Roller-Crimping: How, When & Why | Grazing Covers **for Economic Gain**

Volume 1, No. 1 www.CoverCropStrategies.com

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Giving You the Cover Crop Answers You Need

If you've no-tilled or strip-tilled for a long time, you may remember the early days of adoption — making a lot of decisions on your own and dealing with a lot of trial-and-error. There wasn't a lot of tailor-made research to help, or equipment that worked without the right adaptations.

Fast forward to 2020, and cover crops are now the fledgling practice with so much promise for farmers. But compared to the 1970s when no-till emerged, there are tools to utilize now: YouTube, Facebook, Twitter, ag media, NRCS and Extension experts, and the list goes on.

But there's almost so much information out there it might seem hard to sort everything out. It's impossible to go from a cover crop newbie to an innovator overnight. Sometimes those experienced farmers who have their cover crop program 'down pat' forget what is was like just starting out.

The first article about cover crops in *No-Till Farmer* appeared in 1973, and through the years Lessiter Media has been the authoritative voice and resource for answers on proven cover cropping strategies. The company has assembled more actionable information about covers than anyone else in the ag media. And that's why we've stepped up and launched North America's first print publication devoted entirely to the topic — *Cover Crop Strategies*.

"Cover crops are now the fledgling practice with so much promise for farmers…"

Our team has prepared high-quality content for this special report of *Cover Crop Strategies* to share ideas on getting covers established, using a roller-crimper for termination, successfully integrating livestock into a cover-crop system and using covers to transition away from an overdependence on herbicides and fertilizers.

These stories are only the tip of the iceberg on what's available at *www.CoverCropStrategies.com*. At this website you'll find the most current information delivered through news, feature articles, blogs, podcasts and videos on cover crop seeding, soil health, economics, termination, grazing covers and so much more. And additional, unique learning will be available in March through our second National Cover Crop Summit. See page 23 for details and how to register.

Further strengthening our commitment to being the source for cover crop answers is our ongoing partnership with cover crop expert Steve Groff, and Lessiter Media's recent acquisition of *Cover Crop Innovators*, his online collection of experience-based, interactive cover crop management sessions featuring invaluable from-the-field observations and anecdotes. See page 9 for more information.

As you'll see through this new publication and our online offerings, *Cover Crop Strategies* is truly a one-stop-shop for authoritative, objective cover crop management information that you won't find anywhere else. I hope you enjoy this first edition and learn something you can take and implement on your own farm to increase your cover crop success.

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COVER CROP STRATEGIES

WINTER 2020
VOLUME 1, NUMBER 1

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10 Tips for a Successful Start to Cover Crops

With 2 decades of cover cropping experience under his belt, Illinois farmer Adam Dahmer shares his **advice and suggestions for growers who are new to the practice.**

By Laura Barrera
Contributing Writer

Adam Dahmer was born into a farming operation in Marion, Ill., that was already 100% no-tilled. By the time Dahmer started farming with his family in the mid- to late 1990s, cover crops had become an integral part of the operation.

Dahmer also runs his own cover crop seed and equipment company, Advance Cover Crops, to help other farmers excel with the practice.

In a presentation during the first National Cover Crop Summit hosted by *Cover Crop Strategies*, Dahmer shared 10 lessons and tips from his 2 decades of cover cropping to help beginners use them with success.

#1 Connect with an Honorable Seed Company

Dahmer started his own cover crop business because of the misguided information he saw being provided to some farmers when they started using covers.

> **"Cereal rye is the best species for farmers to start with as they transition their farm…"**

Growers need to focus less on price, he says, and find an honorable seed company that provides superior products, excellent service and honest information — even if it might be more expensive.

"Buying solely on price, a lot of times, will have a direct relationship with the performance of your program in regards to seed quality, actual variety and performance," he says. In 2018, Dahmer had to inform a grower that the ryegrass he was using was actually a turf variety.

"I said, 'I understand it's a lot cheaper, but you're not providing any benefits to the soil that you could be doing with another type of annual ryegrass,'" Dahmer recalls. "There's still a lot of that going on, especially as we get further south. You've got to pay attention to what it is you're planting."

#2 Start with Cereal Rye

Calling it the backbone of almost every farm's cover crop program, including his own, Dahmer says cereal rye is "the best thing for farmers to start with as they transition their farm."

Dahmer says cereal rye is the first species he recommends due to its relatively simple management and the variety of benefits it provides.

On many Midwestern farm operations, cereal rye can be seeded up until mid-November so most farmers won't have any issues with establishment after harvest, Dahmer says. Termination is simple, too, as cereal rye can easily be killed in the spring with glyphosate.

Many growers will also reap several benefits from the species, including weed control; soil protection from erosion, rain, and hot or cold temperatures; its ability to store a lot of nutrients to be released for the next crop; and good rooting depth, a benefit of cereal rye that Dahmer believes doesn't get the attention it deserves.

"I've seen cereal rye roots go down over 36 inches on our operation," he says. "They continue to open up passageways for the corn and soybean roots to go down the following year."

#3 Consider Aerial Application

When Dahmer's family was beginning to use cover crops in the 1990s, they started by aerial seeding cereal rye, a practice that Dahmer says worked "phenomenally well" for them and still works well

TERMINATE ON TIME. *Adam Dahmer learned the hard way why it's important to terminate cover crops at the right time, especially with annual ryegrass. After letting it grow longer in order to have nutrients released from it later, he discovered that he couldn't close the seed slot when he planted into the mature ryegrass due to the amount of biomass on the soil.*

for a lot of growers today.

They would fly their rye into corn when light was hitting about 50% of the ground, which for their location in southern Illinois is around the last week of August to the first week of September. Seeding at this time meant they didn't have to worry about getting in after harvest. And by seeding the rye earlier the plant was able to establish sooner, which contributed to better success with erosion control.

"With most years, we had an excellent stand," Dahmer says. "There were a couple of years during this time period that we didn't have the stand we were striving for due to soil moisture. But year in, year out, it worked very well."

When aerially seeding rye into standing corn the target seeding rate should be 80 pounds per acre, he notes. While some seed will get caught in the corn canopy, he says it'll still get to the ground during harvest and have a later germination.

#4 Don't Let a Lack of Rain Cause a Delay

Dahmer admits that one of the disadvantages with flying on rye is that you're dependent on soil moisture for success. But even if it's dry, Dahmer still recommends growers get the seed out there because it's not possible to know what will happen in the future.

"I know guys will say, 'It's too dry to seed,' so they're not going to do it,'" Dahmer says. "I can promise you'll get a better stand of cereal rye if it's already in the field than you will if it's sitting in the shop waiting for rain. So regardless of the soil moisture available, we would still seed at the same time. And Mother Nature usually does a pretty good job of providing us with enough moisture to get the seed to germinate."

Even if the seed doesn't germinate before harvest, when the combine runs through the field it will push the seed into the ground and provide residue coverage on top, creating a better germination environment.

"It was still out there, and we still didn't have to worry about it," Dahmer says. "Right after that, it would usually come up. The important thing is getting it down below all the residue to get seed-to-soil contact."

"We have to get out of the truck and evaluate the cover crops. They can tell a story just like our yield maps…"

– Adam Dahmer

#5 Pay Attention to Seeding Dates

While cereal rye has a long seeding window in most of the Midwest, for other species, that window might be much shorter. That's why Dahmer says growers should be aware of the seeding dates for the species they want to use, and be honest with themselves on whether they can get it seeded in time. Warm-season species won't survive if they're planted in October.

"There's no need to plant something like a radish if you're not going to get it planted in time for it to get to the size of at least a carrot," he says. "For most of us, that means they have to be seeded by mid-September at the very latest."

This is especially important if you're interested in cover crop mixes. "Don't just throw seeds out there just to feel good that you've got diversity. Because a six-way mix that only has two species that are going to come up is really just a reduced seeding rate for those two plant varieties."

#6 Check Termination Dates

Growers also must be aware of when a cover crop

Selecting the Right Cover Crop Species

In addition to the tips Adam Dahmer shared in his National Cover Crop Summit presentation about getting started with cover crops, he also shared some advice on selecting cover crop species.

- ✔ Use hairy vetch before corn, but never by itself. By seeding hairy vetch with a species like cereal rye it will give the vetch something to trellis up on to elevate it off the soil surface. Cereal rye is also good for absorbing excessive soil moisture, which can also help dry out the soil. Dahmer likes to drill 16 pounds of hairy vetch with 30 pounds of cereal rye.
- ✔ Adding 2 pounds of rapeseed is a good way to diversify a cover-crop mix cheaply at only $1.80-1.90 per acre, Dahmer says, noting rapeseed is more winter-tolerant than a lot of brassicas and growers don't have to worry as much about planting dates and cold temperatures. In addition to increasing plant diversity, rapeseed has also been shown to reduce signs of sudden death syndrome and white mold in soybeans.
- ✔ Use oats if you're planting a lot of legumes. Where Dahmer is located in southern Illinois he gets cold weather in the winter but not a lot of snow, so his cover crops aren't insulated from harsh temperatures. This is why he always includes oats if he's seeding legumes to provide a nice blanket to protect the legumes from cold winds and keep them alive until mid- to late-January.
- ✔ If using cereal rye for weed control, increase your rates. Growers must be sure seeding rates are going to accomplish the goals they want to achieve, especially if the goal is weed control. Dahmer recommends no less than 1 bushel of cereal rye as a place to start for drilling, adding that he's now up to 2 bushels per acre to reduce weeds and his chemical inputs. Read more of Adam Dahmer's tips at www.CoverCropStrategies.com.

needs to be terminated if it doesn't winterkill.

