophthora* moved onto a previously clean farm when a transplanter was borrowed from an infected farm. It can also move with other farm equipment also, like sprayers or even on muddy boots.

Another common way *Phytophthora* moves onto a farm is on infected fruit. If you take possession of produce from another farm, never put any of the unsold fruit in your fields, especially if it is starting to decay. It is not uncommon to see *Phytophthora* in the fields closest to the packing shed where fruit were casually discarded.

(continued on page 21)

VEGETABLE PRODUCTION

The Insidious Disease... (continued from page 20)

Management

Do everything you can to keep it from coming onto your farm. If you share equipment take the time to thoroughly clean it in a non-production area before taking it to your field. That includes irrigation pumps, lay flat, stakes, etc. If you are sharing equipment with a farm that has had a history of *Phytophthora*, you may want to rethink that. Don't put decaying produce from other farms in your fields. Maintain a good level of organic matter in your soil. Beneficial micro-organisms will compete with the disease causing organisms.

What can you do if *Phytophthora* is already on your farm? Do what you can to avoid your soil becoming saturated. Raised beds help. Deep tillage, like subsoiling, allows excess water to drain away, reducing the opportunity for infection. Minimize water between fields by planting grass strips and maintaining field access roads. Use tolerant varieties when available. Tolerance means the infection will be less severe or spread more slowly, not that an infection can't happen.

Currently, the more tolerant varieties of pepper include Paladin, Aristotle, Vanguard and Intruder. In university trials, Revolution and Declaration have shown more variability in tolerance depending on the season. Hard-rind pumpkins are slightly less susceptible. What you shouldn't do is assume that you can control this disease with fungicides. Fungicides may help reduce the severity of the infection but they are not a silver bullet. One grower used Orondis Gold 200 tank mixed with Ridomil Gold (Section 2ee label for this tank mix in PA and other states) through his drip irrigation system the first week in August and felt it helped keep the *Phytophthora* from spreading the rest of the summer.

- Learn to identify the symptoms of *Phytophthora* blight.
- Find out if it is on farms near you. Be proactive in keeping it off your farm. Management tools are limited once it is established.
- Incorporate the good soil management practices mentioned.
- Carefully clean your equipment before moving to a *Phytophthora* free field.
- Dispose of decaying produce where it can't infect new areas.
- Use tolerant varieties when they are available.
- Manage irrigation to avoid over watering.
- Fix leaks quickly.
- Keep field runoff from entering irrigation ponds.

Using Fungicides

Be ready to use fungicides like Revus, Ranman, Presidio, Forum, Tanos or Orondis Gold 200, that work against oomycete diseases. If making multiple fungicide applications, make sure to rotate between different FRAC codes for resistance management.

Some *Phytophthora* strains can be managed with mefenoxam, the active ingredient in Ridomil Gold, however, research conducted in Montour County in 2013 showed that mefenoxam had no effect on managing the *Phytophthora* on that farm. This has also been observed in many fields

in New York. Research on the ability of fungicides to manage *Phytophthora* is ongoing. Check the most recent Mid-Atlantic Vegetable Production Recommendations for the latest recommendations.

Mr. Esslinger is with Penn State Extension in the Central Susquehanna Counties. From the Vegetable, Small Fruit and Mushroom Production News, Penn State Extension, extension.psu.edu/plants/vegetable-fruit/news, October 18, 2016.

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VEGETABLE PRODUCTION

Summer to Fall Seeding for Winter Markets

Many farmers in Massachusetts are now commonly extending their harvest season into the fall and even over the winter. With the drought this year hurting summer yields, some may be interested in recouping some of those losses this winter, by seeding crops now through the fall, especially if irrigation and appropriate cover is available. If you are interested in trying some fall and winter crops, it's not too late! *[This article was originally published in August and is written for Massachusetts growers. Obviously, its suggestions with some adjustments for a warmer climate in Pennsylvania can help growers plan for next winter.]*

Field: At this point in the season, the options include direct seeding leafy crops or small, fast-growing root crops in the field. Here are some crops suggested by Danya Teitlebaum of Queens Greens in Massachusetts to seed by mid-August for a fall harvest.

