The Week in Vegetables

Plenty of growing season left, if you are invested in fall production. Caterpillar pests of Brassicas are capable of doing plenty of damage, so don’t neglect them. Make sure that winter squash and pumpkins aren’t sitting in wet spots if they haven’t yet matured. There are a few scattered reports of late blight on field tomatoes, but overall, very few occurrences anywhere in New England. All the tropical moisture will certainly hasten the end of summer fruiting vegetables in the field because of foliar disease. High tunnel vegetables, however, still have some good growing, though tomato ripening is slowing down. For some, there is pressure to turn that ground into winter beds, but it’s getting late now. But if you are rotating between tunnels, perhaps tomatoes can be removed after the freeze, and beds prepared for February seeding. What do you do with your tunnels? Let’s talk about it this winter, along with lots of other interesting stuff, at some informal round table discussions... possibly at a microbrewery. Who’s in??

We would also like to identify YOUR priorities for educational programming and research! What production issues do you battle with? What new products or practices interest you but you haven’t the means to test them? We would like to test and demonstrate products and practices, both at URI and on your farm, and provide updates on topics of interest.

There is a SURVEY in your future...

We had a great Twilight Meeting! The following are descriptions of the various projects carried out in 2017, for those of you who didn’t make it out. SEE YOU NEXT TIME!

Laser Scarecrows

Birds can be a major source of crop damage. Blackbirds, starlings, and crows are particularly problematic on sweet corn, where large flocks can render entire fields unmarketable in just one day. Netting, bird scare balloons, and similar physical repellants are impractical in large sweet corn fields, so many growers use propane cannons to repel birds. The resulting noise pollution causes problems with neighbors. We have been investigating alternative control strategies, and laser scarecrows are showing exciting potential. On the research farm the field protected by the laser scarecrow had significantly fewer damaged ears than the unprotected field, although bird pressure was generally low. In commercial fields with high bird pressure, growers report damage levels below 5% with the laser. Those fields have previously reported up to 80% damage when not using bird protection. Laser scarecrows appear to be more effective against starlings and blackbirds than propane cannons, and they are essentially silent and inoffensive to neighbors. We will be continuing to explore the potential of laser scarecrows over the next several years, including testing them for protection against Canada Geese, and for use in grapes, blueberries, and similar crops. This work is funded by grants from NE-SARE and the RI Specialty Crops Block Grant Program.

Summer Cover Crops

Cover crops can provide many benefits beyond protecting soil from erosion over the winter. Two benefits with particular utility to vegetable growers are the ability of cover crops to build soil organic matter, and the ability of cover crops to smother or suppress weeds. These benefits are only minimally realized when traditional winter cover crops are seeded in late fall or terminated in early spring. However, seeding winter cover crops in late summer and terminating them in late spring often does not fit into local vegetable production systems. So we have been investigating ways to integrate summer cover crops into vegetable production.
Summer Cover Crops, continued

One option is to use fast-growing cover crops after spring vegetables or before fall vegetables. Buckwheat seeded in June or July can produce 3 tons of above-ground biomass in 6 weeks. Mustard produces 2 tons of above-ground biomass in 6 weeks, and produces more below-ground biomass than buckwheat. Both buckwheat and mustard effectively prevent establishment of summer annual weeds, and they can effectively smother perennial weeds. Japanese millet requires 8 weeks to produce maximum biomass but is an extremely efficient nitrogen scavenger and is compatible with herbicides that control broadleaf weeds and nutsedge.

Another option is to plant cover crops between rows of long-season vegetables. Pumpkins are an ideal crop to grow this way, since they need 10-12 feet between rows to accommodate the vines, but do not really occupy the extra space until the last half of the growing season. We seeded teff in 5-foot bands between rows of pumpkins planted 10 feet apart. The teff was mowed once to control pigweed and similar summer annual weeds that germinated along with the teff, and the entire field was treated with halosulfuron herbicide to control nutsedge. No pre-emergent herbicide was used; instead the pumpkins were cultivated for weed control until the vines began to run. The field is set up with alternating bands of teff and bare ground; we will be collecting data on whether teff affects the pumpkin yields.

Reduced Tillage Vegetables

Since the advent of herbicide resistant crops, most commodity crop acreage in the US has been managed with little or no soil tillage. Switching to no-till has saved farmers time and significantly lowered their fuel bills, since primary tillage is one of the least fuel efficient practices in agriculture. No-till farming has also had a huge positive impact on soil health, essentially eliminating soil erosion in many fields, and improved soils’ ability to buffer the effects of variation in rainfall. With all these benefits, vegetable growers have been eager to similarly reduce their dependence on tillage, but without the adoption of herbicide-resistant crops.

Zone tillage, in which only a narrow planting row is disturbed and the space between rows remains covered with a mulch, is the most widely used type of reduced tillage in vegetable production. Generally a mulch of killed cover crop biomass is used to prevent weed growth between the crop rows. The two biggest challenges with zone tillage are that the soil is generally cooler with less available nitrogen than in a tilled field, and that if the mulch fails to sufficiently control weeds, there are few alternatives to hand-pulling.

