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# NO-TILL

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Special No-Till Management Report No. 61

## Going After Bigger Profits with Organic No-Till



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# Ring in 'Organic' Growth for Your No-Till Operation



If you're no-tilling or strip-tilling, you probably understand the meaning of "learning curve" and the challenges of switching to a new farming practice.

For most growers, the reward for reducing or eliminating tillage, adding cover crops and improving soil health has been worth the risk, with reduced fuel, labor and machinery costs, better nutrient cycling, less erosion, and hopefully, a better bottom line.

But getting a fair price for what you're producing is also important. Since corn and soybean prices have declined from historic highs, many growers are struggling to stay in the black despite their best efforts.

Quite frankly, many farmers are going broke just hauling grain to the elevators and barely getting more than the cost of production out of it.

Meanwhile, demand for organic products has been skyrocketing in the U.S., in part because of increased consumer awareness and concern about food sources.

One organization estimates the U.S. organic food market is growing at more than 20% per year. Yet in 2017, the U.S. had to import 75% of its organic soybeans and 50% of its organic corn

because conventional farmers haven't yet met the need.

Paul Hepperly, former research director at The Rodale Institute, told attendees at the 2019 National No-Tillage Conference that premiums for organically grown soybeans were at \$18 a bushel, compared to \$9 for commodity soybeans and \$25 for organically grown food-grade soybeans.

Doing the math, for 50-bushel soybeans that's \$900 in gross profit per acre compared to \$454 for commodity beans. "If you want to grow tofu organic soybeans in a no-till system, this is something that can immediately start increasing your bottom line," Hepperly says.

But there's a process to follow, Hepperly notes. The certified organic system is based on having no restricted practice for a period of 3 years.

Growers will have to plan how to get there and line themselves up with a certifying agency. They must also develop a farm plan that can be implemented — and detailed record keeping is a must.

*No-Till Farmer* editors have been tracking increased interest from readers and conference attendees in organic no-till methods — two practices once thought to be somewhat incompatible.

But the re-emergence of cover crops and improved options for organic-friendly inputs has changed the game.

This 32-page report shares data trends that lay out growth in the U.S. organic market, and practical insights and tips from three no-tillers and strip-tillers who made the transition from conventional farming to organic and how they tackled challenges like weed control without herbicides.

This report also provides leads on where to find potential funding and technical assistance for converting farm acres to organic methods.

In addition, there's a roundup of naturally-sourced fertilizers, pesticides and soil amendments as well that could be part of an organic operation.

We hope this report will help you map out a smooth transition to organic no-till production and help make your farm operation more profitable in the long run.

Sincerely,

John Dobberstein, Senior Editor

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# Demand for Organic Food Skyrocketing in U.S., Globally

**Premiums paid to farmers for organic grains could make adoption of this system a more profitable choice for no-tillers and strip-tillers.**

By John Dobberstein, Senior Editor

**F**or no-tillers and strip-tillers who've focused on purposeful, responsible farm management and improving soil health, their investment may be coming at a key time, as organic production systems in the U.S. and globally are poised for continued growth in the coming decades.

The overall U.S. organic food market reached nearly \$48 billion in sales in 2018, up 6% from the prior year and more than double the sales of a decade ago, says the Organic Trade Assn. (OTA).

Organic acreage in the U.S. increased by 20% between 2011 and 2018 and now totals more than 5 million acres, although that amounts to less than 1% of the country's total farmland.

Organic agriculture also continues to grow across the globe, says Organic Without Boundaries. Its 2018 study pegged the worldwide organic sector at \$90 billion and 178 countries reported organic farming activities. The U.S. is the leading market, followed by Germany, France and China.

OTA recently proclaimed organic food products are no longer a niche market. Laura Batcha, the organization's CEO and executive director, says there was a notable shift in 2018 in the mindset of those working in the organic sector toward collaboration and "activism" to move the needle on the role organic can play in sustainability and tackling environmental initiatives.

"Activism is a natural reaction from an industry that is really close to the consumer," Batcha says. "When we are in an environment where government is not moving fast enough, the industry is choosing to move to meet the consumer rather than get stalled," Batcha says.

## Why the Shift?

Millennial households are leading the charge among organic customers as they push for transparency and integrity in the food supply chain. But other generations are also buying more organic products: 88% of American households have bought organic food or beverages.

"Consumers are more focused on products that have some benefit to them," Sarah Schmansky, a vice president of growth and strategy at Nielsen, told *The Associated Press*.

It doesn't appear the demand for organic food stuffs will wane anytime soon, especially as price premiums have been falling as options multiply.

Last year, organic food and beverages cost an average of \$0.24 more per unit than conventional food, or about 7.5% more, according to Nielsen. That was down from a \$0.27, or 9%, premium in 2014. There is some variation, as the price premiums consumers pay for organic milk, eggs and bread is much higher.

Organic products are also much more widely available now than before. Once confined to health food stores and high-end groceries like Whole Foods, organic products are now highly visible in most mainstream stores.

## The Good Seal

Certified organic agriculture has also grown by leaps and bounds. According to the USDA's Economic Research Service (ERS), the sale of certified organically produced goods has shown double-digit growth during most years since the 1990s.

The U.S. had less than 1 million acres of certified organic farmland when Congress passed the Organic Foods Production Act of 1990. U.S. consumer demand for organically produced goods

has grown continuously since USDA established national standards for organic production and processing in 2002.

The USDA's Certified Organic Survey for 2016 showed U.S. farms and ranches sold \$7.6 billion in certified organic commodities in 2016, up 23% from \$6.2 billion the year before. Of 2016 sales, 56% was for crops, and 44% was for livestock, poultry and related products.

Between 2015 and 2016, the number of organic farms in the country increased 11% to 14,217, and the number of certified acres went up 15% to 5 million.

California, Wisconsin and New York led the U.S. in the number of certified farms, while Pennsylvania, Iowa, Washington, Ohio, Vermont and Minnesota also had significant numbers. Corn, soybeans and tobacco had sales hikes of at least 25% between 2015 and 2016, while hay registered 11%.

### Certified Organic Farms by Acreage Category

1-9 acres:	2,818
10-49 acres:	4,109
50-69 acres:	977
70-99 acres:	1,467
100-139 acres:	1,477
140-179 acres:	1,024
180-219 acres:	692
220-259 acres:	594
260-499 acres:	2,022
500-999 acres:	1,335
1,000-1,999 acres:	773
2,000 or more acres:	878

Source: Organic Trade Assn.

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## Total U.S. Organic Sales & Growth, 2009–2018

CATEGORY	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Organic Food (\$)*	21,266	22,961	25,148	27,965	31,378	35,099	39,006	42,507	45,209	47,862
Growth (%)	4.3%	8.0%	9.5%	11.2%	12.2%	11.9%	11.1%	9.0%	6.4%	5.9%
% of Total Organic	92.2%	92.1%	92.0%	91.9%	91.9%	91.8%	91.6%	91.7%	91.6%	91.3%
Organic Non-Food (\$)*	1,800	1,974	2,195	2,455	2,770	3,152	3,555	3,866	4,151	4,589
Growth (%)	9.1%	9.7%	11.2%	11.8%	12.8%	13.8%	12.8%	8.8%	7.4%	10.6%
% of Total Organic	7.8%	7.9%	8.0%	8.1%	8.1%	8.2%	8.4%	8.3%	8.4%	8.7%
Total Organic (\$)*	23,066	24,935	27,343	30,420	34,148	38,251	42,561	46,373	49,360	52,451
Growth (%)	4.6%	8.1%	9.7%	11.3%	12.3%	12.0%	11.3%	9.0%	6.4%	6.3%

Source: Organic Trade Assn.

\*Dollars shown in thousands.

**RAMPING UP.** Sales of organic food in the U.S. have more than doubled between 2009 and 2018, reaching nearly \$48 million last year. Sales of organic non-food items have grown even more by percentage, although total sales are much lower than with organic food.

### Net Importer

Figures in the 2017 Census of Agriculture detailing the certified organic acreage and sales in the U.S. also show major growth. The Census found \$7.2 billion in product sales in 2017 on 18,166 total farms, up from \$3.1 billion in 2012.

There were 17,741 farms in the USDA National Organic Program that were certified for organic production — up from 12,771 in 2012. And some 3,723 farms were transitioning to the national organic program in 2017, up more than 500 from the previous Census.

Farms of 1,000 acres or more accounted for more than \$3.7 billion in sales in 2017, 52% of the total organic sales.

The U.S. government has struggled to adjust to customer demand. With organic food demand outpacing domestic supply, the U.S. imported more than \$2 billion in organic products in 2018, according to the USDA. That's likely a conservative figure because the USDA only tracks about three dozen imported foods.

Anna Casey of the Midwest Center for Investigative Reporting told Public International Radio in 2018 that the U.S. has been importing about 75% of organic soybeans and about half of the organic corn used here.

Enforcement challenges for certified programs have also grown along with the size of the U.S. organic industry. Farmers in more than 100 countries are now producing food for the U.S. organic market.

### Moving the Needle

While the U.S. government and Congress has, historically, been slow to address the growing need for organic production here, several changes were made in the 2018 Farm Act (Farm Bill) that could be very impactful for no-tillers and strip-tillers looking to the organic market.

Overall, it adds support for organic agriculture in many farm programs to bolster consumer confidence in the “USDA Organic” label, increases research support for organic farming, and helps incentivize organic transition and production. Specifically:

- ✘ The new Farm Bill creates permanent funding status and provides nearly \$400 million in funding for USDA's extramural grant program, the Organic Agriculture Research and Extension Initiative (OREI), over the next 10 years to help solve the unique challenges of organic production.

- ✘ The bill substantially increases funding for the USDA regulatory program and Congress also added a number of new provisions to improve detection of fraudulent imports and enforcement of organic regulations.

- ✘ Congress created an Organic EQIP Initiative to provide technical and financial assistance to farmers interested in transitioning to organic, as well as those who had already transitioned.

Additionally, the National Organic Program (NOP) has launched the new Organic Integrity Learning Center, which will offer online training that supports the professional development and continuing education of organic certifiers, inspec-

tors, reviewers and other professionals working to protect organic integrity.

Some other recent developments could enhance opportunities for no-tillers and strip-tillers. The Rodale Institute recently announced the opening of an organic center in Iowa, and the organization has also created a holistic standard for agriculture certification — Regenerative Organic Certification.

### The Bottom Line

So does organic production really pay? Authors from Washington State University crunched data from 44 studies involving 55 crops grown on five continents over 40 years and found that organic farming is somewhere between 22% and 35% more profitable for farmers than conventional.

The reason: the higher price farmers get when they sell certified-organic crops. This “premium,” as it's known, stands at around 30%, and stayed roughly equal over the 4-decade period, the authors reported in 2015.

In spite of lower yields, the global study shows that the profit margins for organic agriculture were significantly greater than for conventional agriculture, the authors say.

The actual premiums paid to organic farmers ranged from 29-32% above conventional prices.

“The reason we wanted to look at the economics,” said Crowder, “is that more than anything, that is what really drives the expansion and contraction of organic farming — whether or not farmers can make money.”





# An Introduction to the Organic No-Till Farming Method

**The right equipment and dedicated management makes organic no-till production successful, says director at The Rodale Institute.**

*By Jeff Moyer, The Rodale Institute*

*Editor's Note: Reprinted with permission from Acres U.S.A., the Voice of Eco-Agriculture.*

It's the hope and dream of many organic farmers to limit tillage, increase soil organic matter, save money and improve soil structure on their farms. Organic no-till can fulfill all these goals.

