UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

Volume 24, Number 4 April19, 2013

IN THIS ISSUE:

CROP CONDITIONS

Winter stayed late, with cold days and nights below freezing sticking around well into April. Field work is moving forward steadily now. Soils relatively dry making for good access to early fields. High winds have been a regular event this spring, tearing loose row covers and throwing freshly plowed soil into the windstream. Field preparation, transplanting and seeding are underway for sweet corn, Brassicas, onions, potatoes, and lettuce. Garlic is growing well. Spring farmer's markets are starting up.

Tillage of many kinds has been going strong for the past couple of weeks. Along with traditional plowing and disking, we are seeing more chisel plowing and more use of reduced tillage systems such as deep zone tillage. Over a dozen growers in MA have invested in zone builing equipment and are using it in vegetables and field crops. At the same time there is more diversity in winter cover crops -- more use of crops like oat, sorghum-sudan, cowpea, and field or forage turnip that winter kill and are easy to manage in spring; and more types of winter-hardy grains including wheat.

BUILDING HEALTHY SOILS: THE BENEFITS FOR YOUR FARM

April 24 and April 25 day-long workshops for farmers --- offered in Connecticut Valley and in Southeastern MA

No-till has been widely adopted across midwestern and southern areas of US, but is much less used in New England. Most vegetable growers depend heavliy on tillage and cultivation, and our equipment and growing systems are built around annual tillage. We also know that our soils tend to be low in organic matter and aggregate stability, and compaction is a widespread problem. Given the multiple benefits of reduced tillage, more vegetable and field crop growers in the Northeast are working on ways to reduce tillage and improve soils. How far can we go, given our climate and cropping systems? What systems are practical for us? How can we make better use of cover crops? What are our goals for soil health? These workshop bring nationally known speakers who will offer new ways to think about soil health issues and a chance to discuss -- and see -- what will work on New England farms.

Ray Archuleta is a Conservation Agronomist at the NRCS East National Technology Center, in Greensboro, North Carolina. Ray teaches soil health and the principles of agroecology throughout the country. He has worked for 4 years in the National Soil Quality Team and now is currently working for the National Manure Management Team. He has 25 years of experience with NRCS working in New Mexico, Missouri, Oregon, and now in North Carolina. He is a Certified Professional Soil Scientist with Soil Science Society of America and has a B.S. in Agricultural Biology. His infectious enthusiasm for soil health has earned him the moniker, Ray the Soils Guy. Work by people such as Archuleta, some soil scientists and farmers is prompting NRCS to roll out a more aggressive soil-health campaign specifically to champion farm practices that build more organic matter in the soil.

David Lamm, a 36-year veteran of NRCS, is team leader for NRCS's National Soil Health and Sustainability Team, who work to advance the principles of building soil health among NRCS field staff and farmers across the country. As a District Conservationist in Fort Wayne, Ind., David learned the basics of no-till farming and spent 18 years perfecting, on a grass roots basis, his understanding of what it takes to make no-till work. Armed with this practical knowledge, David worked in Georgia where he broadened his understanding of no-till to include cotton and peanut farming enterprises and incorporated cover crops and irrigation water management systems as key components in successful no-till systems.

April 24 Workshop: UMass Crops Research and Educ. Farm, 89-91 N. River Rd. South Deerfield, MA

Cost $20 including lunch. Registration: you must RSVP by phone or email by Monday at 5 pm if you want to have lunch. Walk-ins are welcome but lunch will not be provided. Make checks payable to Univ. of Massachusetts.

To RSVP and register contact Doreen York 413-545-2254 or dyork@umext.umass.edu.

