UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

Volume 25, Number 21 September 26, 2013

In this issue:

Crop conditions

This has been a beautiful week for harvest work! Farmers are busy harvesting fall crops such as leeks, lettuce, carrots, cabbage, turnips, parsnips, bok choy, broccoli all while keeping an eye on temperatures to determine the best time to bring in squash and root crops. Make sure your fall storage units are clean, tight, and ready to provide appropriate temperature, humidity and ventilation for their target crops. This past week has seen frost advisories across the state however the National Weather Service predicts that Massachusetts will make it into October without a hard killing frost. Temperatures below 40F have been good for bringing in root crops. August rains set off fruit rots in winter squash fields including *Pythium* spp., *Fusarium* spp. and *Phytophthora capsici*, reducing harvest yields that are only now being measured. Though winter squash and pumpkin yields are generally lower this year, September has provided good conditions for final growth and maturity of good quality fruit. Potato harvest is ongoing and generally in good shape as late blight was not found on MA potatoes until Mid-September. Many tomato fields have retired for the season due to late blight, bacterial spot, early blight and Septoria infections earlier this season. Growers are tending their late plantings of carrots, beets, cabbage, Brussels sprouts and leeks, hoping for weather conditions that will keep them growing to be ready for markets and storage in November and December. Now is when broccoli, cauliflower, kale and cabbage are at their best although disease pressure from downy mildew, Alternaria and black rot have taken a toll in some fields and on some varieties. Farms that are gearing up for winter greens harvests are busy planting with an eye to the shortening days and the key timing for winter and early spring harvests in low or high tunnels. Cover crops are becoming well established. It's not too late to get in fall cover crops – there is still time for germination and growth.

Leek harvest is in full swing in MA.

Publication of Vegetable Notes will continue monthly through the winter and this is our last biweekly publication. Many thanks to all of the growers, consultants, and Extension colleagues around the region whose contributions made our weekly Vegetable Notes possible!

Pest alerts

Downy mildews are present in Brassicas, basil, and cucurbits (including pumpkins and winter squash).

Caterpillars are still active in Brassicas and pose a risk to cabbage and broccoli heads as they form. As the weather cools off, apply sprays in the morning to maximize exposure when caterpillars are actively feeding.

Cabbage aphids can explode in Brussels sprouts at this time and seem to have a special affinity for this crop. Many products are available (see http://nevegetable.org/crops/insect-control-3) but need to be applied when populations are

low. It's no fun to discover that sprouts are covered with aphids when the crop is finally ready after four months in the field. Use high pressure or drop nozzles to achieve good coverage of sprouts; removing lower leaves may also help with coverage.

Gray Mold on Garlic. Ann Hazelrig, plant pathologist for UVM, reports seeing lots of garlic with botrytis gray mold covering the cloves forming a mat-like growth between cloves. You can't see this without pulling apart the bulbs. This is primarily a storage problem and often indicates improper drying with too high humidity. Do not sell or use infected/damaged cloves for seed.

Late blight has been present in tomatoes on some farms, and is most likely present in home gardens across New England. The most important concern is to prevent overwintering of live, infected tomato plant tissue. Given the ever-wider use of high tunnels and greenhouses for tomato production, especially to extend the season into the fall, growers and gardeners must pay special attention to cleaning out all residue and disposing of it where it will freeze hard or decompose completely. Late blight is generally less severe in greenhouses, but there definitely are some infected crops in high tunnels and greenhouses--so the risk of overwintering is present. Incorporating infected tomato stems in high tunnels then seeding greens for the winter poses some risk. As we know from this season, even in a dry year late blight can gain a foothold and spread widely.

The cooler weather has slowed the spread of late blight but late blight models recommend a 7 day spray schedule (based on using a chlorothalonil fungicide on a susceptible variety) for most of the state. If your tomato plants are still producing, continued sprays are warranted. New outbreaks of late blight were reported in the past week, especially where spray intervals had been extended.