Many organic farmers are accused of over-tilling the soil. Tillage is used for pre-plant soil preparation, as a means of managing weeds, and as a method of incorporating fertilizers, crop residue, and soil amendments.

Now, armed with new technologies and tools based on sound biological principles, organic producers can begin to reduce or even eliminate tillage from their systems.

## Tenets of Organic No-Till

Organic no-till is both a technique and a tool to achieve farmer's objectives of reducing tillage and improving soil organic matter. It is also a whole-farm system.

While there are many ways the system can be implemented, in its simplest form organic no-till includes the following elements:

- ✗ Annual or winter annual cover crops planted in the fall, overwintered until mature in the spring, and then killed with a roller-crimper.

- ✗ After termination, cash crops are no-tilled into the residue with a planter, drill or transplanter.

Whether you grow agronomic or horticultural crops, this system can work on your farm.

These techniques and tools can work equally well on both conventional (farms based on chemically based practices) and organic farms (farms that follow the USDA's definition of organic).

Organic no-till is a rotational tillage system that combines the best aspects of no-till while satisfying the requirements of the USDA organic regulations.

It's not necessarily a continuous no-till system but one that may include some tillage in rotation, especially to establish the cover crops.

After cash crops are planted, no further tillage or cultivation is generally needed, and this greatly reduces the required field operations.

While organic farmers typically work the field several times just to get the crop in the ground, organic no-till farmers can get by with as few as two field operations: rolling the

cover crop and planting the cash crop in one pass, and then harvesting the cash crop.

By reducing the number of field operations, farmers can save on fuel and time — all the while building up their soil.

## Cover Crop Seeding

Most organic farmers know something about cover cropping, but with organic no-till you'll get a chance to sharpen your skills.

If you're managing a chemically based operation you can still take advantage of these tools and use cover cropping on your farm. Winter annuals like cereal rye and hairy vetch are common examples, but summer-planted buckwheat, field peas, many small grains and annual legumes are also a possibility.

Our rule of thumb is simple: if you can step on the plant and it dies, then you can kill it with a roller-crimper. This means that plants like alfalfa or perennial weeds are not good candidates for rolling.

When seeded at the correct time during the fall, these cover crops will get started by developing an extensive root system and growing a small amount of vegetative matter. During the winter, the cover crops will either continue to grow slowly (in warmer climates) or essentially remain dormant (in the north).

## Jumping to Life

There are several benefits to a winter cover crop, including erosion control, nutrient cycling, and microbial habitat in the root zone.

During spring, the cover crops jump to life and really put on biomass. Then they can be killed with the roller-crimper as they reach the peak of their life cycle.

With the winter annuals commonly used in the system, this corresponds to the period when they're entering their reproductive phase.

For example, with winter rye, the correct time to roll the cover crop is when the rye is in anthesis or producing pollen. With hairy vetch, the vetch should be at least 75% in bloom, but 100% bloom is even better.

An annual crop typically allocates 20-30% of its resources toward the process of flowering and seed production. In addition, enzymatic changes at this time cause the plant to begin senescence, the process of aging and breakdown prior to death.

During this phase of the plant's life cycle, it's much more vulnerable and can be effectively killed by the roller-crimper.

The roller-crimper is a specialized tool designed by John Brubaker and myself and tested at the Rodale Institute. It

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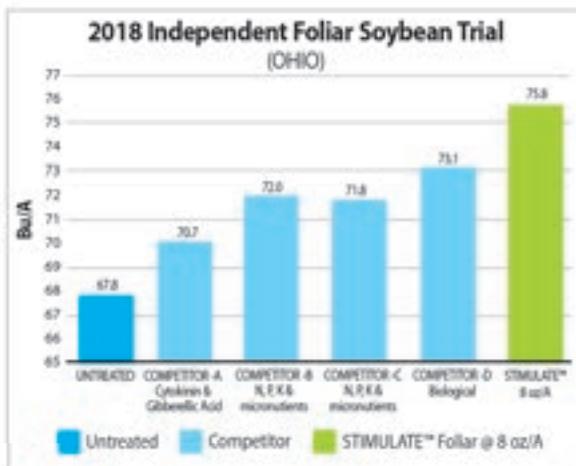
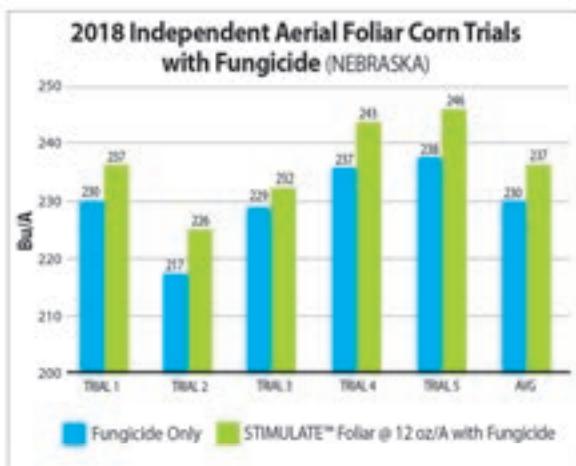
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# “Organic no-till farmers can get by with as few as two field operations: rolling the cover crop and planting the cash crop in one pass, and then harvesting the cash crop...”

– Jeff Moyer

works by rolling the cover crop plants in one direction, crushing them and crimping their stems.

The roller-crimper can be front-mounted on a tractor, while a no-till planter, drill or transplanter brings up the rear, planting directly into the rolled cover crop. Or the roller can be pulled in a separate pass.

## Roller-Crimper Advantages

While other tools, such as stalk choppers, rolling harrows and mowers have been used for the purpose of terminating cover crops, the roller-crimper has several advantages over other tools, as it's designed for organic no-till and performs its function exceptionally well.

The mashed cover crops provide a mulch layer for the cash crop, both preventing the growth of weeds, but also breaking down gradually during the season to provide a long-term slow release of nutrients.

To achieve adequate weed control, the cover crop should be planted at a high rate and produce approximately 2½ tons of dry matter per acre.

For this reason, only certain kinds of cover crops that yield a high amount of biomass work well for no-till.

It's also important to select cover crops with a carbon-to-nitrogen ratio higher than 20:1. The higher the ratio, the more carbon, and the more slowly the crop will break down.

This will provide a consistent weed-management barrier throughout the season.

## Organic No-Till Principles

Organic no-till rests on three fundamental principles: soil biology powers the system; cover crops are a source of fertility and weed management; and

tillage is limited, and best described as rotational tillage.

In both the goals and ideology, organic no-till is very similar to other kinds of organic farming.

These include soil building with organic matter and soil biology, managing weeds, insects and diseases through diverse and non-chemical means, and achieving general plant health through soil health and good management practices.

However, organic no-till uses different methods to achieve those goals. Much more emphasis is placed on cover cropping, which replaces tillage and cultivation as a means of soil building and managing weeds.

In organic no-till, as with all types of organic agriculture, biology replaces chemistry.

This means that organic farmers let the soil organisms do the work of facilitating nitrogen fixation, improving nutrient cycling, as well as enhancing soil structure and texture.

These soil organisms include macro organisms like earthworms and micro organisms like soil bacteria and fungi. Organic no-till goes one step further than the current technology offered in organic systems.

Chemistry, as used by conventional agriculture, has some fundamental problems. When we say chemistry we mean synthetic products such as man-made fertilizers and pesticides.

Conventional no-till is closely tied to herbicide use, since this is the primary means of weed control.

Typically, as tillage is reduced, herbicide management is increased in an attempt to control weeds. Although some surface residues are generated from no-till, they are not enough to provide consistent weed control.

This dependence on herbicides generates a host of problems, from resis-

tant weeds to the destruction of beneficial insects.

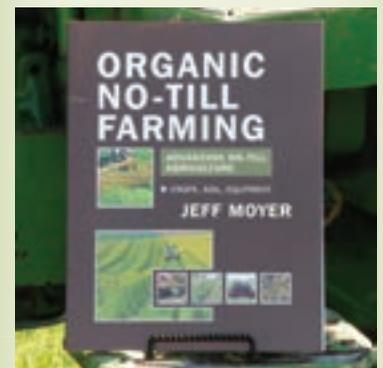
Genetically modified crops (GMOs) are also commonly used in conventional no-till, as the marriage of herbicide-resistant crops and ag chemicals has been a consistent theme.

There are a number of concerns about GMOs: They may cause allergic reactions in sensitive individuals, they can cross-pollinate with non-GMO crops, and there's an increased dependence on chemical herbicides and pesticides.

GMOs also prevent farmers from saving their own seed, since these technologies are all patented. None of these technologies are currently allowed under the USDA organic standards.

*Jeff Moyer is executive director of The Rodale Institute. Having worked in organic agriculture all of his adult life, he is a world-renowned authority in the field, as well as a past chair of the National Organic Standards Board.*

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# 5 Keys to Success for Rolling-Crimping Covers in Organic No-Till



**ESSENTIAL TOOL.** A roller-crimper, such as this one originally designed by The Rodale Institute, is perhaps the most important equipment for an organic no-tiller to own, as it lets growers terminate cover crops without chemicals and lay down thick mulch to smother weeds.

PHOTO COURTESY OF THE RODALE INSTITUTE

## From getting a thick stand of cover crop to terminating them at the right time, roller-crimping experts explain the key components for weed control in organic no-till.

By Laura Barrera, Contributing Writer

**S**ince herbicides aren't an option, rolling and crimping of cover crops is a crucial component to making organic no-tilling work.

Biomass from a healthy canopy of cover crops can suppress weeds, while roller-crimpers handle cover crop termination — all without the use of herbicides or tillage.

But ensuring that the cover crop grows enough biomass to suppress weeds and is completely killed requires dedicated management.

"I've gotten a lot of calls over the years from organic farmers who were disappointed in the result in weed control with covers," says Holtwood, Pa., no-tiller Steve Groff, who has been roller-crimping since 1995. "And, even sometimes in the ability of the crimper to terminate it."

Groff warns this system can be a

little unreliable, as he estimates 1 out of 5 years will be poor, 1 will be excellent, and the other 3 will be decent. But following some guidelines can increase the chances of success.

### 1 Seed Earlier, Heavier

Succeeding with roller-crimping starts the year before at cover crop seeding. Because organic no-tillers are relying on covers to control weeds, it's important to select species that will survive into the following spring and to seed them at a higher rate to provide adequate ground coverage.

Cereal rye is the most popular species for this and the one that University of Wisconsin-Madison assistant professor Erin Silva recommends to organic no-tillers. Silva leads the university's Organic and Sustainable Agriculture Research and Extension program and has been researching how to succeed with organic no-tilled soybeans.

The reason cereal rye is the top choice, she says, is due to its winter hardiness, ability to mature earlier than other cereal grains and its effectiveness in suppressing weeds.

For a seeding rate, Silva recommends no-tillers start at 3 bushels per acre.

"That is quite a bit higher than the bushel or bushel-and-a-half you'd typically use for a cover crop," she says. "But this is really the keystone of your weed management program, so we want to make that extra investment to get that biomass quantity we're looking for."

The goal is to achieve at least 8,000 pounds of biomass per acre, Silva says, adding that no-tillers must calibrate their drill properly to ensure the higher seeding rate is actually getting into the ground.

She advises against aerial applicators, spreaders, and highboys due to less consistent germination and higher risk of poor stands.

Groff agrees no-tillers have to seed cereal grains heavier in this system, but recommends adjusting the rate based on the seeding date and fertility plans.

He suggest no-tillers start with 1½ bushels when seeding in September, 2 bushels in October and 3 bushels in November, then adjust higher or lower for nutrient management.

If a no-tiller plans on spreading manure in the fall, he says the rye will be even thicker and will fall down if the seeding rate is too high.