One particular species to be mindful of is annual ryegrass. Although many growers use the cover and report no problems terminating it, there are some nuances on timing — a lesson Dahmer learned firsthand.

When he found out annual ryegrass will release half of its nutrients at the first rain after termination, he decided to delay termination so the timing of the nutrient release would occur in the middle of May when he needed the extra nutrients.

"That was a mistake," Dahmer says, explaining that when he went to plant the field he couldn't get the seed slot closed because there was too much inconsistency from clumps of ryegrass on the soil.

"There's a reason why they say, 'When you start mowing your yard, it's time to start getting the ryegrass sprayed,'" he says.

Rapeseed is another species to pay attention to. Dahmer recalls a problem several years ago where rapeseed was going to seed. There had been an early fall for the rape to establish, followed by a warm winter, so it didn't winterkill.

The next spring was wet, which prevented growers from terminating it, allowing the rapeseed to continue growing and flowering.

Rape is hard to kill when it's flowering, Dahmer says, and when he drilled soybeans into the field it busted the seed pods open, effectively seeding the field to rape. While he was able to get the field cleaned up, it was a good reminder as to why rapeseed needs to be terminated before it reaches the flowering stage.

#7 What Are Your Cover Crops Telling You?

It's not enough to just focus on seeding and terminating covers. Dahmer says growers need to treat their covers like they would their cash crops, which includes careful observation.

"We have to get out of the truck and evaluate them," he says. "They can tell a story just like our yield maps, our infrared pictures and so forth. If we just walk across these fields, these cover crops will do an excellent job of telling us what's going on with the soil as well."

Dahmer learned from his cover crops that he was losing corn production. He noticed there were spots approaching the headlands, about 15-20 feet long every 12 rows, where the cover crop was smaller in growth because it wasn't capturing any leftover nitrogen (N) from the previous corn crop compared to the rest of the field.

Dahmer says this showed him he'd either been shutting the N applicator off too early or turning it on too late.

"When you add all that square footage up over several hundred acres, it doesn't take long to hurt your final yield," he says. "So we looked at that and we changed our application timing to take care of it."

#8 Stand Issues? Monitor Insects

One observation growers may come across, especially if they're no-tillers with already healthy soils, are stand issues from cover crops that were broadcast seeded, due to the feeding of beneficial insects.

Dahmer speculates this happened on his own farm. One fall, he recalled seeing a "tidal wave of crickets" as he drove his grain cart across a soybean field that already had a dense mat of terminated cereal rye.

> **"Don't just throw seeds out there just to feel good that you've got diversity..."**

Knowing that crickets are a good seed predator, he thinks they may have been the cause for the lack of stand from the annual ryegrass he later broadcast into the soybeans.

"I know a lot of guys who can no longer broadcast seed because they've done such an excellent job getting their soil back to work that even with cereal rye, they have to be careful, because the earthworms will pull the seed down so deep in the soil they cannot get a stand," he says.

"If you start having stand issues, especially with broadcasting, it's a good idea to get out in your soils and monitor your insect pressure."

#9 Run 'R&D' on Your Cover Crops

Regardless of outcomes, Dahmer tells growers they should keep experimenting with different practices to see what works best, as that's the only way to obtain the best information.

"Even after you find something that you like, you still want to see if you can improve it in any way, shape or form."

Research and development includes equipment, whether it's for cover crops or cash crops. "You have to be careful when you ask those blanket statements, like 'What closing wheels are best for annual ryegrass?'" he says.

"Because a guy planting into more sandy soil will have a different opinion from one that's planting into heavy clay."

Even better, get other farmers involved. About 5 years ago, Dahmer did a closing-wheel study with a group of farmers within a 60-mile radius of him to see what worked best for closing the seed slot in fields of terminated annual ryegrass.

"We took 7 or 8 farms in on that, so we gained 7 or 8 years of testing each year, because we had different operations that had similar soils and planting conditions," he says.

#10 Keep Going

While it depends on soil degradation, many new cover crop users will see immediate responses within the first and second year of using this practice. But Dahmer warns that using covers is a long-term program, and every year may not be the best.

"We've spent decades abusing our soil, so now we're trying to fix it," he says. "Don't get discouraged if it slows down after the first couple years. We've got to get our system in check and continue to get better as we progress."

3 TAKEAWAYS

1. Find an honorable seed company that provides superior products, excellent service and honest information, even if it might be more expensive.
2. Cereal rye is a good first species to use due to its relatively simple management and the variety of benefits it provides.
3. Treat your cover crops as cash crops by doing in-field evaluations to help assess soil health.

Killer Tips for Rolling Your Covers

Thorough cover crop termination with this equipment requires using **the right plant varieties and carrying out operations at the right time.**

By Laura Barrera
Contributing Writer

When it comes to terminating cover crops, many growers rely on herbicides to get the job done.

But for growers looking to reduce or even eliminate their herbicide use, a roller-crimper provides an alternative solution.

Typically made of one or multiple drums with blunt blades, roller-crimpers work by pushing the cover crop down and crimping the plants along the way, which not only injures and kills the covers but keeps it on the ground.

This creates a thick mat of residue that will protect the soil and prevent weeds from germinating, says Erin Silva, an associate professor at the University of Wisconsin-Madison.

"We're not cutting the plants, but damaging the stem to damage the vascular system and limit the flow of water and sugars through the plant," she says.

That facilitates the termination of the cover crop," says Silva, who also leads the university's research on roller-crimping covers for use in organic no-tilled soybeans.

While roller-crimpers are simple to use, ensuring an effective cover crop kill with them is a little more complicated. Understanding the roller-crimper's limits, using them at the right time, selecting the right cover crop species and seeding those covers at the appropriate rates are all key to making a successful termination possible.

CUSTOM ROLLER-CRIMPER. *Steve Groff built his own roller-crimper, which consists of eight 22-inch sections, with four in the front that overlap the remaining four in the back. By having the sections that small with parallel linkage, Groff's roller-crimper is flexible enough to reach any contours in the field, such as hairy vetch and winter peas as shown here.*

Know Your Limits

When Holtwood, Pa., no-tiller Steve Groff talks to farmers about using this practice, he warns them that it's not a perfect system.

"When conditions are right, rolling cover crops and not using herbicides can work about one out of five times," says Groff, who's been rolling and crimping covers since 1995. "One out of five times it'll be a disaster, and three out of five it'll be in the middle. That's the realistic expectation."

One of the reasons roller-crimping may not work is if the machine is unable to roll the entire cover crop. This is more likely with larger roller-crimpers on undulating terrain, he says, as they can't reach the cover crop where there are small dips in the field.

For this reason, Groff recommends growers who have contours in their field avoid using roller-crimpers that have sections wider than 10 feet.

Another possible factor is whether the roller-crimper can be more aggressive through added weight or down pressure. How aggressive the roller-crimper needs to be is something growers will learn as they use the tool, Groff says.

However, it's important that the machine isn't so aggressive that it cuts the cover crop. If that happens it may regrow and the new growth could be more difficult to control.

"We don't want the blades or angles too sharp," he says. "We want them to be dull so they crimp. Most roller-crimpers are built with a somewhat blunt edge."

But without the ability to make the machine more aggressive, a grower may need to make multiple passes to terminate the cover if they want to avoid using herbicides. Fortunately, if multiple passes are necessary, roller-crimping is a fairly fast task — Groff typically runs his machine around 9-10 mph.

Timing it Right

The biggest key to getting the roller-crimper to consistently terminate the cover crop is using it at the appropriate time.

3 TAKEAWAYS

1. Proper roller-crimping of covers impairs the stem, damaging the vascular system. But don't completely cut the plants because they could re-grow and be even harder to kill.
2. Understanding the roller-crimper's limits, using it at the right time, selecting the right cover crop species and seeding those covers at the appropriate rates are all key to making a successful termination possible.
3. Growers who have contours in their field should avoid using roller-crimpers that have sections wider than 10 feet.

For growers who don't plan on using herbicides, this means waiting until the cover crop has reached the flowering stage, Silva says. For cereal rye and other grains, the correct stage is anthesis — which is when anthers are hanging off the cereal grain heads and it's shedding yellow pollen.

At that stage, it should lie flat on the ground after roller-crimping, she says. If it springs back up and continues growing, the cover crop was rolled too early.

This is why Silva recommends erring on the later side of anthesis. "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."

Silva adds that broadleaves and legumes need to reach full bloom or early pod set to be terminated with the roller-crimper.

This is one reason why a planter-attached roller-crimper may not be the best option for farmers who would like to terminate their cover crops with just the roller-crimper, because planting may be earlier than when rolling needs to occur.

"One thought is you roll when it's time to roll and you plant when it's time to plant," Groff says. "Those two timings may not be the same time. Sometimes you'll need to come back and do it a second time."

In fact, Groff advises organic farmers to plan on rolling twice, since they can't rely on herbicides to aid in termination. But if a farmer plans on using herbicides in conjunction with roller-crimping, the timing doesn't matter as much.