Roots: Hakurei turnips, radishes and fast-growing beet varieties for bunching.

Leaves: Lettuce, mustard greens & other Asian bunching greens, arugula, kale, chard, spinach, bok choy.

Herbs: Cilantro, parsley and dill.

For growing outside in the open or with protection from hoops and row cover, seeding and transplanting could be done through around mid-September — depending on your location. Growth rates decline rapidly this time of year, as day length shortens and temperatures gradually drop. These crops would be ready for harvest from October through November.



This spinach transplanted into high tunnels in August and September improved yields over direct seeded spinach that germinated poorly during high heat.

High Tunnel: For production in high tunnels for late fall, winter, or spring harvest, seeding or transplanting may go even later. Transplanting can give you a 3-week head start which may be needed when a tunnel is occupied with tomatoes until October. When planning your plantings and choosing seed, look for varieties that are specifically labeled to be cold hardy. In winter high tunnels, they will be subjected to sub-freezing temperatures and multiple freeze-thaw cycles. Some crops will only be in the ground for a relatively short time, while others will need longer to mature for harvest. Below are some good variety choices in each category:

Suggestions for shorter residency varieties:

Spinach: Space, Tyee (see research reports below for more recommended varieties)

Brassica greens: Red Russian Kale, Tatsoi, Komatsuna, Mizuna, Green Wave Bok Choi: Black Summer, Mei Qing Choi

Lettuce: Tango, Red Salad Bowl, Rouge, D'Hiver Claytonia

Suggestions for longer residency varieties:

Radish: Tinto, Cherriette, D'Avignon

Beet: Red Ace, Merlin, Touchstone Gold

Chard: Fordhook Giant

Leek: Tadorna

Scallion: White Spear

Turnip: Hakurei

Carrot: Napoli, Mokum, Nelson

Kale: Winterbor, Redbor, Toscano, Siberian, Red Russian

Collards: Champion

Head Lettuce: Scyphos, Ermosa, Winter Density

"Days to maturity" are longer as the daylight hours get shorter and temperatures drop. The date that crops are seeded, the climate in your growing zone, the microclimate both on your farm and inside of a tunnel, and the severity of the weather in a given year will all affect plant growth and survival. Short intervals between seeding dates become longer intervals between harvest dates. Cutting-lettuce and cutting-brassica crops need many seeding dates at close intervals. Full-sized kale, chard, collards, spinach — plants where you harvest the outer leaves only — need 1 or 2 seeding dates. Some farmers have had success planting during the period with less than 10 hours of daylight — in New England, this is from around the second week in November to the fourth week in January — but there are also reports of poor germination and early bolting. Good record keeping over the years will help you to develop a fall seeding schedule that is specific for your farm.

See Table 1 for seeding date recommendations from Eliot Coleman in Maine. Here in Massachusetts, we may experiment with later planting dates as confirmed by research conducted in New Hampshire by Becky Sideman and Kaitlyn Orde. Also, Johnny's Selected Seeds has developed a useful tool at <http://www.johnnyseeds.com/t-InteractiveTools.aspx> to calculate fall seeding dates for your area.

Becky Sideman and her team at the University of New Hampshire have conducted research over the past several years on high tunnel spinach and low and high tunnel onion production. Here are their most recent research updates:

Winter Spinach Production in Unheated High Tunnels:

Over the two winters of 2014-15 and 2015-16, we conducted studies focused on fall-planted spinach in unheated high tunnels. This work was done in Durham NH at the Agricultural Experiment Station's Woodman Farm. We looked at several different planting dates and varieties, to determine effects of planting date and variety on total season-long yield. Graduate student Kaitlyn Orde has just finished preparing a new research report that describes what we've learned. In general, September transplant dates resulted in much higher yields than later transplant dates, and these plantings started producing marketable yields by late fall. Transplanting from mid-October through early November resulted in good spring yields, but these plantings did not produce before spring. A few varieties stood out as particularly low and particularly high yielding, but

