BY JULIE FINE AND CARO ROSZELL

FARMER LED INNOVATIONS IN TILLAGE REDUCTION ON NEW ENGLAND ORGANIC FARMS

"THE SECRET TO WINNING IS LEARNING HOW TO LOSE. THAT IS, LEARNING TO BOUNCE BACK FROM FAILURE AND DISAPPOINTMENT—UNDETERRED— AND CONTINUING TO STEADILY MARCH TOWARD YOUR POTENTIAL. YOUR RESPONSE TO FAILURE DETERMINES YOUR CAPACITY FOR SUCCESS."

– JAMES CLEAR

INTRODUCTION

Organic farmers have been leaders in developing and implementing sustainable agricultural practices. However, they rely on intensive tillage to manage weeds and soil fertility, often conducting three times more tillage compared to non-organic farmers and resulting in soil health deterioration. Reducing tillage is key to improving soil health because it protects soil structure and organic matter. Across agricultural systems, increasing soil organic matter is a universal tactic to improve soil conditions to resist erosion, conserve moisture, hold carbon, reduce runoff, and release nutrients to crops, all of which improve the financial and environmental resilience of organic farms. As farmers face increasingly challenging and variable conditions, building soil organic matter is critical to their farm operations surviving and thriving.

In very small-scale scenarios, farms can build soil organic matter through heavy compost application, but for production-scale farms, soil organic matter primarily is driven by growing cover crops and minimizing soil disturbance to help build up soil residues. With our short growing season in New England, there's always conflict between growing healthy soil and growing annual crops that pay the bills. While conventional farmers can kill cover crops with herbicide and small scale producers can terminate with tarps, medium-to-large scale organic vegetable farmers lack well-established approaches to tillage reduction.

This project, Farmer Led Innovations in Tillage Reduction, aimed to address this need by combining financial, technical and peer learning models to enable organic farmers to help each other with developing and fine-tuning approaches to tillage reduction.

Over the course of two years, we worked with seven farmers from two states (Maine and Massachusetts) using a peer cohort technical support model to help each farmer reduce tillage and increase soil health practices. Each farmer worked with the Project Lead (Julie Fine) to develop an initial plan for an adaptation to their management system to reduce tillage for a specific crop or crop rotation. Each farmer received two $2500 participation awards towards the material and labor costs of adapting their practices. Farmers met regularly over the course of the two years to workshop their ideas, get input and advice from AFT staff facilitators and each other, and report on the outcomes of their practices.

Central to the FLI theory of change is the idea that trying and ruling out unsuccessful practices is critical to the innovation process, and that discussing what does not work – and why—helps to accelerate the learning process for farmer networks. Due to the isolated and cyclical nature of farming, farming changes are typically made only once a season and usually in isolation on separate farms. Oftentimes, technical support literature and conference presentations about soil health practices focus only on successes. As a result, farmers may be less aware of practice changes that are unsuccessful and may repeat other farmers' failed practices in their attempts to innovate. As a core part of FLI, we encouraged farmers in this cohort to clearly articulate what was not working, in order to accelerate farmer learning for the entire cohort and reduce replication of unsuccessful practices.

In this report, we are pleased to share a profile on each of the participating farms—a brief context to each farm, how they approached tillage reduction on their farms over the course of the project, and future innovative plans to build soil health.

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FARMER PROFILE

JAN, ROB, CARL & GÖRAN

GORANSON FARM

Dresden, ME

Goranson Farm cultivates fresh nutritious organic veggies, berries, and maple syrup on 72 acres in Dresden, Maine. Jan Goranson, Rob Johanson, and sons Carl and Göran farm the land that has been in their family, feeding the community, since the 1960s. They offer products through their farm stand, mail order, area farmers' markets, and a free choice CSA program.

CHALLENGES

The primary challenges faced by the farmers at Goranson Farm are weed pressure, cover crop establishment, disease and pest management, bed preparation and nutrient management. The farmers have historically relied on tillage to manage significant weed pressure. At their scale, organic mulch for weed suppression is cost-prohibitive, and flame-weeding is time and fossil fuel intensive, so cover crops need to be their primary driver of no-till weed suppression. They would like to include legumes to supply nitrogen to their crops, but struggle with clover being a host to scab and rhizoctonia, which can devastate subsequent potato crops. So, they rely on alfalfa as one of the few perennial legume cover crops that does not host scab.

Finally, they have also struggled to identify the best rotation for residue management that allows them to establish clean, level seedbeds for high-value, densely seeded crops; heavy residues clog their seeding equipment and reduce germination success.