Groff says growers can either spray before or after roller-crimping, noting that he prefers to spray before because he feels he gets better coverage, but he's also tried spraying after roller-crimping and it also tends to work fairly well.

Because cover crop termination has to occur later with roller-crimping, growers 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, Silva says.

> **"We don't want to push roller-crimping early, because the earlier we push it, the more regrowth and bounce back we're going to have..."**
> — Erin Silva

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

As long as soybeans aren't too early in maturity — before V1 — then the roller-crimper doesn't significantly damage the crop at that stage.

The Right Species

Due to the nature of the roller-crimper and the importance of timing, some cover crops are better suited for this system than others.

Cereal rye is the most popular species because it grows rapidly and matures early. Silva recommends the Aroostook variety for organic farmers and those looking to avoid herbicides, because it reaches the flowering stage about 10 days earlier than other varieties.

Groff says he seems to get better control of cereal rye when it's mixed with hairy vetch, likely because the vetch helps keep the rye down. And because hairy vetch is succulent and tender, it's also easily terminated by the roller-crimper.

Another mix Groff prefers is triticale with hairy vetch because they tend to mature very close together. When he uses them ahead of his no-till pumpkins, which are planted around the end of May or beginning of June, the roller-crimper will do most of the terminating, because both species will have reached full maturity.

Triticale is another species Silva recommends because it can achieve adequate biomass for weed control, and improved varieties are more winter hardy and less likely to lodge due to thicker stems. However,

If You Use Tillage, Consider Putting Your Roller-Crimper Out Front

For growers who are using roller-crimpers not attached to their planter, they have the choice of using them either in front of the tractor or behind. Cover crop expert Steve Groff says those using a tillage system may want to put the roller-crimper in front.

The Rodale Institute does this, he says, because they discovered when placing the roller behind it couldn't effectively terminate the cover crop sitting in the tractor tracks.

"They had planted their cover crop in tilled ground, and in the spring — when they went in and rolled it — their tractor tracks made an indentation in the soil, deep enough that it didn't really crimp the cover crop and it came up in the tracks," Groff says.

For those who are in a good conservation tillage system, tractor tracks shouldn't be a problem, so they can choose whether to run it in front or behind. One benefit of running the roller-crimper in front is that growers can have their planter or drill behind, saving them an additional pass.

***AVOID LODGING.** No-tiller Steve Groff's biggest challenge with roller-crimping is cover crop lodging, where the stems lie in different directions, making planting more difficult. One solution is to roller-crimp the cover crop before it blows down, even if it's too early for termination.*

it doesn't have the degree of allelopathic weed suppression provided by rye.

Wheat and barley are also good options because they mature early, Groff says, and winter peas are easy to terminate. Although not very common, rolling summer cover crops such as sunnhemp, cowpeas or buckwheat has been done with success. While crimson clover doesn't terminate as easily as hairy vetch, Groff says that if it's in full bloom the roller-crimper can do a decent job on it.

As for species to avoid, annual ryegrass is at the top of the list because it doesn't have stems, so it can't be effectively crimped, Groff notes. If growers want to use annual ryegrass on fields they will roll, he adamantly advises making an herbicide application several days before rolling.

Sorghum-sudangrass should also be avoided if growers aren't using herbicides, as it may grow back.

Perennial grasses also can't be used, Silva says, because they don't reach full maturity like an annual grass does, so the roller-crimper won't kill them.

Finally, oats are a species to consider avoiding as they can be difficult to roll. Groff says if growers don't want to use herbicides the oat plants need to be well into the soft dough stage to be successfully terminated with a roller-crimper.

Consider Seeding Rates

Growers also need to be mindful of their cover crop seeding rate. Organic farmers will need to seed at higher rates to achieve adequate biomass for weed control without chemical herbicides.

Silva recommends they start at 3 bushels per acre with cereal rye. Groff says conventional farmers should begin with a lower rate on cover crops with high carbon-to-nitrogen ratios.

The reason for lower rates is to lower the risk of lodging, which Groff says is the number-one challenge with roller-crimping. Lodging is usually the result of a wind or storm event or, Silva says, excessive soil fertility.

Lodging will cause the cover crop stems to lie across the ground in every which way, making it difficult for a planter to cut through the cover and achieve good seed-to-soil contact. Hairpinning may also occur.

One bushel of cereal rye is a good place to start, he says — unless growers are planting late, then increasing it to 2 bushels is fine. If growers plan on applying manure in the fall, go even lighter since it will make the rye even thicker.

While a thick seeding rate with high-carbon species can lead to lodging, the ratio of legumes in the field can affect it too, Groff says. He gives the example of hairy vetch, saying that it has "absolutely no standability," and can climb up species like rye or triticale and pull them down.

One solution Groff says may prevent lodging is rolling before lodging occurs. One year, he roller-crimped his crimson clover when it was around 30-40% flowered about 3 weeks before planting, because heavy rain was expected the next day and he knew the cover would lodge.

By roller-crimping it early the clover continued to grow in the direction of his rows, making it easier to plant into.

When it's time to terminate the cover crop, growers can either roller-crimp again or use herbicides.

Start Small, Learn All You Can

Groff reminds farmers that with roller-crimping there will be good years and bad years. That's why he advises farmers to start small and talk to others in their region to see what their experience with the practice has been.

"Don't do the whole farm," he says. "Don't expect this practice to always work as good as you hear about. Start small, learn how this works, and learn what the limitations are."

Silva agrees that roller-crimping isn't a guaranteed success and growers should stay flexible and have a backup plan in case it fails.

"Don't get too locked into a mindset of 'you're going to roller-crimp and terminate mechanically no matter what,'" she says. "You really do need to be adaptive with respect to this management system."

LESSITER MEDIA

Lessiter Media Acquires Cover Crop Innovators

Lessiter Media, publishers of *No-Till Farmer*, *Strip-Till Farmer*, *Farm Equipment* and *Precision Farming Dealer* (along with various related digital properties and live events) acquired *Cover Crop Innovators* on Nov. 27, 2019, from longtime farmer and consultant Steve Groff, Holtwood, Pa.

The acquired property will be part of Lessiter Media's *Cover Crop Strategies* division, which launched as a digital property and with the inaugural National Cover Crop Summit in 2019.

Groff is an award-winning no-till farmer and a longtime contributor to Lessiter Media properties, including *No-Till Farmer*, the National No-Tillage Conference and *Cover Crop Strategies*. He will remain in a transitionary consultative role as he expands his newly created "Hemp Innovators" services, an area of wide interest in which he has developed an early expertise.

"We're looking forward to continuing to assist farmers with cover crop knowledge through the next phase of our partnership that we unveiled at the 2019 National No-Tillage Conference in Indianapolis," says Mike Lessiter, president, Lessiter Media. "Through this agreement, we will continue to share Steve's actionable strategies on cover crops to a qualified audience hungry for this information, best practices and knowledge on the fast-moving cover cropping practice."

For more information, visit www.CoverCropStrategies.com

DECISION FACTORS. Tom Cotter's guidelines for cover crop mixes include his goals, the history of that field, future plans for a specific field, soil type, climate, livestock, tillage practices, the seed provider and seed costs.

Farming with Covers is Like 'Playing Chess'

Minnesota grower Tom Cotter shares how he strategically uses cover crops, as well as **tips on seeding varieties and successfully grazing livestock on covers.**

By Tom Cotter

My family has been farming in southern Minnesota for 143 years. Great-grandpa began tilling the soil back then, and every generation since has done the same thing.

Farming is like playing chess. When I was doing everything the conventional way, farming was like checkers. One easy move at a time. Now that I'm in the cover crop world and no-till, it's like chess. I have to think one, two or three moves or years ahead. I also think about what I did 2 years ago.

Each year, I pick out my practice, situation, cover, cash crop and future plans for each field. It's always changing. I like to have options and see what's working the best for each year.

Each Year is Different

With cover crops I often feel farmers are holding themselves back. Everyone is doing the exact same thing as their grandpas did, even though times have changed. I say don't use cover crops and no-till because everyone else is doing it. Do it because you believe in it. When you're doing covers, you learn to adapt and change very fast.

Do we have to change what we plant and make it fit our climate? Absolutely. I look at temperature highs and lows. I can get things to overwinter pretty easily because my snow protects my covers, and my covers protect my soil. The soil protects my underground "livestock," which is soil microbes and worms.

You have to be very flexible when implementing covers. Here are a few things I assess when choosing what type of covers to plant.

- ✔**Check the soils.** Are they heavy or light? Is it balanced? On my farm, if I've got really heavy soil, grasses are pretty dominant there. In really light soil, brassicas take off and do a really good job.
- ✔**How much moisture do you get in a season?** That determines what kind of cover crops I plant on my farm. If it's really

3 TAKEAWAYS

1. Have a long-term plan for each field. Knowing its history and planting intentions for future years will help with decision making.
2. In heavy soil, grass covers do better. In light soil, brassica covers do a good job.
3. Have guidelines to help with selecting cover crop varieties, such as annual weather conditions, objectives, livestock, tillage practices, seed provider and cost.