White mold caused by *Sclerotinia sclerotiorum* is showing up in wetter areas of tomato greenhouses. Wilting of the plant may be the first thing noticed. Look lower in the plant for a brown, woody, stem lesion. There may be a fluffy, white mycelia on the stem associated with the infected area. If you cut open the stem lesion you will see lots of black, hard sclerotia (resembling mouse droppings.) If these hardy, overwintering structures make it into the soil they can persist there for many years and strike again when conditions are right. To prevent buildup of white mold in your greenhouse, cut the affected plant off at the soil line, bag and remove plant material, and bury or landfill. (from Ann Hazelrig, UVM)

Spotted wing drosophila As fruit crops decline and temperatures drop, SWD is likely to build up in greenhouse/high tunnel tomatoes. Any fruit with cracks is fair game for SWD egg-laying, and will result in the same liquefying action that has become all too familiar in small fruits. Sound fruit should be safe. Clean up overripe fruit, and clean out the crop as soon as it's useful life is over to avoid letting your greenhouse serve as a late-season boost for this pest.

Squash/Pumpkins that have colored up should not be left out in the field. Each cool night will damage the fruit making it more susceptible to storage problems later. Also, rains increase in the fall and saturated soils are perfect for development of Phytophthora and other fruit rots on all squash varieties. http://vegetablemdonline.ppath.cornell.edu/factsheets/Cucurbit_FrtRots.htm

PARASITOID SUPPRESSES IMPORTED CABBAGEWORM

History of project. Cole crop growers in the Northeast traditionally have had to control imported cabbageworm (*Pieris rapae*) in their broccoli, Brussels sprouts, cabbage and other Brassicas. In 1988, UMass Entomologist Roy Van Driesche imported and released a parasitoid of this pest from China. This braconid wasp (*Cotesia rubecula*) established and spread and in spring of 2007, he measured its presence in organic, conventional and home garden cole crops in MA and found that *C. rubecula* was present at all 20 sites in the survey, with high levels of parasitism (75%, averaged over all 20 sites). Because this parasitoid kills caterpillars when they are less than 1/3 grown (4th instar larvae), over 70% of the damage that might be done by a healthy caterpillar is prevented. In the 2007 survey, only 10% of the larvae encountered had reached the highly damaging mature stage (5th instars) that does most of the feeding. Additionally in the 2007 survey, he found that the once common parasitoid, *Cotesia glomerata* had been largely replaced in the spring by the newer, more effective species, *C. rubecula*. Over 99% of all *P. rapae* parasitoids recovered in the spring 2007 survey were *C. rubecula*.

Photo 1. Cotesia rubecula larva emerged from within ICW.

2009 late-summer survey: The 2007 surveys were all done in May and June, during the

Photo 2. Cotesia rubecula coccoon and ICW larvae.

first generation of *P. rapae* caterpillars. The question remained whether the high level of parasitism seen in spring would hold up over the summer. It was also possible that the originally introduced parasitoid, *C. glomerata*, would become more common later in the year. To answer these questions, in 2009 Van Driesche repeated the survey done in 2007, visiting 19 sites in MA, one in Burlington, VT and one in Charleston, RI. Based on the collection of 719 P. rapae larvae (or pupae or parasitoid cocoons), he found that parasitism of *P. rapae* in late summer (September-October) of 2009 again 75%, the same as in the spring of 2007. While *C. glomerata* increased somewhat in relation to *C. rubecula* (being 12% of all parasitoids collected), *C. rubecula* remained the dominant parasitoid, accounting for 88% of all parasitism and was present at all 21 of the sites surveyed.

2011 survey: Samples of *P. rapae* and *Cotesia* parasitoids were collected from May to late Sep 2011 in 14 states and 2 Canadian provinces, from New England to North Dakota, southward to North Carolina and northward to New Brunswick and Quebec. In total, 32 samples of *P. rapae* larvae or pupae and parasitoid cocoons were examined, comprising 1571 individuals. *Cotesia rubecula* was present at 22 of the 32 sample sites and where it was present, the average parasitism rate was 47%. *Cotesia glomerata* remains the dominant parasitoid in the mid-Atlantic states, from Virginia to North Carolina and westward to southern Illinois, below latitude N 38° 48', where it has displaced the previously common parasitoid *Cotesia glomerata*. This pattern suggests that the released populations of *C. rubecula* presently have a lower latitudinal limit south of which they are not adapted (see Figure 1.)