WHAT HAS WORKED

The most successful change made by Goranson Farm is the adoption of specialized equipment: a speed disk and a zone tiller. The farmers at Goranson Farm are using a Farmet Softer speed disk to reduce several aspects of tillage intensity: the number of passes (frequency), the depth, and the tillage type. The speed disk runs between 10 and 15 miles per hour, and the speed creates a stratification of particle size, incorporating cover crop residue while settling finer particles on the soil surface. Most cover crops can be incorporated in one pass with the speed disk, reducing the number of passes drastically and creating a level bed.

The depth of the speed disk can be controlled by the top link, averages 3 inches, and is able to bury most cover crop residue in one pass. They usually mow the cover crop first to create small residue size that will break down quickly and create a good seed bed. An 8-foot-tall winter rye cover crop will require 2 to 3 passes after flail mowing.

GORANSON FARM

JAN, ROB, CARL & GÖRAN

WHAT HAS WORKED CONT.

To prevent subsoil compaction the Goransons use a yeomans plow, which is a vertical tillage implement that doesn't invert, pulverize or crush aggregates. It opens up the crop root zone to prepare to be either direct seeded or transplanted. Using this system, they can achieve seedable beds in 4 passes: speed disk, yeoman's plow, a fertilizer application, and bed shaping. This equipment change has nearly eliminated soil inversion and substantially reduced overall disturbance while saving diesel and time.

Additionally, the speed disk provides fast and easy preparation for a no-till seed drill to plant cover crops after cash crop harvest. This reduces tillage frequency as well as transition time to cover crop, allowing for more days in living cover.

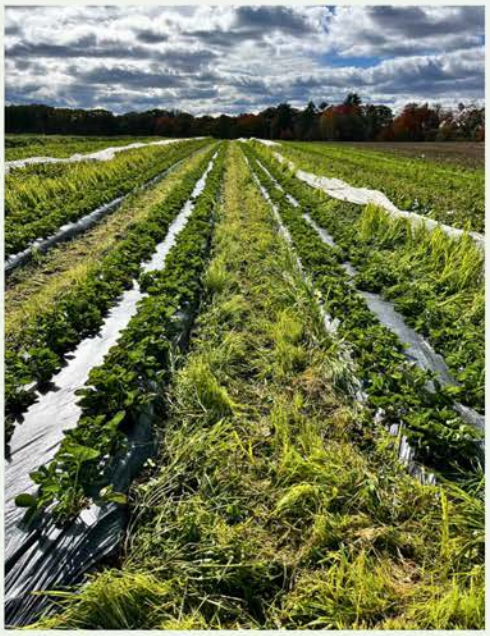
Over the course of the project the farmers explored various equipment options, rotations and cover crop approaches. They explored zone building and continue to refine their zone building approach. Using a front-mounted a tine weeder ahead of their seed drill helped to better establish weed-free cover crops, and using rye as a nurse crop also helped to reduce germination challenges with alfalfa.

WHAT HAS NOT WORKED

Carl, Göran, Rob and Jan and have struggled to get alfalfa established in increasingly frequent drought conditions. When established, it sometimes attracts leaf hoppers, which can defoliate the cover crop and reduce its weed suppressive ability. When perennial cover crops fail to establish, they spend more time and tractor passes managing annual cover crops.

WHAT THEY ARE TRYING NEXT

A new trial for Goranson Farm will be growing fall-planted oats and peas as a living mulch for garlic planted in late October; a practice that one of the other farmers in the FLI cohort had implemented successfully on his farm. They are also experimenting with living mulch in between beds of strawberries, to increase water infiltration and reduce the amount of straw they need to purchase to mulch the walking paths between beds.



FARMER PROFILE

MIKE PERISHO

ANDREWS FARM

Gardiner, ME

Mike Perisho began growing vegetables on his wife Jess's family land in 2014. The pastures and hay fields had been continuously farmed by the Andrews side of her family since the late 1800s and this 5th generation effort is keeping the land in agriculture and cultivating community. Mike has been experimenting with reducing tillage, including roller crimping, in his vegetable production.

CHALLENGES

The primary challenges Andrews Farm faces in reducing tillage are managing weeds and maintaining raised bed, while preventing erosion on their hilltop fields. The farm is significantly smaller than the others in this project, with about 2 acres of vegetable production plus 4 greenhouses. Saving labor, maintenance and passes is also critical.

WHAT HAS WORKED

Andrews Farm has been developing a four-year rotation across its main quarter-acre plots, aimed at improving soil health and reducing weed pressure.

YEAR ONE

In Year 1, the farm installs landscape fabric with pre-burned planting holes for peppers. With approval from their organic certifier, the fabric is left in place through the winter to protect against erosion.