USE ALL THE SENSES. *Austin, Minn., farmer Tom Cotter assesses soil health by examining soil structure, earthworm populations and the sound of roots tearing when pulled. In winter, he checks on cover-cropped areas under the snow to make sure the soil is still pliable.*

dry, I'm not going to use something that prefers wet conditions.

✔**Have guidelines.** For choosing cover crop mixes, I look at my goals, the history of that field and what I have planned for it in the future. I also look at the soil type, climate, livestock, tillage practices, the seed provider and the costs.

What have you been doing for the last 10 years? For the last 40 years? It makes a difference. What is the future of your farm, cash crops and farming techniques? I can't say there's only one way to do something because it's your farm. You need to learn for yourself.

"When I pull up a root, if I hear that tear, I know there is good soil health…"

— Tom Cotter

✔**Diversity is a must.** I have grass-fed cattle. Too many people think cover crops are this one dirty plant that's going to fill in the time that you're not having your cash crop. It can also be a cash crop. In my experience, if you do a good job with cover crops, you'll see weed suppression right away, in year one.

Water infiltration is another huge benefit for me. My cover crops and no-till practices have helped my drainage even without tile in spots. That's the whole principle with covers and no-till or strip-till.

✔**Get those cover crop roots established.** When corn shades everything out, you need to have a root system in place that that plant can survive on. I don't worry about top growth.

For me, annual ryegrass is the staple program. I love vetch, red clover and some brassicas like bayou kale. I have done cow peas, Austrian winter peas and lots of other varieties. I have a little harder time with crimson clover in that scenario.

✔ **Look at the stature of the corn.** If I pick a variety that's going to get 14 feet tall, interseeding is going to be pretty tough. I also look at how upright the leaves are. I even look at east/west and north/south rows. If I'm interseeding into corn at the V6 stage, I like them east/west. If I'm planting later in the year, I like seeding them north/south. That's just the way I see the sunlight hitting the ground.

✔ **Consider government programs.** If you are enrolled, use that money to the max for a goal. I use my payments for covers. I wanted to give my soil this big energy drink and then maintain it with other covers. I kept using it as a jump-start for multi-species covers — a 17-way or 12-way mix. In 2019, it was a 31-way mix.

Get the cover crop going first before hauling manure. That one week or however long you wait, you're going to be that much farther behind on heat units.

Know Your Seed Provider

It's important to know your seed provider. Do you have your own seed that you raised? Sometimes it turns out good, sometimes not. Make sure you get it germ tested.

Be very careful when selling seed to a neighbor. It can wreck a friendship and get you into trouble.

Don't just buy your seed from anywhere or anyone. Ask tried-and-true seed providers how they produce their seed. I had a chance to go to Oregon and see where they grow the world's

grass. I was just amazed at how those fields were made. They were tilled just like concrete.

There are other companies out there that do no-till and livestock grazing. Make sure you check to get seed that is grown in a way that is the same that you're doing on your operation. You get what you pay for. If you find a good deal, there's probably a reason for it.

Build a relationship with your seed provider. The first time I did no-till into cover crops I pulled out my phone many times to call my seed provider. I had so many questions. But even if you're scared about establishing cover crops, you can make it work.

Cheaper is not always better. When I seed, I really don't look at pounds. I look at seeds per square foot. I usually have 2-3 varieties anytime I seed, even if it's V6 interseeding. I want that diversity.

I do look at current weather patterns. If it's dry, I'm going to plant differently. If it's really dry, I'm going to get that seed in the ground and also change some varieties. If there's plenty of moisture, I'll spread the seed on top and not do any tillage.

"If you do a good job with cover crops, you'll see weed suppression in year one..."

— Tom Cotter

Interseeding Brings Choices

V6 interseeding in early summer works great because it gives me more opportunity to get diversity of cover crop species in there. When you interseed, you get choices. I get to plant nearly half a dozen more species that way that I probably wouldn't be able to use in fall. That's important. If I'm not grazing, I lighten it up, but if it's going to be grazed, I plant it heavier.

In mid-summer or early fall, you can broadcast the seed on top if there's a lot of moisture. If there's not, you better drill it. After harvest, get it in the ground. To me, that's No. 1 — I want to get things established as soon as possible.

If need be, hand broadcast and just go throw some seeds out there. If you haven't planted anything, at least throw something out there so you can see what the plant looks like. I guarantee you, when a bunch of plants are out there, they're not going to look the same. If you plant something and see what it looks like, you'll be miles ahead.

I always try to frost seed. I look around the farm and see all my bare spots from wintertime when it freezes and thaws and water sits and chokes out my covers. I spread something on that spot. I don't want to have bare soil. I just want to make sure I have more coverage.

Get Creative with Grazing

I have grazing opportunities. It's amazing what livestock can do. When I started doing covers, I didn't bring the livestock into the operation. I didn't know what I was doing 20 years ago. Now, I love putting cattle out to graze.

Sometimes you have to get creative. In 2018, I had my grazing plan all set out but realized I wasn't going to get to one paddock before the weather changed. So, I harvested that paddock as forage.

When I first started, my costs were $6 per acre. That's how much I could buy cereal rye for per bag. Now prices are up, and with cattle they're even higher. After I've harvested canning crops, I am fine with higher cover crop seed prices because I know I can utilize those covers much better. So, I go up to $46 per acre. Most times, you're going to average right in that $18-$35 range.

Gauging Results

Cover crops play an invaluable role in improving soil health, and it's important for farmers to take assessments of any improvements.

Growers know their land better than anyone and should use all five senses when assessing soil health. When I walk out in my field, I can feel myself sink in the ground. I can see and feel the soil structure. I can see worms.

When I pull up a root, if I hear that tear, I know there is good soil health. I go out in the winter and dig under the snow to pull up my cover crop to check on the soil. It's still pliable.

It's important to ensure the land is healthy and do your best to take care of it.

INTERSEEDING CHECKS. *Minnesota grower Tom Cotter looks at corn height before interseeding, as well as how upright the leaves are on the corn plants. If he interseeds at the V6 stage, he plants the covers in an east/west configuration. Planting covers later in the year is done in a north/south configuration to maximize the amount of sunlight hitting the covers.*

Exchanging Cover Cropping Ideas, Outcomes & Experiments

Four farmers sit down to discuss the regional and even farm-specific considerations for **variety selection and seeding strategies for developing a successful cover cropping program.**

By Jack Zemlicka, Associate Editor

A conversation among farmers about cover cropping can produce as many questions as answers. But those exchanges are beneficial in understanding opportunities and limitations with a cover-cropping program.

Our editors assembled a diverse group of farmers for a discussion on cover cropping techniques, seeding preferences and variety selection. In between pointed comments about lessons learned and what to avoid, the group shared their regional experiences on getting a progressive cover-cropping system established.

At the table were Harold Kallal, strip-tiller from Jerseyville, Ill.; strip-tiller Ryan Shaw from Snover, Mich., along with farm operator Bruce Brock; and Chris Armstrong, strip-tiller from North Bend, Neb.

What follows are excerpts from the 120-minute conversation. Read more from the discussion at www.CoverCropStrategies.com.

Ryan Shaw: "Compaction is a big issue in our area, so we're getting into cover crops and experimenting with different varieties as a way to help break up that compaction, especially on our soybean acres. We're so far north a lot of times we're limited to what we can use."

Bruce Brock: "We're trying to do some shorter-day soybeans and seeding some cover crop out there that'll work that way. We assembled an interseeder build out from an old cultivator. We added Dawn's DuoSeed units and a Salford poly tank and 2018 was the first year we tried it, interseeding some corn acres to test it out."

Harold Kallal: "We used an airplane our first year on about 100 acres of cover crops and it worked great. The next year, we did 400 acres, but it stayed dry from August until about December and nothing grew. We had maybe one plant per acre. So we bought an air seeder to plant cover crops. Our plan is to plant cover crops as soon as we can after harvest. Then we're also going to plant covers into our soybean stubble, then apply anhydrous on the cover crops and see how that works. One of the farmers about 30 miles east of us did that and it looked pretty good."

Brock: "What type of a mix are you doing? Is it a mix or straight cereal rye?"

Kallal: "Right now, we're just using cereal rye and root tillage radish. Depending on the year, the tillage radish can get a big root and then it will have a small root maybe go down another foot. It's got at least a 2, maybe 3-foot penetration. The cereal rye looks like it goes down 15-18 inches. The frost kills the radishes, which for us usually comes the first of December. Then I usually like to kill cereal rye in March.

"We were more comfortable trying to seed all 1,500 acres with a cover crop, and using the interseeder halved our seed cost…"

– Ryan Shaw

Shaw: "We built our interseeder to seed our covers in the fall in between our strips where we were going to have our seedbed for the following spring. We're more comfortable trying to seed all 1,500 acres with a cover crop, and using the interseeder halved our seed cost.

"When we went and no-tilled cereal rye into our soybean stubble and then put our fall strips in with RTK, we were ripping two perfect rows out of the rye. We figured we were wasting half of our seed and if we could seed that rye right where it should be, we're saving half our seed rate from the get-go.

"In spring we can just let that keep growing and we can freshen our strips and make a seedbed and not have to worry about ever hairpinning any of that to dry out or wick out the seed slot."

Chris Armstrong: "We did cover crops, mainly radishes, turnips and cereal rye, for the first time in 2017. About Labor Day, we hired a high-boy operator to seed into our corn on three different fields. Then we had a plane apply covers to a couple of our soybean fields.