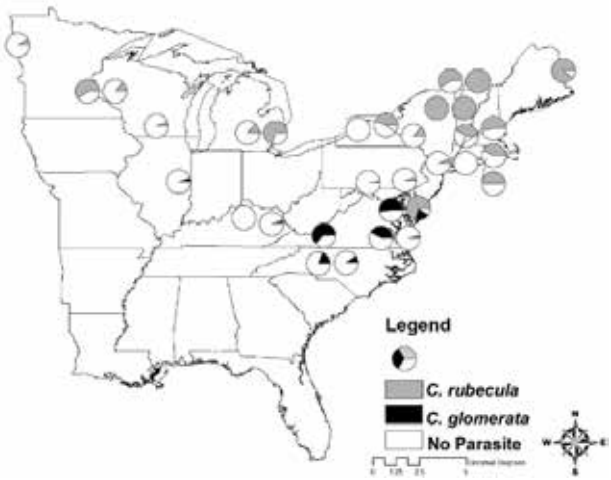

Fig. 1. Observed pattern of Cotesia parasitism of Pieris rapae in parts of the eastern United States and southeastern Canada in 2011. Parasitism by Cotesia rubecula is shown in gray and Cotesia glomerata in black. The percentage of unparasitized larvae is shown in white.

Discussion. This information shows that the classical biological control project against imported cabbageworm started back in 1988 at UMass has been successful over a wide geographic area, and that the new parasitoid is now providing a high and consistent level of mortality in New England and beyond. Although the familiar white cabbage butterfly, *Pieris rapae*, is still present and active in New England Brassica crops, its damage to crops has been significantly reduced. Based on survey data, it is highly likely that *Cotesia rubecula* is present wherever *P. rapae* is found, and is laying eggs in young imported cabbageworm caterpillars and killing them before they cause most of their damage. For farmers and gardeners who scout their crops, the developing larvae of *C. rubecula* may be visible inside imported cabbageworm caterpillars as a translucent band, which is revealed when the caterpillar is opened (see photo 1). The small white *C. rubecula* cocoons are usually found singly on the underside of leaves (see photo 2).

-Dr. Roy Van Driesche, PSIS/Entomology Division, University of Massachusetts

PHYTOPHTHORA BLIGHT: CONSIDERATIONS FOR FALL

This disease, caused by the soil-dwelling oomycete *Phytophthora capsici*, has a wide host range including all cucurbits, tomato, eggplant, pepper, beans, and some weeds (purslane, American black nightshade, Carolina geranium). Pepper and eggplant harvest are slowing down but winter squash harvest is in full swing in MA and Phytophthora blight is being reported from farms across the state on these crops. Symptoms vary by crop and may be easily confused with other diseases or issues such as water-logging. Be on the lookout and submit suspect plants or fruit to the diagnostic lab in order to get a proper ID. This will prevent you from moving the pathogen around your farm and from planting susceptible crops in infested fields in future years and there is a lot you can do now to manage the disease on your farm.

Many of you are probably all too familiar with the symptoms of Phytophthora blight on cucurbit fruit but many other vegetable crops are also susceptible, though they may exhibit different symptoms. Symptoms of Phytophthora blight on squash fruit are firm, round, water-soaked lesions that develop white, "powdered sugar" mycelial growth under warm, moist conditions. Cucurbit plants, especially non-vining varieties, can also develop symptoms of crown rot and eventually

Table 1. Crops susceptible to *Phytophthora capsici* under field conditions

Cucurbitaceae	Solanaceae	Leguminosae
Cantaloupe	Bell pepper	Snap bean
Cucumber	Hot pepper	Lima bean
Gourd	Eggplant	
Honeydew melon	Tomato	
Pumpkin		
Muskmelon		
Summer squash		
Watermelon		
Winter squash		
Zucchini		

Hausbeck & Lamour, 2004.

plant collapse. Symptoms on pepper are distinctly different as plants become infected with *P. capsici* via their roots and develop a crown rot that causes darkening of roots and stems and permanent wilt of foliage, while stems remain rigid. Pepper fruit remains attached to the upright stems but may eventually develop dark, water-soaked lesions which can spread to the whole fruit giving it a soft, wrinkled appearance. On tomato, *P. capsici* causes 'buckeye rot' on fruit where it comes in contact with the ground. Small brown spots on fruit grow into large, round or oblong lesions with alternating rings of light and dark-brown discoloration. The lesions are firm, with smooth margins but eventually become soft. In recent years, Phytophthora blight has been confirmed on lima and snap beans, crops which had previously been considered non-hosts, in the field and on soybean under lab conditions. Bean pods develop water-soaked lesions followed by diffuse, white sporulation. Bean stems and crowns can also be affected and collapse of low-lying areas of fields is common.