YEAR TWO

In Year 2, the fabric is removed, leaving a workable bed surface suitable for using a paper pot transplanter for spinach and onions. Initially they used composted leaf mulch applied after transplanting, which suppressed weeds and significantly reduces labor for hand weeding. Subsequently they switched to compost mulch applied prior to paper pot transplanting to improve workflow (see next section). After harvest, winter rye is seeded as a cover crop.

YEAR THREE

In Year 3, the rye is terminated in early summer through crimping and tarping. Solarization with a clear tarp is often required to ensure complete termination. Then the farm uses a single-shank subsoiler to aerate the bed before transplanting brassicas like cabbage, broccoli, and kale. Following harvest, crop residues and any remaining rye mulch are flail mowed and left in place.

YEAR FOUR

By Year 4, weed pressure has been substantially reduced, allowing for successful direct seeding of carrots and beets after the bed surface is raked. Any weeds that emerge during the season are managed by reapplying landscape fabric the following spring for Year 1 of the rotation. One ongoing challenge in this phase of the rotation is managing bare soil over the winter months.

MIKE PERISHO

WHAT HAS WORKED CONT.

A key strategy for Andrews Farm has been the use of the above-mentioned single-shank subsoiler to aerate permanent raised beds without rototilling. This aeration is necessary to improve water infiltration, air exchange, incorporate fertilizer, and prepare for transplants. While effective at loosening soil, this method has caused uneven drainage, with excessive drainage through the bed centers combined with compaction at the edges.

Using this new system, the farm is able to seed approximately a quarter of its acreage to winter rye each fall, with the goal of creating a heavy cover crop residue mulch layer. The terminated winter rye has served as an effective straw mulch for their strip-tilled fall brassica crops in Year 3 of their rotation, and so far, direct seeding in Year 4 after residues have been raked has been successful.

WHAT HAS NOT WORKED

Living pathways between either landscape fabric beds or long season crops did not work for Andrews Farm; they found that vigorous overwintering cover species in the pathway would overtake beds, while annuals would not provide enough coverage to adequately suppress weeds.

One change is that instead of adding leaf mulch to the onions and spinach, they have started using compost mulch prior to paperpot transplanting. That saves the labor of having to apply leaf mulch at a busy time of year. It's easier to apply compost mulch in the early spring than coming back with leaves in June.

Because of the short growing season and need to maximize cash crops, it's hard to always get a winter rye cover crop established. It can be particularly challenging if frosts come early, or if that fall is very dry.

Access to the right equipment for terminating rye cover crops has been a challenge; Mike learned that roller crimping was a more effective tool for terminating rye by using a flail mower silage tarps, delayed planting, and reduced weed suppression. However, using the financial assistance from the FLI program, they were able to purchase a BCS mounted roller crimper which was effective.

WHAT THEY ARE TRYING NEXT

Looking ahead, Andrews Farm is interested in experimenting with alternative cover crop mixes that are easier to terminate in spring, particularly ahead of direct-seeded crops like carrots. The farm is considering investing in or building a zone-building setup using coulters and subsoiler blades similar to that being used by fellow FLI cohort participant Island Grown Initiative.

Thinking about how to move away from landscape fabric, because it's expensive and made of plastic which degrades over time. Also adding ramiel woodchips to pathways in between landscape fabric beds.

FARMER PROFILE

SETH KROECK

CRYSTAL SPRING FARM

Brunswick, ME

Seth Kroeck grew vegetables organically for 25 years on farms in California, New York and Massachusetts before settling at Crystal Spring Farm in 2004, where he and Maura Kroeck lease farmland from Brunswick-Topsham Land Trust. Marketing to wholesale, the farm produces certified organic carrots, brussels sprouts, heritage grains, specialty peppers, and wild blueberries. As growers, their focus is on reducing their carbon footprint, enhancing biodiversity and nurturing soil health through organic management.

CHALLENGES

Crystal Spring Farm has been working on a number of different reduced tillage strategies that use cover crops to improve soil, suppress weeds, and prepare ground. The light, sandy soil has forced Seth to pursue ways to increase soil organic matter for moisture retention. The farm has moved away from CSA production to entirely wholesale, growing about 10 crops, to have the opportunity to extend cover crop growing days, cover crop rotations between cash crops, and work on integrating soil health practices in a streamlined way.

His primary challenges are controlling root knot nematode, which limits his cover crop options, effective weed management, and establishing overwintering cover crops—especially following fall carrots, which present a challenge for cover crop seeding.

WHAT HAS WORKED

REDUCED TILLAGE CARROTS AFTER WINTER KILLED OATS

Over the last two years Seth has been experimenting with using late fall cover crops to prepare reduced tillage beds for next spring's early carrots.

