

Reduced Tillage and Cover Crops: Five Factors for Success

By Jeffrey Sanders, University of Vermont Northwest Crops and Soils Program

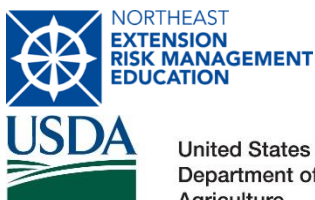
Introduction

There are no fields on your farm that could not be made more profitable by the proper implementation of reduced tillage and cover crops. However, making the jump to adopting these practices can be challenging. We know that regulatory, weather, and other conditions are changing, requiring us to implement more resilient systems. The key to building resiliency to extreme weather events on your farm, for example, is building healthy soils. Reduced tillage, cover cropping, and other conservation practices can help you build soil health and manage these risks to achieve a more resilient farm.

Therefore, this guide identifies five factors that you, as a farmer, will need to address when considering reduced tillage and cover crops. They are:

1. Psychological (attitude related)
2. Educational (knowledge related)
3. Environmental (field related)
4. Agronomic (plant related)
5. Mechanical (equipment related)

The following describes each factor with some considerations for addressing them.



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① Psychological Factors – Your Attitude

One of the most important factors in looking at any new practice—including reduced tillage and cover cropping—is attitude. In the past, there has been a general mindset that “no-till = no yield.” It takes a different way of thinking to move from this opinion and from conventional to reduced tillage, so your attitude towards managing risks will need to change accordingly.



Reduced (left) vs conventional tillage. We need to change our way of thinking so we choose the field on the left over the field on the right.

You need to be “in it to win it” as it is more likely that you will not be successful or profitable without the determination to be both. You, the farmer, must learn about the system you are implementing, knowing when to be patient and when to push and be prepared to do both.

As former Major League Baseball great Tommy Lasorda said, “The difference between impossible and possible lies in an individual’s determination.” So when looking at reduced tillage and cover cropping, it is best to plan your management around these three maxims:

Plan to be Profitable. Prepare to be Profitable. Expect to be Profitable.

CHECKLIST	
Are You Ready for Reduced Tillage?	
<input type="checkbox"/>	What is the drainage on your field?
<input type="checkbox"/>	What has the rotation been? Continuous corn?
<input type="checkbox"/>	Does your field get manure? What are your fertility levels?
<input type="checkbox"/>	How weedy is your field? How aggressive are you willing to address the weeds?
<input type="checkbox"/>	Can you get your field sprayed immediately after planting? (rolling down a cover crop)
<input type="checkbox"/>	What are your typical yields on this field? What population do you plant at? Will you be purchasing an excellent seedling Vigor hybrid?
<input type="checkbox"/>	Are you willing to wait until the field is dry?
<input type="checkbox"/>	Are you willing to add extra nitrogen to help young seedlings?

No-till is more resilient (especially in years with adverse weather) and can be simpler than conventional tillage but it requires a different kind of management. So before you prepare your fields and equipment for reduced tillage and cover cropping, you need to prepare yourself for a new way of thinking. The checklist on the left may help give you some food for thought of questions to consider and/or ask farmers and ag service providers to help you prepare.

② Educational Factors – Your Knowledge

Reduced tillage and cover cropping practices will likely require new or different information that you may have learned from your farm’s elders. Farming “the old way” may or may not work with these systems so you will need to push yourself to understand what you are trying to do and why and then put the pieces into place to make those goals a reality.

Learn as much as you can from conferences, field days, and other farmer-focused events to gain information from ag service providers and, most importantly, from the experiences of other farmers. Visiting with farmers who are successful at reduced tillage and cover cropping is invaluable because you not only learn their successes, but most farmers are also very willing to share their mistakes—what *not* to do—too. In Vermont, several organizations offer events that bring farmers and other experts together to share information on reduced tillage and cover cropping. These include the [University of Vermont \(UVM\) Extension](#)—the [Champlain Valley Crops, Soils, and Pasture Program](#) and the [Northwest Crops and Soils Program](#)—and local [Conservation Districts](#), and farmer organizations, among others.