P. capsici persists in soil for many years as oospores and is dispersed primarily by movement of water through infested soil or splashing sporangia off of infected fruit. This is why symptoms often develop first in low-lying or poorly drained areas of fields. Growers often assume that stunting or death of plants in these areas of the field is caused by waterlogging, but infection with *P. capsici* may be the real cause. Importantly, water run-off from an infested field may contaminate surface water sources used for irrigation. This has been well documented in irrigation ponds and rivers in NY and MI and researchers at UMass have trapped *Phytophthora* species in several locations along the Connecticut, Deerfield and Mill Rivers in MA in an attempt to determine when *P. capsici* starts to build up in our irrigation sources. Look for results of this study in future Vegetable Notes issues. Long-lived oospores may also be spread throughout the field and the soil profile during tillage or cultivation, and they can be spread from field to field or farm to farm on infested soil clinging to tractor or truck tires, harvest buckets or workers' boots.

P. capsici symptoms on zucchini

During the busy harvest period, plan on harvesting from uninfested fields before you go into infested fields with tractors, trucks, workers, and bins. Take time to wash equipment when moving between fields to remove soil or crop residues that may contain sporangia or oospores. Do not leave fruit in fields or in cull piles as a single fruit infected with both mating types of *P. capsici* can contain thousands of oospores that could establish populations in new fields or contribute to increasing the population size and diversity within a previously infected field. Asexual, short-lived sporangia are produced on sporulating fruit lesions and account for the rapid, above-ground spread of disease within a field or a season via surface water, rain, or splash. Sporangia germinate directly or release 20-40 zoospores and one infected spaghetti squash is estimated to contain 44 million sporangia with the potential to release 840 million zoospores (Hausbeck and Lamour, 2004). If the infested area is large and plant material cannot be removed from the field, make sure to till it under deeply. Remember that there is a 2-6 day lag period between infection and symptom expression so if you suspect *P. capsici* is present, hold fruit for a few days before sending large wholesale shipments out to avoid their being returned due to rot.

If you do have *P. capsici* present on your farm a minimum crop rotation of 3-4 years is recommended, although fields that have been out of susceptible crops for >5 years have had outbreaks this year. Keep in mind that every year you rotate an infested field to a non-host crop the number of spores that survive to the following year will be reduced. The host range of *P. capsici* is broad but there are a number of non-hosts including brassicas, carrots, onions, and small grains. Tolerant pepper varieties are available and should be planted when the disease may be present and a susceptible crop must be planted before the end of the minimum rotation period. Cover crops can be used to help mitigate the effects of *P. capsici*, as the addition of soil organic matter stimulates beneficial microbes. A healthy soil microbial community can reduce plant pathogen activity by outcompeting them for space and nutrients, by direct parasitism of plant pathogens, by producing antibiotic compounds that slow pathogen growth,

A pepper field infested with P. capsici

and by stimulating the plants' natural defense systems. Furthermore, research suggests that brassicaceous cover crops (especially mustards and canola) release several compounds and gases as they break down that are toxic to microorganisms, and *P. capsici* specifically. This "biofumigation" process kills plant pathogens and beneficial microorganisms repopulate the soil quickly. Successful reduction in pathogen population size through biofumigation requires large volumes of brassica residues which must be incorporated shortly before planting and need to be chopped, rototilled, cultipacked, and irrigation added. Allelopathy is also a concern for some sensitive crops when using this system.

Management of Phytophthora begins with prevention. Be aware, informed, and proactive. If infections occur, a program that includes multiple control strategies can reduce the pathogen population size over time.

