UMass Extension
Vegetable Notes
For Vegetable Farmers in Massachusetts since 1975

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In this issue:

Overwintered crimson clover with chicken tractor, electrical fencing and garlic. photo: L. Zivalic

Crop conditions

Recent warm weather and sunshine are certainly helping crops to perk up after a cool, wet spring—happy summer! It's good weed-killing weather too, now is a good time to get out there before weeds take hold (see article this issue to learn about the 'critical weed-free period'). Strawberry harvest is ramping up, shelling and snap peas are being picked now, beets are being bunched and fragrant fennel bulbs are being neatly trimmed. Summer squash and zucchini crops are starting to roll in, planting of fall brassicas and other transplanted crops continues, as well as endless successions of sweet corn and greens. Pumpkin and winter squash fields are planted, while some fields are going into summer cover crops. In other words, things are really in full swing! It's graduation week and high school students are finally available to join the farm crew. As summer field crews expand, don't forget to provide Worker Protection Standard (WPS) training for new employees—you can learn more about how to give the trainings here and can download resources here.

Pest alerts

Alliums:

Garlic Potyvirus has been confirmed at a second location in Massachusetts this year in Middlesex Co., in a German white porcelain variety that was planted from saved seed. Garlic infested with multiple viruses may have reduced yields while many crops may have a virus without affecting yield. One of the effects of garlic potyvirus is reduced cold tolerance, so left uncovered stand will be reduced. Symptoms include heavily sprouted tops, yellow mottling on younger leaves, thickened and twisted leaves. Delaware garlic farmers have experienced similar problems, see articles here from this year and last year by Jerry Brust: http://extension.udel.edu/weeklycropupdate/?p=9441

Garlic bulb mites were diagnosed on garlic with the potyvirus from Middlesex Co., MA. Heavy infestations have been diagnosed this year in many fields. Submit seed garlic for testing at the UMass Diagnostic Lab before planting so as not to spread this pest.

Brassicas:

Imported cabbageworm eggs have been seen across MA but no caterpillars yet, keep an eye out in the coming weeks and use the action threshold in Table 1. to determine if control is necessary.

Garlic potyvirus. top: A. Madeiras. bottom:D. Sipler

Table 1. action thresholds for caterpillars in Brassicas:

Crop	Stage	% Infested Plants
Cabbage & Broccoli, Cauliflower	pre-cupping (before head formation begins)	35%
Cabbage & broccoli	head formation to maturity	15%
Cauliflower	After heading	10%
Kale, collards & other greens		10-15%

Leafminers (*Liriomyza* spp.) were seen on brassica seedlings in two greenhouses and on pakchoy in the field in Hampshire Co., MA this week. This pest is occasionally seen in our area. From University of CA:

Adults are tiny black flies with a bright yellow spot on their thorax. Females puncture leaves to feed on plant sap and lay eggs within the leaf tissues. After 2 to 4 days the eggs hatch and larvae feed between the upper and lower surface of leaves, making the distinctive winding, whitish tunnels or leafmines that may be the first clue to the leafminers' presence. Larvae emerge from the leafmines and pupate on the leaf surface or, more commonly, in cracks in the soil. Many generations may occur each year, and the entire life cycle can be completed in less than 3 weeks when the weather is warm. Regularly check young seedlings for leafmines. Most mines occur on the cotyledons and first true leaves. If leafminer populations build to high levels when seedlings have only four or five leaves, chemical treatment may be necessary. Treat if you find an average of one or more mines per leaf in your overall field samples. Broccoli or cauliflower with six or more leaves are rarely damaged by leafminers, regardless of population numbers. However, for cabbage or lettuce, if edible leaves are mined, chemical control may be justified—Spinosad and Radiant are labeled, use of an adjuvant may improve control.