Bring that information back to your own farm to see how you might utilize that information in your own business. Use grants and cost-share programs available from the [USDA Natural Resource Conservation Service \(NRCS\)](#), [Vermont Agency of Agriculture, Food & Markets \(VAAF\)](#), and other groups to offset the risks to getting started. Some organizations—like UVM Extension, the [Farmer’s Watershed Alliance](#), Conservation Districts, and others—may have equipment you can borrow, rent, or otherwise use to see how it performs on your farm.

Start small by conducting your own on-farm research, using check strips and trials to figure out what works on your farm. By conducting your own test plots and building off the successes and failures of others, you will gain knowledge, experience and confidence to transition your farm to a reduced tillage system. Don’t forget to track results so that you build on and celebrate your own successes and remain committed to your goals.



Demonstration of a roller-crimper and no-till planter.



Events like the annual UVM Extension Northwest Crops and Soils Field Day provide opportunities to see equipment, learn the latest research findings, and meet other farmers.

③ Environmental Factors – Your Fields

There are two levels of environmental factors to consider:

- Field Level, and
- Watershed/Ecosystem Level.

Field Level

At the field level, start with the soil. Increased soil health will result in better root growth, nutrient uptake, and microbiologic activity. And, better drained fields will be better suited to implementing conservation practices.



Soil testing is the first step. The soil pH should be balanced for crops (eg., 6.2 to 6.8 for silage corn).

Try to reduce compaction where ever possible *before* attempting to implement reduced tillage. In fact, you should start reduced tillage in fields that are already in good environmental condition. Do not attempt to begin no-till in continuous corn fields. Instead, rotate them to hay and then begin no-till coming out of sod.

In general, you should be in a position to properly fertilize and condition the land on which you hope to implement reduced tillage. You will also need a strategy to handle manure application.

Learn how to implement these practices without jeopardizing your business. If you have a limited land base and you need 110% yields based on cow numbers, be careful about how you implement your strategy.



Watershed/Ecosystem Level

At the watershed and ecosystem level, remember that soil type, proximity to water, surface and subsurface drainage all play roles in your success. A properly implemented conservation program can benefit the farm, the community, and the watershed.

Good soil health resulting from your conservation practices can yield very well, infiltrate more rainfall, reduce nutrient and soil loss, sequester more carbon, use less fossil fuel, and be a more efficient and highly functioning system.

④ Agronomic Factors – Your Plants

Because reduced tillage and cover cropping go hand-in-hand, there are a number of agronomic factors to consider when implementing these practices.

Cover Crop Considerations

Here are some questions to consider with regard to cover crop success.

- What are your plans to terminate cover crops in the spring? You need to ensure that you have a good herbicide program as existing cover crops need to be terminated before they become competition to the cash crop.
- What method of cover cropping do you intend to utilize? Do you have access to the right equipment? Successful cover crop establishment depends on good soil to seed contact so choose timing and equipment accordingly.
- Will your herbicide program affect cover crop establishment? Herbicide programs are especially important when interseeding cover crops as residuals matter!
- Does the corn leaf architecture (vertical leaf vs. horizontal leaf) of the varieties you are using inhibit cover crop growth? Consider vertical leaf options to allow for better sunlight penetration through the canopy to the cover crops.
- What is the current condition of your field with respect to weed pressure? Early season cover crop interseeding with minimal residual herbicide may not be profitable on weedy fields.
- What are your cover crop seeding rates? When interseeding, take care that broadcast rates are not too low. Be sure to adjust NRCS seeding rates to reflect seeding dates. For example, early fall drilled rye NRCS rates may be too high, while late fall NRCS rates may be too low. If you are seeding down next spring, you may not want a heavy cover crop on that field.
- What seed varieties are you using? VNS (variety not stated) seed tends to be less expensive but also can be unreliable in some cases.
- What is your manure management plan with cover crops? Manure may be applied by broadcast before seeding is worked in, or on top of a seeded field, or even broadcast onto 6-inch tall cover crop—these all can work but you have to figure out how to make it work in your operation.
- Have you selected the right relative maturity variety corn for your cover crop program? One day in September is like four days in October for growing cover crops—growing degree days (GDD) matter. Flex ear corn versus fix ear for corn yields and seeding rates based on methods of seeding for cover crops.



