

No-till at Astarte Farm, Hadley, MA

At a glance

Astarte Farm is a certified organic market garden located on 6.6 acres in Hadley, Massachusetts. The farm was established in 1999 by Dan Pratt and was taken over by Jim Mead in 2014. Astarte has been practicing no-till since 2014. Their practices include the uses of biochar, compost, occultation strips, and maintaining predator and pollinator habitat in beds and along buffer zones.

History of the farm

Astarte farm was first settled by the English in 1650, but they moved away because there were no nutrients left in the soil after they exhausted the land with monocrops of sweet and broom corns, pumpkin, and tobacco. The land was farmed again by Polish immigrants in the 19th century who used practices involving animal manure and soil conservation techniques. When Dan first began plowing the land in 2000, there were a total of two worms in an entire half-acre and there was highly compacted soil 8-10 inches down, which Dan describes as basically clay, due to disc blades continuously running. This caused standing water in the fields for 2 ½ years, until switching to more natural methods. Dan found that the farm was extremely successful in its first 3 to 4 years, but beds began to sink around year 6. In contrast, the beds that were mowed and undisturbed by cultivation were rising. He was using an Italian spader at the time (which is now being used as a wheel weight for the tractor) because it was supposed to disturb the soil less than tilling. While this may not have inverted the soil profile as tilling does, it still disturbed the fungal, beetle, and worm activity.

The farm is now a highly diversified market operation and sells almost 100% of the produce to the River Valley Co-op in Northampton. Their 3.5 acres of vegetable crops are decided upon with the produce manager of the co-op, but on the farm one will also find grapes, blueberries, pollinator buffer zones, and several full beds planted for pollinator and predator habitat.

No-till

In 2014, the farm went completely no-till. Dan was inspired by various workshops as well as Elaine Ingam's *Soil Food Web*. In her research, Ingam claims there are enough nutrients in the soil to grow any crop as long as there is enough of a "soil food web" (biological activity) to support it and keep chemical processes regular, much like the duff layer of forest soils. Dan first began no-tilling with garlic, simply because it was fall when he made the decision. The process started with a cover crop of buckwheat, mowed down with a mulching lawn mower, then he laid down a small amount of biochar, then a two-inch layer of compost, and finally, weed-guard paper mulch. Astarte uses an OMRI-listed 3-foot wide roll of paper mulch with pre-punched holes for planting.

Today, the process looks quite similar, except he is now adding an additional two inches of compost after planting and using occultation strips to prepare the beds. The occultation strip is basically a ground cloth made of woven polyester, so it is durable but

lets water and oxygen through. It is conducive to life under the soil, but not to plant growth.

The beds at Astarte are semi-permanent and they maintain either a grass or woodchip and cardboard pathway on either side. They often start transplants 3-6 weeks earlier than normal so they can establish 160-foot beds ahead of time. Using this method, they know how much of the crop is going in alive.

Cover crops

Astarte tends to use cover crop cocktails and summer alfalfa or buckwheat in their beds. Historically Dan has used winter rye, but problems were coming up because the root mass did not have enough time to break down before it was time to plant. He eventually remedied this by replacing it with oats.

The cover crop cocktail he uses includes oilseed radish, oats, bush beans, and partridge pea. Partridge pea is not only good for nitrogen fixing in the soil, but also has a “gland” at each leaf stalk that produces nectar, so it is always buzzing with activity, Dan cites up to 20 varieties of bees. The cocktail also includes daikon radishes, oats, and a field pea mix. Radishes are planted in bands on the outside of the beds to facilitate easier harvesting. Primarily, they are looking for something that is nitrogen fixing, something cereal, and something deep rooting.

The cover crops at Astarte are mostly frost-killed, but they also use rolling and crimping techniques to terminate. They use a Rodale model roller-crimper made to fit the width of the beds, which fits on the front forks of the tractor. Dan says this way it is easier to move around due to the ability to use down pressure. The roller-crimper is used for the buckwheat, though it has proved to be problematic, as it tends to clog up from the wetness of the stalks, causing a necessary stop every 50 feet or so.