Table 2. Sweetcorn trap counts week of 6/14/17 to 6/21/17

Location	# ECB
Western, MA	
Amherst	2
Sheffield	-
Whately	1
Central, MA	
Leominster	2
Eastern, MA	
Millis	0
Sharon	1
Swansea	7
Dover	0
Seekonk	4
NH	
Litchfield	16
Hollis	0
Mason	0
Washington County, NY	21
Albany, NY	10

Cucurbits:

Striped cucumber beetle have been reported for several weeks now. They use aggregating pheromones when they emerge to summon other beetles to a field in order to mate causing one extension educator to exclaim that they are experiencing "stripers with an attitude!" in some fields in NH and RI. An action threshold of 1 to 2 beetles per plant is recommended.

Squash vine borer has been captured in pheromone traps for the first time this year on Monday in Amherst, NH and Wednesday in Bristol and Worcester Cos., MA. Be sure to monitor fields individually for this pest rather than relying on reported trap captures, since populations of this pest are highly variable from field to field, even on the same farm. Action threshold is 5 adult moths captured per week—direct spray toward the base of the plant where eggs are laid.

Three TSSM on the underside of a cucumber leaf visible with a 10x

Two-spotted spider mite has been found infesting cucumber in a high tunnel in Worcester Co., MA this week, where thrips and potato leaf hopper were also found. See this excellent factsheet from the UMass Greenhouse Crops and Floriculture Program for treatment options and scouting tips. While difficult to see with the naked eye, look for russeting on leaf surfaces where spider mite colonies may be found on the undersides of leaves with a 10x hand lens.

Cucurbit downy mildew has reached as far north as MD, and the recent storm increased the chances of CDM spreading to Southern New England. Start monitoring this disease here: http://cdm.ipmpipe.org/. Sign up for text alerts!

ECB eggs at blackhead stage- about to hatch on dahlia. photo: A. Radin.

Sweetcorn:

European corn borer trap counts are higher in NH and NY though still surpris-

ingly low in MA (Table 2). Let us know if you are experiencing otherwise! Some locations in NY are starting to see feeding injury from ECB in corn tassels while there is hardly any silking corn out there, and a heavy infestation of egg masses were found on a Dahlia crop in RI. ECB hosts important to vegetable growers include: dahlia, sweet corn, potato, pepper, zinnia, sorghum sudan grass and snap beans.

Brown and Green CEW photos: E. Grundberg

Corn earworm was blown in by the recent storm into some locations in NY and possibly elsewhere. Damage has been reported in tasseling corn in Orange Co., NY. See photos for identification tips (the caterpillars can be brown or green!)

Common armyworm damage has so far been isolated to hotspots in Northern parts of VT and NH and Northern and central NY on field corn and hay crops. Keep an eye out through middle of July.

Multiple

Japanese beetle adults were seen this week in Worcester co., MA on vegetable amaranth and the solanaceous crop-known as 'managu.' Insecticides may be needed to control adult beetles if numbers are high and damage is significant. The New England Vegetable Management Guide lists products for Japanese and/or Oriental beetles in basil and sweet corn sections—for controls in a crop where these beetles are rarely a pest and therefore not mentioned in the guide, check the label of commonly used broad spectrum synthetic pyrethroids, carbamates, and neonicotinoids (as foliar spray). Organic options include neem/azadiractin products and pyrethrin.

PEST SCOUTING AND USING THE UMASS SCOUTING SHEETS

When a pest has been detected on or near your farm, or when monitoring data or environmental conditions indicate that a particular pest may be emerging, it's often a good idea to get into the field and see for yourself what's happening. Successfully implementing IPM requires that you are aware of the conditions on and around your farm each year and over time. Furthermore, establishing a scouting program can help you keep track of what you see and allow you to detect pest problems early and prevent and manage issues before they cause economic losses. Regular scouting will also help you determine whether your spray program and other control strategies are effective, as you can see pest numbers going up or coming down over time. The UMass Vegetable Program has developed a series of crop-specific scouting sheets, linked below, to help you keep track of your scouting and make decisions about what you find!