Seth transitioned to sowing high rates of oats (200 pounds per acre) later in the season than is conventionally recommended, around October 20th. The goal is to get a short mat of oats with a lot of roots, as opposed to the traditional September-planted oats which are grown for aboveground biomass. With this approach Seth gets thick green mat that dies off after developing 4- 6 true leaves. While the plants lacked the large root system that maximizes soil health benefits, this system was effective at reducing soil movement from wind and water, and has the advantage of an easier spring turnover of residue, allowing Seth to minimize tillage in the spring. Additionally, by planting late oats, fall annual weeds are prevented from taking root, leaving a cleaner field for drilling in a spring cover or early spring carrots.

In spring, he uses a Yeoman plow to prep carrot rows for May 1 seeding. The 3-row Yeomans subsoiling plow loosens the soil 10-12 inches deep without disturbing the entire bed top. Oat reside is pushed aside, and carrots are seeded easily with a monosem vacuum seeder and germinate alongside the stubble. While this works well for carrots, it wouldn't be successful for all crops. However carrots are a major crop for Seth, and he appreciates saving time in spring, only tilling the exact rows needed in one pass. This has the added benefit of setting up the farm for controlled traffic, further reducing overall tillage.

NO-TILL COVER CROP SUCCESSIONS

Seth borrowed a no-till drill from Wolfe's Neck Farm to seed winter rye, wheat, or triticale in the fall. These cover crops were terminated by mowing in May and June and then a second cover crop succession of clover was immediately no-till drilled into the residue. This approach allowed Seth to double the surface organic matter he was building between tillage events in his crop rotation.

CRYSTAL SPRING FARM

SETH KROECK

WHAT HAS NOT WORKED

LEAF MULCHING

Seth began his time in FLI having entered into an agreement with his town to bring in leaves, and he was interested in leaf mulching on the bare soil following fall carrots. He tried, initially, spreading large amounts of leaves over bare soil. This was unsuccessful for him, because the leaves blew away, not offering consistent soil protection. Where the leave did mulch sufficiently, they tended to tie up nitrogen in the spring and present challenges for seeding the next cash or cover crop.

ROLLER CRIMPING MILLET

Rolling a summer millet cover crop in the fall didn't work as expected; flail mowing and then drilling in the fall cover crop worked better.

WHAT THEY ARE TRYING NEXT

MULTISPECIES COVER CROP

Seth reported learning from the other growers in the cohort who use more multi-species cover crops, finding the idea of summer cover crop successions particularly interesting. Looking forward, he plans to continue communicating with the FLI cohort to learn more about how they are using multi-species cover crops with the goal of implementing them in his rotations.

GROWING THEIR OWN COVER CROP SEED

Seth bought a PTO combine and started growing out some of his cover crop and harvesting it with his combine. By saving a small portion of his cover crops within each rotation to grow and save his own cover crop seed, he can reduce his seed costs. He started out with rye, buckwheat and oats and is now moving towards harvesting some for food production through a partnership with a local baker and brewery who are seeking specialty grains.

FARMER PROFILE

CHUCK CURRIE

FREEDOM FOOD FARM

Raynham, MA

Freedom Food Farm is a certified organic farm in Raynham, MA growing a sustainable, full-diet year-round since 2012. They produce vegetables, small grains, greenhouse crops, pastured-raised livestock, and hay. Chuck Currie has been innovating ways to use regenerative and no-till farming methods, striving to mimic natural ecological systems on the farm.

CHALLENGES

Due to the very sandy soils at Freedom Food Farm, the primary challenges Chuck Currie and his team face are soil moisture and nutrient retention. Additionally, Chuck is interested in establishing as much of a closed-loop system as possible for his farm, for input cost control and for greater self-reliance and resilience in the face of climate- and politically-related supply chain vulnerabilities.

In the interest of building soil health as its own goal and to solve for these challenges, they are building the soil's top mulch layer through a combination of transferred mulch and successive cover crops. They use a no-till drill to seed cover crops, and then terminate by either mowing, rolling, or tarping. Transplants are set using a water wheel transplanter with a no-till attachment. Additional green chop mulch is collected from both harvested cover crops and by harvesting from pastures when there is more growth than is needed for the farm's livestock.

This greenchop is added to some crops for additional weed control and fertility. This approach combines transferred mulch practices, no-till residue management, and cover crop succession to maximize the potential benefits of high residues for weed suppression, soil health and soil moisture conservation.