This summer we grew butternut squash and broccoli in a zone till system with a mulch of winter rye and vetch. The mulch had been planted in September using a no-till drill with rye at 60 lbs/acre and vetch at 23 lbs/acre. It was terminated in May using glyphosate, and then rolled and crimped. Broccoli and butternut squash were transplanted in early June, and additional butternut was direct-seeded. The squash plots were treated with Sandea herbicide when plants had 4-5 true leaves to control yellow nutsedge. Broccoli is sensitive to Sandea so nutsedge was controlled by shielded application of glyphosate between the rows. Weeds (primarily pigweed) were hand pulled once in the squash, concentrating on the south end of the field. Broccoli was hand-weeded twice.

The mulch suppressed weeds sufficiently for the transplanted butternut squash to become established and close the canopy. However, the direct-seeded butternut squash were mostly engulfed by the weeds. The broccoli grew well, but produced more small heads than desired, with approximately 25% of heads having a diameter of less than 4 inches.

Summer Low Tunnels

Low tunnels are normally associated with season extension, and with protection from low night temperatures. However, ventilated tunnels of clear slitted or perforated plastic are useful for increasing daytime temperatures in the crop canopy. We have been using slitted rowcovers to establish melons since 2010, and have found that they greatly increase vegetative growth, leading to more vigorous plants at the onset of flowering, higher yields, and better fruit quality. Normally we remove the covers when the melon plants begin flowering, to permit pollination. However, we have found that leaving covers in place until harvest increases fruit quality, particularly in cool summers.

This year we tested two designs for growing-season-long tunnels. The challenge with tunnels that remain in place all season is that they need to be easy to open and close to allow access to the crop. Thus typical methods of anchoring the plastic (soil, stakes, sandbags, rocks) are impractical. One approach to easy-open tunnels is the TunnelFlex system from Dubois Agrinovation. This system uses a combination of heavy ground pipes and elastic cords over specially designed hoops to secure the plastic. The system is expensive - $450 for 100 feet of bed under tunnel – but all components, including the plastic, can be used for multiple years. Another approach is the grower-developed double hoop system, which uses conventional 9-gauge wire hoops and 6 foot perforated plastic. In this system the plastic is laid over the hoops, stretched tight, and staked at the ends of the beds. A second set of hoops is then placed over the plastic, close to the first set. This further tightens the plastic, and prevents billowing. The materials cost is only $30. The hoops are re-usable, although the plastic lasts only one season.
Summer Low Tunnels, continued

We found that the taller hoops of the TunnelFlex system made weeding and harvesting easier, and it held up well to wind. However, the lower edges of the tunnel remain loose, providing reduced protection when plants are small. Also the plastic is perforated only on the sides, and rainwater puddles in the plastic between the hoops. The double-hoop tunnels were really too small for the vines, and the sides had to remain up for the second half of the summer. They were vulnerable to wind unless the plastic was pulled very tight, and well-staked at the ends of the rows. However, the plastic is perforated all over, so puddling of rainwater is not a problem, and the perforations allow easy access for bees.

“Field Tunnels” for Season Extension

[This project is funded by Rhode Island Department of Environmental Management as part of a Specialty Crops Block Grant from USDA.]

These tunnels aren’t very high; and they are not so low-you can go in them. They are pretty cheap to make using bulk materials, coming out to about $75 for each 20’ x 7’ unit. The target audience for these tunnels is our urban growers who have small production areas and need to extend their seasons in the spring and fall to satisfy their markets.

Here at our farm, we are measuring absolute yields of a small variety of crops that are often grown by our African immigrant producers. This includes: “Garden Egg”, a.k.a “bitter ball”, a small eggplant; “Lagos Spinach” or “Quailgrass”, a leafy Celosia green closely related to ornamental flowers like Cockscomb; one species of vegetable Amaranth grown for its greens; a chili pepper variety; and the leafy green Mallow-family plant known to us as Jute (for fiber) but known in some countries as “Lalo.”

All plots received the same amount of compost to start. All plots are set up with drip irrigation, which few urban growers are using. This is a particularly important practice that we would like to see adopted because all of the water they use is metered, and drip is very efficient and effective. We are looking at three factors:

+ or – “Field tunnel”
+ or – Organic fertilizer
+ or – Black plastic mulch

We have been weighing EVERYTHING that we harvest to find out which setup is most productive overall. The numbers aren’t all in yet but we can see that all + forms of treatment have effects on some crops and not on others.

Foliar Feeding of Determinate Tomatoes: A Collaboration between Confreda Farms and URI

[This project is funded by Northeast Sustainable Agriculture Research and Education.]

Tomato production for wholesale markets can be a costly but lucrative enterprise. In recent times, a wide array of growth enhancing products have come onto the market, most of which are technically fertilizers. “Technically” means that these substances contain plant nutrients. They also contain other things, one of the more common of these being “HUMATES.” Go ahead and do a search with this word. You will be hard-pressed to find a publication from agricultural researchers who are affiliated with public institutions. Nearly every hit will be from a commercial purveyor of products or from people affiliated with an industry. There is a vast business in selling fertilizers containing humates to farmers. They are touted as being instrumental in improving a wide variety of properties, including: “growth of beneficial soil microbes; deactivation of toxic metals; improvements in soil structure including water retention capacity, enhanced nutrient and micronutrient uptake and photosynthesis; resistance to abiotic stress, including salinity; and increased growth, yield and product quality.”