Some things to consider before you go into the field:

Field history. What crop or crop family was planted here last year and what pest issues were there? Consider insect pests, but also diseases that might persist in soil or on crop residues, and weeds. Also note locations of field edges, as pests may emerge from windrows or woods, or adjacent fields. Note shaded areas or places with poor drainage.

Pest identification. Know what you're looking for! It's important to be able to identify some of the key insects that may be feeding on your crop, and be able to tell the good bugs from the bad. You should also be able to recognize some of the signs and symptoms of insect feeding, and of common diseases and physiological disorders. There are lots of great ID guides out there, including the Northeast Vegetable & Strawberry Pest Identification Guide—a collaborative effort of the New England Extensions. It can be very tricky to tell the difference between one problem and another in the field, though, so if you find something suspect, consider having it diagnosed at the UMass Plant Diagnostic Lab, or testing soil or plant tissues for nutrients at the UMass Soil and Plant Tissue Testing Lab.

Pest life cycles. Consider when certain pests are active and if they overwinter or persist in the environment, or if they have to travel from warmer locations on storm fronts. Pheromone traps, sticky cards, keeping track of growing degree days (GDDs), and using web-based monitoring tools can all help with knowing when to keep an eye out for particular insects and/or diseases. It's also important to know what the different life stages of insect pests look like, where you might find them, and which stage(s) will harm your crop.

Economic threshold and economic injury level. The economic threshold is the pest population size or the level of damage that a crop can tolerate without economic impact. When the threshold is reached, some control should be implemented. The economic injury level is that point above which crop yield will be effected by pest damage, and

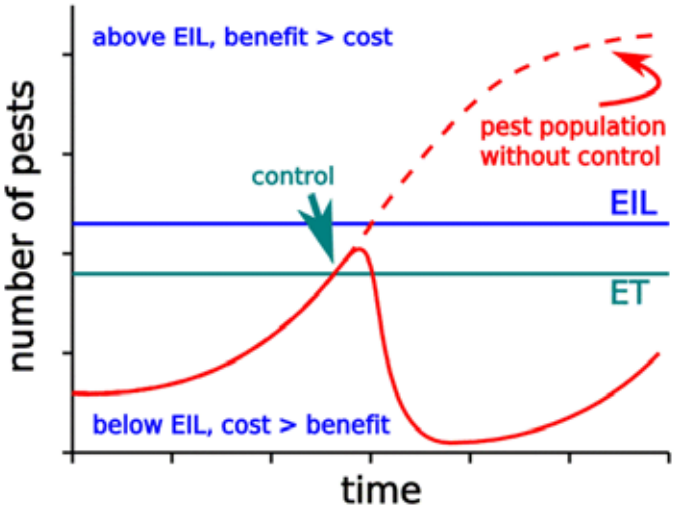

Figure 1. Relationship between economic threshold (ET) and the economic injury level (EIL)

the benefit of controlling the pest outweighs the cost. Often, thresholds have been established through scientific research. You may develop your own thresholds based on your scouting records and trends on your own farm, as well as what your markets may tolerate. Shareholders of a CSA may be more tolerant of some insect feeding than a high-end restaurant, for instance.

Management options. What pesticide options and other control strategies do you have available and how effective are they? Your economic threshold may be lower than those published if you are using organic materials, since they are designed with conventional pesticides in mind. Or you may not have an effective control option for a current pest problem, but scouting and keeping records will help you prevent problems in the future, by using crop rotations, row covers, or materials applied at-planting. Have some sense of what you will do with the information you collect.