AGENDA

8:00 AM	Registration
8:30 AM	Welcome -- Christine Clarke, State Conservationist, NRCS, Massachusetts
8:45 AM	Eye Opening Demonstrations: A Soil Health Primer -- Ray Archuleta, Conservation Agronomist, NRCS, Greensboro, NC
10:15 AM	Break
10:30 AM	Economic Benefits of Soil Health -- David Lamm, Soil Conservationist, NRCS, Greensboro, NC
11:15 PM	Benefits of Deep Zone Tillage -- Ruth Hazzard, Team Leader, UMass Vegetable Extension Team
11:45 PM	Cover Crops for Soil Health -- Tom Akin, Conservation Agronomist, NRCS, Massachusetts
12:30 PM	Lunch
1:00 PM	Field Exercises at UMass Farm fields -- Ray Archuleta
2:00 PM	Demonstration of Deep Zone Tillage -- Ruth Hazzard & Kyle Bostrom, Farm Manager, UMass Crops R&E Farm
4:00 PM	Adjourn

April 25 Workshop: Town of Rehoboth's South Fire Station, 104 Pleasant Street, Rehoboth, MA.

Cost $20 including lunch. Registration: to RSVP and register contact sue Guiducci 508-990-2854 or sguiducci@earthlink.net. Make checks payable to BCCD.

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11:15 PM	Cover Crops for Soil Health -- Tom Akin, Conservation Agronomist NRCS, Massachusetts
12:00 PM	Benefits of Deep Zone Tillage -- Dr. Jude Boucher, UConn Extension Vegetable Crops IPM Coordinator
12:30 PM	Lunch (Catered)
1:00 PM	Field Exercises at Bristol Aggie farm fields -- Ray Archuleta, Conservation Agronomist NRCS, Greensboro, NC
2:00 PM	Travel to Steve Noons' Farm, Rehoboth, MA
2:30 PM	Field Exercises at Steve Noons' Farm -- Ray Archuleta
3:30 PM	Discussion of Deep Zone Tillage -- Steve Noons
4:30 PM	Adjourn

GETTING STARTED WITH DEEP ZONE TILLAGE

Deep Zone Tillage (DZT) is a type of reduced-tillage that combines the best features of no-till, conventional-till and sub-soiling. Instead of tilling up the whole surface of a field, with DZT you prepare narrow seed beds for planting and leave the area between rows protected with a cover crop residue (Fig 1). As one grower stated, "a seedbed between the rows is only a weedbed!" Some of the reasons growers switch to DZT include faster field preparation, reduced fuel and fertilizer use, less machine hours and maintenance, erosion control, elimination of plow pans and soil compaction, building soil organic matter, improving soil health, and much more.

DZT Equipment

DZT machines will prepare 2, 4, 6 or more rows or seedbeds at once. Your tillage machine should match your planter for number of rows and spacing.

Figure 1

Figure 2

When ordering a DZT machine, it should come set up with a front coulter to cut through dead crop residue, a straight (not a curved) sub-soiling shank (Fig. 2), so that it shatters the ground instead of lifting it, two wavy or scalloped coulters (Fig. 3) to work up the ground on either side of the shank, and a rolling-basket (Fig. 4) to break up soil chunks and prepare the seedbed. In New England, the sub-soiling shanks must have automatic spring resets (Fig. 5) to allow the shank to trip over rocks or ledge. Depth wheels allow you to control how deep the shank penetrates. The shanks should come with protective, hardened points and side wear plates (Fig. 6), which require replacement after extensive use. Unverferth builds a machine with a straight shank and automatic resets called a Zone Builder (Model 132). It should be ordered with a Strip Builder attachment for each row (coulters and rolling basket).

Figure 3

Figure 4

Figure 5

Figure 6

Residue managers (Fig. 7) should also be purchased and mounted on your planter in front of the planting shoe to remove any crop residue or stones and provide a final cleaning of the seedbed. Cleaning or sweeping the seed bed is necessary unless you plan to kill all cover crops at less than 8 inches height or mow and remove rye after it matures.

Since an equipped 2- and 4-row Zone Builder weighs approximately 2,000 or 3,600 pounds respectively, you will need a 70 hp or 120 hp tractor to pull the machine. The tractor should have 30-inch rear wheels to allow the hitch to lift the shanks off the ground. The tractor should also have front weights to help offset some of the weight of the Zone Builder and help improve steering.

