UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

Volume 29, Number 8 June 1, 2017

In this issue:

Growers at the UMass student farm were able to get Surround to mix well using a sheetrock drill and removing the screen/filter from their nozzleheads. This should provide early season protection against striped cucumber beetle. Photo: A. Brown

Crop conditions

We have received many complaints from growers that even their cool season crops have not germinated well or that transplants have just been sitting in the field without much growth. If you have been experiencing this, you are not alone. Soil temperatures from data loggers buried 4-6" deep in rye/vetch cover crop all over Massachusetts showed remarkably similar results (figure next page). Temperatures were recorded hourly for a period from April 20th until May 26th, when most cover crops were incorporated and the data loggers were removed, then replaced after tillage. There was a two and a half week period from April 30th - May17th when soil temperatures remained below 60°F. Most vegetables (except for lettuce and turnip) require 10 days or more to germinate at soil temperatures below 60°F. One observation we found surprising was that soil temperatures could fluctuate by 10°F or more in one day, though the effect that has on crop growth is unknown. Also, the Amherst location had slightly higher soil temperatures--this is likely due to the short and sparse cover crop growth, leaving the soil surface exposed and able to heat up more.

We've been busy planting (and waiting like the rest of you) too, with many trials planned or underway on topics including: nitrogen mineralization from cover crops to meet cash crop demand; cabbage maggot control in direct-seeded brassicas; sentinel plot for cucurbit downy mildew; efficacy and economics of using disease-resistant cucumber varieties for fall production; conserving natural enemies for biocontrol of cabbage aphid; efficacy of alternative insecticides to control cabbage aphids; evaluating new fungicides for disease control in fall brassicas; and wrapping up a mustard biofumigation study for management of root knot nematode.

We will also be continuing a collaboration with researchers at Cornell University who are studying movement of potato virus Y between crops, fields, and farms. We are looking for a few more sampling sites in the Pioneer Valley where tomato, potato and pepper are being grown in close proximity… do you know of any such places?! We would just ask for access to the fields, a list of the varieties planted and a field map and we do the rest—the sampling consists of us walking through each crop and taking a small leaf tissue sample from about 300 plants/crop at 4-5 timepoints throughout the season. If you are able to help us find another location or two to sample we'd love to hear from you, just write to Sue Scheufele: sscheufele@umass.edu

Pest alerts

Allium:

Onion thrips are now present in Franklin and Hampshire Cos., MA in transplanted onions. Thrips overwinter as adults in crop remnants, alfalfa, wheat, greenhouses, and weeds along the border of crop fields. A widely used threshold is