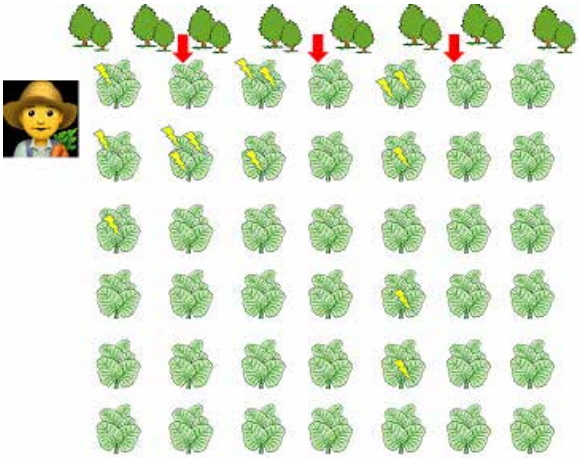

Figure 2. A farmer sees heavy pest pressure on the edge of a field near tree line. image: S. Scheufele

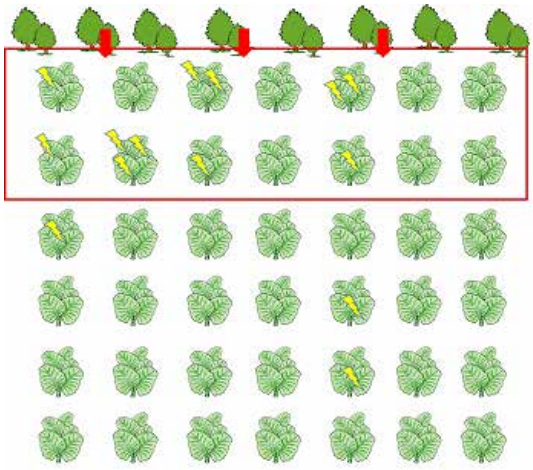

Figure 3. After surveying the whole field, the farmer finds that it is under threshold, and no treatment is necessary. image: S. Scheufele

Now to scouting!

The idea here is to take a random sample that is representative of what is happening in the whole field or crop, or to identify hot spots or problem areas in the field or among different crops or varieties. Don't make spray decisions based on what you see on the first couple of plants! You might panic because the first plant is covered in beetles, but realize that the problem is localized and you are well below threshold when you look across the rest of the planting.

First, take a look at the field as a whole and note if anything looks abnormal. Then, decide how you will divide the field into units. If you plan to look at 25 plants, decide about how frequently you would have to stop to get a sampling of the entire field.

We have scouting sheets for the following crops:

Allium	Eggplant	Strawberry
Brassica	Pepper	Sweet corn
Cucurbit	Potato	Tomato

Each sheet has a list of common pests, and thresholds if available, along with some sampling instructions. Thresholds or control options may vary depending on the stage of the crop, so there is a place to note that as well. Fore example in potato you should scout 3 plants per site when the crop is small or 3 individual stalks once the plants are hilled. Note the unit you are using and what the threshold is.

Using the appropriate scouting sheet for the crop you are inspecting, move through the field—moving in a V or W pattern works best—and look at whatever plant(s) happen to be wherever you stop. It helps to count about the same number of paces between samples, so that you avoid looking for places that are obviously affected or infested and getting a biased sample. Try to get a sense of how widespread a problem is and what percentage of the crop is affected. Look at and around the plant, then inspect more closely—pests and symptoms can often

be found on the undersides of leaves or on stems. It's good to have a hand lens with you for looking at small insects or mysterious lesions. Record what you see in the appropriate line on the sheet, along with any notes you think are important. There is a spot on the sheets labeled 'scouting map' so you can record your path. This may reveal that there is higher pressure on one area of the field, which can indicate where a pest is entering, or a preference for a certain variety.

When you have finished sampling, count up your results. Take the average for whatever unit you are considering for your threshold—it may be insects per leaf, or damage per plant—and compare that number to your threshold. If you are above threshold, apply your control strategy. If you are below, wait to treat and scout again at some regular interval. If you implement a control, scout again afterward to determine if the treatment worked and when or if to make another application. Consider natural enemies you may have found when deciding whether a pesticide application is warranted or which material to use.

Using these sheets throughout the season and over multiple years can help you to identify trends and understand your pest levels and cycles and the effectiveness of your management strategies over time. If you do use the UMass scouting sheets, we'd love your feedback! Let us know if they are helping you manage your scouting program, and if you have suggestions for how they can be improved. Contact us at 413-577-3976 or umassvegetable@umext.umass.edu.

