

Organic Weed Management at Fort Hill Farm - a Case Study

Background. Paul Buccigliaglia has been farming at Fort Hill Farm in New Milford, CT, since 2002. The farm has a 22 acre field with about 17 acres in vegetables and cover crops. Paul's market is 90% CSA (currently 400 shares) and about 10% farmers' market with a little wholesale of excess produce. The farm is certified organic by Bay State Organic Certifiers. It has a sandy loam soil, and was in hay for a decade before vegetable production. Prior to that, the farm was cropped for a large dairy. The soils are uniformly high in phosphorus, with an organic matter level around 2.5 percent.



Diversified vegetable beds at Fort Hill Farm in New Milford, CT

Primary weeds. Paul has been dealing with the same weeds since he's farmed here: the major species are large crabgrass, redroot pigweed, common lambsquarters, and purslane. Although still a minor weed, there has been a noticeable increase in hairy galinsoga.

Production practices. The land is kept covered as much as possible over winter; roughly a third of the fields has fall planted oats and peas, a third has hairy vetch/rye and the other third has mowed cover crop residues or vegetable crop residues where crops were grown into the late fall. In the spring, every 2 out of 3 years, 10 to 15 tons per acre of leaf compost and/or horse manure compost is applied. This is primarily for adding organic matter to the soil, since these composts are relatively low in nutrients. The soil is low in K, B and Ca so these are added by broadcasting mineral fertilizers around the same time as the compost is spread. Then the amendments are incorporated with 6 foot wide Imants spader; it requires one pass over the entire field, but the machine is rather slow so 1 to 2 acres are tilled at a time.

"We try and grow as much rye and vetch as we can but it's tricky to time its incorporation in the spring. We want to spade early so we can stale seed bed before planting crops; sometimes we allow too much time for the cover to grow, then we get more N but the residue is not as decomposed as I'd like. We want at least 10 days between spading and planting, even more if it's early in the season. If it doesn't rain we irrigate to promote weed seed germination."

A Case 1194 tractor with a 5 foot wheel base is used to mark the beds while dropping fertilizer from a Schafer 5 foot drop spreader. All his tractors have narrow tires, from 8 inches to a maximum of 12 inches, which maximizes useable bed space. The drop spreader applies material to a 4-foot wide area on the surface. Lately Paul has used a 6-0-4 McGeary fertilizer preplant, then an 8-1-1 if needed for sidedressing.

Total N from the fertilizer blend is generally 40 to 75 lbs/acre, depending on the crop and the quality of the preceding cover crop (e.g. legume density and maturity). An old IH 140 tractor has a Budding basket weeder permanently belly mounted with the baskets as close as they will go. It is used to run over the beds to make them perfectly level, and to mix the preplant fertilizer into the soil. This is done immediately after application to avoid N volatilization. Then it either rains or overhead irrigation is used to apply a half inch of water to get the weeds started. In early spring large row covers may also be applied to create heat to make the weeds grow, so they can be killed by stale seed bedding.



Budding baskets belly mounted on an old IH 140 tractor are used to incorporate pre-plant fertilizer into beds and for stale seedbed control of small weeds before planting crops.

Cultivation tools. The belly-mounted Budding baskets are used for stale seedbedding prior to planting crops. “If there’s water and heat after forming the fertilized beds then in 3 to 5 days we get some weed germination; I like to wait a little longer than that and then go through with the baskets on the 140 to stale bed the growing areas; the 140 also has C-shanks with sweeps to cover tire tracks. The first stale bed pass is usually 5 to 10 days after the initial pass to level beds and incorporate the fertilizer. We try to do two stale seed bed cycles of weed germination/basketweeding. That knocks about 90% of the weeds down. After that I hate to bring up any new weed seeds. We’ll often plant right after the last stale seed bedding; then we irrigate again to get a good crop stand because our soil is so light.”



Williams cultivator with tines over the entire bed and C shanks with sweeps in tire tracks.

“We also have a 5 foot wide Williams cultivator and we use it with just the Lely tines and the wheel track eradicators on it, which are C-shanks with duck feet. However, I don’t like using the tine weeder for stale bedding. The window is much narrower for stale bedding with the tine weeder and if weeds have emerged we’ll nearly always use the basket weeder because it will kill bigger weeds, especially if they are grasses.”