"It froze so soon that the radishes and turnips were so small. The rye that we flew on was also kind of disappointing, even though it germinated right away. It was just real uneven in the soybeans. What we'll try next is a twin-row planter that we plant soybeans with. We're going to buy some cover crop discs and seed plates and plant a few fields, then come in and strip-till on the side, in-between those rows."

Brock: "We get our cover crop seed from growers who raise it around us, and they even clean the seed for us. It's worked out real well. We've gotten to know someone who can advise us on how much to seed by the half-pound instead of a pound or 5 pounds. When I interseeded corn it was a 7-way mix. The total poundage I seeded was 11 pounds per acre. That really was keeping the cost down, too."

Shaw: "He makes sure we have a reason why we're doing it. If we asked him for a mix, he's more than happy to sell it to us. But he'll ask, 'What are you trying to accomplish?'

"We picked out a mix where we wanted to use 4 pounds of buckwheat. He said, 'You don't want to do that. It will come up so fast, your canopy of your corn will shade it, but the buckwheat will shade all your clover.'

"It's those things that I never would have thought about. The average cover crop salesperson might just sell you what you asked for and then you might get burned because you wouldn't know why it didn't work the way you expected it to."

Banking Cover Crop Benefits for a Bigger Soil Health Payoff

Indiana grower Jason Federer says long-standing use of cover crops is helping him **transition away from chemicals** as he counts soil health the ultimate 'long-term profit.'

By Dan Crummett
Contributing Writer

Jason Federer says he's been around cover cropping for as long as he can remember. He recalls watching his father frost-seed alfalfa and clover into wheat on their farm near Wolcott in northwest Indiana.

"That was the beginning of cover cropping, on a small scale," he says. "But, now we're trying to do it on all of our acres after I watched what it was doing for us."

Federer says water infiltration, overall soil health and increased management flexibility are the biggest factors in his interest in using covers on the 4,000-acre corn, soybean, wheat and alfalfa operation 90 miles south of Chicago. Also, he says extensive cover use hasn't shown a yield drag on his row crops.

"The flatland farm is primarily a uniform, dark, medium prairie soil with a tendency of poor drainage," Federer explains. "Let's just say we have more problems with too much water than with not enough, and over the years I've watched infiltration improve behind our cover crops.

"It's hard to quantify, but I'm convinced the practice is helping overall soil health, just from the abundant population of earthworms we find. Also, when you pick up a handful of soil it just smells 'healthy' and is very friable," he explains. "I also see steady improvement in runoff reduction after big rains."

Today, Federer has 250 acres certified organic crops and another 800 acres in various stages of transition.

"I'm into organic thinking and go with the premise that something will grow on bare ground regardless, so it's best if I can guide what is growing out there," he says. "It's not so much what I see year to year, but I know it's nature's design, so I'm trying to work with it instead of fighting that design."

Reliable Rye

Federer says he consistently uses cereal rye as a winter cover behind corn ahead of soybeans.

"It's almost fool proof as long as the weather doesn't hinder you," he says. "Ideally, I'd be planting cereal rye right behind the corn harvester, but we've planted as late as January with good success."

Federer plants the rye at 1 bushel per acre, along with 1 ton of chicken manure. Due to more extreme weather and for better timing and workload, interseeding in corn during cultivation at V4 or V5 stage is being initiated on all corn acres. Interseeding allows for longer cover life and better establishment to provide a more improved stand through the winter.

"If we're on organic fields, I'll seed 2½-3 bushels per acre if I'm planning to roll-crimp to terminate the crop, rather than using chemicals," he says.

While cereal rye is a useful and dependable standby as a single species cover, Federer is also striving to incorporate interseeded cover-crop mixes in his corn fields to improve the density of aboveground cover and the diversity of plant growth and rooting habits in the soil.

A typical interseeding mix includes buckwheat, annual ryegrass, creeping alfalfa and crimson clover. Federer has also included sunnhemp with good results. The biggest challenge is devising a good cover-crop strategy after soybeans.

"We've flown on covers over soybeans before, and if the conditions are right it works great. If conditions work against us for some reason, we have a lot of wasted seed and application expense," he says.

"One year, we had a late soybean harvest and good growing conditions for the oats and rapeseed we were using for cover. It looked like silage coming out of the combine. We were cutting 6-8 inches of cover as we harvested beans.

"It didn't hurt the beans, but harvesting was certainly no fun. Ryegrass would have been a better choice as a cover that year because it has drier biomass on top," he says.

Federer also says a legume in the mix ahead of corn has worked well for him.

3 TAKEAWAYS

1. Extensive cover use hasn't shown a yield drag on row crops.
2. Consider roller-crimping as an alternative to chemical termination of cover crops.
3. Interseeding allows for longer cover life and better establishment to provide a more improved stand through the winter.

RESIDUE CAPABLE. *Jason Federer's newly-refurbished John Deere 1560 no-till drill features Mudsmith gauge wheels, Aricks 90 Series seed boots and pivot/pin sets, Exapta seed flaps, Needham Ag V8 firming wheels and Copperhead Ag Drill Cruiser closing wheels.*

"We've had better luck drilling spring peas and oats when we can't get something established early enough in the fall to overwinter successfully," he says. "We try to choose covers ahead of corn that have more fragile residue, so if they do get big, I'm not fighting a lot of that no-tilling, or where I till organic ground in the spring.

"On the organic fields, ideally we'd like to roller-crimp before or after planting soybeans," he explains.

Cutting Chemicals

Federer says using covers has provided enough weed suppression that he's reduced herbicide use and can use "weaker" herbicides. He's trying to remove chemicals with the longest-lasting effects first, opting for a quicker breakdown.

"The chemicals should only be used to give the crop the upper hand, not to scorch the earth because it looks cleaner to antiquated standards," he says. "I'm trying to move away from chemicals because I don't think we're doing ourselves any favors relying so heavily on them.

"In our area, I think we've selected for waterhemp by using glyphosate. We have no Palmer amaranth, but waterhemp is prevalent. Still, on my organic fields, I don't have waterhemp and it's not like the seeds aren't out there."

Currently, Roundup is only used ahead of corn to burn down grasses. Federer says he had sprayed it on every acre multiple times, but gallons used have been cut tenfold. Select is currently used to burn down grass ahead of soybeans.

Conventional chemicals have worked well for Federer up to now, but he's pushing toward roller-crimping, mowing or using light tillage for terminating covers. He says the organic market provides a premium for crops and allows growers to cut inputs.

"The economic benefits are obvious: A premium for the product and a management recipe that requires fewer inputs. You don't have near the expenses every year, so you don't have to make as much.

"If I can make enough on a corn crop organically, I don't have to farm that field the next year if I can't get the crop in for some reason. I can put it in covers for a year; I don't have to take a crop off every field every year," he explains. "I like money like everyone else, but the flexibility of being able to go to covers is also nice."

Federer says weed suppression from covers is a big key to those reduced inputs in his operation.

"Those that really stand out are cereal rye ahead of soybeans, and alfalfa ahead of corn. It's just phenomenal what alfalfa will do ahead of corn in addition to the fertility it adds to the soil," he explains. "Similarly, we've used a clover mix ahead of corn that worked, but not nearly as well as the alfalfa."

Alfalfa is also a go-to transition crop for Federer as he moves acres into organic certification.

"As we go into a transition, we'll plant winter wheat and frost-seed alfalfa into that. We'll take a few cuttings to pay some bills and leave some to provide additional organic matter in the ground," he explains.

Federer says even on conventional tillage acres he's not necessarily shooting for maximum production. "I'm just trying to do a good job for the soil, because I believe soil health itself is a long-term profit."

Federer's yields haven't suffered from using covers, but he explains his yields are used to compare practices on his acres alone.

"If someone wants to talk whole-farm averages for a given area under certain management practices that can be constructive, but there are only a few people I'd trust to give the bad along with the good.

"The only times when yields give me much cause for concern or excitement is when they're unexpected — either good or bad — and I don't know the reason why.

"It's always nice to see the yield monitor jump, but in the end, it's what you're making per acre that counts."

Tools of the Trade

Federer frost-seeds with a Valmar 246 air boom seeder and spreads cereal rye and oats with a Valmar 8608 air-boom spreader. He'll then work them in shallow with a Lemken Heliodor compact disc.

Cereal rye and other drilled covers are planted with a newly-renovated John Deere 1560 no-till drill, equipped with Mudsmith gauge wheels, Aricks 90 Series seed boots and pivot/pin sets, Exapta seed flaps, Needham Ag V8 firming wheels, and Copperhead Ag Drill Cruiser closing wheels.

Interseeding is handled by a Hiniker 6000 cultivator toting a Valmar cover crop seeder.

"Something will grow on bare ground regardless, so its best if I can guide what is growing…"
– Jason Federer

ROLLER-CRIMPER. *As Jason Federer's management moves away from burndown chemicals, especially on organic acres, his new roller-crimper will be taking on additional cover crop termination chores.*

Cooling Off Soils with Covers Yields Success

Cover crops have helped Myron Johnson **boost soil organic matter** and retain crucial soil moisture in Alabama's humid, subtropical climate.