We also have more detailed scouting guides for sweet corn and cucurbits:

Sweet Corn IPM Guide

Cucurbit Disease Scouting and Management Guide

--by Lisa McKeag, UMass Vegetable Program

KNOCK WEEDS OUT AT CRITICAL TIMES

--Written by Mark Schonbeck, Virginia Association for Biological Farming for eXtension March 23, 2010

The "control" part of organic weed management aims to remove weeds that threaten current or future production at the least possible cost in labor, fuel, machinery and potential harm to the soil. Trying to eliminate every weed on the farm would likely lead to red ink, and can defeat efforts to build healthy soil. Thus, the farmer must continually evaluate: do I need to kill the weeds in this crop now? When are the critical times for weed control during the course of the season? For the organic farmer, critical times for weed control are those points at which cultivation or other measures will most effectively protect current and future crops from the adverse effects of weeds. Critical times include:

- When the crop is planted
- When flushes of weed seedlings are just emerging
- During the crop's minimum weed-free period
- When perennial weed reserves reach their minimum
- Before weeds form viable seed or vegetative propagules

Start with a Clean Seedbed. Weeds that emerge before or with the crop have a greater impact on crop yield than later-emerging weeds. Planting into a clean, weed-free field is essential. Remember that an apparently clean seedbed prepared just a few days before the vegetable is planted may have millions of germinating weed seedlings per acre that have not yet visibly emerged. Whenever possible, plant immediately after the final step in preparing the ground – whether that step is harrowing, rototilling, incorporating amendments, shaping the beds, or strip-tilling the crop rows.

For many crops, blind cultivation can be used to keep the seedbed clean until the crop is up. Larger-seeded vegetables can be rotary-hoed to give them a head start. Weed seedlings that beat slow-germinating crops like carrot to the punch can be removed by flaming. Some farmers time this operation by covering a small patch with a pane of glass. When the crop first emerges under the glass, the field is flame-weeded. The rest of the crop then emerges a day or two later, in a clean field.

Get the Weeds When They are Small. The smaller the weed, the easier it is to kill through light cultivation or flame weeding. Early in the growing season when large "flushes" of weeds often emerge, many farmers do a very shallow culti-

vation when weeds are in the "white thread" stage or are just emerging (long before the weeds begin to compete with the crop), rather than waiting until the field is visibly weedy. Shallow cultivation often pays because it:

- Minimizes damage to soil structure and soil life
- Minimizes light-stimulated germination of additional weeds
- Requires less fuel and less effort
- Can kill millions of newly emerging weeds per acre

This approach may be especially advantageous during early stages of crop establishment and growth. Cultivate before weeds get more than an inch tall. Some weeds develop an incredible ability to re-root and survive light cultivation once they pass this stage. Weeds two to three inches tall require more vigorous cultivation, which consumes more fuel, disrupts soil structure, and stimulates additional weed seed germination. One possible disadvantage to this "proactive" approach to timely cultivation is that it can result in multiple passes through the field to keep removing small weeds until the crop is established.

Avoiding Overcultivation: Minimum versus Critical Weed-Free Periods. Weed scientists and farmers have a couple ways of estimating when cultivation is most important for keeping weeds from hurting the current crop. One is to ask how long after crop planting can weeds be allowed to grow before they must be removed (the "maximum weed-infested period"). Another is to ask how long the crop must be kept clean before later-emerging weeds can be allowed to remain (the "minimum weed-free period"). A third is to determine the stage(s) of development in which the presence of weeds is most likely to hurt yields (the "critical period of weed competition" or "critical period for weed control").

Assuming that the crop is planted into a clean seedbed, germinating crops and weeds start their "race" at the same time. Weeds that germinate with the crop usually do not affect the crop's growth until two or three weeks after emergence – when they first become large enough to begin competing for moisture and nutrients. This initial "grace period" during which weeds can grow without reducing the crop's yield potential is the maximum weed-infested period. The farmer needs to cultivate or otherwise control weeds before the end of this period.