(continued on page 23)

POTATO PRODUCTION

Identifying Potato Tuber Diseases

Susan B. Scheufele

Potato harvest is underway. There are many diseases that affect potato tubers so as you begin to sort through your potato harvest this year, take a moment to check for disease symptoms. Proper identification will help you decide which tubers will store well and which should be sold as tablestock, and will give you a better idea of which soil-borne diseases are present in your fields, improving your future crop rotations.



Common Scab, R.W. Samson

Common Scab (*Streptomyces* spp.) produces tan to dark brown, circular or irregular lesions which are rough in texture. Scab may be superficial (russet scab), slightly raised (erumpent scab), or sunken (pitted scab). The type of lesion is dependent on potato cultivar, tuber maturity at infection, organic matter content of soil, strain of the pathogen, and the environment. Common scab is controlled or greatly suppressed at soil pH levels of 5.2 or lower, though a closely related but less common species of *Streptomyces* known as acid scab can survive down to 4.0.



Early blight symptoms on tuber, S. Jensen

(continued on page 24)

VEGETABLE PRODUCTION

Summer to Fall... (continued from page 22)

Summer-Fall seeding for Winter Markets on a 44 th Parallel Vegetable Farm in Maine (Eliot Coleman)			
T/D ¹	Crop	Sowing Dates	Notes
D	Arugula	8/29 -9/16, and 9/22-10/2	Sow successions every 2 days until 9/16 for outdoor fall harvest and sow in late September in unheated high tunnel for winter harvest
T	Beets	7/5, 7/19, 7/26, 8/2	Sow early July for storage and later for outdoor harvested baby beets
D	Carrots	7/5, 7/28, 8/4 -8/15	Sow early July for storage and later for fall and winter markets. Cover after November 1 st and harvest before February to preserve sweetness
T	Kale	7/16, 8/1, 8/13, 8/27	Sow July for outdoor fall harvest, and mid-late August in high tunnels and greenhouses for winter harvests
T	Lettuce	8/12 -9/9	Sow outdoor and under cover. Baby leaf is available outdoors from sowings made as late as 9/6
T	Onion	8/25 ²	For low tunnel overwintered onions
T	Scallion	7/21, 8/1, 8/8	For fall harvest
D	Spinach	8/16-9/3 and 9/15 -9/21 ³	Sow in August for harvest outdoors until thanksgiving. Sow in September for over wintering in high tunnels
D	Turnip	8/22-9/9 and 9/20 -10/13	Sow late August and cover with low tunnels for winter harvest. Sow in September-October in greenhouses for harvest until Christmas.

¹ T = transplant D = direct seeded.

² Note: in New Hampshire trials, the highest low tunnel yields came from onions seeded mid-August and transplanted September 15-October 1.

³ Note: in New Hampshire trials, transplanting spinach was recommended for August-September high tunnel plantings to overcome VERY poor germination in high heat. Also, planting until late October did not compromise spring yields.

Table 1. Eliot Coleman's seeding dates for winter growing.

more important were qualitative differences in leaf shape, ease of harvest, etcetera . You can read the full report at http://extension.unh.edu/resources/files/Resource006103_Rep8625.pdf. Becky Sideman, Univ. of New Hampshire Extension