-Susan B. Scheufele, UMass Vegetable Extension

FALL SOIL TESTING AND NUTRIENT MANAGEMENT

Solomon working at the ICP

The UMass Soil and Plant Tissue Testing lab has made some major changes between 2011 and 2013 to improve our soil and tissue testing process. The lab has hired a new analytical chemist, Solomon Kariuki. He is a wizard with instrumentation, has fine-tuned the accuracy of results, and built in programs that automatically check for precision. The purchase of 2 drying ovens for soil and plant tissue, a water filtration system, and a second inducted coupled plasma instrument (ICP) for research samples have allowed the lab to run more samples, improve turnaround time and produce more accurate results. The new Lachat Flow Injection Analyzer specifically provides more accurate readings of soil available Phosphorous (P) and has helped the lab give soil amendment recommendations based on recent nutrient regulations that require reduced P applications. You may have noticed the lab has also implemented a new report generating system for soil tests that is designed to help the users interpret their results more easily. Some of these changes include a new categorizing system that defines the "optimum range" for macro-nutrients needed for plant growth according to the Recommended Soil Testing Procedures for the Northeastern United States and specifically, a reduced "optimum" range for phosphorus. The New England Vegetable Management Guide reflects these changes in interpretation of soil tests and more information may be found on that website.

Taking Soil Samples. Although soil samples can be taken any time, many prefer to take samples in the fall because this allows time to apply any needed lime, plan a fertility program and order materials well in advance of spring planting. Fall soil tests can be beneficial in determining what has occurred within the growing season and help you plan more effectively for the next year. Finally, turnaround time for a sample submitted in the Fall is only 3-4 days, but can take over a week during the Spring rush. Avoid sampling when the soil is very wet or soon after a lime or fertilizer application. If a field is uniform, a single composite sample is sufficient. A composite sample consists of 10 to 20 sub-samples taken from around the field and mixed together. To obtain sub-samples, use a spade to take thin slices of soil representing the top 6" to 8" of soil. Make sure to remove any thatch or other organic debris such as manure from the surface before taking your sample as this will inaccurately determine your soil organic matter content. A soil probe is faster and more convenient to use than a spade. Put the slices or cores into a clean container and thoroughly mix. Take about one cup of the mixture, dry it at room temperature spread out on paper, put it in a zip lock bag or box obtained from the soil lab and tightly close it. Label each sample on the outside of the bag or box. For each sample, indicate the crop to be grown, recent field history and any concerns.

In many cases, fields are not uniform. There are many reasons for this including: uneven topography, wet and dry areas, different soil types and areas with varying previous crop and fertilizing practices. In such cases, the field should be subdivided and composite samples tested for each section. Soils should be tested for organic matter content every two or three years. Be sure to request this as it is not part of the standard test. A standard soil test costs $15; with organic matter it costs $20.

Submitting soil samples. Depending on your goals, different tests are appropriate. In addition to standard soil tests, other services are available including: Pre-Sidedress Soil Nitrate Test (PSNT), manure analysis (from the University of Maine,)

compost analysis, greenhouse media, soil texture, and plant tissue analysis. (Click on each link to access the submission form).

A Fall nitrate test or "report card nitrate test" indicates how closely crop nitrogen (N) uptake has been matched with nitrogen supply for the season. High (> 20 ppm) or excessive soil nitrate content in the fall indicates that too much N fertilizer was applied in the prior season, and a fall cover crop would be beneficial to conserve this remaining N for the following season.

A standard soil test that includes other macro- and micronutrients can help you make the best choice to fit a particular crop to a given soil nutrient profile for the following season. When submitting your soil sample for testing, include the crop code on the form for the crop to be grown in that field the following year. Haven't done your crop rotation plans yet? You may ask for recommendations of up to 3 different crops without extra charge. Use this form for Vegetable and Fruit Crop Soil Submissions.