But Silva points out that in northern areas, seeding past September will be too late to achieve the biomass necessary for weed suppression.

For growers in these regions, this may mean planting earlier corn hybrids and soybean varieties to get the cereal rye seeded earlier, or incorporating a grain like winter wheat or oats into the cash crop rotation, since their harvest is earlier in the year.

Being located in Wisconsin also means that Silva hasn't been able to see how legumes or brassicas can work in this system with organic no-till corn because they can't get enough biomass on them in the time frame they need them to.

But she's heard of success with these species in Pennsylvania, North Carolina and Nebraska.

## 2 Choose the Right Tool

The next factor in succeeding with a roller-crimper is the tool itself. While there are a variety of shapes, sizes and styles of roller-crimpers available on the market, Groff says they can all get the job done.

"If you have a roller-crimper that was designed to roll cover crops, they're similar enough to say there's not one that's better than another," he says.

But there are some factors no-tillers should consider when choosing one for their operation — one of which is whether their fields have a lot of contours.

This is important because a bigger roller-crimper on undulating terrain won't effectively roll parts of the field where the soil may be a couple inches lower.

In this case, it might be best to use a roller-crimper that consists of smaller sections. For example, the 10-foot roller-crimper Groff developed for his farm has 22-inch sections — four in the

## Cover Crop Species to Use and Avoid With Roller-Crimpers

Not sure which cover crops to use? Make smart choices with these tips on which cover crop species are most appropriate for roller-crimping and which ones to avoid, from Holtwood, Pa., no-tiller Steve Groff, Marion, Ill., no-tiller Adam Dahmer and University of Wisconsin researcher Erin Silva.

### AVOID

**Annual Ryegrass:** The stems don't lend themselves well to roller-crimping, Groff says.

**Dwarf Essex Rape:** Can't be terminated with a roller-crimper alone, Dahmer says.

**Sorghum-Sudangrass:** Tends to grow back after roller-crimping, says Groff.

### USE

**Wheat or Barley:** Both tend to mature fairly early, Groff says, which means they can be roller-crimped earlier.

**Winter Peas:** Groff says they're succulent, so they're easy to terminate.

**Triticale:** Silva says it can achieve adequate biomass, and improved varieties are more winter hardy and less likely to lodge due to its thicker stem.

**Hairy Vetch:** Its succulent and tender stems make it easy to terminate with the roller-crimper, Groff says. Dahmer adds that it needs to reach 100% bloom to be terminated. Pairs well with triticale because they tend to mature very close together. However, it tends to pull down other species it's with, so no-tillers may need to roll twice if they suspect lodging may occur.

**Clovers:** Crimson clover doesn't terminate as easily as hairy vetch, but can be used. Williamsport, Ind., no-tiller Rick Clark recommends balansa clover because the stem is pinky-sized and hollow, so the roller-crimper has no problem terminating it.

**Cereal Rye:** Great for weed suppression. Consider the variety Aroostook, Silva suggests, as it's marketed for roller-crimping with its ability to reach the flowering stage about 10 days earlier than other varieties.

**Sunn Hemp or Buckwheat:**

front and four in back — with the front rank overlapping the back. The sections can also flex, so they're able to crimp every part of the field consistently.

Groff recommends growers with undulating fields avoid roller-crimpers that have sections wider than 10 feet, explaining that a roller-crimper of that size may require multiple trips across the field to fully crimp dips in the field.

Another option is a tool like Underground Agriculture's ZRX roller, which attaches to planters and fits one roller-crimper per row. This will follow the contours of the field better and eliminate an additional pass in the field, which can reduce compaction while saving time, labor, machine wear and tear and fuel, says Silva. But it can make the option of roller-crimping before planting more challenging.

Rolling a second time may be necessary if the roller-crimper wasn't aggressive enough on the first pass. This is why having the ability to make the roller-crimper more aggressive through

added weight or down pressure is another factor no-tillers should consider in selecting a roller-crimper.

If a no-tiller opts for a roller-crimper separate from the planter, they'll need to decide whether to put it in front of or behind the planter. Groff says this is more of a personal preference that shouldn't make a difference in the effectiveness of the roller-crimper if it's being used in a true no-till situation.

The Rodale Institute suggests farmers run their roller-crimper in front because they discovered when they rolled it behind, it wasn't able to effectively terminate the cover crop that was in the tractor tracks.

"They had planted their cover crop in tilled ground, so in the spring when they went in and rolled it, their tractor tracks made an indentation in the soil enough that it didn't really crimp the cover crop and it came up in the tracks," Groff says. "In a good no-till situation you won't leave tractor tracks, so you



**AVOID LODGING.** Having a cover crop lodge can result in its stems lying in different directions, which can make planting more of a challenge. To avoid this, no-tiller Steve Groff will often roller-crimp his cover crop before a rain or wind event so that the stems will be parallel to his rows. He'll come back later with the roller-crimper when it's time to terminate it.

don't need to put it on front. That's not as important."

Marion, Ill., no-tiller Terry Dahmer uses a 30-foot I&J Mfg. roller-crimper in front of the tractor so he can pull his air seeder behind. The challenge with this setup, he says, is it's hard to correct the roller-crimper while driving.

"Whenever you're trying to correct this, you're trying to slide that roller sideways," says his son, Adam Dahmer. "Empty weight, this thing weighs over 7,000 pounds. When it's on the ground you have no weight on your front end. So where you drop the roller is where it's rolling."

Tractor horsepower is another consideration. Groff says the amount needed depends on the type of roller and its weight. The heavier it is, the more horsepower you'll need to lift it up.

As a general guideline, 100 horsepower is preferred for the 10-foot, 2,500-pound roller-crimper that Groff has, but he says no-tillers should work with their equipment dealer to match the right tractor to a roller-crimper.

Whichever size or style of roller-crimper a no-tiller ends up choosing, Silva says the No. 1 thing it should do is always provide effective termination.

"A lot of things can work, but a farmer wants to choose the strategy that allows the technique to work most consistently over a wide variety of field and environmental conditions," she says.

### 3 Roll at the Right Time

One of the benefits of rolling and crimping covers for termination is the tool is low maintenance, as no-tillers

just need to grease the bearings, Groff says, noting that you hardly ever need to sharpen the blades. It's also a fast task, with Groff driving 9-10 mph when he roller-crims.

The challenge is deciding when to use them. This depends on what cover crop species are growing and their stage of maturity.

With cereal grain crops, Silva says they need to be rolled and crimped at anthesis, which is the flowering stage of the crop.

This is when anthers will be hanging off of the grain heads and yellow pollen will be shedding. After roller-crimping, the cover crop should lie on the ground as a flat mat — not spring back up and continue to grow, she notes.

No-tillers should also err on the later side of anthesis to ensure successful termination, Silva adds.

"We want to see anthesis occurring throughout the rye head as well as throughout the field," she says. "We don't want to push it early because the earlier we push it, the more regrowth and bounce back we're going to have."

If the cover crop does re-grow it will compete with the subsequent cash crop. That's why perennial grasses don't work in this system, Silva says — they do not have the same life cycle as an annual grass.

With broadleaves and legumes, they need to reach full bloom or early pod set, she says.

Because cover crop termination has to occur later than it would in a conventional system, organic no-tillers may need to plant cash crops into the cover crop before rolling or select a

shorter-season cover crop species so it will reach maturity earlier.

With soybeans it's possible to plant soybeans into cereal rye at the boot stage and then roller-crimp the rye at anthesis, which is around the V2-V3 stage for soybeans. This allows soybeans to be planted 2-3 weeks earlier, rather than waiting until after the rye has been rolled and crimped.

Silva says the roller-crimper doesn't significantly damage the soybeans at that stage. If the soybeans are too early in maturity — before V1 — then the roller-crimper may hurt the stand.

### 4 Roll Twice to Prevent Lodging

While no-tillers must wait until the crop has reached 90% of its life cycle to be successfully terminated by a roller-crimper, they may need to roller-crimp more than once to avoid problems with lodging at planting time.

The biggest challenge Groff faces with roller-crimping is when a wind or storm event causes his cover crop to lodge.

This often results in the stems of the cover crop lying across the ground in every which way, making it difficult for his planter to cut through the cover and achieve good seed-to-soil contact. Hairpinning may also occur.

While lodging has been linked historically to excessive soil fertility, Silva says, a lack of genetic breeding may also be a reason why it occurs with cereal rye.

"It may be cereal rye that hasn't been necessarily selected for lodging resistance," she adds.

"It tends to be more susceptible to lodging as compared to winter wheat and some other cereal grains. If we get a storm with a lot of rain or wind, it just tends to go down."

Groff adds that lodging is also more likely to happen in organic no-till systems because of the thicker cover crop seeding rate. The thicker the stand, he says, the increased potential for it to lodge.

Because of this, Groff recommends organic no-tillers plan on rolling their cover crop twice, which will not only prevent lodging but also help completely terminate the cover crop.

While Groff is not in organic production, this is a strategy he's used on his own



**“We want to see anthesis occurring throughout the rye head and throughout the field. We don’t want to push it early. The earlier we push it, the more regrowth and bounce back we’re going to have...”**

*– Erin Silva*

farm. One year Groff roller-cripped crimson clover when it was around 30-40% flowered, about 3 weeks before planting, because heavy rain was expected and he knew the cover would go down.

“It won’t stop growing,” he says. “I’m still going to get the benefits over the next 3 weeks, but my main stems are going to be lined up parallel to planting.”

To terminate the cover crop, Groff says no-tillers will need to roller-crimp again over the cover crop at the time they would have if the cover was still standing.

Groff notes that lodging isn’t as much of a concern with succulent legumes like crimson clover and hairy vetch because they’re much easier to cut through than a species like cereal rye or triticale.

Determining when to make that first pass with the roller-crimper depends on the cover crop stand, Groff says, explaining that growers will eventually have a gut feel for the right time as they continue this practice over time.

“If I could look at the field, I could tell you in 5 seconds what to do because I’ve got the experience” he says.

“I’ve done this so long now it’s intuitive to me. Just like it’s intuitive for

some back in the tillage days to know when you till and don’t till.”

Until that intuition is there, Groff says growers should err on the side of being proactive against lodging. “It doesn’t cost much to roll and lodging is difficult to overcome. It’s difficult to plant through it.”

Silva notes that roller-crimping the cover crop multiple times is not a practice she has tried in her research, but in addition to Groff’s strategies, she recommends no-tillers make sure their planters are in the best shape possible for cutting through a thicker, uneven residue mat, if lodging does occur.

## 5 Be Flexible

The final piece of advice Silva and Groff offer organic no-tillers is to stay flexible and understand that it’s not a perfect system.

“If the cover crop looks less than ideal in the spring — it looks skimpy, or you got it in too late, we had a lot of winterkill — just be ready for a plan B,” Silva says.

“Don’t get too locked into a mindset of you’re going to roller-crimp and

terminate mechanically no matter what, because you really do need to be adaptive with respect to this management system.”

In a true organic system where herbicides are not an option, this means either tilling or mowing.

Groff says that Underground Agriculture’s RowMow weed management system, which was designed to control weeds by mowing between the rows in organic no-till soybeans, could be used for keeping cover crops under control as well.

“The biggest concern in organic farming is not getting weed control if you don’t have a good solid stand of cover crops,” he says.

It’s why he and Silva encourage no-tillers to start small — preferably no more than 10-20 acres in the beginning, Silva says. Groff adds no-tillers need to learn the limitations of the practice before expanding, while staying nimble and being prepared to make decisions on a field-by-field basis.

“There is no exact prescription,” he says. “Success is a summary of many little management decisions.”