WHAT HAS WORKED

Over the course of the project Chuck has refined the following rotation:

YEAR ONE

In Year 1, Chuck grows sweet potatoes, onions or melons with standard tillage on plastic mulch with drip irrigation on raised beds. He uses transferred mulch (harvested from his pastures and cover crops) in between the plastic beds. The residue built up in the aisles won't be tilled for 3 -4 years. After harvest, he removes the plastic and no-tills drills a winterkilled cover crop mix, usually oats, peas and daikon radish into a portion of the field and seeds the rest into winter wheat. He lets the oats, peas and radish mix grow to 4-6 inches tall, then transplants garlic in between the cover crop rows, right through the living cover. After the cover crop is winter killed, he adds leaves for additional mulch. The cover crop provides longer days in living cover, and the residue reduces the amount of leaves needed to attain the desired mulch thickness.

FREEDOM FOOD FARM

CHUCK CURRIE

YEAR TWO

In Year 2, Chuck harvests the wheat for grain, and for the garlic beds, he uses an undercutter bar to loosen the soil without overly disturbing it. He then transplants brassicas (napa cabbage and kale) and mulches the beds with green chop using the transferred mulch system. In fall, he harvests the kale and cabbage and no-till drills an overwintering cover crop.

YEAR THREE

In Year 3, in spring, Chuck grazes or harvests the overwintered cover crop for mulch. Depending on how the cover crop and soil health looks, he may flail mow the overwintered cover and then no-till drill a summer cover crop for additional biomass, mowing and reseeding another overwintering cover in the fall.

YEAR FOUR

In Year 4, he may flexibly crop a portion of the field if needed due to space/market demand before returning to Year 1 of the rotation, or will repeat Year 3 with a flexible combination of mulch harvest, grazing, and cover crop fallow depending on the farms' cropping, livestock feed, and mulching needs.

WHAT HAS WORKED CONT.

This system works for a limited number of crops, so Chuck has actually changed his marketing in order to make this system work. It allows him to use cover crops and harvested mulch from his pastures to replace a significant portion of his fertilizer needs, reducing off farm inputs, while providing weed suppression and nutrient cycling.

Chuck also uses woodchips and composted woodchips strategically to control weeds and manage pathways, especially in his hoophouses, building soil organic matter and increasing fungal activity in the soil, which supports nutrient cycling and retention

WHAT HAS NOT WORKED

The most effective soil health management system for Chuck hasn't worked for all the crops he has historically grown. In order to adopt the soil health management system that ended up working best for Freedom Food Farm (described above) Chuck had to reduce the diversity of crops that he produces.

WHAT THEY ARE TRYING NEXT

Chuck is currently entering Year 4 of the rotation described above for the first time, and is working on refining that year of his rotation cycle. He is keeping his plans flexible for now to allow him to be responsive to changing markets and what this year's weather will demand in terms of livestock feed needs and mulch crop inputs.

FARMER PROFILE

GIDEON PORTH

ATLAS FARM

Deerfield, ME

Founded in 2004, Atlas Farm is a 120-acre certified organic, diversified family farm with its roots in the fertile soil of the Connecticut River Valley. Atlas Farm strives to be a model of ecological food production, engaging in organic farming practices, and renewable energy, and striving to minimize resource consumption and environmental impact.

WHAT HAS WORKED

LIVING TEFF COVER CROP BETWEEN TOMATO ROWS

A relatively little known plant in the region, teff is a staple grain crop in the horn of Africa. In New England, it is gaining popularity as a fast-growing, heat-loving, but manageable summer grass cover crop that reliably winter kills. Unlike oats, which slump in the summer and which no longer reliably winterkill, and unlike sorgum sudangrass which winterkills but grows to be massive, teff fills the niche of a relatively low, manageable, tender summer grass.

One of Gideon's trials during our project was living teff aisles between his tomato beds, leaving some in bare soil cultivation for comparison. As expected, the teff grew well, wasn't weedy, was easy to manage, and winterkilled. What was unexpected was the extent of its ability to hold soil in place even in the face of flooding. In 2023, heavy rains throughout July caused severe flooding on Massachusetts farms and Gideon's trial field was among his flooded fields. The aisles in bare soil cultivation showed severe washouts and gully erosion, while there was no erosion on the teff aisles, despite the entire field having been flooded.

The only challenge to living covers in this system, for Gideon and his team, is figuring out how to effectively manage the edge area between the plastic mulched beds and the cover crop aisles, where weeds can come up as a result of a gap between plastic and cover crop, and where the crew has to avoid mowing in order to not shred the plastic.

GIDEON PORTH

WHAT HAS WORKED CONT.

STRIP TILL IN LIVING CLOVER MULCH

The Dutch white clover was established the previous year, setting the foundation for a strip-tilling approach using a traditional big zone builder. The challenge, however, was finding the right equipment to maintain and weed the tilled zones effectively. After the initial zone tillage, the first attempt at maintenance involved straight coulters followed by a chisel shank. By the third iteration, Gideon used a couple of spider gangs and a rolling basket to break up clumps and smooth out the strip before transplanting winter squash. These tangled on the clover at the edge of the strip, binding up. Ultimately, the best approach involved using two hilling discs at the front, positioned on either side of the chisel with one rolling basket behind. This setup effectively redefined the edges of the strip while slicing through any clover that had begun encroaching. They follow this operation with one cultivation pass using a single set of finger weeders in the row.