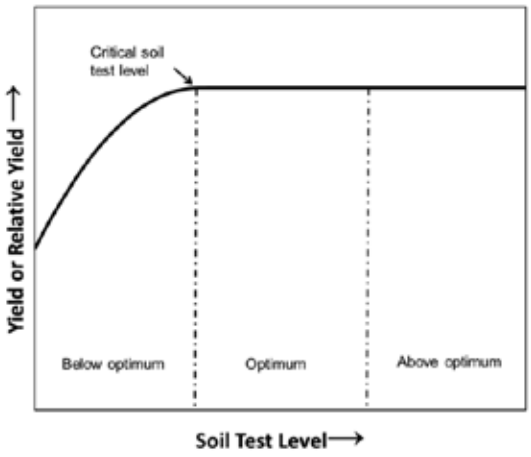

Figure 1. Conceptual relationship between soil test level and crop yield or relative yield. The critical level is defined as the soil test level for a given nutrient above which there is a low probability to an increase in yield due to addition of that fertilizer.

Interpreting Results and choosing amendments. For specific information on interpreting your UMass Soil Test results, see this factsheet that accompanies each soil test report.

Soil pH: The lab report will recommend the amount of lime to apply based on the buffer pH, exchangeable acidity and the crop(s) to be grown. Lime can be applied any time, but fall is preferred to allow several months to raise the pH. Split applications (half in the Fall and half in the Spring) may also be used effectively.

Sheet Composting is the process of applying undercomposted ingredients directly to the soil and incorporating. High carbon to nitrogen ratios in this process can hinder the rate of decomposition and bits of undercomposted materials can interfere with seeding. If this method is used for adding soil nutrients and organic matter, it is best done in the late summer or fall. However, a soil test should be conducted in the Spring to better determine nutrient availability for crops. Matured compost applications are usually made in the Spring, although testing may happen in the fall in order to estimate plant available nutrients for next year's crop.

Manure is an excellent source of nutrients, however, as manure ages and decays, considerable nutrient loss occurs from leaching, surface runoff, or volatilization of ammonia into the atmosphere. Manure may also contain pathogens such as E. coli and salmonella. If manure is used, vegetables should not be harvested within 120 days of application. This is a requirement for organic production and a good practice for everyone. In most cases, manure should be applied in the fall or to a non-food rotation crop. Fall-applied manure should be incorporated immediately and a winter cover crop should be planted to protect N from leaching. Manure applications should be made in cold weather to reduce volatilization, but not to frozen ground as this increases surface runoff potential. In order to make accurate nutrient applications to best fit your crop needs, a manure analysis should be conducted if the manure is procured from an on-farm source.

Cover crops planted in the fall, preferably before September 15th, are an excellent way to capture and store nutrients for your crops in the following spring. While your soil test results will not recommend cover crop selection, here are some general guidelines for fall planted covercrops and their spring contributions of plant available nitrogen (PAN):

Legume cover crops provide up to 100 lb PAN/a. To maximize PAN contribution from legumes, kill the cover crop at bud stage in the spring.

Cereal cover crops immobilize up to 50 lb PAN/a. To minimize PAN immobilization from cereals, kill the cover crop during the early stem elongation (jointing) growth stage.

Legume/cereal cover crop mixtures provide a wide range of PAN contributions, depending on legume content. When cover crop dry matter is 75 percent from cereals + 25 percent from legumes, PAN is usually near zero.

Micronutrient application recommendations cannot be determined accurately by soil labs in New England because deficiencies in crops have not been widely measured in our soils. However, the soil test results do report the ranges found in all the soils that come through the lab so that you may compare where your soil falls in regards to other soils in New England. For recommendations on specific micronutrients needed for crop growth, such as Boron, see the New England

Vegetable Management Guide section on micronutrients. Preferred timing of micronutrient applications in the Fall vs. Spring has not been determined. Other Nutrient applications should be avoided until spring when a growing crop is best able to use the applied nutrients in water soluble form and avoid leaching, runoff, or volatilization.