By Sarah Hill, Associate Editor

From an early age farming is what Myron Johnson knew would be his occupation. But dryland farming near Headland, Ala., isn't easy: retaining moisture, keeping the soil cool and keeping weeds away are constant challenges. Part of Double J Farms' success can be credited to adding cover crops in 2010 to their strip-tilling efforts.

"We started using cover crops because we wanted to retain as much moisture as possible so crops can take advantage of it throughout the growing season," Johnson says, noting that increasing soil organic matter is another goal.

Steep Learning Curve

Three generations of farmers can be found on both sides of Johnson's family. His great-grandparents began farming in the early 1900s on a small part of the land where Johnson now grows corn, cotton, peanuts, oats, wheat and triticale.

The acreage is split into 800 acres of cotton, 900 acres of peanuts, 100 acres of wheat, 200 acres of irrigated corn, 100 acres oats and 100 acres of triticale. The farm also has about 500 acres of pasture divided into 13 paddocks for 300 commercial crossbred beef cows.

Johnson joined his father in the farming operation in 1979 after high school graduation. Only 4 years later he took over managing the then 400-acre farm for his mother when his father suddenly passed. It was a heavy burden for the 21-year-old, with a steep learning curve.

"I knew I needed some dependable help to keep the farm going" Johnson says. "So, in 1984, I asked my cousin Eric Tew from Atlanta to come and join me."

The two managed the farm for Myron's mother until she retired in 1995. At that time they purchased the farm from her and formed a partnership, J & T Farms.

Tew handled equipment mechanics, while Johnson took care of other areas. The cousins' partnership was quite successful until 2002, when Tew lost a year-long battle with cancer. At that time Myron and wife, Laura, bought out Eric's half of the farm and it became Double J Farms Inc.

Today, Johnson's nephew, Calin, works full-time on the farm and employee Rodney Brown is resident herdsman. Laura handles the bookkeeping and human resources duties.

If You Need It, Invent It

Although the operation has been strip-tilling since the 1980s, it was in 2010 that they converted to a system requiring high residue management (planting cover crops and allowing them to reach full size). This was made possible by inventing a cover crop roller attached to the front of the strip-till rig that allowed them to make one trip in tall residue that flattened the cover crop and made the strips to plant into.

The new strip-till rig replaced four separate pieces of equipment and is used on all crops.

***SHOP-MADE STRIP-TILL RIG.** Myron Johnson invented a strip-till rig with a roller to terminate covers while making strips for cash crops. Blades mounted on the pipe roll down and cut the cover crop in front of shanks that create strips. Rubber closing wheels seal up the seed trench, followed by a set of five rubber tires that are 12 inches tall and 10 inches wide that smooth the soil out.*

The strip-till machine has a crop roller in the front made from 12-inch pipe. Blades mounted on the pipe roll down and cut the cover crop in front of shanks that create strips. Rubber closing wheels seal up the seed trench, followed by a set of five rubber tires that are 12 inches tall and 10 inches wide that smooth the soil back out.

"We wanted a cover crop that produced a large volume of biomass and needed equipment that would help us make a good seedbed with good seed-to-soil contact," Johnson says. "Everything is rolling, all pressing the soil back down.

"We didn't want to use coulters or blades on the rig because we didn't want to incorporate that heavy residue back into the soil and make it hard for the seed to get that good seed-to-soil contact.

"The rubber tires keep the residue on top of the soil, so when we come along with the planter, the sweepers on the planter can move residue over to plant and not move any soil."

Johnson got his unique invention patented in 2014 after a 1½-year patent process, which usually takes 3-5 years. Before beginning the patent process, Johnson talked with an equipment

manufacturer about the roller, but they were not interested. Eventually in 2012, Johnson made a deal with Kelley Mfg. Co. to produce and sell the roller.

Before Double J Farms began strip-tilling, crews were making 3-4 trips across the field with heavy tillage and other soil management. Now they're saving themselves two trips across the field — reducing fuel and labor use and wear-and-tear on the equipment.

Cover Cropping Foundation

Double J Farms plants cover crops on all of their acreage. "We're still experimenting with different cover crop blends and use some blends that have radish and crimson clover," Johnson adds.

The operation's primary cover crop blend is tritacle and wheat or oats. Previously it was cereal rye but they were unable to produce enough seed so they switched to triticale because it would produce the needed seed.

They plant 100 pounds per acre of triticale because it produces good grazing in the pastures for the cattle and the most biomass, which converts to organic matter in the crop fields.

"After planting covers for 3 years, we began to see the soil change and organic matter increase," Johnson says. "When we started, organic matter was less than 1% across the farm. Now, it's close to 3% in nearly 10 years. Some outlier soil samples have even showed organic matter levels of 5%."

"When we started planting covers, organic matter was less than 1%. Now it's close to 3% in nearly 10 years…"

— Myron Johnson

Properties in the farm's clay soils have also shown improvement. Johnson says the soil doesn't tend to harden as much and is much looser. Improvement to water-infiltration rates is obvious as well, as Johnson says he can see this driving down the road past his neighbors' fields.

"If we get an inch of rain, I drive past my neighbors' fields who don't plant cover crops. They're conventional farmers. There will be water standing on the surface of their fields. It will look like a lake," Johnson says. "In fields with cover crops, you won't see any water standing in the field."

The operation also grows its own cover crop seed. Double J Farms found that growing cereal rye for cover crop seed would vary in yield of 10-18 bushels of seed per acre, while triticale would consistently yield 40 bushels of seed per acre, so they switched to primarily growing triticale.

"It was a big change to go from planting rye to triticale," Johnson says. "I'd rather have rye because it produces the most biomass, but triticale isn't far behind. It's got a larger stalk and even though it doesn't get as tall as rye, it's a little thicker."

Because the triticale produces so much seed, Johnson says he now has the ability to plant 100 pounds per acre of cover crop seed — something he wouldn't do because of the cost if he was purchasing it.

Johnson seeds cover in the fall by spreading seed and fertilizer with a spreader truck and covering the seed with a Great Plains 24-foot Turbo-Max vertical tillage machine.

"All of our decisions are based on the fact that we're dryland farming," Johnson says.

Cover crops are terminated in early April with glyphosate, so the soil starts storing moisture before the intense southern summer heat sets in.

Busy All Year Long

Double J Farms started growing cotton in 1989 and the crop has been a great addition to our cropping system, Johnson says. Peanuts and cotton prices usually determine which one Johnson plants more acres of.

Two tons of chicken litter are applied in the fall to give the soil a boost of nitrogen (N) and allow the N more time to break down.

Johnson says the fall is very busy, but in the spring, they don't spend as much time in the field. Corn is planted around April 16 and cotton is finished up by May 10, and peanuts by the end of May.

When corn is at the V4 stage Johnson top-dresses 60 units per acre of ammonia nitrate or ammonia sulfate and 30 units per acre of potash. A second application of 60-80 units per acre of ammonia nitrate or ammonia sulfate and another 30 units an acre of potash is done a few weeks later.

The peanuts are also treated 5-7 times (about every 10-14 days) with 1-1½-pints per acre of chlorophalonil, an organic non-systemic fungicide compound, that is applied through a foliar spray.

Corn is harvested at the end of July, and if the weather isn't too dry the farm may get a second corn crop planted. Peanuts begin harvesting on September 1, and cotton harvest is toward the end of September, often overlapping.

Johnson runs a 2007 John Deere 9996 cotton picker to harvest cotton, and the operation uses a 2015 KMC 3384 and two 3374 model peanut pickers. He uses a John Deere 9660 STS combine for corn harvest.

Any corn not used to feed backgrounded beef calves is sent to a local poultry farm for feed. Cotton is sent to the Moseley International Gin in nearby Abbeville, Ala. Peanuts are sold in Headland at a buying point.

Soil samples on corn fields are taken in the fall after harvest, but soil samples on peanut acres can be taken before harvest.

"The timing of fall planting for cover crops is the main ingredient to the next good commercial crop," Johnson says. "That's where the yield is at. That's why I am committed to getting cover crops in the ground."

3 TAKEAWAYS

1. Don't be afraid to experiment with different cover crop blends.
2. Be patient. Improvements in soil health can take several years to become visible.
3. Twin-row planting can allow you to space out plants at the same seeding rate.

How to Keep Herbicides from Hurting Your Cover Crop Investment

Paying attention to details such as cover crop seed size, herbicide half-life and application dates **can help growers mitigate injury carryover.**

By Scott Reaver
Contributing Writer

While cover crops provide a host of documented benefits, there's a wrinkle in managing them that growers must learn to handle: herbicide use.

Herbicide carryover has ruined many a farmer's cover crop plan, although identifying these cases can be tough because the weather, seeding methods or other issues are often blamed instead.

To change this outcome, growers must change their mindset. "To successfully integrate cover crops, you really have to prioritize their establishment," says John Wallace, a weed scientist at Penn State University Extension.

This ranges from proper time management, herbicide selection, the right seed varieties for both cash crops and cover crops, and even the right seed sizes, Wallace says. And weather conditions play a huge role in carryover.

Herbicide Dissipation

The two primary ways herbicides dissipate after application — thus avoiding or minimizing carryover — are through plant uptake and microbial degradation. Adequate soil moisture speeds up the process, Wallace says.