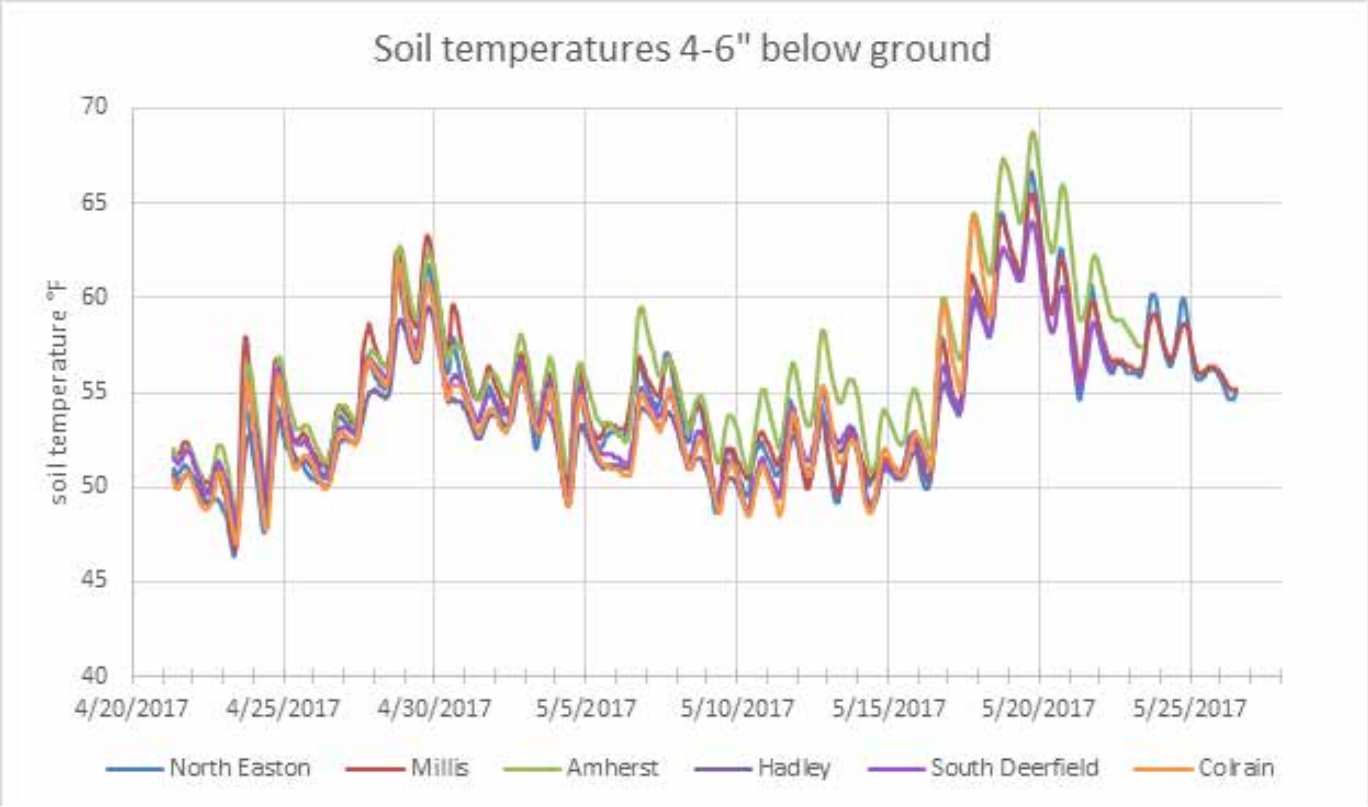

Fig. 1 Soil temperatures in rye/vetch cover crop in 6 vegetable fields in Massachusetts

1-3 thrips per leaf. Development time (base temperature of 52.7°F) is 140 GDD for egg, 180 GDD for larva (2 instars), and a total of 323 GDD for each generation. At summer temperatures, a generation can be completed in 2-3 weeks and numbers of adults increase as the season progresses. The product Movento had good efficacy in trials conducted at Cornell for the earliest applications in the season because it has efficacy against nymphs. It must be applied with a penetrating surfactant to be absorbed by the onion leaves.

Beets and Swiss Chard:

Cercospora leaf spot was observed on Swiss chard in Hampshire Co., MA. This fungal disease thrives in wet, moist, warm (75°F) conitions and spores are spread by rain, splashing water, and wind. The fungus survives in the soil for two years so rotation is an important tool. Control related weed hosts e.g. lambsquarter's which can also be infected. Strobilurin fungicides are effective against this disease but should be mixed with protectant fungicides like copper, many of which are also labeled, and used in rotations with other FRAC groups to delay development of resistance. Fontelis (FRAC Group 7) and Tilt (FRAC Group 3) are also labeled.

Cucurbits:

Fig 2. Seedcorn maggot infestation in giant pumpkin in Hillsborough CO., NH photo: G. Hamilton.

Seed corn maggot second generation appears to be causing damage in a Hamden Co., MA field which is at about 980 GDD base 40°F now (Table 1). There may be 2-3 generations in New England with second generation peak flight at 1,080 GDD base 40F. The larvae of the first is the most damaging, though with prolonged cool weather, the second generation may also cause problems (Fig. 2).

Striped cucumber beetle is present in recently transplanted cucurbit fields in RI and MA. Numbers have reached threshold of 1-2 beetles/plant in high tunnels in Hampshire Co., MA. An action threshold of 1 to 2 beetles per plant is recommended. The UMass student farm devised a way to get good coverage with Surround (kaolin clay) to protect their seedlings from SCB (see cover photo).

Squash vine borer traps have been set out at 3 farms in MA and will go out in NH over the next 2 weeks. This pest overwinters as pupae in the field and has historically emerged in early June, sometimes with 2 generations per year. Traps are usually placed in summer squash and zucchini. 2nd-3rd plantings are usually hit the

hardest since growers are no longer using protective covers or covers are removed when the crop is flowering for pollination. Use a treatment threshold of 5 moths per week in the pheromone trap targeting sprays at the base of the plant.

Eggplant and Potato:

Flea Beetle is causing significant damage on eggplant transplants in a greenhouse in Middlesex Co., MA and on seedlings in the field in Hampshire Co., MA. There two major flushes of adults – one in late-May and early-June, and the second from mid-July to mid-August. Treat newly set transplants if they have 2 flea beetles per plant, seedlings 3" to 6" tall if they have greater than 4 beetles per plant, and plants over 6" tall if they have 8 beetles per plant. Full size plants rarely require treatment for flea beetles.