**ROLLER-CRIMP TWICE.** While hairy vetch is easy to terminate with a roller-crimper due to its succulent and tender stems, Steve Groff says no-tillers may need to go over it twice to prevent lodging, because it tends to pull other species down with it. Both photos are of hairy vetch that was roller-crimped twice.



# No-Till, Cover Crops and Research Provide Solid Ground For Organic Transition

Iowa grower Levi Lyle was well prepared to go organic by the time he made his move, making for a smooth transition.

By Martha Mintz, Contributing Editor

**T**hirty years of no-till had Levi Lyle’s soils in excellent shape and primed for transition to producing organic corn and soybeans. His father, Trent, unknowingly started them down the organic path by converting the Keota, Iowa

farm to no-till when Levi was just a young boy.

Soils gradually improved over the decades with the addition of cover crops in 2014 pushing soil health to new highs. The strength of his soils, in part, are what gave Levi the confidence to start transitioning to organic production. Weather permitting, he’s set to harvest his first certified organic corn crop in 2019.

“As a kid I didn’t realize the long-term impact no-till would have on our farm, but it turns out it perfectly prepared us to transition to organic,” Levi says, noting their continuously increasing soil organic matter (SOM) and biological activity on their 60 organic acres. Thriving soils both hold water through dry periods and in years like 2019 have a greater capacity to absorb



**OPENING DOORS.** Levi Lyle was able to have a custom designed roller-crimper fabricated and is working with a local manufacturer for larger-scale production.

PHOTO COURTESY OF JASON JOHNSON



excessive rain. “As small farmers being pinched for profit, I made the case to my Dad that venturing into organics would help us increase our profit margins.”

When Trent was skeptical at first, Levi knew he needed to gain his father’s confidence by becoming better informed.

He decided to become an expert by talking to as many organic farmers as he could. This led to a job as an organic inspector.

While visiting farms across Iowa, what he found were formidable challenges. He observed many central Iowa organic farmers struggling to manage the soybean portion of their rotation. Inability to control weed pressure pushed many out of organics.

Row cultivation of soybeans taxed



## Tips For Going Organic

- ✓ Secure support from all involved in the operation and move forward with a long-term plan.
- ✓ Get the proper equipment, such as a roller-crimper.
- ✓ Identify motivations beyond profitability for going organic.
- ✓ Roll and crimp cereal rye for weed control.

available labor and profitability and the weeds were still there.

Keying into current research helped him see an alternate path for his system, sidestepping the weed troubles. In the research work of Jeff Moyer of The Rodale Institute and Erin Silva with University of Wisconsin-Madison he found a promising potential solution.

“Their work with roller-crimping made me realize I needed to incorporate growing cereal rye and using a roller-crimper to be successful in an organic system,” he says.

### Crimping For All

Levi had already started playing with cereal rye cover crops on his conventional acres. Those initial covers were terminated early in the spring to make sure corn and soybeans could grow without interference.

For organic, though, he needed to let rye grow much longer and use a roller-crimper to terminate. But roller-crimpers weren’t readily available in Iowa.

“I could see the frustration of organic soybean growers in my area and knew cereal rye could help. The only answer was to bring a roller-crimper to our area,” he says.

Levi built his own roller-crimper, rented it out to area organic farmers and started transitioning 60 acres of his farm to organic production, too.

Levi opted for the Rodale model roller-crimper. The crimpers are in a ‘V’ or chevron shape. The design cuts the pounds per square inch in half compared to a straight-bar implement, reducing compaction, he says.

The ‘V’ shape provides constant contact with the ground along the curved surface, distributing the weight of the implement evenly. More even distribution means the overall weight of the implement can be reduced, allowing Levi to mount it on the front of his tractor for one-pass rolling and planting.

“Mounting it on the front eliminates

the fuel cost of the extra pass,” he says.

At the time, no one in the Midwest was commercially producing roller-crimpers, so Levi worked with a local manufacturer to fill the void. It comes in at 1,300 pounds — allowing for front mounting — and the ability to fill it with water for increased weight if needed.

“Extra weight has proven mostly unnecessary. The only times I’ve added water are when the rye stand is thin, which isn’t good for organic production anyway,” he says.

He hopes to begin manufacturing the roller-crimpers for distribution soon.

**“The paperwork is part of the learning curve of being organic. With a good system in place, it becomes second nature after a year or two...”**

The success of roller crimpers for organic producers, however, starts with a good stand of cereal rye growing in the fall. Levi drills 2 bushels (around 100 pounds) of cereal rye per acre.

“I see some people getting by with a lower seeding rate but with the backup plan of cultivating with a high-residue row cultivator,” he says.

Levi and his father decided to plant soybeans on 15-inch rows as opposed to the 30-inch rows recommended by roller-crimping research. This means they can use a lower soybean seeding rate (180,000 seeds per acre) and still get a quick canopy, but the rows are too narrow



## “We want to wait until the rye has pollinated so it will lay down, die slowly and make a nice mulch for weed prevention ...”

for them to cultivate if weeds become an issue. That’s why a good cereal rye stand is so critical and the reason the 30-inch rows are usually recommended.

As he moves into growing organic corn, he plans to use a 105-day hybrid to allow for earlier cereal rye seeding after harvest. On the flip side, he holds off until June to plant soybeans so he can plant and roller-crimp his cereal rye in one pass.

“We want to wait until the rye has pollinated so it will lay down, die and make a nice mulch for weed prevention,” he says. “It’s time to roll when pollen starts to flake off the seed head, usually in June. It usually works out to about 10 days after conventional farmers are planting — but in 2019 I was ahead of them because my rye cover crop helped manage the excessive moisture.”

During his transition years he produced 55- and 45-bushel soybeans respectively. Even giving up some yield, he easily made up the profit difference by eliminating herbicide cost and trips through the field.

### Working Transition

Levi encourages those looking at going organic to discuss with their certifier the potential option of growing

soybeans twice with cereal rye cover crops between.

Normally it isn’t allowed to grow a crop two years in a row, but Levi was able to make the case of not switching each year because he was growing a fully mature cover crop between the soybean crops.

Corn requires more labor and input costs and must be sold at commodity prices during transition, making avoiding growing it during the transition a financial benefit.

Cereal rye helped the agronomic transition. Levi had seen weeds quickly get out of control in those first years for other farmers, but he was able to roller-crimp the thick cereal rye cover crop for excellent weed management.

“I had very clean soybean fields during the transition and now I’m excited to grow my first organic corn crop,” he says.

He’s not quite ready for no-till organic corn, though. After 2 years of soybeans and cereal rye, they chiseled the soon-to-be certified acres in preparation for planting organic corn.

“At this time, I don’t have the confidence to no-till organic corn. Baby steps are important. I’ve seen organic farmers dive in with large acreages, have a crop

failure and return to a conventional system. I don’t want that to happen to me,” he says.

Instead he’s investigating ways to no-till corn successfully by committing some acres to a joint research project with Iowa State University and University of Wisconsin-Madison.

For his trial, he planted fava beans in early spring 2019. Despite a cool, wet spring they were 6 inches tall by mid-May. In June he will roller-crimp and no-till corn into the cover crop.

The hope is they will be controlled by the roller-crimper and will have produced a fair amount of nitrogen (N) for the corn.

“Getting weed suppression and N production will be critical for successful organic no-till corn,” he says.

Part of the reason they chiseled was to incorporate hog manure for their fertility. Levi has hopes his soil health and the strategic use of covers can do away with that need.

“I buy into what Ray Archuleta says about soil microbial activity allowing you to cut back on the use of traditional fertilizers,” he says, noting research that says otherwise inaccessible nutrients in the soil are made available to crops by increasing soil biological activity.



PHOTO COURTESY OF JASON JOHNSON

**WEED SOLUTION.** No-tilling into a thick, roller-crimp terminated cereal rye cover crop allowed Levi to transition to organic without developing the weed problems that often plague early organic producers.



PHOTO COURTESY OF JASON JOHNSON



**LEARN AND APPLY.** Instead of jumping in with large acreages, Levi experiments on a small scale. Here, corn emerges through a roller-crimped cereal rye and Austrian winter pea cover crop.

“I’m closely monitoring phosphorus, potassium and micronutrients in my field with the hope my cover crops and soil life provide them. This would mean even greater profitability and opens the possibility for future generations to continue farming in this way,” Levi says.

### Clean and Record

Transitioning to organic while still maintaining conventional acres — known as parallel production — means a few extra steps for Levi to avoid contaminating his high-value organic crops.

“I have to make sure the planter doesn’t have any GMO seed and that the combine auger and hopper are flushed. Grain bins must be cleaned and swept and implements are power washed to ensure there is no chemical residue,” he explains.

A buffer crop helps him maintain separation in the field. Regulations do not designate a specific buffer, just an appropriate barrier as determined by the farmer. This could even be a row of trees, Levi explains.

He opts to make one pass around the outside of his organic field with his 6-row combine.

Those bushels are lumped in with the rest of his conventional harvest. He then cleans his combine again and harvests organic fields.

He also uses grass buffers that are a part of an Environmental Quality Incentives Program (EQIP) project. The 20-foot strip gives him good space from the neighboring conventional farm.

“I prefer the grass buffer, preferably in EQIP or the Conservation Reserve Program (CRP) as then I don’t have to manage it like a crop and I still get paid for it,” he says.

From buffers to cleanouts, every activity must be carefully documented. Levi opts for a 3-ring binder with dividers for the different sections of organic certification.

It contains his application paperwork, non-GMO affidavits from his seed and input providers, documentation for timing of field work, cleanout records and more. “It really isn’t a burden to document, and the result is I have an excellent record of the practices I’m using on the farm,” he says.

### Fresh Ground

Levi has found while many farmers profitably make the transition to organic production, profitability alone isn’t enough to sustain a farmer’s motivations.

To him, organic farming means a community that can support more small producers, which in turn support more local businesses to service those producers. It means keeping the local school open and giving the next generation an opportunity to farm.

“It’s those reasons, not just profits, that get me excited about organic production and push me to perfect and expand my organic production,” he says.



PHOTO COURTESY OF JASON JOHNSON

**DOUBLE UP.** A lighter roller-crimper allows Levi to mount it to the front of his tractor for one-pass cereal rye termination and soybean planting.



# Organic No-Till Keeps Farming Interesting, Full of Profit Potential



**Indiana grower Mike Shuter enjoys a good challenge, and battling no-till organic weed pressure has given him a good riddle to untangle.**

By Martha Mintz, Contributing Editor

**"T**ears still stain the shirt I was wearing that day," says Mike Shuter of the day he had to do some light cultivating to control weeds in an organic corn field with a 35-year history of being no-tilled.

Weeds have been the greatest challenge in the transition to no-till/strip-till organic production for the Frankton, Ind., farmer. This problem is further complicated by Shuter's drive to protect the biology he's built in his soil. Every action he takes requires him to consider the impact on soil life — life he's convinced is key to his current and future success in raising organic corn and soybeans.

"Our motivations for going organic were to reduce chemical use and to take advantage of higher prices," Shuter says.

## Soil-Centric

Their journey started in 2015 when they began transitioning fields to organic production, a journey which has shone a bright light on the importance of soil biology and what all it can do to further reduce inputs in both organic and non-organic acres.

"We're concentrating more all the time on promoting soil biology: microorganisms, mycorrhizal fungi and bacteria in the soil that can actually feed the crop by freeing up nutrients already in the soil, among other benefits."

When juggling the combination of no-till, soil biology preservation and organic production, Shuter says it's critical to be flexible. Not only is a Plan B necessary, but a Plan C, D and F, too. It can be complicated, but Shuter loves it.