- Are you paying attention to nitrogen (N)? Take care to avoid over-fertilizing your cash crop especially later in the season. Excessive nitrogen N in your corn crop will inhibit dry-down that will push back harvest and increase silage moisture at harvest. On the other hand, paying attention to nutrient requirements, particularly N, when you are no-till planting into mature cover crops is a major consideration at the beginning of the season. The covers will tie up about 60 units of N—based on recent observations of pre-sidedress N testing (PSNT) testing in silage corn—so additional fertilizer may likely be needed to prevent delayed growth of your cash crop.
- Does your cover crop establishment method increase or decrease the likelihood of good soil to seed contact? Soil to seed contact with cover crops is a key to success.

Reduced Tillage Planting of Silage Corn

Agronomic considerations for reduced tillage planting of silage corn include the following. First, crop rotations are critical in no-till systems. Corn on corn degrades soil health much quicker than diversified rotations. You may want to consider more intensive rotations, as opposed to continuous corn, to provide long-term increased yields.



The goal of planting no-till corn is simply to get 99% of the corn seedlings to uniformly emerge from the ground within 24 hours of each other. Optimal soil temperature must be 50 or more degrees with somewhat dry soil.

Select your hybrids for seedling vigor as well as other factors. Consider vertical leaf varieties if planting cover crops into standing corn to allow sunlight to penetrate the cash crop canopy. Shading within rows is extremely stressful on growing cover crops in most conditions.

Plan to increase plant populations 10% above your target, depending on the conditions at planting and equipment preparedness. You need to have even emergence to be successful; remember, one ear of corn per 1,000 plants is equal to 7 bushels of corn per acre -- this translates into nearly 1 ton of corn silage per acre.

It is recommended to add 30 to 50 units of N at planting, especially during your initial transition to reduced tillage. If a corn plant turns yellow, there is a management issue of that field that should be corrected. It could be nutrient-based, drainage-based, or some other factor, but it is not the fault of the no-till planter.

In general, the less tillage you plan to use, the more you should invest in your planter. Soil to seed contact is very important as is closing the seed trench.

⑤ Mechanical Factors – Your Equipment

Once you have considered factors 1 through 4, the next step is considering equipment. Any reduced tillage system follows three basic steps with the goal of getting a uniform crop:

1. Cut the soil and crop residue to create a furrow for the seed.
2. Place and firm the seed.
3. Close the trench.

Although it sounds straightforward, there are several challenges that may occur in each step, so the simpler you can keep the system, the better. The trick to success is getting these steps right 99% of the time under varying field conditions down the row and across the rows.

The planter is the one factor you have absolute control over; you need to prepare it for success and maintain it for performance. It doesn't matter what brand of planter you have, the important thing for you is how it is working in the soil and performing what you want it to do.



Reduced tillage planter options range from modified corn planter on left to drills on right (for perennial hay and pasture).

Corn Planter Modifications

Whether you plan to purchase a new planter or modify your current standard corn planter, there are a number of considerations to prepare it for reduced tillage. With a conventional planter, you are basically just asking it to drop the seed. But with a no-till planter, you are asking it to do everything including cut the soil, place the seed, and close the trench. So you need to make sure everything is working well before you go out to the field. Tearing the planter down annually and replacing any worn parts is important for success.

Any corn planter can be modified to plant no-till. The following are a few highlights of modifications; these are outlined in checklists prepared by UVM Extension as reminders of things to check before planting season arrives: [No-Till Corn Planter Tune-Up Checklist](#) and [No-Till Corn Planter Checklist: Planter Maintenance & Upgrades](#).

- **Floating row cleaners.** Important in clearing the residue from in front of the seed opener, row cleaners typically rolls along the soil surface and throw the residue off to the side.



Examples of no-till planter modifications.

They are particularly important in high residue systems as they can cut down on hairpinning and other issues.