Colorado potato beetle emergence continues with egg-laying starting to occur in some areas. Treatment should be considered in the following scenarios:

- 10% defoliation
- Adults: 25 beetles/50 plants
- Small larvae: 4/plant
- Large larvae: 1.5/plant or stalk, based on a count of 50 plants/stalks

Table 1. Accumulated Growing Degree Days: 1/1/17 - 6/1/17

Location	GDD (base 40°F)	GDD (base 50°F)
Western, MA		
Ashfield	805	274
South Deerfield	932	343
Pittsfield	825	289
Central, MA		
Bolton	959	368
Northbridge	955	359
Phillipston	816	279
Eastern, MA		
Ipswich	907	319
Waltham	1020	390
Seekonk	1104	407
Hollis, NH	944	367
Burlington, VT	936	374
Newport, RI	978	301
Castleton, NY	1106	444

Sweetcorn:

European corn borer The first NY (E strain) adult moths have been captured at 4 out of 11 sites in NH, 3 sites in NY, and at one location in MA (Table 2). Adult emergence occurs at (374 GDD), first eggs (450 GDD), and peak flight (631 GDD) base 50°F. Adult flight has begun in some parts of MA (Table 1), so farmers with emerged corn should put out traps this week to make sure they are ready to capture the first adults.

Table 2. ECB trap catches

Location	ECB Weekly Total
Western, MA	
Whately	1
Central, MA	
Leominster	0
Eastern, MA	
Dover	0
Millis	0
Sharon	0
NH	
Litchfield	0
Hollis	1
Mason	0

Common armyworm was found heavily infesting 4" tall corn in Ulster Co., NY. While this is fairly abnormal, the same pest was found in Franklin Co., MA last year. While this pest is not very widespread, when it does occur it can be fairly damaging. It's host range is broad, including field crops, cover crops, small grains and almost any vegetable crop including lettuce, sweet corn, brassicas, tomatoes, peppers etc. This pest overwinters south of PA in field residue and flies north in late-May to early- June. Don't rely on trap captures alone for spraying your sweet corn—walking through early corn fields now is a good idea and will help you catch and stay ahead of other potential corn pests like this one. Treat if 50% of the crop has feeding damage, frass or other signs of infestation. According to Chuck Bornt of Eastern NY Extension: "Best control is achieved when the larvae are small (1st and 2nd instar). There are a number of insecticides labeled for armyworm including organic products Pyganic, Dipel, and Entrust. There are also a number of conventional insecticides labeled for armyworm control including Warrior, Baythroid (both are recommended for 1st and 2nd instars), Coragen and Lannate."

Fig 2. Common armyworm in 3rd or 4th instar.
Photo: K. Campbell-Nelson

THE 'OTHER BLIGHTS' OF TOMATO

While late blight has become the dominant force in tomato disease management, it is certainly not the only foliar leaf blight around. In fact, there was not a single confirmation of late blight in Massachusetts last year. We have not seen any late blight so far this year, but recent weather has been conducive for this oomycete disease to thrive if inoculum were present. There are several fungi and a few bacteria that cause leaf spots and defoliation as well (some of these have been reported in greenhouse and high tunnel production already this year). A few key fungal diseases are described below.

Septoria photo: S. Scheufele

Septoria leaf spot (*Septoria lycopersici*) is one of the most destructive diseases of tomato foliage, resulting in considerable leaf drop that can cause sunscald, failure of fruit to mature properly, and reduced yields. Once infections begin, the disease can spread rapidly from lower leaves to the upper tomato canopy.

Symptoms consist of circular, tan to grey lesions with a dark brown margin that appear on lower leaves first, after the first fruit set. If conditions are favorable, lesions can enlarge rapidly, turning infected leaves yellow, then brown. *S. lycopersici* forms pycnidia (structures where asexual spores are formed) in the center of expanding lesions which can be seen with a 10X hand lens as tiny black dots. The presence of pycnidia, plus the generally smaller size of the lesions and the absence of target-like circular bands within the lesion, distinguish this disease from early blight.

The pathogen overwinters on infected tomato debris or infected solanaceous weed hosts (jimsonweed, horsenettle, groundcherry and black nightshade), and can also survive on stakes and other equipment. Tomato seed may be coated in spores. Once established, Septoria is spread by splashing water, insects, workers, and equipment. High humidity, long periods of leaf wetness, and temperatures of 60- 80°F are conducive to disease development.