Overwintering Onions for Spring Harvest: For those who are considering growing fall-planted onions for overwintering, it's time to begin planting soon! In our experiments, we looked at several different varieties of onions at several planting dates, to narrow down the best time of planting and find new varieties (especially red ones) that will perform well in this system. We evaluated onions in high tunnels and low tunnels to determine whether onions might mature much earlier in high tunnels. Here's a brief synopsis of what we found: First of all, we did find a couple of promising red varieties. Also, we found that varieties varied greatly in terms of sensitivity to bolting. Planting early increased the chances of bolting in general, but for the most bolting-resistant varieties, planting early resulted in earlier maturity and bigger bulbs. To learn more, check out the full report at http://extension.unh.edu/resources/files/Resource_005477_Rep7652.pdf. Becky Sideman, Univ. of New Hampshire Extension Compiled by K. Campbell-Nelson, 2016, from

Danya Teitlebaum, Queens Greens, Hadley MA; Eliot Coleman Four Season Farm, Harborside ME; Becky Sideman and Kaitlyn Orde, University of New Hampshire Extension. From Vegetable Notes for Vegetable Farmers in Massachusetts, Univ. of Mass., Vol. 28, No. 17, August 4, 2016.

POTATO PRODUCTION

Identifying Potato... (continued from page 23)

Early blight (*Alternaria solani*) usually affects potato foliage but tuber infections can also occur. Tuber lesions are dark, sunken, and circular often bordered by purple to gray raised tissue. The underlying flesh is dry, leathery, and brown. Lesions can increase in size during storage and tubers become shriveled.

Fusarium Dry Rot (*Fusarium* spp.) causes internal light to dark brown or black dry rot of the potato tuber. The rot may develop at an injury site such as a bruise or cut. The pathogen penetrates the tuber, often rotting out the center. Extensive rotting causes the tissue to shrink and collapse, usually leaving a dark sunken area on the outside of the tuber and internal cavities.

Black Dot (*Colletotrichum coccodes*) On potato foliage symptoms are nearly indistinguishable from early blight and on tubers it produces tiny black sclerotia (fungal resting structures). Symptoms on tubers can be easily mistaken for silver scurf.

Silver Scurf (*Helminthosporium solani*) affects only tuber periderm (skin). Lesions are initiated at the stolon end as small pale brown spots which may be difficult to detect at harvest but will continue to develop in storage. In storage, lesions may darken and the skin may slough off and many small circular lesions may coalesce to form large affected areas. Tubers may also become dried out and wrinkled due to excessive moisture loss in storage.

Black Scurf and Rhizoctonia Canker (*Rhizoctonia solani*) Black scurf is purely cosmetic and does not reduce yield, even in storage. Irregular, black hard masses on the tuber surface are overwintering structures (sclerotia) of the fungus. Presence of these sclerotia may be minimized

by harvesting tubers soon after vine-kill and skin set. While the sclerotia themselves do not cause damage, they allow the pathogen to survive in the soil and serve as evidence of its presence. In cool, wet soils, *R. solani* can cause dark, sunken lesions on underground sprouts and stolons. These lesions can cut off the supply of nutrients, killing tubers, or can reduce the transfer of starches to the tubers, reducing their size. Cankers



Fusarium dry rot, C. Averre



Black scurf, G. Holmes



Rhizoctonia canker, Clemson Univ.

can also form on the tubers themselves, usually at the stolon or in lenticels. Cankers on tubers which can be small and superficial but may be large, sunken and necrotic.

Pink Rot (*Phytophthora erythroseptica*) and **Pythium Leak** (*Pythium* spp.) Pink rot infections start at the stolon end and result in rotten and discolored periderm with a clear delineation between healthy and diseased tissue. When exposed to air, tuber flesh turns pink and then brown-black. *Pythium* spp. that cause leak infections invade tubers through harvest wounds and continue to develop in transit and storage.

Infections result in internal watery, gray or brown rot with well-defined red-brown lines delineating healthy and diseased tissue.

Late Blight (*Phytophthora infestans*) affects potato foliage and tubers. Foliar symptoms start with brown to black, water soaked lesions on leaves and stems which produce visible white sporulation at the lesion margins under humid conditions. Whole plants and fields may collapse rapidly. Tuber infection is initiated by sporangia from foliage being washed down into the soil and usually begins in wounds, eyes, or lenticels. Lesions are copper brown, red or purplish and white sporulation may occur on tuber surfaces in storage or cull piles. Infected tubers are susceptible to infection by soft rot bacteria which can turn entire bins of potatoes in storage into a smelly, rotten mass.