Optional Equipment

Some growers mount seed firmers (Fig. 8) on their planters to assure that all seeds are tucked into the soil to the same depth and to help synchronize seed emergence. Other growers replace packing wheels with spiked closing wheels, especially when trying to close the furrow in clay soils.

Figure 7

Figure 8

The Zone Builder can be ordered with concave baskets (Fig. 9) to provide a slightly raised seedbed or cultipacker-type press wheels (Fig. 10) to help crush blocky soils. Some growers, with very stony ground, get shims (Fig. 11) to reduce the spring pressure on the re-sets so that the shanks trip easier when they contact a rock or ledge. One grower even purchased peg plates (Fig. 12) that attach to the top of the rear coulter posts to help him align the rear coulters to the same angle in every row. You can also replace the pair of rear coulters with a housing of three or four coulters for more aggressive seedbed preparation, again, usually

Figure 9

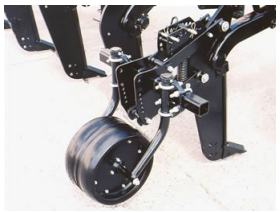

Figure 10

only necessary on clay soils. Liquid or dry fertilizer attachments are also optional. Finally, one grower installed hydraulic lifts on his depth wheels to allow him to roll the machine across town instead of lifting it on his three point hitch (Fig. 13).

Equipment Maintenance

Grease fittings to start season. Set front coulter to penetrate 2 inches and replace when dull and it fails to cut crop residue. Replace shank points and side wear plates as needed (Shank Protection Kit). Adjust angle of back coulters to provide more or less aggressive tillage for a smooth seed bed, depending upon soil type and residue height or thickness.

Figure 11

Figure 12

Preparing fields for DZT

Be sure all fields are limed to the proper pH before starting DZT. While some lime will be moved deeper into the soil by the shank and coulters, it is not as easy to make large adjustments in pH with reduced-tillage equipment compared with conventional tillage that mixes the lime throughout the soil in the plow layer. Plan to make maintenance lime applications more frequently to keep pH adjusted properly.

Use a penetrometer (or metal probe, Fig. 14) to check the depth to the top and bottom of the plow pan in your fields. The shank on your DZT machine should be set to till about two inches below the plow pan to improve soil drainage, allow plant roots access to the lower soil profile during dry weather and to save fuel.

Figure 13

Figure 14

Choosing, Planting and Killing Cover Crops

To further reduce tillage, instead of harrowing crop residue (i.e. sweet corn stalks) before planting a cover crop, most DZT growers mow off crop residue, before spinning on cover crop seed. Some DZT growers purchase no-till grain drills to completely eliminate tillage while planting a cover crop.

It is important that cover crops are completely dead in the spring before using DZT.

Most growers use winter rye as their cover crop because it will establish throughout September and even into October during warm falls. In most cases, rye should be killed in the spring before it is 8 inches tall, to maximize nitrogen credits and for easy DZT in early spring vegetable plantings. Larger rye may take up to 3 weeks to die and be ready for DZT in cool spring weather. For pumpkins and winter squash, growers often prefer to let the rye reach 24-30 inches before killing it, which provides a protective barrier of residue to help keep the fruit clean and sound. Rolling the rye and heavy seeding rates (>150 lbs./A) need to be used to provide even minimal weed control. During or after pollination, rye can also be mowed and baled without risk of regrowth. It is easy to DZT through rye stubble, but a light dose of post-emergence herbicide (i.e. 1 pt of Roundup) may be needed with your pre-emergence herbicide to kill small weeds that emerged before the rye was cut.