Humates in these formulations are derived from Leonardite and other “lignite” coals. They are not, contrary to common wisdom, found naturally occurring in healthy soils. The few academic publications evaluating them that can be found express skepticism in the efficacy of humate-containing products.

Foliar feeding is another practice which seems to be ever more popular in both organic and conventional production systems. This practice probably originated in Western arid regions where soil is naturally alkaline. Alkaline soil renders metal micronutrients insoluble, an issue we do not have in the rain-fed East with its naturally acidic soils. In the West, foliar feeding of some micronutrients that are in chelated (“key-lated”) form can be an effective way of touching up. In the East, its utility is questionable except
when a glaring deficiency is detected, yet it is regularly practiced. Humates behave as chelators, so fertilizers are often formulated using metal micronutrients and humates.

There are other foliar fertilizer formulations (say it three times fast) which do not contain humates that are also widely recommended by industry representatives. **The Confredas have been trying these products on their farms and have not yet arrived at a verdict on their efficacy. We assisted them in evaluating several of these on their farms, and we also established a trial at URI.**

**List of Products:**

HumaZinc (6-24-3); Nachurs 10-18-4; Solucal 6-0-0 8% Ca; Nachurs 0-0-24; Nachurs 7-0-7; Megafol 3-0-8; Valagro 3-0-15; CoRoN 25-0-0 0.5% B;

Most of these are in liquid form, delivered in “Totes” (275 gal); most cost around $2,000 per tank.

**Results SO FAR:**

Two Confreda Farms plantings were assessed, one in Warwick and one in Cranston. In both of these plantings (early season and mid season), no differences were detected between foliar fed and non-foliar fed areas of the fields in terms of GROSS yield, MARKETABLE yield, or Percent Marketable yield.

At URI in the early season planting, no differences were detected between foliar fed and non-foliar fed areas of the fields in terms of GROSS yield, MARKETABLE yield, or Percent Marketable yield.

**Trial of intensive vegetable production systems**

The purpose of this long-term experiment is to compare the performance of four vegetable production systems which differ in tillage and other soil management practices and nutrient sources:

- **Agrifacts:** Conventional tillage, conventional synthetic fertilizers applied per the *New England Vegetable Management Guide.*
- **Precision organic:** Minimal tillage (rotary power harrow), organic fertilizers as nutrient source, sidedressing applied through the irrigation system and scheduled based on evaluation of the nitrogen status of the plant using a SP AD meter, irrigation to be automated in the future using Decagon soil moisture sensors.
- **Locally autonomous:** Minimal tillage (rotary power harrow and broadfork), local, certified organic yard waste compost from the Rhode Island Resource Recovery Center supplied by Casella Organics as nutrient source, modeled after practices described by Fortier and Coleman and often practices in urban agriculture.
- **Urban cap and fill:** No tillage, no application of fertilizers. Windrows of a 50:50 RIRRC compost:loam mix on woven geotextile fabric meeting ASTM standards specified by the City of Boston. Modeled after urban practices for mitigating soil contamination.

Each system or treatment is replicated 5 times in a complete randomized block design. At 25' x 50' in size, the plots are scalable to urban to peri-urban production. Each consists of 6 raised beds 2.5' x 50' in size separated by 1.5' paths. In the summer of 2007, 6 crops were grown: tomato 'Mountain Fresh Plus,' zucchini 'Raven,' eggplant 'Orient Express,' kale 'Toscano,' Swiss chard 'Bright Lights,' and edamame (edible soybean) 'Tohya.' Measures include total yield, marketable yield, weed pressure, and indicators of soil quality including soil organic matter, infiltration rate, bulk density, and below ground ecosystem services.
Layered annual polyculture trials

Polyculture systems of two or more crop species are an underutilized and under-researched intensification strategy for urban to peri-urban farming. Intercropping can result in overyielding in these systems compared to monocultures of the same species. With crop plants of different heights, layered systems in particular could vertically expand production, fully exploiting the current agricultural land base. Research on layered perennial systems, e.g., agroforestry schemes, indicates they provide overlapping social, ecological, and economic benefits but require long-term land tenancy, a relative rarity in urban production. Layered annual systems may provide similar benefits without long-term investment. Used by immigrant farmers who underplant vining crops on trellises with leafy crops requiring less light, these systems have not been scientifically evaluated or adapted for conventional crop production.

This project compares the performance of traditional bitter melon-amaranth and bitter melon-sweet potato polycultures with that of the corresponding monocultures, answering the questions: Does the polyculture yield more than the monocultures? Is the polyculture more profitable than the monocultures?

In 2018, we will evaluate whether these traditional layered annual polycultures can serve as models for the development of polycultures of more conventional crops grown by non-immigrant farmers, such as pole beans or cucumbers in place of the bitter melon and conventional greens substituting for the leafy ground layer.