Weeds that emerge with or shortly after the crop have the greatest potential for causing economic damage if allowed to grow unchecked. Later-emerging weeds have less effect, and those that emerge after a certain point in time no longer affect yield. This point is the minimum weed-free period.

The interval from the end of the maximum weed-infested period until the end of the minimum weed free period defines the critical period for weed control for the crop. Since the crop can be adversely affected either by early-emerging weeds allowed to persist into this period, or by weeds emerging during this period and allowed to grow, the weed control strategy should focus on keeping the crop clean through this time. If cultivation is limited to one or two passes, it must be strategically scheduled within this period, and implements designed to be effective against the largest weeds present must be used. Possible advantages to this approach include:

- Less labor and machinery time is expended on weed control
- Fewer operations are easier to schedule
- Less frequent disturbance of the soil surface can mean less surface crusting and erosion
- Larger weeds leave more residue that can further protect soil surface from degradation

However, this approach can be risky especially in vegetable crops that are not highly competitive or have long critical periods for weed control (e.g., carrot), or that need to be quite clean at harvest (e.g., salad mix). When cultivation is delayed until the beginning of the critical period for weed competition, the farmer depends on favorable conditions for effective cultivation at that time. If an untimely rain falls, the additional delay will likely result in a significant yield loss. Therefore, most Extension agents and consultants advise organic vegetable growers to "get weeds while they are small," especially early in crop development.

Keep the Crop Clean Through its Minimum Weed-Free Period. Once the early flushes of weeds have been knocked out, continue monitoring and controlling later-emerging weeds until the crop has passed through its minimum weed-free period. For vigorous vegetables this period is generally the first one-third of the crop's growing season, or four to six weeks for crops like tomato, squash, cucumber, snap bean, and transplanted brassicas; and perhaps a little longer for egg-

plant and pepper. Less vigorous crops like onion or carrot may need weed-free conditions for at least the first half of their life cycle, perhaps eight weeks or more.

How "clean" is clean enough during this period? Crops differ in their inherent weed tolerance even during the minimum weed-free period. Slow-growing, weed-sensitive vegetables like parsley, direct-sown onion or carrot can suffer if weeds are allowed to reach the two-leaf stage before cultivation. Thus, it may pay to "cultivate early and often," knocking weeds out in the white-thread stage until the crop is well established. In vigorous crops like beans, sweet corn, or potatoes, one early cultivation and a second pass to remove later-emerging weeds at the two-leaf stage or even a little larger, may be sufficient.

While the crop is still small, those weeds emerging closest to crop plants compete most severely. Therefore, cultivation must effectively remove within-row weeds, as well as weeds between rows. Timing is critical for mechanical within-row weeding, which works only when the weeds are tiny and the crop is sufficiently large that it can withstand the effects of light cultivation. Later in the minimum weed-free period, the growing crop begins to shade out emerging within-row weeds, while weeds emerging between rows can still grow unimpeded and pose a threat. At this point, some vegetables can be cultivated with a between-row implement adjusted to throw some earth into the row to bury and thereby hinder small within-row weeds. This works well for potato, corn, tomato, broccoli, and other tall vegetables that tolerate hilling-up, but of course not for lettuce, spinach, and other vegetables whose edible parts form close to the ground.

Hit Perennial Weeds When Their Reserves are Low. Invasive or wandering perennials like quack grass, nutsedge and Canada thistle that reproduce through a propagating network of rhizomes, roots, stolons, tubers or bulbs are often the most difficult to manage. An initial tillage pass deep enough to chop up these structures will effectively propagate the weed, as each fragment soon regenerates a new plant. However, these plants are weaker than the larger plants growing from undisturbed underground structures. During the first three or four weeks after fragmentation, the pieces of root or rhizome draw down their underground reserves in order to regenerate shoot growth. When the growing weeds each have several open leaves, they begin rebuilding reserves through photosynthesis. Soon thereafter, they can begin to form new rhizomes, bulbs, tubers, or other vegetative propagules.