Mixes of rye and other cover crop species help improve soil health by increasing populations of soil microorganisms. Some growers use a mix of rye and tillage- or Daikon radishes. The radishes grow up to 20 inches deep and keep hard pans from reforming. They capture and then re-release excess nitrogen when they winter kill, while the rye provides spring cover for the soil. Radish mixes should be planted in August for good fall growth. "Cocktail mixes" of up to 13 different cover crop species can be used to increase the diversity of soil microorganisms.

Oats can be used and will winter kill where a grower prefers to avoid using a herbicide to kill the cover crop. Oats should be established in August.

Buckwheat, sorghum-sudan or Sudex can be used as a late summer cover crop/smother crop to build up soil organic matter and to avoid additional tillage (i.e. instead of harrowing to prevent weeds from going to seed after early harvested crops, such as sweet corn). Plant in June, July or early August.

Herbicides

Glyphosate (i.e. Roundup) or paraquat (i.e. Gramoxone) may be used to kill the cover crop. Remember that it may take

three weeks to kill the cover crop in cool weather, and plan ahead, so that your fields are ready for DZT and planting. For best results, glyphosate should be applied with 10-20 gallons of water per acre, while paraquat should be applied with 80 gpa.

Sweet corn, pumpkins, squash, cucumbers, beans and peas can all be direct-seeded after DZT. Most transplants can also be set following DZT. Standard pre-emergence herbicides can be used for most crops. Post-emergence herbicides may or may not be needed depending upon weed pressure in a particular field, just as with conventional tillage. Herbicides must reach the soil to be effective. This is easy if the cover crop is dead. Rain or irrigation may be needed to improve coverage and activate products. The soil texture and organic matter content determine the rate of herbicide to use, not the amount of crop residue on top.

Growers new to DZT should start with large-seeded crops with effective herbicide choices, such as sweet corn, pumpkins or winter squash.

Sweet corn: Use a common broadleaf and grass herbicide mix (i.e. Callisto and/or atrazine + Dual Magnum or Prowl or Frontier or Lasso). Post-emergence products (i.e. Impact) can be used if needed.

Pumpkins or winter squash: Use common pre-emergence herbicides (i.e. Strategy or Curbit + Sandea). Post-emergence applications may be applied if necessary (i.e. Sandea or Poast).

After several years of using DZT, annual weed pressure may decline, but perennial pressure may increase. Control perennial weeds (i.e. dandelions) with fall applications of systemic herbicide (i.e. Roundup).

Fertilization with DZT

As with conventional tillage, all fertilizer should be banded at planting or side dressed to avoid feeding weeds between rows. Sometimes potassium is bulk spread prior to field preparation and planting to avoid burning plant roots with excess salt (N + K), depending upon how much fertilizer is recommended by the soil test. If applicators are installed to apply starter fertilizer to both sides of the row, then more than 90 pounds of N and K can be banded at planting. Side-dressing equipment may be retrofitted with no-till disk openers (Fig. 15) to allow for placement of nitrogen below the soil surface, even outside of the tilled zone. Sidedressing may also be followed by cultivation to help prevent volatilization (Fig. 16).

For sweet corn, a tank can be added to the tractor or DZT machine (Fig. 17) and liquid nitrogen (28-32%) can be placed 8-inches below the seed through a tube running down the back of the DZT shank (Fig 18). Liquid potash (K) is also available. A nitrogen stabilizer (slow release N) should be used if you will not be side-dressing additional N. If the rye cover crop is killed at about 8 inches, 20 pounds of N should be credited towards the total needed by the crop.

Field preparation with DZT

The Zone Builder should be operated at 3 to 4 mph. Row markers or foam markers can be used to space rows. Fields can be prepared without sinking equipment even when they are wet because the cover crop provides support. Over several years, pulling the Zone Builder becomes easier because compaction is reduced over time.

Figure 15

Figure 16

Planting

Planting can be done the same day as DZT or at the same time. Following the prepared seedbeds with the planter is easy. Because it doesn't take a week to prepare the field, and moisture is retained under the mulch, DZT results in better seed emergence and stands when planting during dry spells.