- **Vee openers.** Choosing a heavy duty (3.5 mm thickness) vee opener is important to create a good seed trench.
- **Coulters.** Coulters tend to work better in lighter soils. If soils are moist or heavier, we've seen that coulters are detrimental to no-till because they create a zone of influence in front of the vee openers.
- **Seed firmers.** The seed firmers push seed down into the trench. We have also installed inexpensive Mojo Wires on our planters to add tension to the seed firmers, creating more down pressure to make sure the seed gets placed on the bottom of the trench.
- **Closing wheels.** There are numerous options for closing wheels and friendly debate about what works best. The challenge with heavier soils is closing the trench, so spoked wheels (like Thompson wheels, for example) tend to perform better in those soils. Rubber wheels should work fine in dry, lighter soils. Remember, not one size fits all, so what you end up using will depend on your farm and its soil conditions.
- **Fertilizer systems.** Fertilizer systems may also be installed to band or dribble nutrients—particularly N—at planting. Getting N near the seedling without seed burn is very important to make up for any nitrogen deficit experienced by not tilling and nutrient tie up from cover crops.

Why is all this focus on the planter modification and maintenance so important? Remember that every bag of corn has a potential of producing 35 tons per acre potential. Everything we do after we open the seed bag determines how close we get to that potential.

Cover Crop Equipment

There are numerous cover crop seeding options, including the following:

- Standard drills
- Dawn® Biologic Interseeder
- Air Seeders
- InterSeeder™
- Helicopter
- Home made interseeders
- Chain Harrow
- Highboy
- Vertical tillage
- Broadcast Equipment
- Spreader



A few cover crop interseeder options include the InterSeeder (left) and highboy high clearance seeder (right).

Conclusions

In conclusion, the degree of adaptation (success) of cover cropping and reduced tillage practices on your farm will be determined by your commitment to make them work and your ability to learn how to manage these practices on your farm.

Once you are committed to being successful, invest where it makes the most sense for your business. Start with the planter first for no-till, then move to seed and application equipment for cover crops.

Do not forget to calculate the termination costs associated with cover crops.

You must look at how these practices fit into your overall business model, set goals and expectations, then work to reach them. For example, reducing fuel and time to plant by 70% may be a goal which translates into money—which must be balanced against any lost yield to see if it was truly financially sustainable.

And don't forget to *keep records*—you cannot measure success at any level without solid information. Track costs, time, labor, yields, and whatever else you are using to gauge success.

Remember, UVM Extension and other organizations are here to help you succeed. Be sure to contact us if you have questions.

Contact Information

UVM Extension Northwest Crops and Soils Program

278 South Main Street, Suite 2

St. Albans, VT 05478-1866

802-524-6501

Heather Darby, ext. 437,

heather.darby@uvm.edu

Jeff Sanders, ext. 453,

jeffrey.sanders@uvm.edu

UVM Extension Champlain Valley Crops, Soils, and Pasture Program

23 Pond Lane, Suite 300

Middlebury, VT 05753-1189

802-388-4969

Jeff Carter, ext. 332,

jeff.carter@uvm.edu

Kirsten Workman, ext. 347,

kirsten.workman@uvm.edu



Some Reduced Tillage Reminders

Keys to Success

- Make sure soil conditions are optimum.
- ☀ Make sure planter has the correct attachments and that they are properly adjusted.
- ☀ Monitor planting conditions and planter performance as you plant and make any necessary adjustments.
- Scout aggressively for weeds and pests after stand is planted.
- ☀ Consider altering crop rotations and using the latest technologies to maximize yields and reduce risks.

Pitfalls to Avoid

- Thinking that min-till practices can be implemented the same as conventional till practices.
- ☀ Getting discouraged if you experience yield drag in the first year of implementation.
- ☀ Being in a hurry while planting. The implement is doing all the work. If you go too fast, germination rates will be reduced under most conditions.
- ☀ Not having GPS technology on the planting tractor to keep the proper row spacing.
- Not having the proper attachments on the planter to ensure the seed trench is covered and packed properly. If the seeds are not covered properly the stand's population will suffer.

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