After the stale bedding, once crops are sown, Paul relies on 3-row and 4-row basket weeders for weed control, as well as the tine weeder, depending on the crop and the type of weed pressure. “Typically we’ll basket weed carrots twice and hand weed once. For bigger crops like corn or broccoli that will form a canopy, there will be a pass or two with the basket weeder and possibly the tine weeder if the crop is well rooted (i.e. it passes the ‘tug test’), then there may be a final cultivation by hilling, but generally only rouging of large weeds is required. I have a large and a small set of disk hillers. I make the call whether it’s worth it to bring up new weed seeds in order to control the weeds that are there before the canopy closes. If the stale bedding works well then a lot of subsequent cultivating isn’t needed.”

Cover crops. The main covers Paul uses are: rye and hairy vetch planted before Sept. 20, rye alone planted after late September, oats and field peas planted before Sept. 5 or in early spring preceding mid summer planted vegetables, and crimson clover which is undersown into crops (usually after last cultivation, or after last hilling in crops like leeks, and under peas before trellising). “Crimson clover is an aggressive cover crop that establishes well on our sandy soil. The clover winter kills and is easy to incorporate in the spring.”



Crimson clover in fall Brassicas has been a fairly reliable cover crop at Fort Hill farm. The seed is scratched in with a tine weeder or hilling disks early in the season, sown at 15 to 20 lbs/acre. The crop winter kills completely and the residue is easily incorporated with a spader in the spring.

“I don’t grow spring planted clover any more; the potential damage of weeds setting seed in there doesn’t make sense. Soy plus Sudax, rye plus vetch, and spring planted oats plus peas have very few weeds maturing seed in them. I don’t buy the thinking that cover crops automatically suppress weeds; they may suppress weeds from growing as much as they would compared to bare ground, but if you get weeds maturing and setting seed in the cover crops then you are going backwards from a soil weed seed bank perspective.”

“We really like soybeans and Sudax; we’ll sow that instead of oats and peas if we can get in by the second week of August. Soybeans and Sudax can be planted deeply and will germinate reliably in hot, dry soil. We get 3 to 4 feet of growth from the soy/Sudax mix planted by mid August; we’ll get 8 to 10 feet if we plant it by early July. We favor the soy in the mix by using 10 to 15 lb/acre of Sudax and 100 to 150 lb/acre of soybeans; we do that because we want the nitrogen. We’ll flail chop that cover sometime after soybean flowering (for a July sowing), or in the fall after a light frost stops growth (for an August sowing). We leave the residue on the surface, to be spaded in the spring.



Flail mowing a July-sown soybean/Sudax cover crop in September. The cover was pretty effective at suppressing weeds but is being cut before broadleaves go to seed. The seed mix was too heavy on the Sudax in this case – it did not allow for the desired amount of soybean growth to add nitrogen to the soil.

Labor for weed management. “We have 30 five-foot wide beds to an acre; you can stale bed one bed in 3 minutes, it’s very efficient. To cultivate one bed with a crop in place takes about 6 or 7 minutes. So, taking a bed of carrots for example, 2 stale beds passes is 6 minutes, 2 passes cultivating is about 14 minutes, so there is a total of 20 minute of tractor work per bed, equal to 10 hours per acre. Hand weeding to keep the beds very clean requires 1 to 2 hours per bed depending on how well the stale bedding worked, so that can be 30 to 60 hours per acre. At \$10 per hour labor it sounds like a lot but the retail value of carrots is high, probably \$18,000 to \$25,000 an acre so you need to keep that in perspective.”

Other observations. “In terms of weed management, I would like to move our crop rotations toward two categories: weed generators and weed victims. We tend to generate weeds in crops like potatoes, corn, and winter squash that cannot be cultivated or even hand weeded late in their growth cycle. Then we get slammed in the subsequent victim crops which cannot compete with the weeds and need to be kept very clean, like arugula, mesclun, carrots, onions, and spinach. In the future I want to move to a system where we set aside land for the weed victims and we don’t grow any of the weed generators in that area, which would really reduce hand weeding time.”

“Right now we try to limit weed seed production in the weed generators by going in after crop harvest and removing any remaining large weeds. There may be as many as 200 large broadleaf weeds per acre after a crop like winter squash, which we cut with lopping shears, load in a truck, and dump in the woods. At 200 large broadleaf weeds per acre, multiplied by approximately 150,000 seeds per large weed, that removes something on the order of three million weed seeds per acre from the soil weed seed bank. That is worth doing if the next crop is a going to be a weed victim, but I might not bother to do that if the next crop was a weed competitive weed generator. Removing the large broadleaf weeds is very cost effective, but it is much harder to remove crabgrass that has matured seed, which is one reason that crabgrass populations continue to increase on our farm.”

- Vern Grubinger, 3-9-11