Need further assistance interpreting your soil test results? Contact the soil lab or any of the following Extension Educators:

Soil and Plant Tissue Testing Laboratory:
West Experiment Station
682 North Pleasant Street
University of Massachusetts
Amherst, MA 01003
Phone: (413) 545-2311
e-mail: soiltest@umass.edu
website: soiltest.umass.edu

Greenhouse nutrient recommendations:
Doug Cox
French Hall 211
University of Massachusetts
Amherst, MA 01003
Phone: (413) 545-5214
Email: dcox@umass.edu

Cover crops and nutrient management:
Masoud Hashemi
Bowditch Hall, UMass Amherst
201 Natural Resources Rd.
Amherst, MA 01003
Tel: (413) 545-1843
Email: masoud@psis.umass.edu

Vegetable crop nutrient recommendations:
Frank Mangan
French Hall, UMass Amherst
230 Stockbridge Rd.
Amherst , MA 01003
Tel: (413) 545-1178
Email: fmangan@umext.umass.edu

Katie Campbell-Nelson
205 Agricultural Eng. Bldg., UMass Amherst
250 Natural Resources Rd.
Amherst, MA 01003
Tel: (413) 545-1051
email: kcampbel@umass.edu

-Katie Campbell-Nelson, UMass Vegetable Extension

APPLYING FOR FEDERAL CONSERVATION PROGRAMS? STEP 1: GET A CONSERVATION PLAN

Massachusetts farmland or forest land owners and managers who would like federal help addressing soil, water, forest management, energy efficiency and wildlife habitat concerns are encouraged to contact their local USDA Natural Resources Conservation Service (NRCS) office by **October 18th** to get a conservation plan.

The key steps to the process are:
1) Contact NRCS to get a Conservation Plan for the farm (voluntary and free!). If you have never worked with USDA before, you will need to register your farm with the Farm Service Agency (FSA)
2) Work with NRCS to determine what particular Conservation Practices you may be able to implement or enhance with their programs.
3) Apply to a program and complete all eligibility forms. This is to make sure that the farmer meets all of the Farm Bill requirements for eligibility and also the particular program rules for eligibility. Sometimes portions of this are done in Step 1, when you register your farm with FSA.
4) Wait to see if your application is accepted. The program is competitive and selections are made by a ranking process meant to select projects with the greatest environmental benefit.

"A conservation plan is the required first step to participating in federal conservation programs. Land owners and managers who have a conservation plan and submit a program application by October 18th will be ready for the next round of

federal funding through the Farm Bill, if and when it's available," said Christine Clarke, Massachusetts State Conservationist for NRCS. Applications may be submitted at any time for NRCS programs, but are reviewed when funding becomes available - usually once each year.

NRCS has offices in USDA Service Centers in Greenfield, Hadley, Holden, Hyannis, Pittsfield, Westford, and West Wareham, which work with local conservation districts and other partners to serve farmers and landowners throughout the commonwealth. USDA Service Center locations are listed on-line at http://offices.usda.gov or in the phone book under Federal Government, U.S. Department of Agriculture. General program information is available on the NRCS Massachusetts website at www.ma.nrcs.usda.gov.

"In the conservation planning process, NRCS conservationists discuss with landowners their conservation objectives, help them identify natural resource concerns and suggest alternatives for treatment. They will also identify programs that may provide financial help to implement the suggested practices," said Clarke.

If you own or manage farmland or forest land, run a greenhouse, or grow shellfish or other specialty crops in Massachusetts, these are some of the 2008 Farm Bill conservation programs that can help you address natural resource concerns and opportunities on your land:

Environmental Quality Incentives Program (EQIP) – EQIP helps farmers and forest landowners address water quality, water conservation, invasive species control, soil quality, erosion control, nutrient and pest management, residue management, irrigation efficiency, energy conservation, air quality and other natural resource concerns. Growers interested in increasing their use of Integrated Pest Management (IPM) practices on their farm are eligible to receive training and assistance from UMass Extension. In Massachusetts, EQIP is also available to help greenhouse operations with water quality and conservation practices, aquaculture operations with best management practices, and certified organic growers and those transitioning to organic production with specific conservation practices. Massachusetts farmers can also receive help establishing seasonal high tunnels to extend the growing season in an environmentally friendly manner.

Wildlife Habitat Incentives Program (WHIP) – WHIP provides assistance to landowners who want to improve fish and wildlife habitat or restore natural ecosystems on their land.

Agricultural Management Assistance (AMA) – AMA helps farmers adopt conservation practices that will reduce or mitigate risks to their agricultural enterprises. In Massachusetts, financial and technical assistance is available to producers for drought mitigation.