Additionally, colder soil slows down both uptake and degradation processes. Sufficient sunlight, especially for herbicides on the soil surface, often leads to better degradation. Soils with higher organic matter content will have far better degradation, while there's a greater risk of herbicide residue binding to soil particles in soils with lower soil organic matter, he says.

Wallace cites lack of rainfall during the growing season as the single biggest cause of this problem.

"When we go through periods of drought during the growing season, this increases potential for carryover because we see less plant uptake, so the herbicide doesn't dissipate,'' he says. "We see less microbial degradation so microbes are less active.

"But if we have really good soil moisture in good growing conditions after planting and after application of residual herbicides, those are conditions in which we're probably going to see herbicides dissipate as expected."

Climate Impacts

Adoption rates for cover crops varies depending on the region, rainfall totals and other issues. Wallace notes that rates tend to be higher in the Northeast and mid-Atlantic where climates and precipitation are cooperative.

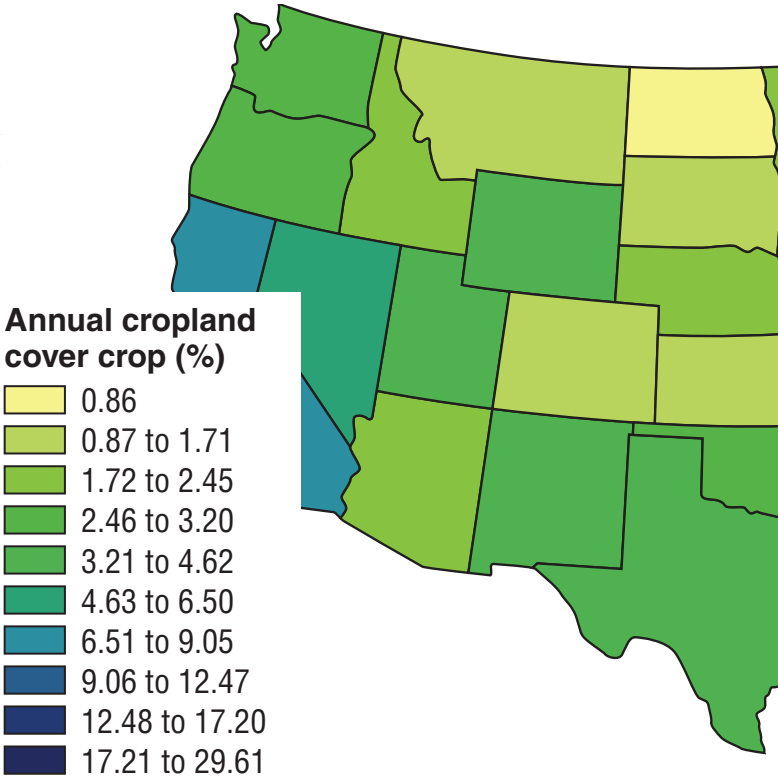
Growers in drier or colder climates, which may have a very narrow window of time for establishing covers, are getting very creative by choosing crops with shorter maturity rates, allowing them to move up harvest dates and sow cover crops earlier.

Interseeding in the spring is one way to provide a better environment for developing a herbicide program while minimizing carryover issues.

More factors are in play during the growing season because the cash crop is still in the ground. If covers are getting injured in the fall 180 days after herbicide application, the interseeding approach could involve applying a pre-emergent herbicide for the cash crop 6-7 weeks before the cover is planted. So 42 days instead of 6 months is a big difference, he notes. Some growers are waiting until corn is between V4 and V6 before interseeding.

Wallace says some growers are opting for shorter-life residual herbicides for both pre- and post-emergent applications and, as a result, possibly reaping a secondary benefit by improving their odds of controlling glyphosate-resistant weeds.

Growers are using a variety of herbicides to maximize chances of controlling weeds while minimizing carryover risk for covers, and using a variety of covers towards the same end.



Wallace warns of danger choosing a cover crop species that is too similar to the targeted weeds for herbicide application, such as a broadleaf herbicide application a broadleaf cover crop is being planted.

"Either use a different herbicide or plant a different cover," Wallace says.

There may be some flexibility in this area because seed size is a factor, too. Wallace says certain herbicides are effective on larger-seeded weeds and others more effective on smaller-seeded weeds.

There is a wide variety of seed sizes among cover crops in the legume family, from larger-seeded Australian winter pea or hairy vetch to the smaller-seeded clovers.

It's also critical to know the key characteristics of the herbicide, weeds and cover crops involved, and Wallace says to never use a pre-mixed herbicide when covers are being seeded. Using a variety of herbicides can be part of the solution, but tailor your applications to each situation, he notes.

"If a cover is too similar to the targeted weeds for herbicide application use a different herbicide or plant a different cover…"

Gauging Half-Life

Growers must also understand the nature of herbicide application rates and when the chemicals will be at half-life or less. To avoid carryover, the shorter the herbicide half-life the better, Wallace says.

For example, a 20-day herbicide after 60 days is at about 12% strength compared to strength at application. But a 60-day herbicide, warns Wallace, would still be 50% strength in the soil after 60 days and would present a danger.

Water solubility of the herbicide is another important factor, says Wallace. Herbicides that are more water soluble tend to be prone to leaching and more likely to remain in the soil, but herbicides that are less water soluble would be more likely to degrade due to sunlight. This would be especially likely if no-till residue is still near the surface.

Wallace points out that soil characteristics likely play a role in carryover of herbicides, and he's seen a greater risk of injury to interseeded covers in regions with lighter soils, such as in the mid-Atlantic area, compared to areas with heavier soils.

QUICK TURNAROUND. *Growers are successfully getting the cash crop out as soon as possible and going back in the field with a grain drill to sow a cover crop. This is especially critical in regions with a short fall growing season.*

Cautions for Grazing Covers

Livestock producers have both their own unique incentives and concerns if covers are part of their grazing or hay-production programs.

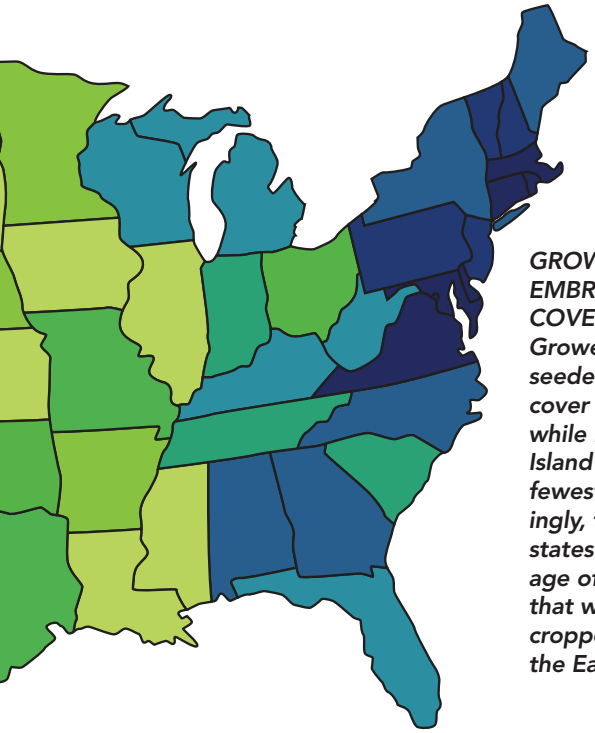
Allowing livestock to graze on cover crops can be a great way to extend the grazing season as the growth of warmer weather living forage slows down. Further, it can be a bonus source of winter forage to be harvested if the cover crop does well.

It also provides the opportunity for healthier animals, as certain covers are very high in nutrition.

The soil benefits from the manure, and certain cover crops can be grazed to termination — maximizing its value to the grower.

Wallace says rotational restrictions are listed on the herbicide label and the restrictions are written with the safety of animal and human consumption in mind. Dairy producers should be especially careful.

A good rule of thumb when planting multiple cover-crop species simultaneously is to always follow the most restrictive rotation interval.



GROWERS EMBRACING COVER CROPS. *Growers in Texas seeded the most cover crop acres, while Rhode Island seeded the fewest. Interestingly, the top 15 states by percentage of cropland that was cover cropped are on the East Coast.*

Source: Soil and Water Conservation Society

3 TAKEAWAYS

1. Seed size can be a factor in herbicide carryover, as certain herbicides are more effective on larger- or smaller-seeded weeds and may have the same effect on different cover crops.
2. Heavier or lighter soils, or those with higher or lower amounts of organic matter, can have an impact on the degradation of herbicides.
3. When planting multiple cover crop species simultaneously for grazing, follow the most restrictive rotation interval.

Adding Organic 'Muscle' to Soils with an Aggressive Cover Cropping Routine

By mixing and matching cover crop varieties, Grant and Dawn Breitkreutz have **boosted soil health and improved organic matter by up to 3 points** in 10 years.

By Sarah Hill
Associate Editor

Change is never easy. Sometimes, it can be just flat-out painful. Third-generation farmers Grant and Dawn Breitkreutz have been implementing big changes on their farm near Redwood Falls, Minn., for the past 2 decades.

During that time, the Breitkreutz family has converted a conventional corn and soybean and a cow/calf operation into a regenerative, multi-enterprise family business.

Change of this magnitude requires farmers to have a willingness to admit their way of farming might not have been the best way. It's also challenging to embrace different farming methods after growing comfortable with conventional approaches for a long time.