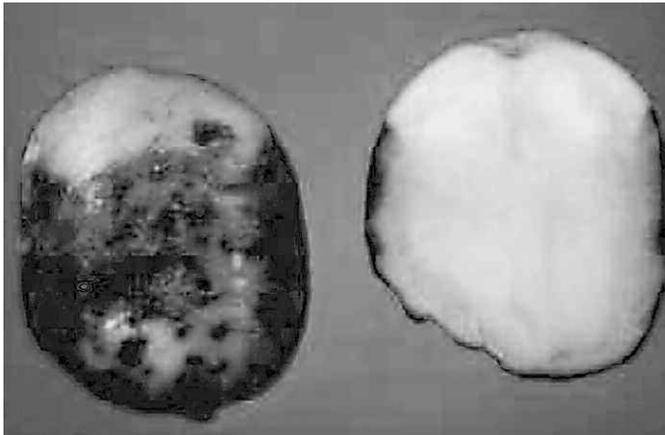
Potato Virus Y can cause necrotic ring spots on tubers, depending on which strain of the virus is present, which potato variety is grown, and the time of infection. Affected tubers have roughened rings of darker brown or reddened skin. Necrosis beneath the rings may extend into the tuber flesh. Necrotic symptoms in tubers often increase after storage. Potato varieties vary in their susceptibility to PVY and the symptoms they exhibit on foliage and on tubers; Yukon Gold is particularly susceptible to tuber necrosis.

(continued on page 25)

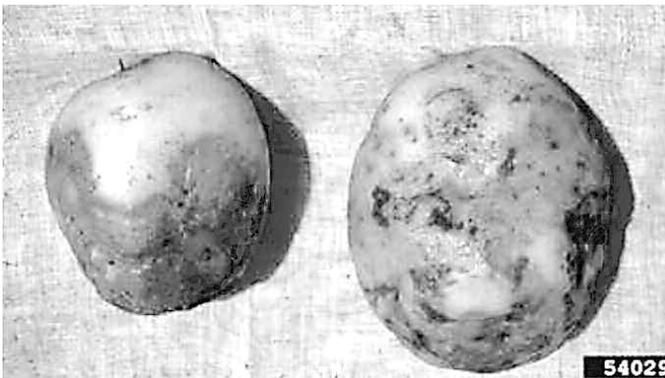


POTATO PRODUCTION

Identifying Potato... (continued from page 24)



Pink rot, UMN



Late blight, R.W. Samson

Physiological Disorders

Black Heart is caused by lack of oxygen during storage which causes the tissue to die from the inside out and turn black. The condition is not reversible but if you notice it quickly and correct your storage conditions you can prevent the whole crop from being affected.