"I don't know of any harder way of farming than organic no-till, but I like the challenge. I've seen 45 years of crops now, and it just makes it fun to farm," he says.

He also sees his regenerative and organic crop production practices as securing a future for his children and grandchildren. He farms with his sons,

Brian and Patrick, and predicts at least three of his grandchildren may want to continue the family business.

Together they crop 3,200 acres, which includes 255 certified organic acres with another 365 acres headed for transition; finish 8,000-9,000 hogs and maintain 80-100 head of beef cattle they fatten and sell direct to consumers.

## Wrestling Weeds

Shuter has seen a predictable increase in weed pressure during his 4 years of organic production. His first line of defense is cover crops, but there are no guarantees as he's discovered. Fall 2018 cover crop seeding went poorly due to cold, wet conditions and the covers failed to thrive. So come spring the weeds were at an advantage — weeds that now need to be addressed if yields are to be maintained.

There are options for organic growers, even no-till organic growers, but Shuter isn't a fan of most beyond cover crops for his soil-centric operation. In spring 2018 he used a flame system on some weeds. The resulting inferno of using this tool in a no-till organic system chock-full of cereal rye residue wasn't ideal.

"The flamer can make one heck of a big fire when it gets going in the residue," Shuter says. That's



**LIKE MINDS.** Mike Shuter (center) and his sons, Brian (left) and Patrick agree that working to perfect organic no-till production is likely the key to long-term profitability for their generations and those that follow. A team at home is a great start, but they also look far and wide for other organic innovators with which to brainstorm.



a problem because he wants to keep his residue to protect his soils and became concerned the heat of the resulting large fire could impact his soil organisms. He holds similar concerns for the electric shock weed-killing systems.

“They only kill weeds above the crop canopy, and I can just envision what that giant electric shock going through the soil would do to the soil life,” he says. “I don’t want to kill all my little friends that are working under the soil for me.”

Unhappy with current options, the Shuters decided to come up with their own plan — killing weeds with exceptionally hot water. The goal is to hit weeds with water that is 220-230 F, blistering the plants and causing them to dehydrate and die.

“The process won’t affect our soil biology in any way,” Shuter says.

A Miller Nitro self-propelled sprayer serves as their base, providing ready-made water supply and booms. They added a system to heat water under pressure to hotter than boiling. It’s then applied under hoods specially designed to protect the growing crop. They demonstrated the system in fall 2018 and are working to perfect it and get it in the field in 2019. They intend to use it to control small weeds without disturbing their residue mat.

“I don’t envision it totally taking the weeds out. We’ll probably need to use it 2-4 times per season to get us through until the crop canopies,” he says.

## Tips For Going Organic

- ✓ Be ready to change plans.
- ✓ Concentrate on building soil health and soil life.
- ✓ Develop SOPs and document, document, document.
- ✓ Keep organic fields together to help prevent pollination contamination.
- ✓ Dedicate time to identifying end-user markets.
- ✓ Find a group of supporters doing similar things.

## First Line of Defense

Cover crops will still be the primary weed control tool in part due to their multi-function purposes of building soil health, making nutrients in the soil plant-available and producing nitrogen (N). They’re also a critical part of the transition process for the Shuters.

To start the process, they need to quit

“regenerative” — as Shuter prefers to describe it — operations they use this to broadcast cereal rye into standing crops. But for organic, Shuter uses a higher rate and gets excellent seed-to-soil contact. To this end he instead uses his drill to seed the cover crop directly after harvest.

After his last conventional corn crop, he drills 120-150 pounds of cereal rye per acre. He then drills soybeans into standing green cereal rye, roller-crimping the cover crop with an I&J Mfg. roller-crimper within a day or two of planting.

“You want the cereal rye to be in anthesis, which means pollinating, for rolling to work. That means planting beans a little later,” he says. Historically they’ve drilled beans in

7½-inch rows, but intend to switch to planting in 30-inch rows in 2019.

“If we use 30-inch rows we can plant the soybeans a bit earlier and then wait a couple weeks for the rye to reach anthesis and roll it,” he says. “That’s not possible with the drill, because with the 7½-inch rows we’re essentially rolling down a significant amount of the rye

**“I don’t know of any harder way of farming than organic no-till, but I like the challenge. I’ve seen 45 years of crops now, and it just makes it fun to farm...”**

using any synthetic fertilizer or chemistry by September 1 and continue on for 36 months without those inputs before earning organic certification.

The Shuters built a cover crop seeder by rigging up their Miller Nitro self-propelled sprayer with drop tubes on its 120-foot boom. In both their no-till/strip-till conventional or



**ADAPT, OVERCOME.** The Shuters have a knack for engineering their way around a tough challenge. They’ve adapted their Miller Nitro sprayer to broadcast cover crops into standing crops (seen here) and reworked it into a water weeder to provide weed control in organic crops.



**WATER WEEDER.** The Shuters wanted a weed control option that would be safe for their soil life. Unlike fire or electricity weed control tools, or tillage, this custom-built machine kills weeds by scalding them with super-hot water.

with that seeding pass, and we don't want to do that until the timing is right."

Their transition plan is to raise two crops of soybeans with a cereal rye cover crop in between, so they simply repeat the same process the following year. They've worked with their organic certifier to start their process in the fall so they get a cereal rye cover, soybeans, cover, soybeans, cover and corn. The corn crop can then be harvested as certified organic.

A cover-crop mix is used ahead of organic corn as opposed to the straight cereal rye.

In fall 2018 they drilled oats, hairy vetch, crimson clover, Balansa clover and Austrian winter peas after soybean harvest. But, as noted, a cold, wet fall meant nothing much came up.

In normal conditions, the oats would likely winterkill and the Shuters would spread poultry litter or hog manure on the remaining cover in the spring. The cover would then be roller-crimped ahead of planting.

Shuter uses strip-till practices for his organic corn for added fertility and weed control. He's able to add a pelletized poultry litter product with his strip-till bar. His cover crop mix, when it works, will also provide a significant source of N.

## Avoiding Contamination

From planting to marketing, it's critical to protect organic crops from

various avenues of contamination that can destroy their value-added status.

The Shuters have grown seed beans for 30 years, so they already had a well-established process for identity preservation of their crop.

They have bins dedicated to organic soybeans and corn and make sure to clean bins, belt conveyors and harvest equipment to avoid cross-contamination with their conventional crops.

Cross pollination is a little more complicated. A buffer strip of some sort is required between organic and conventional crops, but that won't necessarily stop pollen, Shuter says.

To be extra careful, he maintains a good dialogue with his upwind neighbor about plans for their bordering fields that have the most potential for contaminating the organic crop.

For 2019, his neighbor's plan was to plant 111-day corn while Shuter intended to plant a 105-day crop. Trying to get in the field as early as possible to plant his 105-day corn even further reduces the risk of cross pollination.

He notes his years of no-till and strip-till mean even in wet years he is often able to get into the field faster than his conventional-tillage neighbors, in part due to soil structure and residue and in part due to not needing to do any soil preparation.

Of course, spring of 2019 pushed that to the limit for most farmers, causing Shuter and many others to move to their backup, backup plans.

Another trick Shuter uses is to position his no-till corn acres next to neighboring fields growing soybeans when possible.

Further protection is gained by concentrating his organic acres in a certain area to reduce the number of acres bumping up against conventional crops.

"We try to keep most of the acres we're transitioning to organic together in a block to reduce the risks," Shuter says. "It would be a nightmare to have them all scattered about."

## Embrace the Paperwork

Part of maintaining organic certification is documentation.

"You need to document everything you're doing," says Shuter, who mostly just writes everything down in a notebook.

This includes how the sprayer, planter, drill, strip-till unit, tender trucks and other equipment are cleaned, when and what input applications were made and pretty much every other farm activity related to organic production. Having standard operating procedures (SOPs) is helpful.

"Developing your own SOPs, along with following the established SOPs for certification, makes it easier to document.

"All the record keeping can be painful, but if you get it so you're just redoing a lot of the same things each year you don't have to reinvent the wheel to get everything recorded," he says.

A lot of practices will also need a certifier's approval.

"For our water weeder we had to communicate with the certifiers about the fact we would likely need to run muriatic acid through the heater every once in a while to remove scale. We had to get approval for that. Luckily, I'm a records nerd and I enjoy the process," he says.

## Reaping Rewards

Marketing an organic product is also an enjoyable task for Shuter, as the premiums are so rewarding. It does require a shift in thinking.

"Most people are selling their grain to an ethanol plant or a grain accumulator that's just amassing a commodity to sell. With organics, you have a more valuable crop that you've got to market more often than not to, essentially, an end user," he says.



**STICKING TO STRIP-TILL.** While Mike Shuter strives to maintain as close to a no-till system as possible on his organic acres, he still finds it necessary to strip-till fertilizer ahead of his organic corn. He uses this 24-row Misenhelder Welding toolbar with Orthman 1tRIPr row units and a Salford fertilizer air cart. He uses a pelletized poultry litter in addition to the nutrients supplied by his cover crops.

He's fortunate to have a good organic corn market just 30 miles down the road. He's also looking at the possibility of growing food-grade organic corn to tap into the organic division of nearby Grain Millers, a specialty grain processing facility.

Marketing strategy starts during the transition to organic methods. Part of the reason Shuter opted to grow 2 years of soybeans during the transition period is that the non-GMO corn market in the area is saturated.

He knew he could get better premiums on non-GMO soybeans.

"I found a food-grade exporter looking at giving \$2.25 per bushel over Chicago Board of Trade price for non-GMO soybeans," he says. That's great for profits, but Shuter expects closer to \$19 per bushel for organic soybeans and \$10.50 per bushel for organic corn.

"Our yields may take a hit, especially when we struggle with cover crops, but with not having the expense of synthetic fertilizer and getting a premium, we still sort out better than conventional," he says.

His conventional corn averages 180 bushels per acre, hitting 212 bushels in the exceptional conditions of 2018. His organic corn, on the other hand, yielded just 70 bushels due to weed pressure and still trying to figure out fertility needs, mainly how to provide N.

"We didn't lose money and I'm confident we can double that yield pretty easily as we get things figured out," he says.

### Unusually Prepared

Shuter credits his exceptional soil health earned through 35 years of no-till and 8 years of using cover crops for setting him up for no-till organic success.

"I would hate to transition from conventional farming to no-till organics because the soil isn't in the right place to support the system," he says.

"Continuing to use no-till as we made the shift to organic production was the only option for us because we

biology, and the fact that those organisms can free up nutrients locked in the soils that the tests aren't showing, we realize we're not going to need all those inputs."

He feels using hog and poultry manure, along with growing nutrients with cover crops to grow value-added crops, is the better route. It will take experimentation and weathering some failures, but he's prepared himself for the challenges.

"My advice to others who might try organic no-till is to be prepared to change your plans. The more agile you are, the better your chance of getting a positive result. You have to work with whatever cards you're dealt," he says.

Sometimes it's tough to take, such as when he had to take a Hiniker row cultivator to the weeds in his no-till organic corn crop.

He only disturbed about 2 inches of soil, but it was a difficult decision. It just pushes him to come up with better backup plans for the future, such as his water weeder.

Also helpful to Shuter is networking with others.

"Find a group of supporters that are doing similar things and pick their brains. Those people don't have to be in a 30-mile radius of you, either. Go to conferences, share ideas and find a mentor," he says.

Even with help, organic no-till is fairly new territory for nearly everyone, presenting Shuter with a formidable challenge — but one he enjoys taking on.

**"Be prepared to change your plans. The more agile you are, the better your chance of getting a positive result. You have to work with whatever cards you're dealt ..."**

didn't want to destroy the soil and soil biology we had built."