The basket used on Atlas's Unverferth zone builder initially had a concave basket which left a slightly raised strip, which initially seemed helpful for visibility and water infiltration in this system, but the problem was that when flail mowing, it wasn't possible to get the flail mower low enough to set the clover back and kill weeds without disturbing the strip by mowing the soil itself in that raised area. So, the concave basket was replaced with a regular basket for this system.

Despite the trial feeling somewhat messy, the results were unexpectedly positive—delicata squash yields significantly outperformed the control. Beyond the yield success, the experiment also had long-term benefits for the sandy field. With a full year of clover coverage followed by a highly productive squash season, the field maintained 70% living cover, contributing to improved soil health and nutrient cycling.

WHAT HAS NOT WORKED

Gideon trialed a few approaches throughout his time in the project, including a spring and summer cover crop succession of oats and peas, followed by buckwheat, to prepare for no-till transplanting kale in early August. This strategy reduced tractor passes by 75% and required no tillage during the cropping season. However, the cover crop biomass was not sufficient to suppress summer weeds. Also, these trial fields were historically highly tilled and low in organic matter. There was significant soil hardness, which is common early in the process of no till transition, that was compounded by that summer's heavy rains. It was difficult to transplant into the hard no till beds. When the brassicas were finally no-till transplanted, there was a lot of weed competition and not enough cover crop mulch remaining.

WHAT THEY ARE TRYING NEXT

Gideon and his team are expanding the acreage on which they are implementing living clover mulch and strip tillage, and trying out this method with new crops. The farm team is also experimenting with making crop beds where living teff aisles were the previous year, and seeding the previous year's crop aisles into cover crop as a way of reducing tillage and benefiting from the soil building benefits of the living cover aisles.

FARMER PROFILE

ANDREW WOODRUFF AND TIM CONNELLY

ISLAND GROWN INITIATIVE FARM

Vineyard Haven, MA

Island Grown Initiative, a non-profit organization that works to build a regenerative and equitable food system on Martha's Vineyard, stewards a 40-acre farm at the heart of the island. Since 2018, under the guidance of veteran island farmer Andrew Woodruff, the farm has been transitioning to low- and no-tillage regenerative agricultural practices, utilizing tarps, landscape fabric, multi-species rotational grazing and year-round, diverse cover crop mixes. The farm also includes a 30,000 square-foot glass greenhouse, a year-round CSA, a robust gleaning program, and hosts frequent and year-round field trips from local schools. Approximately 1/3 of what IGIF grows is donated to islanders in need through both its own food equity programs and Island Food Equity Network partners.

CHALLENGES

Andrew and Tim have been exploring soil health management systems, cover cropping and tillage reduction for many years prior to participating in the cohort. While they were largely happy with their progress, they saw room for improvement with soil compaction, weed suppression, labor, and equipment challenges. They came to the cohort to learn from others how to improve on their existing systems to better address these specific issues.

WHAT HAS WORKED

Farmers Andrew Woodruff and Tim Connelly have been using strategies like strip tillage, roller crimping cover crop, tarping, landscape fabric, rotational grazing, and diverse, year-round cover cropping to reduce soil disturbance and build soil health across its 40 acres. Through the FLI program they focused on three main areas:

COVER CROP INTEGRATION

Tim and Andrew have been planting fall brassicas into crimped and tarp-terminated cover crops like rye, vetch, peas, and crimson clover, tracking metrics like yield, labor, compaction, and weed suppression.

LIVING CLOVER MULCH

The farm is experimented with transplanting several crops (including brassicas and tomatoes) into established perennial white clover; over the course of the two years of the project they refined their planting approach.

CUSTOM ZONE BUILDER

As a part of their planting approach improvement, Andrew used FLI project funds to purchase parts to develop a custom, adjustable zone builder to facilitate precision strip-tillage into cover crop residues and the living clover mulch. They have also developed a controlled traffic system where they never drive over the beds but maintain permanent wheel tracks to reduce compaction in the growing zones.

ISLAND GROWN INITIATIVE FARM

ANDREW WOODRUFF AND TIM CONNELLY

WHAT HAS NOT WORKED

The first year using the zone tiller, they went into mature multispecies cover and due to the tall, heavy biomass the zone tiller clogged and didn't work. Now they build the zones early, when the winter rye is only 6" tall, and pre-define the strip. They return later in spring to redefine the strip and prepare for transplanting.