One grower created a fifth-wheel style hitch for his planter (Fig. 19) so that he could prepare the field and plant in one pass. He developed the fifth-wheel style hitch that connects to the front of the Zone Builder (rather than the back) to distribute the weight of the planter closer to the tractor to avoid levering the front of the tractor up and decreasing steering.

Figure 17

Figure 18

Raised Beds/Plasticulture

An effort should be made to pass a shank directly under each crop row on the bed. One grower prepares raised-beds using conventional tillage and bed-making techniques. He simply passes DZT shanks through the tilled soil at 14-inch spacing prior to making the bed and laying plastic (Fig. 20).

Another grower would make two separate close passes with the Zone Builder if the bed was to have two rows of crops (i.e. peppers). He would then run the bed-maker over the slots created by the Zone Builder. He used extra-large disks on his bed maker to gather enough soil to make a firm bed.

Some growers only prepare beds on land where DZT has been used for several years to break up plow pans and relieve compaction. Instead of disturbing the entire field surface using conventional tillage (plow and harrow), they may simply loosen a strip of soil for the bed-maker using chisel plow shanks.

Figure 19

Figure 20

Cultivation

A Reigi Weeder can be used to remove weeds in the row for widely spaced crops (e.g. pumpkins or peppers). Lilliston rolling cultivators or spider cultivators can be used through light residue. Traditional shank and shoe cultivators will also work.

-by Jude Boucher, University of Connecticut Extension. Reprinted from Crop Talk, December 2012, Vol 8:14

NEWA: A GROWER-FRIENDLY WEATHER AND PEST RESOURCE FOR MASSACHUSETTS

For the third year, UMass Extension Vegetable and Fruit programs are partnering with the Network for Environment and Weather Applications (NEWA), a web-based weather and pest reporting and forecasting system, to provide growers with ready access to useful weather and pest data. The NEWA website was developed by the New York State Integrated Pest Management program and relies on a network of on-the-ground weather monitoring stations. NEWA generates forecasts and alerts for insect and disease pests of both fruits and vegetables.

In Massachusetts, over twenty locations are reporting data every hour into the NEWA network. Some of these are located at airports and report hourly temperatures, daily max and min temperatures, rainfall, windspeed, relative humidity and hours > 90% RH. Others have been set up on vegetable and fruit farms around the state, reporting directly from the field via the Internet to the NEWA website. These also report leaf wetness periods. Now, from your own computer or smartphone, you can access the kind of weather data and pest forecasts that you need to help make management decisions on your farm.

For each weather station, you can choose a range of output reports. One of the most useful is basic growing degree day (GDD) accumulation -- by day, month and season -- at various base temperatures. There is also a 'forecast' option that will tell you expected GDD's for the next seven days. This can help you to predict emergence of pests. Use this in combination with GDD models for pest flights that can tell you when to expect activity. For example, the models for cabbage and onion maggot indicate the cumulative GDD milestones for the beginning, peak and end of spring maggot fly activity. European corn borer emergence in spring (350 GDD, base 50 F) can be monitored using GDD – an excellent complement to our pheromone trap network.

In addition, hourly data can be run through models that describe or predict key disease events that are weather dependent. For example, the model for late blight of tomato and potato tells when the first outbreak might occur. The models for both late and early blight indicate the severity of recent conditions, and what ongoing spray schedule is recommended. Vegetable growers have used these to time their fungicide applications.

This is an excellent resource for farmers, easy to navigate and updated hourly and daily. It's great to just pick a weather station and get degree days, a whole weather report for the previous month, or a forecast for a specific pest. The local forecasts and real-time temperatures can also be helpful in determining when frost protection in needed.

To find the growing degree days accumulated at the weather station nearest your farm, go to http://newa.cornell.edu/, hover your cursor over 'Weather Data' on the menu along the top, and choose 'Degree Days' from the drop down menu. That will bring you to a page where you can select your nearest weather station (NOTE: Mass stations may be grouped together or listed alphabetically). Select your base temperature, the month and the year, and click 'Get Report'. Voila!