PREPARING FOR WINTER - GREENHOUSE INSULATION

There are simple and inexpensive steps you can take to reduce energy use during the heating season. These recommendations are derived from the fact sheet Practical Ideas to Cut Your Greenhouse Energy Bill in Half by Agricultural Engineer John W. Bartok, Jr.

- Reduce air leaks by weather stripping doors, vents, and fan openings. Lubricate fan shutters frequently so that they close tight. Shut off some fans during the winter and cover openings with insulation or plastic.
- Make certain to apply two layers of poly as glazing. Choose a brand with an infrared inhibitor for the inner layer.
- Insulate the perimeter below ground – installing 1 - 2 inch thick insulation board to 2 feet below ground level will reduce the heat loss from the warm interior soil to the cold ground outside.
- Insulate sidewalls and endwalls to bench height using either a 2 inch foam board, or an inexpensive aluminum-covered bubble insulation. Insulating existing structures is worthwhile. Cost of foam board insulation is about $1/sq ft with a payback of less than one heating season.
- Insulate behind sidewall heat pipes. Use insulation board or aluminum-faced building paper to radiate heat back into the greenhouse. Leave an air space next to the wall to prevent frost damage to the wall.
- Install an energy screen and save as much as 20%- 50% on heating costs. Screens trap the heat inside and reduce the heat loss surface area. Tight closures should be maintained where curtains meet sidewalls, framing or gutters. Add roll-up or drop down sidewall screens for additional savings. These can be either manual or mechanized.
- Perform yearly maintenance on boilers, burners and back-up systems. Clean and adjust furnaces and do an efficien-

cy test run before heating season. Consider upgrading the efficiency of your system with installation of root-zone heat tubing, a high-efficiency heater or boiler, or an insulated water tank for heat storage. Cost-effective alternatives to fossil fuels are also available.

If you have more involved greenhouse retrofits in mind, but aren't sure where to begin, contact the Massachusetts Farm Energy Program at http://www.berkshirepioneerrcd.org/mfep or read up on your options in the Farm Energy Best Management Practices Guide for Greenhouses.

Additional information can also be found in the publication *Energy Conservation for Commercial Greenhouses* available from the CIT Resource Store, University of Connecticut

UPCOMING EVENTS

Field Day – Native Pollinators in Massachusetts

When: October 2, 2013 8am to 4pm

Where: Ocean Spray Cranberries headquarters in Lakeville-Middleboro, MA

The Native Pollinators in Agriculture Project, in conjunction with in-state partners, is hosting a field day in southeast Massachusetts for growers, conservation and business partners, and media representatives. Following opening remarks and a presentation on "Why Pollinators matter," attendees will travel by bus to a number of field sites to examine pollinator habitat and see native pollinators in action. The tour will continue with stops at a cranberry harvest site, the UMass Cranberry Research Station, as well as a stop to view rights-of-ways that are being managed to enhance pollinator habitat. Field tour includes Standish Bog Company, Plymouth, AD Makepeace Company, Wareham, and the UMass Cranberry Research Station.

To register for the field day, send an email to Lindsay Grossman at lgrossman@agpollinators.org

Vermont Crop Storage Workshops

When: October 9, 2013 8am to 4pm **Where:** 52 Farmvu Drive White River Jct, VT

When: October 10, 2013 8am to 4pm **Where:** 374 Emerson Falls Rd, Suite 1 St. Johnsbury, VT

When: October 16, 2013 8 am to 4pm **Where:** Coach Barn 1611 Harbor Rd Shelburne, VT

Sponsored by UVM Extension with support from the USDA's Northeast Sustainable Agriculture Research and Education program, these workshops will focus on long-term storage of crops for sale through the winter and into early spring, but will be relevant to many agricultural and food storage needs.

More info: http://blog.uvm.edu/cwcallah/storageworkshop/.

Registration link: https://www.eventbrite.com/event/7979513941

Vegetable Notes. Ruth Hazzard, Katie Campbell Nelson, Lisa McKeag, Susan Scheufele, co-editors. Vegetable Notes is published weekly from May to September and at intervals during the off-season, and includes contributions from the faculty and staff of the UMass Extension Vegetable Program, other universities and USDA agencies, growers, and private IPM consultants. Authors of articles are noted.