Early Blight photo: IPM images

Early blight (*Alternaria solani*) occurs on the foliage, stem, and fruit of tomato as well as potato. In tomato, the disease first appears as small brown to black lesions with yellow haloes on older foliage. Under conducive conditions, numerous lesions may occur on each leaf causing entire leaves to become chlorotic (yellow). As the lesions enlarge, they often develop concentric rings giving them a 'bull's eye' or 'target-spot' appearance. As the disease progresses, plants can become defoliated, reducing both fruit quantity and quality. Fruit can become infected either in the green or ripe stage. Infections usually occur through the stem attachment. Fruit lesions appear leathery and may have the same characteristic concentric rings as the foliage. Fruit lesions can become quite large, encompassing the whole fruit.

On potato, foliar symptoms are quite similar, though complete defoliation rarely results. Tuber lesions are dark, sunken, and circular often bordered by a purple to gray raised tissue. The underlying flesh is dry, leathery, and brown. Lesions can increase in size during storage and tubers become shriveled.

The fungus overwinters on infected crop debris in the soil and can survive there several years. High humidity and warm temperatures (75-85°F) favor infection and disease development. Production of spores requires long periods of leaf wetness but can occur during alternating periods of wet and dry. Spores are dispersed mainly by wind but also by splashing water or overhead irrigation.

Septoria and Early Blight Management. Some tomato and potato varieties with early blight resistance or tolerance are available, however, most tomato cultivars are susceptible to Septoria leaf spot. Adequate nitrogen fertility throughout the season can help delay onset of early blight; lower leaves become more susceptible as the nitrogen demand increases with fruit production and nitrogen is pulled from older leaves. Preventative fungicide sprays at regular intervals (depending on weather conditions and disease pressure) will delay onset. Rotate out of tomato crops for at least two years, control susceptible weeds, and incorporate debris after harvest. Reduce the length of time that tomato foliage is wet by using drip

Botrytis photo: D. Ingram

Leaf Mold top and bottom of leaf photos: Cornell Extension

Powdery Mildew photo: S. Scheufele

irrigation, usinge wider plant spacing, and staking. Keep workers and equipment out of wet fields where possible.

Many fungicides are registered and effective against both early blight and Septoria, please see the New England Vegetable Guide for recommendations. Use the NEWA Tomato forecasting model to help with the timing of fungicide applications for early blight and Septoria.

Botrytis Grey Mold & /Ghost Spot (*Botrytis cinerea*). Botrytis cinerea causes leaf spots, stem cankers, fruit rot, and ghost spot on fruit. The pathogen thrives in the greenhouse where humidity is very high, but it has been observed in field tomatoes as well. Leaf lesions are dark gray and have no yellow halo, and therefore are often mistaken for late blight lesions. Under conditions of alternating heat and humidity, the pathogen grows in such a way as to form concentric rings, and for this reason can be confused with early blight. The way to tell it apart is by its characteristic fuzzy brownish-gray sporulation. If you hold the leaf up and look across the lesion you will see fine mycelia sticking up with little tuftlets on the end that resemble grape clusters. *B. cinerea* primarily feeds on dead tissue and is only weakly pathogenic, therefore, you will likely see this sporulation on senescent tissue including flowers or leaf tips and margins where nutritional disorders have caused tip burn. Spores that land on fruit cause ghost spot, which appears as pale white haloes or ring spots on the green tomato fruit. On ripe fruit, the ringspots may be yellow. Ghost spot develops when the fungus initiates infection, but disease progress is stopped by dry environmental conditions. This spotting may adversely affect market quality. Under favorable conditions ghost spot may lead to fruit rot.

Leaf Mold (*Fulvia fulva*). This disease can occur in the field, but is most common in greenhouses, in both soilless and hydroponic systems. Leaf mold infections begin on older leaves and cause pale-green to yellow spots visible on the upper leaf surface, with olive-green to grayish-purple fuzzy growth on the underside of the leaf where the fungus is producing spores. Heavily infected leaves turn yellow, then brown and may wither and drop. Occasionally petioles, stems, and fruit may be affected. Infected flowers wither without setting fruit and infected fruit has leathery, black, irregularly shaped lesions.

The fungus overwinters in soil on crop residue and as sclerotia (hard, black, long-lived resting structures) and may be introduced on infested seed. Disease development is favored by warm, moist conditions with relative humidity over 85%. The fungus can survive and reproduce between 50-95°F, with optimal infection and growth between 71-75°F. The disease can spread rapidly as spores disperse throughout a greenhouse on air currents, water, rainsplash, insects, and workers.