To find the forecasts for a specific pest or disease, go to http://newa.cornell.edu/, hover your cursor over 'Pest Forecasts' on the menu along the top, and choose whichever pest model you're interested in from the drop down menu. That will bring you to a page where you can select your nearest weather station. Click 'Get Report' and it will bring you to the most current model report for your selected pest. For pests not listed on NEWA, a good resource for degree day information on vegetable and fruit insects can be found at University of Wisconsin Extension, http://hort.uwex.edu/articles/degree-days-common-fruit-vegetable-insect-pests.

In Vegetable Notes this season we'll be putting out articles with specific information about how to use these models to inform your pest management programs as the season progresses.

-Ruth Hazzard & Andy Cavanagh for the Vegetable and Fruit IPM Team

BIOLOGICAL CONTROL OF ECB WITH TRICHOGRAMMA OSTRINIAE IN SWEET CORN: BE READY FOR EARLY RELEASES!

A tiny wasp that will search out and kill the egg masses of one of our major sweet corn pests – can this really work? A number of sweet corn growers around the state have been testing *Trichogramma ostriniae* (pronounced ah-STRIN-ee-ay) parasitic wasps and have found that they do help to control European corn borer (ECB) in both corn and peppers. The use of these wasps in commercial sweet corn fields in Massachusetts has resulted in the reduction or elimination of foliar insecticide sprays, saving time, labor, pesticides, and fuel, reducing soil compaction, and maintaining and improving ear quality. This method is an ideal IPM practice because it prevents the emergence and feeding of caterpillars in the first place, as opposed to rescuing the corn with sprays after the caterpillars have become a problem. Using *Trichogramma* to control ECB in early corn (corn to be harvested in July) is especially useful because timing sprays in the early corn can be tricky. Also, most of the caterpillar damage in early sweet corn is from ECB - thus, wasp release control measures are not complicated by the need to control other major caterpillar pests. *Trichogramma* can also be used for second generation ECB, which attacks both peppers and corn. Even though corn earworm can become the major pest in late season corn, ECB also causes a lot of ear damage and corn is cleaner when ECB is controlled. In pepper, *Trichogramma* reduces fruit infestation, resulting in fewer culls and greater success with high-quality, high value, ripe red peppers. It also reduces culls in ornamental corn.

Biology

Trichogramma species are tiny parasitic wasps, smaller than the period at the end of this sentence. Female wasps lay their eggs in the egg masses of host insects. *Trichogramma* larvae feed and pupate inside the egg, killing the egg and preventing hatch. *Trichogramma ostriniae* lays its eggs in ECB egg masses. As they mature, unparasitized ECB egg masses turn from a cream color to white, to white with a black head mass in the center of each egg. When parasitized by *Trichogramma*, the entire egg turns black. *T. ostriniae* have excellent dispersal and ability to search for egg masses in the field. They do not overwinter but they will reproduce and contribute to the control of ECB throughout the season.

Release timing

While some native species of *Trichogramma* persist in the wild, *T. ostriniae* need to be reared at an insectary, shipped to the farm and released each season. Since *Trichogramma* control ECB by parasitizing egg masses, knowing when to release the wasps requires knowing when the ECB moths are laying eggs. Thus, knowing when ECB flight begins, reaches a peak, and ends in a given field is key to the proper timing of *Trichogramma* releases. You can use regional information about flight activity; however, to get the best coordination of timing on your farm, we recommend that you monitor ECB flight in your own fields.

ECB moths have two generations per growing season in Massachusetts; the first one emerges in late May or early June, while the second generation begins to emerge in late July and early August. Time the first release of *T. ostriniae* to the beginning of ECB egg laying, which will begin within a week after the first ECB moths are caught in traps. If the corn is

less than 6 inches high, you may want to wait a few days. For corn maturing in the middle of moth flight, target releases to corn that is in the 4-6 leaf stage (12-16 inches tall).