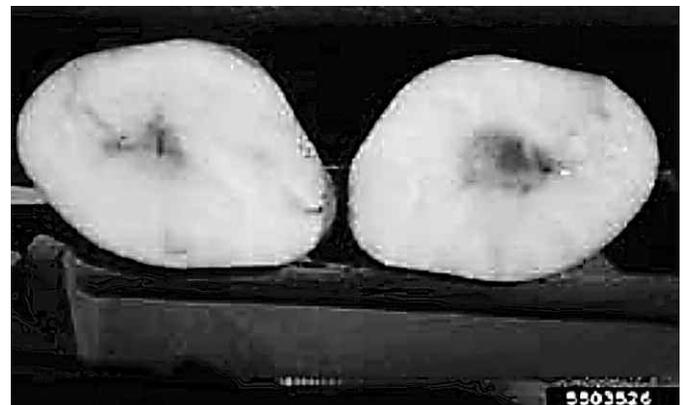
Brown Center and Hollow Heart are internal physiological disorders of potato which often occur together. Brown center is an area of dead pith cells which turn brown, while hollow heart is a star- or lens-shaped hollow area in the center of the tuber. These disorders make fresh-market tubers unattractive and can reduce repeat sales. Severe hollow heart negatively impacts the quality of chip-processing potatoes and can result in shipments not making grade. Both disorders are related to stress, and occur at a higher incidence when growing conditions abruptly change during the season. Brown center and hollow heart likely form during tuber initiation but could also form during tuber bulking. If the disorder occurs during the early part of the season, then it is most often preceded by brown center and forms in the stem-end of the tuber, while late-forming hollow heart usually occurs near the bud-end with no brown center symptoms occurring. Conditions such as when soil temperatures are less than 56°F for 5–8 straight days, or when available soil moisture is greater than 80% cause brown center to start forming. Incidence of brown center and hollow heart also increases with periods of stress caused by high or low soil moisture, especially if heavy rains occur suddenly after a dry spell. Large tubers are more prone to develop the disorder, so using

closer spacing and making sure not to have too many skips in the row can reduce incidence of brown center and hollow heart. There are also differences in the susceptibility of potato varieties: 'Atlantic', a widely grown potato for chip processing, is relatively susceptible to both disorders. In 'Russet Burbank', susceptibility to both brown center and hollow heart is highest soon after tuber initiation when the tubers are small.

*Ms. Scheufele is with the Univ. of Massachusetts Vegetable Program. From **Vegetable Notes for Vegetable Farmers in Massachusetts**, Univ. of Mass. Extension, Vol. 28, No. 21, September 1, 2016.*



Necrotic strain of PVY on Yukon Gold tuber, potatovirus.org



Hollow heart, B. Phillips

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BERRY PRODUCTION

Primocane-Fruiting Blackberries: The Story Grows

John R. Clark

Background

Many of you have heard me tell the story of how primocane-fruited (PF) blackberries came about (some, many times). The short version of the story is that a wild plant was found by L.G. Hillquist in Ashland, VA that exhibited PF. Although never released as a variety, "Hillquist" made its way to Arkansas and was used in a 1967 cross in the Arkansas blackberry breeding program. The one plant selected from this cross did not primocane fruit. In the 1990s, this selection was used in an investigation of PF inheritance by Jim Moore's last graduate student, Jose Lopez Medina. Thousands of seedlings were grown in his study, and in 1997, 14 were selected that exhibited PF. I felt honored to be involved with what I believed would be blackberry-world-changing technology. And as I write this 19 years later, this is becoming true: there are thousands and thousands of PF blackberry plants in the ground now.

The berries produced on these plants were not impressive. They were small, often misshapen, variable in color, and not very good in flavor. In 2000, I sent two of these selections to my good friend and collaborator, Chad Finn with USDA-ARS in Oregon. I viewed these plants in mid-October 2001 and I could not believe my eyes! It was two weeks before Halloween, a misty, cool day, and the plants had lots of very large berries that ranged from overripe to green, plus flowers and buds still developing. I came home excited. I had seen the future, and it was looking good.

I had begun to make crosses with the original 14 selections, and in 2000 I saw the first seedlings from these crosses. I examined the unirrigated seedling field in late June and there were primocane flowers produced on many seedlings. I went back a few weeks later to see how the berries were developing, and the field was a dismal sight—berries were often dried up, flowers dead, and few new flowers were developing.

What was the problem with these plants in Arkansas? My thinking was that it is too hot for these plants to bloom and set fruit in the Arkansas environment. I decided that about 90°F and above for a week or more resulted in major consequences on these flowering and fruiting variables.

In 2005, Michele Stanton and advisor Joe Scheerens at the Ohio State University conducted a study that used the first two PF varieties ever released, Prime-Jan® and Prime Jim®, which had been introduced in 2004. They subjected the plants to 75°, 85°, and 95°F temperatures in growth chambers, and found as temperature increased, flowering was greatly impacted. They measured an immense array of variables, but their major findings matched up quite well with my hunch. Now, years later, I still think that approximately 90°F or above for multiple days contributes to limiting PF blackberry performance.