Powdery mildew (*Oidium neolycopersici*) of tomato has emerged as an important disease of greenhouse and high-tunnel tomatoes, and is occasionally seen in field tomatoes. Look for white, powdery, circular lesions on the upper and lower leaf surfaces. Unlike other powdery mildews, affected leaves may rapidly wither and die, but remain attached to the stem. There are no symptoms on fruit or stems, but loss of foliage may result in sunscald. The pathogen does not require free water to germinate and cause disease but it does thrive under humid conditions and a range of temperatures (50-86°F). This pathogen can be very aggressive and lead to reduced yield and poor fruit flavor if untreated.

Botrytis, Leaf Mold and Powdery Mildew Management: These are primarily diseases in greenhouses because of environment, so reducing humidity and improving airflow are key. Control weeds and remove plant debris. Space plants

and sucker them or remove lower leaves to allow good air circulation, reduce humidity within the canopy, and minimize leaf wetness by watering with drip irrigation or early in the day. In the greenhouse, improve horizontal air flow with fans, and reduce humidity by a combination of heating and venting in the evening, particularly when warm days are followed by cool nights. Avoid excessive nitrogen fertilization. Remove all diseased plant residues and destroy them; disinfest the entire greenhouse after harvest. Practice hot water seed treatment for tomatoes as a general rule. For Fulvia in particular there are a few products labeled for use on indoor tomato to control this disease. Choose resistant varieties. See this fact sheet from Cornell for a list of resistant varieties.

Please see the New England Vegetable Management Guide (www.nevegetable.org) for current management recommendations. Always alternate fungicide applications between materials with different modes of action to prevent resistance development.

-Bess Dicklow and Susan B. Scheufele, UMass Extension

WATCH FOR THRIPS IN ONION

We are now seeing onion thrips (*Thrips tabaci)* in onions here in Western MA. This pest prefers hot, dry conditions, so we may not see rapid build-up this week with more rain in the forecast, but it is a good idea to start scouting and manage populations before they get out of hand. This UMass Scouting Sheet for alliums can help you keep track of your scouting and guide your decision-making. The host range of onion thrips is wide, including many vegetable families, field crops such as alfalfa, wheat, oat and tobacco, weeds including amaranth, goldenrod, ragweed and sunflower, and ornamentals such as roses, but onions are their preferred host and where they cause the most economic damage. Cabbage may be infested at any time in the season, but the most common thrips damage in brassicas in New England occurs later in the season on fall transplants. Succulent peas are sensitive to thrips feeding damage, and onion thrips can also cause damage in greenhouse tomato and cucumber.

Identification and life cycle. Onion thrips are tiny, slender insects that range in color from translucent to yellow to brown and are only 1/16” in length. They spend the winter as adults in crop remnants, alfalfa, wheat, greenhouses and weeds along the border of crop fields. Early spring reproduction can occur in field crops, especially wheat, before movement into onion. Adults insert eggs singly into plant tissue, adults and nymphs feed on leaves, and pupation occurs in the soil near the plant. Development time (base temperature of 52.7°F) is 140 GDD for egg, 180 GDD for larva (2 instars), and a total of 323 GDD for each generation. At summer temperatures, a generation can be completed in 2-3 weeks. Thrips have rasping mouth parts which they use to tear open plant cells to feed on plant juices.

Damage. In onions, damage is caused by adults and nymphs piercing cells and removing cell contents along leaf blades. Symptoms are irregular, blotchy whitening of the leaves (known as ‘blast’), and if feeding is heavy, leaf curling or twisting and overall stunting of plant growth can occur. The result is reduced bulb size and lower overall yields, or if severe enough, plant death. Feeding that occurs during bulb formation and rapid bulb expansion has the most effect on yield. Scallions are particularly sensitive because the whole plant is marketed. In addition to direct injury, thrips damage can increase occurrence of purple blotch (*Alternaria porri*) and other bacterial diseases, as wounds caused by feeding allow for easy entry by pathogens. Thrips also vector the iris yellow spot virus which affects many allium crops.

Monitoring. Scout plants along field margins where infestations build early, as well as checking across the field. Scout weekly to determine if populations are increasing. Look closely between the leaf blades, especially in the center of the plant around the growing tip, to find the light yellow nymphs or darker adults. Though tiny, you can see the slender, yellow nymphs moving about on the leaf when the leaves are parted. Count number per plant and note number of leaves per plant to determine if thresholds are reached. The number that constitutes an economic threshold varies with the stage of plant growth, efficacy of insecticide to be used, water availability, and health of the plants. A widely used threshold is 1-3 thrips per leaf or 30 per plant.