Additional tillage, or even simply removing top growth, whenever the weeds reach the three to four leaf stage can be quite effective in further weakening invasive perennial weeds. The farmer may need to do this several times at three or four week intervals to knock out a serious infestation. Planting buckwheat or other "smothering" cover crops at high seeding rates immediately after tillage intensifies pressure on the weed, and can get the job done faster with fewer tillage passes. When wandering perennial weeds emerge in a vegetable crop, cultivate to sever top growth whenever the weeds reach this critical three to four leaf stage. Sharp sweeps or knives set to work just below the soil surface will do the job.

SHORT-TERM SUMMER COVER CROPS

Many fields had a late start this year, however, there is still plenty of opportunity to plant a summer cover crop into fields left fallow or where spring crops are coming out but where a fall crop like brassicas, garlic or wheat is planned. Bare soil is subject to pounding rains, erosion and weeds going to seed. Shade produced by a thick cover crop in the summer can keep weed seedheads from forming. According to NRCS, farm soils in Massachusetts are most prone to erosion in early summer when we get heavy rains on tilled fields. There are several good legume and non-legume cover crop choices for planting in June or July that grow rapidly in the summer heat. When planting mixtures in the summer select equally vigorous crops (similar height and growth rate) so they will not compete and shade each other out. For example, Jean Paul Cortens, a New York farmer, likes a mix of 50 lbs/A sun hemp, 10 lbs/A Japanese millet, 5 lbs/A sunflower, and 50 lbs/A cowpea or field pea.

Legumes

Cowpea (*Vigna unguiculata*) is also known as black-eyed or southern pea. It is fast growing with peak biomass often in 60 days and tolerates drought and heat. Cowpeas can fix up to 100 lbs N/A with biomass of 3000-4000 lbs/A. It breaks down rapidly after incorporation. Cowpeas also can be harvested in the immature pod stage as a fresh legume so can serve dual purpose on small farms. *Drill at 40-50 lbs/A and broadcast at 70-100lbs/A.*

Sunhemp (*Crotalaria juncea*) This tropical legume (not related to other hemps) has great potential in our humid, tropic-feeling summers. Sunhemp can produce very high amounts of biomass (10 ton/A in Florida or 3-4 tons/A in Massachusetts). It is a high nitrogen-fixing legume and can contribute over 100 lbs N/A to a following crop. Sunhemp grows very fast in the summer, reaching 6 feet or taller in 8 weeks. Allow sunhemp is to grow 1-3 feet tall, then mow it and let it regrow again. If allowed to get too tall the stems will become tough and fibrous and will not decompose rapidly. This crop is an excellent companion for sorghum sudangrass which can also be mowed to keep it from getting too fibrous. Sunhemp is a day length sensitive crop. It will grow any time during the summer, however it will not flower and go to seed until the days start getting shorter in very late summer. Seed is mostly sourced from Hawaii at this point and may be expensive, but the N contributions may be worth it! *Drill 20-30 lbs/A.*

Sunhemp. photo: M. Hashemi

Crimson Clover (*Trifolium incarnatum*) is a beautiful cover crop which overwintered well in 4 Massachusetts cover crop trials planted in early September 2016, though it is not typically considered an over-wintering cover crop in our state. It is also a great choice for a short-term summer cover or perhaps seeded between plastic rows to reduce splash, weeds, and erosion. It tolerates well-drained soils, heat and drought and has good tolerance to shade and low fertility soils. Shade tolerance makes this cover crop a good choice for mixes. Depending on coverage, it can fix 70-150 lbs N/A. *Drill 10-20 lbs/A, and broadcast at 12-24 lbs/A.*

Mow Sorghun-sudangrass before it reaches 5ft tall to avoid it becoming too fibrous. photo: UMass Extension