He sees organic no-tilling, and relying on his soils to provide nutrients, as a more efficient way of raising a crop than applying large volumes of expensive inputs.

"We've spent decades applying fertilizer based on soil tests that show what nutrients are available with an acid extraction, but that's not showing what a crop can get to," he says.

"As we come to understand soil

# Green Fallow, Less Tilling Builds Organic System



**Will Glazik and family are using cover crops, longer rotations and minimal tillage to raise organic crops while also improving soil health.**

*By Martha Mintz, Contributing Editor*

'Get bigger' or 'get different' were the clear paths stretching to the horizon for Paxton, Ill., organic no-tiller Will Glazik's father, Jeff, back in the early 2000s.

"Coming out of the late '90s, the farm economy wasn't doing so hot," Will Glazik says. His parents were working off-farm jobs in addition to farming 400 acres. Things were headed down a bleak path. "They had to make the decision to either get bigger or get different."

Getting bigger meant trying to compete with neighbors for land and edge out other area farmers. They always wanted more farming neighbors, so for that and many other reasons they opted for finding a different market. They started transitioning to organic farming in 2002 and were certified by 2004.

The next big change came when they shifted their views on soil health. Will and his brother, Dallas, earned degrees in agronomy from the University of Illinois.

He was exposed to a variety of farming practices while working for a crop production company.

At a cover crop expo, he met fellow farmer Jacki Davis. She wanted to have the healthiest soil she could while raising organic crops.

Eventually, through helping her achieve her goals, Will came around to her way of thinking, too. Now the Glaziks are using cover crops, longer rotations and minimal tillage to raise organic crops while also building soil health.

## Raising Rye, Revenue

Will, Dallas and Jeff work the farm — now 1,000 acres — together raising soybeans, wheat, oats, cereal rye and several varieties of corn. They're also experimenting with peas, barley, buckwheat and spelt.

Some of these crops are earmarked specifically for the distillery they started, Silver Tree Beer and Spirits. They've been making vodka for 3 years and look to add more products to utilize a wider variety of their organic crops.

"Creating our own value-added markets and finding others has allowed us to be more experimental in our search for no-till organic rotations and conservation practices that otherwise may not be economical," Will says.

Cereal rye, established ahead of no-tilled soybeans, has been among the family's first keys to minimizing tillage.

"In my area I need to get cereal rye planted by Sept. 1 or I won't have a strong enough stand to get a good mat and full

weed control in my soybeans," Will says. A good strong stand also crimps better for more thorough control.

To ensure a thick and thriving stand, Will seeds a heavy rate of 150-200 pounds per acre. Since his drill maxes out at 100 pounds per acre, he makes two passes to seed.

"I halve the rate and plant the field at opposite angles, essentially making an 'X,'" he explains. They then plant



**LESS IS MORE.** Will Glazik has removed all coulters and row cleaners from his planter, allowing his double-disc openers to plant soybeans with minimal disruption to his protective mat of cereal rye.



soybeans and run the roller-crimper later. They run the planter and crimper straight across the field, intersecting the “X” so neither implement is running straight down the cereal rye rows. This is critical for weed control, he says.

“If I planted soybeans in the same direction as the rye and then rolled it, the rye would lay down right in the row and leave 7½ inches of bare soil. Instead, I plant perpendicular or at a slight angle so when the rye lays down it makes a full coverage mulch,” Will says.

The family has experimented with rolling-crimping timing, initially crimping first and then planting soybeans. They’ve now settled on planting first and then crimping.

“I start planting soybeans early, the first part of May on good years, and then crimp after the soybeans come up in late May or early June,” Will says.

The soybeans will have 1-2 true leaves. The roller crimper can run over them without killing them at this stage, allowing for better control of the cereal rye with the roller-crimper.

“You must wait until the cereal rye is at full anthesis for good control. It should be past pollination and setting seed, but the seed shouldn’t yet be viable,” Will says, but laughs that if the seed becomes viable it just means he’ll have an even better cover crop come fall.

Glazik uses an I&J Mfg. roller-crimper. He says the brand of the tool is not important, but it has to be heavy. They shoot for 150-200 pounds per foot of width. The weight is needed to tackle the quantity of rye it will face.

“The rye should be 5-6 feet tall and so thick you can’t see the ground. That will be anywhere from 6,000 to 10,000 pounds of biomass,” Will says.

Some of the rye is knocked down when soybeans are planted into the still-growing crop but stands back up.

Soybeans are planted in 30-inch rows with an 8-row White 6100 planter. Will removed all row cleaners and no-till coulters, simply maintaining sharp double-disc openers with rubber closing wheels. “The rye will be about 3 feet tall at planting and I don’t have any issues,” he says.

Even with a strong stand and cor-

### Tips For Going Organic

- ✓ Have plenty of on-farm storage to hit critical markets.
- ✓ Make the mental transition. Don't push yields for profit: push profit through marketing and management.
- ✓ Do everything you can for your soil and your soil will provide for you.
- ✓ Utilize green fallow.
- ✓ Build a network of like-minded people.

rectly timed roller-crimping, he notes he only gets about 85% control on the cereal rye cover crop.

There is always some that survives and sets seed that germinates in the fall, and that can cause problems in the rotation.

“We used to plant wheat after soybeans, but the cereal rye becomes a weed in the wheat field. We were still able to market it, but we took some discounts on it,” he says.

The 30-inch rows do give Will the option of using a 1500 Kinze high-residue cultivator to knock down weeds.

He can set the V-shaped plow shares to ride ¾-1 inch under the soil to just cut

low. About 25% of our acres are in green fallow every year,” Glazik says, noting very few organic farmers utilize this concept. “Green fallow allows us to keep cost of production low, low enough to make a profit even at conventional market prices.”

Of course, they market their crops at a premium, allowing them to be even more profitable while still utilizing a green fallow.

“Green fallow is a way for us to take care of our soils so they can take care of us and reduce our production costs even further throughout the rotation,” he says.

For the green fallow, they use mostly species that will winter kill with the exception of the red clover and alfalfa they use as the base of their mix.

After soybean harvest, volunteer cereal rye blankets the ground. As soon as possible in the spring, they drill field peas and flax along with one-cut red clover (or alfalfa on acres they intend to graze).

The mix is mowed in summer to make way for seeding the summer cover crop mix, which usually includes buckwheat, cowpeas and small amounts of sorghum-sudangrass.

They use other cover species as needed to address specific concerns. Fenced fields are grazed with their herd of grass-fed beef.

The surviving cover crop species are terminated using a field-scale rotavator tillage tool 2 days prior to planting corn.

Will sets the tool to run very shallow, about 3 inches, allowing him to get a complete kill on the cover crop and weeds without disturbing the whole soil profile.

Eventually he’d like to no-till corn, but his experiments have yet to pan out. He’s done some small test plots with no-till organic corn. “I’ve raised a crop, but it’s not been a successful crop,” he says, noting it ran 50-75 bushels an acre with low test weights.

**“The Glaziks run the planter and crimper straight across the field intersecting the ‘X’ so neither implement is running straight down the cereal rye rows...”**

the growing point of the weed without disturbing the soil or residue mat much.

“Normally the beans are near canopy by the time cultivating is necessary, so shifting the residue a bit isn’t that big of a deal.

“The trick, though, is to cultivate in the same direction you laid down the rye. Think of it like combing your hair — you don’t want to go against the grain,” he says.

### Green Fallow

To further reduce issues of cereal rye being a weed in the following crop, Will has also gone to planting a green fallow cover crop after soybeans.

“I’m a firm believer in green fal-



**JUST A SHAVE.** A 1500 Kinze high-residue cultivator rides  $\frac{3}{4}$ -1 inch under residue to knock down weeds and any volunteer rye with minimal soil disturbance. It slides right under the residue, cutting the plants off at their growing point.

But he's learned a lot. The first year he tried he was using orchardgrass in his green fallow mix.

"It was a strong competitor to the corn and sucked up extra moisture and

nutrients," he notes. "I also took a cutting of hay off before planting, which took away all my fertility."

Where he didn't have orchardgrass, the yields looked better. He also recently discovered a Canadian red clover with potential. It flowers in late May to early June and is terminated by mowing.

"Where I tried that clover without the alfalfa the corn did really well, although I didn't measure the yield," Will says.

Adding small grains is helping increase the acres he can no-till and expand the rotation. The current plan is to no-till oats into corn stalks, then seed Berseem clover with oats. A cereal rye cover crop will be seeded into the clover after oat harvest and they hope the clover will winterkill.

Next up, they'll no-till soybeans into the cereal rye, a year of no-till green fallow, then just one rotavator pass prior to planting corn.

"I will plant Berseem clover and cowpeas with the corn. The cowpeas are mixed in the planter box along with the corn and I use the insecticide boxes to sprinkle about 5 pounds per acre of Berseem clover over top of the corn row. I'll then cultivate it with the low-disturbance cultivator when corn is 4-5 leaves tall and broadcast a cover

mix of cowpeas, turnips and buckwheat," Will says.

He says the biggest issue with the rotation is ensuring he has time to plant when he needs to. The green-fallow cover helps with that, plus it provides needed nutrients.

"We don't use much off-farm fertility. We're trying to grow most of it," he says. They do bring in 1 ton of turned chicken-layer manure per acre,

**"With on-farm storage you have more control on when and how you market your crop..."**

per year and use lime and gypsum where needed as indicated by soil tests. The manure is broadcast onto the green fallow with corn being the next crop up.

"The goal is to grow the best cover crop possible and then leave it there on the ground to break down and feed the soil," Will says, noting some forage on some fields is removed by grazing or haying.



**SPEEDING RECOVERY.** Though he still needs some tillage ahead of corn, Will Glazik helps the soil recover and build a protective cover by interseeding crimson or Berseem clover and other cover species that will continue growing to protect the soil after harvest.



**“The green fallow is a way for us to take care of our soils so they can take care of us and reduce our production costs even further throughout the rotation...”**  
*– Will Glazik*

### Maintaining Separation

Another major undertaking in the organic world is having to keep exceptional records to maintain certification. “Marketing is probably the easiest part of being organic,” Will says. “You’ve raised a crop a lot of people want and are willing to pay a premium for. We work with a number of brokers.”

The Glaziks do raise food-grade corn, which ups the ante on protecting their crops from contamination. “For food grade they’re very strict on how much GMO they will allow in the corn,” Will says.

Their main strategy is working with their neighbors, talking with them in the winter months to find out what hybrids they’re planting. Then the Glaziks select hybrids that won’t start tasseling and pollinating until the neighbors’ crops are finished. That may also mean pushing planting back by a couple weeks.

They raise hybrid yellow corn plus two varieties of open-pollinated corn with GA1 recessive gene codes for smaller pollen tubes.

This deters other dent-corn pollen and further minimizes the risk of contamination. They raise Rebellion and a red corn, Bloody Butcher, for use in their distillery.

For crops headed off farm, Will is a big believer in using on-farm storage as a marketing tool.

“Some brokers will take the crop right out of the field, but you may pay in lost premium,” he says. “With on-farm storage you have more control on when and how you market your crop.”

Will has pushed the pencil and knows he may be raising less crop than others, but that the profits are better — which allows him to take some yield hits when experimenting with no-till production practices in an organic system. He also thinks it’s smarter.

“I know organic farmers raising 220-bushel corn, 60-bushel soybeans and 100-bushel wheat. No-till can be a bit of a yield drag in organic systems, but it doesn’t matter,” he says. “I’m raising a crop with a lot fewer input costs, less labor and less machinery using no-till.”