Another lesson learned came from an experiment using tarps to suppress perennial white clover, so that it didn't out compete the subsequent cash crop. The tarp was left in place a few days too long, and the clover died. It's sensitive to suppression in the spring, and sensitive to drought in the fall.

One interesting challenge has been turned into a long-term success. After many experiences of rolling a cover crop mixture of winter rye, vetch, peas, and crimson clover, most species are terminated but the vetch regrows. This could be a problem, but they've been persistent and repeatedly rolled the vetch when it's at full flowering stage until it's been fully terminated. This multilayer cover crop residue has provided good fertility for zone tilled late brassicas.

Soil compaction and yield drag is always a consideration with tillage reduction, and Andrew and Tim have silty soils that compact relatively easily, so this has been a challenge at Island Grown Initiative. Andrew and Tim have sometimes overcome yield drag by increasing fertilizers, but hope that long term, the accrued benefits of cover cropping and reduced tillage methods will lead to improved soil structure and that their organic matter levels will increase sufficiently to not need extra fertility.

WHAT THEY ARE TRYING NEXT

Andrew and Tim continue to experiment with zone tilling in perennial white clover, especially for fall brassicas. They are also continuing to refine their zone building techniques for direct seeded crops that can't be planted into living clover or heavy biomass systems. For these crops, they are experimenting with methods to build soil health and manage cover crops without excessive biomass. To achieve this, a new approach they are trying is pre-seeding cover crops between the strips or zones where vegetables will be seeded. They then stale bed those zones, and terminate the cover crops via rolling, flailing, or tarping. They then seed crops directly between those terminated rows, allowing for a relatively clean seeding strip with some residue between crop strips.

FARMER PROFILE

NATE FRIGARD

CRIMSON & CLOVER FARM

Florence, MA

Nate Frigard has owned and operated Crimson and Clover Farm since 2011, under a 99-year lease on 40 acres plus another 15 acres (under different terms) of preserved farmland in the Connecticut River Valley.

The farm grows vegetables for 600 local and Boston-based CSA shareholders and is a primary contributor to Neighborhood Markets, an affordable farm stand that operates regularly in six neighborhoods where residents experience food insecurity.

CHALLENGES

Crimson & Clover Farm has experimented extensively with cover crop successions, including semi-permanent living clover mulches, into which they rip furrows and plant vegetable crops. Their challenges with this system include:

- Identifying the best equipment for furrows—they have been using a repurposed buckeye cultivator with buckeye clamps. Coulters cut the residue, a shank tills a strip to about 1 foot deep and wavy coulters follow the shank. A make-do setup, this has proved not to be quite heavy duty enough for the task.
- Weeds have also proved challenging in this setup; some weeds that come up in the clover, and in the furrow slice where the soil was disturbed.

Through this project, Nate also trialed growing teff between plastic-mulched rows of pepper, tomatoes and eggplant. This worked fairly well, although weediness at the edge of the plastic presented challenges.

CRIMSON & CLOVER FARM

NATE FRIGARD

WHAT HAS WORKED

Sunflowers and brassicas worked well with a living clover mulch. More significantly, crops that followed tillage of a 3-4 year living clover fallow were very successful. These fields exhibited strong fertility and reduced weed pressure, pointing to the benefits of reduced tillage and long-term cover crop fallow. Based on this learning, Nate is exploring how to work more long-term clover covers into his rotation and how to make some interplanted lower-value crops work; in this case, the clover fields would be considered first and foremost a long cover cropped field with occasional cropping as a secondary consideration with low-stakes crops.

WHAT HAS NOT WORKED

For Nate, crop quality and yield in the living clover mulch fields was variable, and some poor yields on high value crops has led Nate to avoid this system for his higher value crops. Sunflowers and brassicas both worked well in the living clover system, but solanaceous crops did not work well with living clover mulch.

WHAT THEY ARE TRYING NEXT

Nate is focusing on building soil health through cover crop successions with strategic, reduced tillage as a part of his long-term crop planning.

He is considering the following reduced-till cover crop succession ideas:

- Establishing sudangrass, mowing it a couple of times and then zone tilling a crop into it.
- Seeding a spring oat or oats and peas cover, mowing that down and getting 2 successions of summer cover crops (buckwheat, sunn hemp, sorghum etc) to create cover layers, and then either mowing those fields to plant garlic or letting it winterkill and planting early spring crops into the residue.
- Or alternatively, making raised beds and planting them to a sorghum sudangrass and sunn hemp summer cover, then flail mowing that and planting oats and peas as a fall cover, allowing those to winterkill to set up a nice thick residue for spring, into which the beds would be no-till planted.