To help align the concentrated presence of *T. ostriniae* with ECB host egg laying we recommend three releases, each approximately 7 days apart. Our current recommended release rates in early corn are 60,000 wasps per acre per release. Another approach which costs a bit less is to release 30,000 on the first week (when flight begins) and 60,000 for the second and third release.

Growing degree days (GDD) can help with timing. Using a base temperature of 50 degrees Farenheit (DD50), the first spring moths will emerge at 375 DD50 (this coincides with the time when Bridal Wreath Spriraea is in full bloom), and the first eggs are laid at 450 DD50 (when Pagoda dogwood is in late bloom). Eggs require 100 degree days to hatch (See below for these miletones in Celsius growing degree days). Releases should be made when eggs are in the field, but before eggs hatch. Degree day information for many locations in MA can be obtained through the NEWA website (see related article). To be conservative, we prefer to release the same week that flight begins as the additional GDD for egg laying will very likely accumulate within that week.

Comparison of FDD and CDD		
ECB first generation development		
	F (base 50)	C (base 10)
emergence	375	208.33
first eggs	450	250.00
egg hatch	550	305.56
FDD= growing degree days in Farenheit		
CDD= growing degree days in Celsius		

Handling *Trichogramma*

Trichogramma are shipped from the insectary as pupae inside protective cards. They are ready to emerge upon arrival, although there will be a range of pupal age so they will emerge gradually, over 1-7 days, depending on temperature. It's best to put the cards out in the field the same day as they arrive. If you cannot release them upon their arrival, keep the cards in their shipping box in a cool location at about 50°F – not in the refrigerator! The insects are alive: avoid exposing them to extreme temperatures (below 40°F or above 90°F) so they will still be alive and in good shape when you put them in the field.

Releasing *Trichogramma*

Place the proper number of cards to provide the desired release rate in the center of the field, or at regular intervals through the field, away from the field edges. *Trichogramma* wasps will disperse well throughout the field - one to four release sites per acre is adequate. Tie cards securely to corn leaves or on a stake. Do not put them on the ground. Leave the packet stapled shut so that other insect predators do not consume them.

Scouting release fields

Where *Trichogramma* has been released, you can scout as usual. Eggs that were parasitized and did not hatch will never reach the larval stage, resulting in a lower rate of infestation with caterpillars. Use the standard ECB threshold (15% infestation in caterpillars or fresh damage) to decide whether to spray.

Spraying release fields

T. ostriniae will suppress ECB, but will not always provide complete control. In addition, an early corn earworm flight

may arrive during silking. Thus, insecticide applications may still be needed to achieve high levels of clean corn. Use selective insecticides with low impact on natural enemies (aka beneficials). *Trichogramma* that are inside host eggs are somewhat protected from the spray and many will survive, but adult wasps may be killed by insecticides that are harsh on beneficial organisms.

Ordering *Trichogramma*: PLACE YOUR ORDER NOW!

Trichogramma ostriniae may be ordered from IPM Laboratories in Locke, New York.

PH: 315-497-2063 | FAX: 315-497-3129 | Email: ipminfo@ipmlabs.com .

To ensure that you will be able to receive *Trichogramma* this year you must call IPM labs as soon as possible. *T. ostriniae* are custom-reared based on pre-orders, so let IPM labs know your needs well in advance. When placing your order, have the number of acres you wish to release in and the size and number of plantings you have for early corn. You need to estimate your release dates based on past experience; these can be fine-tuned, to some extent, closer to the release date.

- By Amanda Brown & Ruth Hazzard, Extension Vegetable Program, University of Massachusetts-Amherst.

For more information about Sweet Corn IPM, see Using IPM In the Field: Sweet Corn Insect Management available online at: http://www.umassvegetable.org

Vegetable Notes. Ruth Hazzard, Amanda Brown and Andrew Cavanagh, 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.