It may be a challenge, but Will is excited about the direction his soils are headed as he reduces tillage and focuses on soil health.

“When I worked as a conventional agriculture crop consultant I saw a lot of no-tillers be very successful at changing their soils,” he says.

“They took in and held more water and the biology of their soils was amazing compared to their neighbors. I’m now seeing similar results because I have a great diversity of insects, earthworms and so much more I can’t

see — but know is there in my fields — working to build my soils.”

And he’s making those strides with the help of others.

He’s the co-founder of the IDEA Farm Network, a learning community of more than 430 innovative farmers constantly pushing the limits toward better methods for growing row crops.

They host a very active Google group and hold formal meetings and informal “tailgate sessions.”

Through these platforms, people can learn from their peers and ask even basic questions without embarrassment.

“It can be discouraging as someone who is trying new things. All the neighbors think it’s weird and you’re the talk of the coffee shop.

“The IDEA Farm Network gives them the chance to get together and feel like they’re a part of something.” 



**LESSON LEARNED.** An attempt to no-till corn into a living cover crop failed due to the mix he used, including orchardgrass, which proved difficult to control and was a hefty competitor for water and nutrients.



# Cover Crop, Fertilizer Tips for No-Till Organic Corn

**Applying more fertility to fields with high N carryover from manure, legume use may not be needed beyond cover crop mineralization.**

*By Steven Mirsky, USDA-ARS  
Research Ecologist*

**C**onsistent weed control and nitrogen (N) availability are important factors in determining yield in organic no-till corn production. Utilizing cover crop mulches for weed control can reduce organic producers' dependency on cultivation, thereby reducing weed control failure due to unfavorable weather.

Planting a cover crop mixture of cereal and legumes can provide the dual benefits of weed suppression and fertility provision.

Depending on nitrogen carryover from previous management, additional fertilizer may be required beyond that provided through cover crop mineralization to maximize corn yield.

This article discusses cover crop management and starter fertilizer considerations for producers interested in organic no-till corn production.

Cover crops can be terminated with a roller-crimper, creating a weed suppressive mulch. A cover crop can suppress weeds by reducing light availability to

weeds and by releasing allelochemicals (which inhibit the growth of other plants) during cover crop residue decomposition.

High cover crop biomass production is the key to achieving season-long weed suppression from a cover crop mulch.

Cereal cover crops can achieve high biomass production but have limited value for early-season N release, while legume cover crops can provide substantial N release but often do not provide season-long weed control.

## Managing Cover Crops

Using a cereal and legume cover crop mixture can simultaneously provide N and suppress weeds. Early fall cover crop establishment using a grain drill can aid in achieving high biomass.

Two years of research at the Sustainable Agricultural Systems Lab (Beltsville, Md.), North Carolina State University (Kinston and Salisbury, N.C.), and The Rodale Institute (Kutztown, Pa.) resulted in high cover crop biomass production from a mixture of cereal rye (90 pounds per acre)

and hairy vetch (12 pounds per acre) seeded early using a small grain drill (**Table 1**).

Cover crop seeding would cost approximately \$60 per acre. The N content of the cover crop ranged from 85 to 173 pounds per acre across the sites (**Table 2**).

Cereal rye dominated cover crop biomass in the mixture at all sites (**Table 2**). Hairy vetch contributed more to overall cover crop biomass in the Kinston environments, which had low N carryover from previous management (**Table 2**).

Cover crop termination was targeted for soft-dough stage for the cereal rye and 100% flowering for the hairy vetch.

At several sites we experienced good success planting corn into a cover crop that was terminated 1-3 weeks before planting.

This may be attributed to cleaner slicing through the cover crop mulch by the planter due to drydown of the cover crop between termination and corn planting.

Soil moisture can also be replenished when planting is delayed

**Table 1. Cover crop management and corn planting for each site**

Site	Cover Crop Planting	Roller-Crimping 1	Roller-Crimping 2	Corn Planting
Beltsville 2013	9/15/12	5/31/13	6/21/13	6/21/13
Beltsville 2014	9/27/13	6/5/14	6/19/14	6/19/14
Kinston 2013	10/11/12	5/8/13	5/16/13	5/8/13
Kinston 2014	9/27/13	5/12/14	5/20/14	5/29/14
Kutztown 2014	9/13/13	6/6/14	None	6/6/14
Salisbury 2013	9/27/12	5/15/13	5/28/13	5/29/13
Salisbury 2014	9/18/13	5/14/14	5/22/14	5/22/14

*Source: USDA*

**Table 2. Cover crop biomass and N content**

Site	Cereal Rye Biomass (lb/acre)	Hairy Vetch Biomass (lb/acre)	Total Cover Crop Biomass (lb/acre)	Cover Crop N Content (lb/acre)
Beltsville 2013	12,673	1,108	13,781	158
Beltsville 2014	4,807	1,871	6,678	85
Kinston 2013	–	–	5,649*	108
Kinston 2014	5,354	3,244	8,598	164
Kutztown 2014	10,428	1,926	12,354	173
Salisbury 2013	–	–	8,720*	132
Salisbury 2014	6,983	2,062	9,045	150

\* **Note: Cover crop biomass was not separated by species at the Kinston 2013 and Salisbury 2013 sites.**

Source: USDA

following cover crop termination. Recommendations differ about when to terminate cover crops via roller-crimping, and successes have occurred with terminating the cover crop both before planting and at planting.

Extensive cover crop regrowth between the first and second cover crop roller-crimping events was not observed in most sites. At the Kinston 2013 site we did observe some cover crop regrowth and a second roller-crimping event occurred at corn spiking.

Excellent weed suppression was observed in 6 of the 7 sites. Weed suppression was compromised at the Kinston 2013 site where only 5,649 pounds of cover crop biomass per acre was achieved (Table 2).

The Kinston 2013 site had low N carryover from previous management, and this restricted cereal rye growth. The result was less cover crop biomass, which compromised the ability of the cover crop mulch to suppress weeds.

## Achieving Respectable Stands

Planting into heavy cover crop biomass can be a challenge for some organic producers.

The lead researchers in this project have been continuously modifying no-till planters to create a planter design that will plant reliably and efficiently into heavy cover crop biomass.

Current planter modifications include both heavy-residue slicers and Yetter residue managers mounted to an added front toolbar. When planting con-

ditions do not allow for a clean slice in the cover crop residue, the residue must be moved from the crop row with the Yetter residue managers to ensure good seed-to-soil contact.

When planting conditions permit, the Yetter residue managers can be raised, allowing for minimal movement of the cover crop residue from the crop row. This minimizes in-row weed pressure.

If possible, producers should have a flexible planter design that can provide options for cover crop residue movement depending on planting conditions.

Perfect stands were not achieved across these sites; however, stands were better than achieved with previous research in this system.

## Using Starter Fertilizer

To maximize corn yield, additional fertilizer may be required beyond that provided through cover crop mineralization. Surface-broadcasting or “topdressing” poultry litter is a popular fertility management strategy for organic corn producers in the Southeast because it is convenient and relatively inexpensive.

If topdress poultry litter applications continue to become more regulated due to environmental concerns, producers may be limited to using other organic fertilizer sources and application techniques.

Many organic producers still have dry-fertilizer hoppers on their planters that can be utilized to provide starter fertilizer. Loose litter doesn’t flow well from the dry fertilizer hoppers but pelleted material works well. Organic producers can choose from several pelleted

organic fertilizer materials that vary in N content and price.

This research study evaluated: topdressing different rates of poultry litter, subsurface banding organically certified pelleted materials, and applying no additional fertility beyond that provided through cover crop mineralization (Table 3).

All starter fertility treatments were evaluated across the same cover-crop mix of cereal rye (90 pounds per acre) and hairy vetch (12 pounds per acre).

The subsurface starter fertilizer treatments were applied via a John Deere 7200 planter equipped with dry fertilizer hoppers that delivered a subsurface band of fertilizer. Pelleted fertilizers were used for the subsurface-banded treatments.

Setting the dry fertilizer hoppers for maximum fertilizer delivery allowed pelleted fertilizer to be delivered at 575-625 pounds per acre. Keep in mind when using pelleted fertilizer materials that hopper openings can still plug up if the hoppers have tapered output tubes.

At the Beltsville, Md. 2013, Beltsville 2014, Kinston 2014, Salisbury 2013 and Salisbury 2014 sites, corn yield was greatest with the high-rate topdress poultry litter treatment, and was reduced with the low-rate topdress poultry litter treatment and the subsurface feather meal treatment. Corn yield was lowest and similar between the subsurface poultry litter and no added fertility treatments at these sites.

Feather meal is an expensive fertilizer source but did provide yield increases at

**Table 3. Starter fertility treatments**

Fertility Treatment	Rate	N Applied (lb/acre)	Cost (\$/acre)
Topdress Poultry Litter	4 T/A	240	120
Topdress Poultry Litter	2 T/A	120	60
Subsurface Feather Meal*	575–625 lb/acre	75–82	280–305
Subsurface Pelleted Poultry Litter**	575–625 lb/acre	17–19	57–63
No Added Fertility	–	–	–

\* Feather meal source was NatureSafe Blending Base (13-0-0).

\*\* Pelleted poultry litter (3-2-3) was obtained from Perdue AgriRecycle.

Notes: The same cover crop mixture was planted across all fertility treatments. The 2 T/A topdress poultry litter treatment was not tested at the Kinston 2013 site.

Source: USDA

these five sites compared with no fertility.

For producers on a site with moderate N carryover from previous management and limitations on topdress poultry litter use, subsurface banding feather meal is a viable option for increasing corn grain yield. But the economics of using feather meal may be limiting.

The Kinston 2013 site had low N carryover from previous management, which was reflected in the lower cover crop biomass achieved at this environment (Table 2).

Corn yield was greatest with the topdress poultry litter treatment, and corn yield was not affected by the presence or absence of weeds within this treatment. This is likely attributed to high N provision enhancing the corn's competitiveness with weeds.

### Summing it Up

In the subsurface and no added fertility treatments at this site, the corn crop was not competitive with weeds, and heavy weed pressure in these treatments adversely affected corn yield.

At this site, corn yield did increase with the subsurface poultry litter treatment, which only provided 17-19 pounds of N per acre. N typically releases more rapidly from poultry litter than from feather meal.

The corn yield increase observed with the pelleted poultry litter treatment compared to the no-added-fertility treatment can likely be attributed to enhanced corn competitiveness early in the season from rapid nutrient release from the poultry litter. If a producer is on a site with low N carryover, it's

critical to provide adequate N through starter fertilizer applications to ensure crop competitiveness with weeds and high corn grain yield.

At the Kutztown 2014 site, corn grain yield was similar among all starter fertility treatments.

This study site has a long history of legume and manure use and therefore high N carryover from previous management.

Results from this site indicate that it may not be necessary to apply additional fertility to sites with high N carryover from a long history of manure and legume use, beyond that provided through cover crop mineralization, to maximize corn yield. Additional research on sites with high N carryover is necessary to confirm results observed at this study site.



**PILE IT ON.** Rolled-and-crimped cover crops in organic no-till systems provide a mulch layer for the cash crop, both preventing weed growth and breaking down gradually during the growing season to provide a long-term slow release of nutrients. No-tillers should aim for their cover crop to produce at least 2½ tons of dry matter per acre to effectively suppress weeds.



# New Soil Amendments, Fertilizers Cater to Organic No-Till Systems

**These all-natural nutrients, inoculants and other products help support profitable no-till practices that also meet tough organic standards.**

*By No-Till Farmer Editors*

**A**s the market for organically produced food has increased in the U.S. and worldwide, so have efforts by manufacturers to offer naturally derived fertilizers, soil amendments, crop protectants and other products.