Live and Learn

After seeing that dismal seedling field in 2000, I thought about dropping the whole idea of breeding PF blackberries. But, I had followed the impact PF had on red raspberries and could not let go of the idea of what an innovation this would be for blackberries. If I was going to pursue PF blackberries in Arkansas, I needed to figure out a way to see fruit if I was to select improved offspring. I decided two things: one was to select based on floricanes fruits, and second was to plant on a site with irrigation and better care than the first seedlings were provided. I had noticed that the floricanes fruits of the PF selec-

tions were much like floricanes fruits of our standard, floricanefruiting (FF) blackberries, so it made sense to evaluate PF blackberries on floricanes also. In June 2002 I was evaluating seedlings from another round of crosses of the first PF selections and I got mighty excited looking at the performance of many progeny on floricanes. One population of seedlings (one cross) produced an array of great offspring, and one of these became Prime-Ark® 45, released in 2009. It produced primocane flowers, so I knew that it was PF. In Arkansas; the PF berries were small and misshapen, much like was seen before. However, testing in coastal California found that the primocanes yielded great quantities of large berries. At the same time, I found that it produced a tremendous yield of floricanes berries in Arkansas and a measurable yield of primocane berries in some years, which could be of quite good quality and size in more "moderate" summers.

Further Progress

The Arkansas breeding program has been vigorously crossing and selecting PF blackberries since the early 2000s. Great progress has been made in enhancing fruit quality, incorporating thornlessness with PF, and expanding other desirable traits in the PF package, leading to the release of Prime-Ark® Freedom in 2012 and Prime-Ark® Traveler in 2014. These varieties are both thornless; the former targeted primarily for the home-garden market, the latter for commercial shipping. However, breeding for heat tolerance has proven to be a challenge. These PF varieties still only perform well in Arkansas in years with mild summers.

Several proprietary varieties have also been developed that are now in commercial production, and these are a result of cooperation between the University of Arkansas and private entities. These, plus the Arkansas developments, will lead the further expansion in the years to come. And, additional breeding programs will begin to focus on this crop since the parents and genes for PF and other traits are now in the public domain.

Commercial Value of Primocane-fruited Blackberries

Far and away, PF blackberries are most important in coastal California. So far, I have not found a better environment for this plant in the world. The moderate summer temperatures, very long growing season, and warm fall all contribute to the perfect environment for this plant. Prime-Ark® 45 is the most widely planted and marketed thus far. However, the Driscoll Elvira has recently been widely planted also. These two lead the way but others are coming that have potential to complement what is being grown. With the hundreds of acres in place now, California leads the world in PF blackberry production. And, with the good prices for blackberries (particularly compared to red raspberries), growers have migrated to this crop more heavily in the last two years. There is significant production now that is marketed between mid-August and late October.

Most of the production is on primocanes, although some innovative growers are utilizing floricanes on Prime-Ark® 45 to attain an early summer crop, thus double-cropping the plants. This practice takes close management to carry out well. An exciting finding has been that primocane-only production seems

(continued on page 27)

BERRY PRODUCTION

CLASSIFIED

Primocane-Fruiting... (continued from page 26)

to be avoiding red berry mite infestation of the berries, a very major issue in California.

I have not heard much about production of PF blackberries in the Midwest or Northeast. I welcome comments if this type of plant has had success there. The upper Midwest and Northeast have a season that is usually too short to ripen the fall crop. [Kathleen Demchak, small fruit specialist at Penn State notes that the PF blackberries can produce in Pennsylvania when grown in high tunnels.]

*Dr. Clark is with the Univ. of Arkansas. From **The Bramble**, North American Raspberry and Blackberry Assn., Vol. 31, Issue 2, Summer 2016.*

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