Non Legumes

Sorghum-Sudangrass (*Sorghum bicolor* x *S. sudanense*) Sorghum sudangrass is a cross between grain sorghum and sudangrass. It is a warm-season annual grass that grows well in hot conditions and produces a large amount of biomass. It's thick root system and high biomass makes it useful for soil building. Sorghum sudangrass can reach 6-12 ft. tall. Expect 3-4 tons of biomass addition per acre in Massachusetts. As a grass, to get the most growth you will need to add nitrogen fertilizer (40-80 lbs/A) which will be cycled on to the next crop. Sorghum sudangrass is very effective at suppressing weeds and has been shown to have allelopathic and biofumigant properties useful for nematode management. Brown midrib types will decompose more quickly because they have less lignin. *Drill 35-40 lbs/A or 40-50 lbs/A broadcast.*

Phacelia is attractive to pollinators and parasitoids. photo: S. Scheufele

Phacelia (*Phacelia tanacetifolia*) also known as blue or purple tansy is a good cover crop for use in rotation on vegetable farms because it is not related to many crop families. This fast growing cover crop prefers mid-summer seeding. While it does not have a deep taproot, this crop is a wonderful soil aggregator in the top 2 inches. Beneficial insects including parasitoids, bees and pollinators are attracted by the fuzzy blue/purple flowers. This cover crop will winterkill at 15°F. *Seed at 1lb/A drilled and 3 lb/A broadcast.*

Forage-type Pearl Millet (*Pennisetum glaucum*) or Japanese Millet (*Echinochloa spp.)* have similar functions as a summer cover crop: they grow rapidly but can be more easily managed than sorghun sudangrass though with less biomass. Both millets grow about 4-6 ft. tall and have similar seeding rates. They are well adapted to sandy and/or infertile soils and do well in the summer heat. Forage types are better adapted for soil improvement than the grain types. To get the most growth you will need to add nitrogen fertilizer (40-80 lbs/A). Pearl millet has been shown to suppress some nematodes. Forage pearl millet can make a good mulch for late-summer planted no-till or strip till crops. *Seed at 12-15 lbs/A drilled or 15-20 lbs/A boardcast.*

Buckwheat should be mowed about 40 days after planting or within 10 days of flowering to prevent it from going to seed. photo: S. Scheufele

Buckwheat (*Fagopyrum esculentum*) If weed suppression is the main goal, buckwheat is preferable and can be sown as early as May 20. As a broadleaf plant, it covers

the ground earlier than grass cover crops, especially in early June, and out-competes weeds. A good stand of buckwheat attracts beneficial insects, improves soil tilth, and produces more biomass than any other cover crop in the short time it grows, but doesn't do well if the plow layer is compacted. It scavenges phosphorus from soil and makes it available to subsequent crops. If the field is low in nitrogen and phosphorous, buckwheat will do well without additional fertilizer. Buckwheat decomposes quickly after incorporation. The main production risks associated with buckwheat are a failed stand and letting it go to seed. *Buckwheat can be drilled at 50 lbs/A or broadcast at 70 lbs/A.*

Additional Information

Summer Soil Improving Crops for Vegetable Rotations , Gordon Johnson, Extension Vegetable and Fruit Specialist, University of Delaware.

Cover Crop Guide for Vegetable Growers: http://www.covercrop.net.

Cover Crop Mixtures and Planting Dates: http://www.hort.cornell.edu/extension/organic/ocs/reports/Cover%20Crops%20Planting%20and%20Termination.pdf

Managing Cover Crops Profitably: http://www.sare.org/publications/covercrops.htm

Cover Crop Periodic Table: http://www.ars.usda.gov/Main/docs.htm?docid=20323

--Updated for 2017 by Katie Campbell-Nelson

Events

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 from representatives of NRCS and MDAR's Commonwealth Quality Program. Other industry representatives will also 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.

There is no cost for this program but an RSVP is appreciated so that we can get a headcount for food here: https://www.surveymonkey.com/r/SZ6CRXJ

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

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