Cultural practices can reduce thrips numbers by delaying or inhibiting their establishment in the crop, or by reducing survival. These include:

- Incorporate or remove crop residue at the end of the season.

- Rotate into fields where no alliums or brassicas were grown for the past 2 years.
- Avoid planting onions or cabbage near alfalfa, wheat or clover; thrips may migrate to onions when these crops reach maturity or are cut and harvested.
- Avoid importing plants or sets from other farms or regions, or using last year's onions for sets.
- Maintain sanitation and scout regularly in the greenhouse to avoid thrips on transplants.
- Use straw mulch, which has been shown to slow population buildup.
- Alternate onion rows with carrot rows, which has been shown to reduce thrips in onion
- Use reflective plastic mulch.
- Provide adequate water for onion growth: onions need consistent, adequate moisture, and dry soil conditions worsen the effects of feeding damage.
- Heavy rain or overhead irrigation can lower populations (but may increase risk of foliar disease).
- Use selective insecticides to conserve minute pirate and insidious flower bugs, which are the most effective predators, as well as other natural enemies.

Chemical Control: Thrips move from the protected growing tip up the leaves during the evening, so that's the best time to spray. Use moderate to high pressure, 100 gal water/A, and appropriate nozzle spacing to achieve the best possible coverage. Wetting agents or spreader-stickers are strongly recommended so that insecticides don't quickly wash off the waxy foliage. If repeat applications are needed, use a 7 to 10 day spray interval. Use a shorter interval in hot weather. Rotate between insecticide groups after 2 applications to help prevent resistance. Note that products labeled for thrips control are not exactly the same for onions and Brassicas and dry bulb onions and fresh eating onions are often labeled differently. Please see the New England Management Guide for control options, there are many effective materials for conventional and organic growers alike. Always read the label carefully before applying any pesticide.

- UMass Extension Vegetable Program. Updated for 2017 by L. McKeag.

Events

Small Vegetable Farm Equipment Field Day

When: Friday, June 2, 2017, 2 PM – 6:00 PM (Pizza at 6:00 PM)

Where: Oxen Hill Farm Field, Corner of Quarry and Phelps Rd., W. Suffield, CT

Oxen Hill Farm, owned and managed by Jonathan Griffin and family, is a 150-acre certified organic farm that has a nice variety of cultivators and other equipment that they will demo. They just built a brand new barn and cooler system. They are also distributors for the Italian small farm equipment made by Checchi & Magli including: single-row potato planters and harvesters, transplanters and plastic mulch layers; double-row potato hillers and veg crop transplanters. The Quarry Road field has a large variety of crops grown on plastic, bare-ground and under plastic (1,400-foot-long caterpillar tunnels) and uses landscape cloth between plastic beds on tomatoes for weed control.

Trevor Hardy, from Brookdale Fruit Farm, will give a brief presentation on "Setting Up Your First Irrigation System." Equipment Dealers from around the region will display and demo a variety of large and small machines and hand tools.

Sponsored by: USDA's Beginning Farmers Program, Oxen Hill Farm, UConn Extension and the equipment dealers listed above.

UConn is an Equal Opportunity program provider and employer. Please contact us two weeks in advance if special accommodations are required.

Water Management Twilight Meeting

When: Wednesday, June 28, 2017 from 4pm-6pm with dinner to follow!!

Where: Tangerini's Spring Street Farm, 139 Spring St, Millis, MA 02054

FSMA and drought got you down? Come to this Twilight Meeting at Tangerini Farm in Millis, MA. Tour the newly installed irrigation system for orchard and vegetable crops built with funding support from NRCS with the designer, Trevor Hardy of Brookdale Farm, Irrigation and Row Crop Supply. Find out water sampling protocols and lab requirements for FSMA from the UMass Food Safety Specialist Lisa McKeag and about grant opportunities for irrigation and food safety improvements. Other industry representatives will be available for consultation and **dinner will be provided** following the tour.

We will cover: irrigation water sources, sampling for FSMA requirements, ins-and-outs of drip irrigation, overhead irrigation in corn, strawberry and direct seeded crops, irrigation under FSMA, and orchard irrigation.

THANK YOU TO OUR SPONSORS

Vegetable Notes. Katie Campbell-Nelson, Lisa McKeag, Susan Scheufele, co-editors.