Biochar

In the days before going no-till, Astarte used organic blended fertilizers, but they have since stopped using them, which Dan says was their biggest leap of faith. Now, the farm primarily relies on biochar, a practice complimentary with no-till. While biochar is not technically a fertilizer, it allows processes to take place that help the crops succeed. Basically, the biochar has the ability to soak up unused nutrients, and then release them when they are needed. The biochar also has a lot of pore space, which provides moisture and a refuge for soil creatures that would normally die off when a plant is harvested. This way, the sugar exchanges remain active in the soil. Because biochar is such a strong purifying agent, they typically either use a 20% blend with compost, or pre-inoculate the biochar. The biochar is pre-inoculated with a worm compost tea and a lactobacillus EM-1. They also use a 5% blend with compost for potting soil, which helps to refine and protect against herbicide or other chemical residues that may exist in the compost.

Weeds and bugs

On Astarte Farm, weeds often come in the form of grasses. In the days before tilling, there were more sightings of weeds like pigweed and lambsquarters, but now they

are dealing with some more perennial weeds. The crew is still doing a lot of hand weeding, but also suppressing weeds with the use of occultation strips. They have found that a bed prepared with these strips is weed free for a month to six weeks after planting. They use compost like mulch either before laying the strips down or added before transplanting. They can often get two lettuce crops out before running into a serious weed problem.

This year was the first year Astarte experienced significant flea beetle damage. This would often happen when Dan was tilling, but the solution back then was just to kill the crops that were prone. This year's case is attributed to the abnormally cool and wet spring. He has also noticed a lot of parasitizing by wasps on aphids. He is addressing these pest issues with predator habitats. The predator habitats are beetle mounds based on a design by the Xerces society. They are full beds with a two-foot high mound running the entire length and are planted with three or four native grasses, mountain mint, and several flowers. This design is conducive to wolf spider and beetle habitat. They have found that using these has worked well for keeping away aphids, but less so on species like the tomato hornworm. Dan mentions that this method, while showing results, may not be necessary as they continue with no-till, as ground beetles will likely dwell in the undisturbed soils of a no-till plot, or anywhere "you're not running discs".

Equipment

For equipment, Astarte utilizes the aforementioned Rodale model roller-crimper, which is put on the front forks of a 27-30 horsepower Kubota tractor where buckets would normally go. They also use a bed under-cutter made specifically for them by a local blacksmith. This is a horizontal blade used to dig a trench at the end of a bed; it is used mostly for pulling garlic. They use this for pulling garlic instead of using a fork because they can leave 1/2-1 inch of the root, and it does not disturb the soil as much. They also utilize an ABI Elite Spreader. This is a hydraulically-controlled drop spreader used exclusively for spreading compost. By adjusting the speed of the motor, they can put down 1/2-2 inches of compost in a single pass.

Challenges

Dan's initial problems with no-till came with planting small-seeded crops. It took them an entire year to get carrots going. Dan attributes this to inexperience with a hand-push seeder. He says it takes a delicate touch to maintain a quarter-inch planting depth, especially with less even beds caused by adding compost. With practice, though, this has become less of an issue. This summer, he had a tough time getting spinach to germinate. This was due to the compost mulching, which creates a black solar soak, making it difficult for crops to germinate that require low soil temperatures. Dan says fixing this issue is a matter of paying better attention to weather and, again, getting more practice with the seeder.

Results

Since transitioning to no-till, there has been a shift in the quality of Astarte's product. Dan is noticing that the same lettuce he grew while tilling now lasts longer out of the ground. Dan has always touted the idea of *terroir*, that one can taste how produce is grown, and often pays attention to flavonoids and the color of the vegetables, hoping to maximize the amount of flavor per fruit. He sees no-till as benefitting the produce in this way, creating a qualitative difference in the product.

Advice and important information

Dan mentions the roller/crimper as a big part of the success in Astarte's no-till endeavors. He has had nearly universal success with this, but ran into trouble once when he let the seed head dry on the oats and germinate in the lettuce bed. Dan says this is just a matter of keeping an eye on one's cover crops and rolling at the right time.

For farmers transitioning to no-till, Dan recommends investing in occultation strips to prepare beds and kill weeds, but cautions that one should have something to hold them down as he has had issues with the strips blowing away.

Finally, a big part of Astarte's success comes from their use of compost as a fertilizer and mulch. This is one of the major expenses at Astarte, because they purchase their compost externally. If they were to create the compost themselves, the system would be even more economically viable.

Recommended resources:

Soil Food Web – Elaine Ingham

www.soilfoodweb.com

Xerces society

www.xerces.org

No-till Vegetables at Tobacco Road Farm – Bryan O'Hara

O'Hara, B. No-till Vegetables at Tobacco Road Farm. *The Natural Farmer*. Retrieved at <http://thenaturalfarmer.org/article/no-till-vegetables-at-tobacco-road-farm/>