DESIGNED BY CHARLINE XU

THE CENTRALITY OF PEER LEARNING IN SOIL HEALTH AND TILLAGE REDUCTION FOR THE FLI COHORT

"FARMERS TAKE A GIGANTIC RISK WHEN THEY TRY NEW THINGS, SO TO HAVE REAL HARD INFORMATION AND REAL EXAMPLES OF HOW THINGS ARE DONE AND WHAT WORKED AND WHAT DIDN'T FROM OTHER GROWERS, IT GIVES YOU A LOT MORE CONFIDENCE TO TRY IT OUT ON YOUR FARM."
- SETH KROECK, CRYSTAL SPRING FARM

CONCLUSION

In meeting notes and interviews with our FLI cohort participants, their comments underscored the centrality and irreplaceability of farmer education and decision-making processes when working to reduce tillage and build soil health. The farmers in our cohort consistently emphasized that conversations with other growers, farm visits, and farmer-to-farmer exchanges are far more valuable than traditional educational materials or academic resources when it comes to real-world application. In addition to the centrality of peer learning as a knowledge- building and decision support tool, additional themes emerged from our interviews with our participants.

LACK OF TRADITIONAL RESOURCES

Farmers in our cohort spoke to the lack of sufficient formal resources—particularly tailored to the nuanced and context-specific nature of reduced tillage and soil conservation. Several farmers remarked on the scarcity of books or academic guides specific to these practices, noting that while some academic information exists, it often falls short in providing the practical, adaptive insights that come from lived experience. As one farmer put it, "the people on the ground doing it are your information source."

RISK MITIGATION THROUGH SHARED EXPERIENCE

Farmers noted that because their livelihoods depend on their success, trying new methods—like no-till or cover cropping—comes with significant financial and operational risks. Hearing directly from peers who have tested those methods makes the risks feel more manageable. Firsthand stories of both success and failure help set realistic expectations and provide tactical knowledge, such as how to scale up a technique or avoid specific pitfalls. One participant noted how discussions helped translate small-scale strategies into practices adaptable for larger operations, bridging a critical gap between theory and practice.

COMMUNITY SUPPORT AND TRUST

The exchange of information isn't just about technical advice— it fosters a culture of experimentation and shared problem-solving. Farmers described feeling energized and empowered after hearing from others who were engaged in similar challenges. This social validation seemed to reduce feelings of isolation, especially for younger or less traditionally trained farmers. This kind of informal, intergenerational knowledge transfer was highlighted as one of the most important aspects of agricultural education today.

LEARNING THROUGH CONVERSATION AND OBSERVATION

Farmers credited FLI cohort meetings and other opportunities for on-farm meetings and conferences with providing them access to information about new practices they wouldn't have otherwise considered. Learning from the observations of other farmers, in a conversational format, provided not only new technical knowledge; it also inspired curiosity, built excitement, and increased their willingness to experiment.

Additionally, farm visits emerged as an especially impactful format. Farmers shared stories of witnessing problem-solving in action on other farms—sometimes identifying solutions to likely future challenges. These visits allow farmers to contextualize prior learning, see tools and techniques in use, and engage in honest, direct conversations.

CONCLUSION

THE CENTRALITY OF PEER LEARNING IN SOIL HEALTH AND TILLAGE REDUCTION FOR THE FLI COHORT

"WE'VE GOTTEN A LOT OF GREAT IDEAS AND FEEDBACK FROM OTHER PARTICIPANTS. ALSO THE SOLIDARITY... IS GREAT TO HAVE AS A MORALE BOOST. WE FELT LIKE WE WERE LARGELY OPERATING ALONE BEFORE THIS GROUP WAS FORMED."

– TIM CONNELLY, ISLAND GROWN INITIATIVE

ENCOURAGEMENT OF EXPERIMENTATION

Participants stressed the importance of trying things out, failing, and learning iteratively. In addition to the elements of peer learning described above, it importantly also functions to normalize soil health experimentation on diversified vegetable farms. Peer networks create not only a space to share the results of trial and error across farms that would otherwise be isolated, but also create a space for encouragement and inspiration. As Chuck Currie put it:

"DON'T BE AFRAID TO TRY THINGS. DON'T BE AFRAID TO FAIL. THAT'S HOW YOU LEARN."

LEARN MORE

Please visit **www.farmland.org/farmer-led-innovations** where you will find videos, photos, links to blog posts, and an interactive map. Check back in for more content as we convene future cohorts.

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As a result of this generous support and the positive response of our farmer participants, American Farmland Trust's New England Climate and Agriculture Team has secured additional funding (an NRCS Conservation Innovation Grant) for a Connecticut cohort and is working to expand the Farmer Led Innovations program model to other New England States.