The following is a brief roundup of some of the leading products on the market that are compatible with organic production methods.

Most of the products below are listed with the Organic Materials Review Institute (OMRI), an international nonprofit organization that determines which input products are allowed for use in organic production and processing.

OMRI-listed products are allowed for use in certified organic operations under the USDA National Organic Program. Find out more about the OMRI program and listed products at [www.omri.org](http://www.omri.org).

## The Andersons

➤ **NutraSoft OP** is an  OMRI-listed pelletized gypsum with 21% calcium and 16% sulfur. The OP designation means this dispersing granule (DG) product is OMRI-listed, unlike The Andersons NutraSoft DG, which is sold into conventional markets.

The OP granules are held together with a water-soluble binder, allowing the product to disperse back into powder when it comes in contact with water (rain, irrigation, dew) after it's applied. These uniform pelletized gypsum granules are user-friendly and can be applied easily in a variety of ways, from broadcast to precision placement.

NutraSoft OP will loosen hard-packed and heavy clay soils, allowing for better root growth and water penetration and retention, the company says. It's also an effective conditioner for soils that are high in sodium, as it will remove harmful salts that prevent seed germination and are damaging to plant growth.

Many organic farmers apply NutraSoft OP over the row during planting, sometimes using old insecticide boxes. With this application, the company says, growers have witnessed a slight decrease in the weed germination timing window due to the calcium and sulfur dispersing in the row.

➤ **NutraLime OP**  pelletized limestone provides quick soil acidity adjustment and elemental calcium and magnesium for producing top yields in production agriculture.

The OP designation means this dispersing granule (DG) product is OMRI-listed, unlike The Andersons NutraLime DG, which is sold into conventional markets. The OP granules are held together with a water-soluble binder, allowing the product to disperse back into powder when it comes in contact with water (rain, irrigation, dew) after it's applied.

This allows the product to begin to modify the soil pH levels within 2 weeks. NutraLime OP is available in 2 versions, a pelletized high-calcium lime (30% calcium and 4% magnesium) and a pelletized dolomitic lime (20-21% calcium and 9-12% magnesium).

➤ **Humic DG** granules  from The Andersons contain 70% humic acid, 10% humic acid precursor, fulvic acid and humin.

The OMRI-listed product is formulated with dispersing granule (DG) technology to create spherical, ultra-dry particles that rapidly disperse into thousands of microparticles upon contact with moisture. Humic DG granules' increased surface area, when compared to screened humate, has been measured to be four times more efficient.

The Andersons has tested Humic DG in organic corn production for the past 2 years and found consistently positive results, according to information distributed by the company. In 2017 and 2018 in Wisconsin, Humic DG was applied at a rate of 10 pounds an acre in furrow, with manure broadcast pre-plant. Both years yielded a similar result, with a yield advantage of 10.2 and 10.8 bushels per acre, respectively, compared to the treatment where only manure was applied.

➤ **Black Gypsum**  DG granules provide a homogeneous blend of gypsum and humic acid, containing 17% calcium, 13% sulfur, and 10% humic acid. The OMRI-listed product features dispersing granule (DG) technology, a spherical, ultra-dry granule that rapidly disperses into thousands of microparticles upon contact with moisture.

These microparticles deliver calcium, sulfur and carbon directly into the soil. The DG technology allows for reduced application rates as compared to other agricultural-grade gypsum products — which makes this an economical soil amendment, the company says.

Black Gypsum DG lets growers apply both gypsum and humic acid in one pass.

The Andersons tested Black Gypsum DG in organic corn production in Wisconsin. In 2017 and 2018, Black Gypsum DG was applied at a rate of 150 pounds an acre, broadcast pre-plant with manure. The portion of the trial treated with Black Gypsum DG yielded 15.4 and 7.4 bushels per acre, respectively, greater than manure alone.

➔ **Fulvic LQ** is an OMRI-listed, high purity 4% fulvic acid. This formulation contains a high concentration of the measurable fulvic fraction of humic substances, helping plants to better realize their full genetic potential, the company says.



Fulvic LQ's properties increase bioavailability of the nutrients it accompanies in the tank and drastically increase absorption into the plant, says the company.

In both conventional and organic trials performed by The Andersons, adding Fulvic LQ has consistently increased yield because it feeds soil microbes that help growers mine more mineral nutrition from their soils.

➔ **SmartPhos DG Natural** is a pelletized soft rock phosphorus



(P) and spreads exceptionally well compared to other forms of soft-rock P, the company says. The OMRI-listed product is made with the same dispersing granule (DG) technology that is formulated into The Andersons' lime, gypsum and humates.

The actual available P in the first year will be closer to 8% with soft-rock P being a slow-release source. It has immediate in-season availability as it dissolves and delivers P directly into the soil upon contact with water.

While an organic farmer relies heavily on manure for nitrogen (N) and P credits, the option to spread SmartPhos DG Natural in a user-friendly granule can target low P soils with a slow-release form of P.

## Sure Crop

➔ **Activate** is a bio-stimulant containing a concentrated fulvic acid



electrolyte liquid. It assists in breaking down and solubilizing elements for quicker adsorption by plant cells. This allows for better efficiency of nutrients that are either stored in the soil profile or applied as fertilizer, the company says.

OMRI-listed Activate also promotes photosynthesis and metabolic activities by the plant and can increase a crop's ability to withstand drought or other stressful growing conditions.

Activate can be applied at planting, as a sidedress or foliar or through irrigation systems. It may be applied with most fertilizer solutions or in combination with water.

## Oro Agri

➔ **Oroboost** is an adjuvant for use in organic agriculture. It is compatible with and will improve the performance of foliar-applied organic insecticides, fungicides, herbicides and nutrients, the company says.



Proprietary Orowet technology used to formulate Oroboost provides flexibility in how it functions as an adjuvant. At lower rates, it is a superior spreader that gives contact pesticides excellent coverage on the leaf surface. When Oroboost is used at higher rates it penetrates the leaf surface, allowing its patented TransPhloem technology to move systemic pesticides and nutrients throughout the plant for rapid translocation.

The critical first step in foliar-applied, organic pest control is getting good coverage of the leaf surface with pesticide sprays. Oroboost provides excellent wetting and coverage of the leaf surface. It also delivers a greater number of droplets and a more uniform droplet size that contributes to its excellent spray coverage compared to other adjuvant types, the company says.

➔ **Oro-RZ** adjuvant can be added to the spray tank with all soil-applied fungicides, insecticides, herbicides and nutrients. It improves the penetration and uniform distribution of spray applications in the soil profile to deliver better pest control and plant nutrition, the company says.



Most crops have an in-soil portion that is the target of disease or insect attacks. A fungicide or insecticide application needs to surround these plant parts to protect them against infestation. With its ability to distribute a spray application thoroughly throughout the soil profile, Oro-RZ envelops these portions of the plants with the pesticide solution to protect them against attack.

The key to optimal pre-emergent weed control is to create an uninterrupted blanket of herbicide, horizontally and vertically, within the soil profile where weed seeds germinate. Oro-RZ's penetrating and spreading ability distributes a pre-emergent herbicide application uniformly within the soil to prevent gaps in protection.

## Groundwork BioAg

➔ **Rootella** mycorrhizal inoculants are produced by



Groundwork BioAg for commercial agriculture. Based on beneficial fungi, mycorrhizal inoculants increase crop yields, especially under stress conditions, the company says. Growers can also reduce fertilizer application rates, notably P.

Rootella products are pure mycorrhizal inoculants based on over 30 years of research, 100% natural and highly effective. All Rootella products — with the exception of Rootella T and Rootella X — are suitable for use in organic farming according to USDA National Organic Program (OMRI and CDFA-OIM) and European regulations (EC 834/2007).

Mycorrhizal inoculation by application of Rootella products restores the mycorrhizal balance and significantly improves plant nutrient uptake.





# Resources for Marrying No-Till Organic Methods

**There are many government- and privately-funded incentives and informational resources to help no-tillers going the organic route.**

By *No-Till Farmer Editors*

**M**any farmers will remember the challenging journey they faced when converting their farm to no-till practices years or even decades ago. Switching a productive farm operation from conventional to organic practices also has inherent management challenges and risks, but possibly big rewards as well.

No-tillers who need help starting, improving or expanding an organic farm can find a variety of sources for funding and technical support from both government and private sources.

## THE RODALE INSTITUTE

✓ The Institute offers an **Organic Transition Course** that outlines the theory and practice of organic agriculture. It includes lessons on soil health and management; compost; plant health; best practices for fighting weeds, pests, and disease organically; livestock management; business plans and marketing; certification and more.

✓ Additionally, The Rodale Institute is now offering **consulting services** aimed at helping conventional farmers transition to an organic system.

Utilizing a team of researchers, farmers, educators and other experts, the consulting service provides farmers with the information to start growing organic crops for market, while simultaneously improving soil health, increasing the farm's resilience and supporting long-term financial stability.

✓ The Institute will open the **Midwest Organic Center at Etzel Sugar Grove Farm** (part of the Indian Creek Nature Center) in Marion, Iowa in 2019. The center will provide resources and support for Iowa's organic farmers and enhance

the growth of more organic farms throughout the Midwest region.

## USDA

✓ The **USDA** provides organic certification cost share opportunities for organic producers and handlers.

Organic producers and handlers can visit over 2,100 USDA Farm Service Agency (FSA) offices to apply for federal reimbursement to assist with the cost of receiving and maintaining organic certification. Program options include:

\*\* **National Organic Certification Cost Share Program (NOCCSP):** The NOCCSP is available to producers and handlers (e.g., all four scopes of certification) in all 50 States, the District of Columbia, the American Samoa, the Commonwealth of the Northern Mariana Islands, the Commonwealth of Puerto Rico, Guam, and the United States Virgin Islands.

\*\* **Agricultural Management Assistance (AMA) Organic Certification Cost Share Program:** The AMA is available to certified organic producers (only crop and livestock operators) in 16 states designated by Congress: Connecticut, Delaware, Hawaii, Maine, Maryland, Massachusetts, Nevada, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Utah, Vermont, West Virginia and Wyoming.

✓ In 2011, the USDA held a **major conference** in Washington D.C. to examine findings from research on the agronomic, economic, ecological, and quality-of-life performance of organic farming systems. Conference proceedings are published in the online interdisciplinary journal *Crop Management*. Most sessions were recorded live and are available on the Oregon State extension website, <https://eOrganic.info>.

## SARE

The **Sustainable Agriculture Research and Education Program (SARE)** provides a variety of competitive grants for research, education, and outreach activities that support sustainable agricultural systems. The program encourages site-specific experimentation, and many grants have focused on organic production or marketing.

## PRIVATE SOURCES

✓ The **Pipeline Foods Farm Profit Program** provides consulting services for farmers transitioning to organic production. <https://www.pipelinefoods.com/about-the-fpp/>

✓ **Whole Foods Local Producer Loan Program** provides low-interest loans for independent local farmers and food artisans. <https://www.wholefoodsmarket.com/mission-values/commitment-society/loan-program-details>

✓ The **Lakewinds Organic Field Fund** provides financial assistance for current and transitioning Minnesota farmers. 🌱

## Know the Rules, Regulations

The **National Organic Program (NOP)**, established by Congress in 2001, is a federal regulatory program that develops and enforces uniform national standards for organically-produced agricultural products sold in the United States.

Operating as a public-private partnership, NOP accredits private companies and helps train their inspectors to certify that farms and businesses meet the national organic standards.

USDA and accredited certifiers also work together to enforce the standards, ensuring a level playing field for producers and protecting consumer confidence in the integrity of the USDA Organic Seal.



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