Stoney Creek Farm includes 180 Red Angus cross cow and calf pairs, a 750-head custom cattle feeding operation, 465 acres of permanent pasture, 140 acres of no-tilled non-GMO corn, soybeans and wheat and 50 acres of alfalfa. In 2018, the family added a direct-marketing business, selling 70% of their beef to local consumers.

Grant credits Dawn with being the driving force behind changing the way Stoney Creek Farm runs. "She's always been the one questioning why we're doing things a certain way," he says, noting their daughter, Karlie, and son-in-law, Cody, also help with the farm. "Then I sit back and start to think about it. Let's try 30 acres and see how it works."

Grant admits they've made mistakes throughout the transition but been able to learn from many of them to improve the efficiency of their diverse operation.

"If you take the full synthetic production system and switch to a regenerative system all at once, it will be a complete failure for at least 4 years," Grant says. "It was 5 years before we saw the soil start responding to what we were doing."

Figuring Out No-Till

Switching to a no-till system with 3 or 4 crops and incorporating intercropping was the biggest change they've made over the years, Grant says.

"People told us there's no way you can plant green like that and get a successful corn crop," says Grant. "We figured out how to do it, and it works great. Our biggest indicator of success is earthworms.

"We've done the research on our pasture lands. We're at 850,000-1 million earthworms per acre, and in our cropland we're at 1 million-plus earthworms per acre. So, in a cubic foot of soil, we

BIG CHANGES. *The Breitkreutzes configured their no-till drill to interseed cover crops into standing corn rows. Switching to a no-till system with 3 or 4 crops and incorporating intercropping was the biggest change they've made to their operation over the years.*

have 47 or more earthworms."

Rather than planting by date, the Breitkreutz family waits until soil temperatures reach 55 F or warmer at a 2-inch depth. That's usually May 5-10, which is still within their crop insurance parameters and lets them get maximum potential out of the crop.

"We're not going to out-yield our neighbors, but we're still above the county average," Grant says.

The Breitkreutzes save their own non-patented soybean seed for the next year's crop. The non-GMO crop is sold at a premium. "There are local processors consistently paying $1.20-a-bushel more for non-GMO over conventional soybeans," Grant says.

Typical costs of production for Stoney Creek Farm run about $2.59 per bushel of corn produced. Grant notes that most of his neighbors are paying $3.80-$4.25 per bushel of corn.

"Fifteen years ago, our neighbors would stop and ask what we were doing," Grant says. "We'd explain it to them and watch them keep doing what they're doing. We do have many more neighbors who are experimenting with parts of what we're doing.

"Some are reducing their fertilizer use, reducing their herbicide use and increasing cover crops."

Sequestering 'N,' Infiltrating Water

In addition to changes with their tillage system, cover crops also play an important role at the farm. The Breitkreutz family seeds cereal rye, hairy vetch and clover to sequester nitrogen (N) and hold it in the soil for the corn until releasing it late in the season.

"We try to have at least 9 species in every mix. A lot are in there for a specific reason, such as breaking up compaction or gathering and holding nutrients for next year's corn crop…"

They mix their own cover crop seeds using their old feed mixer before putting it into a grain drill to seed. The family prefers to use a cover crop mix of 3 grasses, 3 legumes and 3 forbs.

Commonly seeded mixes include annual ryegrass, cereal rye, triticale, oats, winter wheat, winter barley, turnips, radishes, kale, millet, clover, alfalfa, timothy, rape, Berseem clover and buckwheat. For fields where weaned calves will be turned out, they up the cover crop mix to 14-18 species.

"We try to have at least 9 species in every mix," Grant adds. "A lot of the species we use are in there for a specific reason, such as breaking up compaction or gathering and holding nutrients for next year's corn crop."

Cover crops are terminated with herbicide. Having covers in the system has helped the family reduce herbicide application costs by half. But Dawn hopes to ultimately eliminate that application with another termination method.

"With our diverse cover crop mixes we plan to use a roller-crimper to create a mat on the soil surface so we don't have to use herbicides."

They harvest cereal rye grain as feed, bale the straw to use as bedding in the feedlot and plant that field with another cover crop that can be used for grazing later in the fall.

"A cover crop needs to be managed just like corn or soybeans," Grant says. "For example, if the weather is dry that cover crop needs to be terminated before all the soil moisture is gone."

Measurable Results

The land has responded well to the family's conserva-

MIX IT UP. *The Breitkreutz family prefers to use a cover crop mix of 3 grasses, 3 legumes and 3 forbs, such as annual ryegrass, cereal rye, triticale, oats, winter wheat, winter barley, turnips, radishes, kale, millet, clover, alfalfa, timothy, rape, Berseem clover and buckwheat. For fields where weaned calves will be turned out, they up the cover crop mix to 14-18 different species.*

tion efforts. Grant says there are several fields that have gone from 1.6-1.8% organic matter levels to 4.6-4.8% organic matter in less than 10 years.

"We have some fields where we've documented a 1-point increase in organic matter in only 2 years," he adds. "So we're sequestering carbon and holding it in the soil. We've shown that we can increase organic matter in a short amount of time, but we've transformed the way we farm," Grant says.

The Breitkreutzes also measure their success by the amount of water that can be infiltrated. Grant says that some of their fields can currently infiltrate between 8-12 inches of water per hour.

"Right across the fence on our neighbor's land they're at less than 1 inch of water per hour," he adds. "That's how we've changed the biology in the soil and what it's doing. We've been dealing with massive amounts of water. We don't count on snow for moisture.

"What we've learned is we can infiltrate that snow because our soils don't freeze if we keep them covered with a successful cover crop."

Wildlife also seem to be drawn to the Breitkreutz family's covers. Grant shared a story about a field with 14 different cover crop species that was overtaken by birds for 3 weeks.

"We'd planted that cover crop after a forage crop, with the intention to use it for our weaned calves," he says. "We think the birds were there for the insects. On a calm day, you could literally hear the buzzing from all the pollinators that were out there."

Deer also seem to like grazing on cover crops, too.

"The Minnesota River is a mile north of our farm," says Grant. "We used to have 50-60 deer here in the winters. Twenty years ago, we'd be lucky if we saw three or four deer here. In 2019, we stockpiled a bunch of pastures on the north end of the farm to start calving our cows out on.

"We had 72 inches of snow in two months, and the deer were stuck and basically starving. When the snow finally started to melt and the deer could move, we had 280 head of deer show up and ate everything we'd stockpiled for our cows."

"On our cropland, we're at 1 million-plus earthworms per acre. In a cubic foot of soil we have 47 or more earthworms..."

— Grant Breitkreutz

In 2019, the Breitkreutzes harvested their cover crops as grain for feeding their livestock instead of terminating them and planting corn.

"It's actually opened up the diversity of things we can do on our farm," Grant says. "Our goal is to push until we can drill corn with no synthetic fertilizer, and we're very close right now."

Year-Long Intensive Grazing

A year-long intensive-grazing system keeps the cattle fed even during Minnesota's tough winters. Grazing paddocks are 4-5 acres, and the herd is split into groups of about 50 per paddock. The farm has 19 watering stations spread across 27 paddocks.

"We've learned that when we bring our calves home from where they're out grazing all summer long, we try to keep our calves still grazing something that's very high in nutrition with the same water supply," he says.

During winter grazing, the Breitkreutzes prefer to turn cows out on a former row crop field, which is usually corn stalk stubble.

"We move the cows, instead of moving the manure with a manure spreader," Grant observes. "When we first brought 58 cows home, we burned 400 gallons of diesel fuel hauling out manure. Now, we still may use diesel to haul feed to the cows, but we're not hauling manure and we're handling 4 times as many cows."

The family does not buy any extra feed for their cattle. If feed stocks begin to run low, they select animals from their herd to sell instead. Some calves are sold to other feedlots, as the Breitkreutz family does not have the facilities or time to finish them out.

Dawn notes that when fields lack diversity, the cattle require a larger number of acres to graze in order to meet their nutritional needs. Grant says that they utilize brix soil testing to help determine how many acres to provide for grazing.

"We know if we're at an 8 or higher, we're at a pretty high nutrition level," he says. "It's something I never thought I would use in school, and now we use it every day."

3 TAKEAWAYS

1. A diverse cover cropping program can help improve organic matter content. The Breitkreutzes saw theirs increase more than 3 percentage points during a 10-year span.
2. For farms with livestock, consider harvesting cover crops to use as feed, rather than terminating them or planting green the following spring.
3. Mixing your own cover crop seed can be both efficient and economic. The Breitkreutzes use a mix of 3 grasses, 3 legumes and 3 forbs — each with a specific purpose, such as breaking up compaction or gathering and holding nutrients for the following year's crop.

COVER CROP STRATEGIES ON THE 'NET

A roundup of the most prominent cover cropping trends, tactics and tips from CoverCropStrategies.com.

BLOG

Fight Back Against Nematodes with Cover Crops

Sarah Hill, Associate Editor

Nematodes. Some types of these microscopic roundworms can be beneficial, but some are also parasites, causing serious damage to plant roots or even killing crops.

There has been some research published about the ability of cover crops to manage plant-parasitic nematodes, since the roundworms can only move very short distances on their own. But they've also raised questions about whether covers can serve as a host.

If you have a field with a nematode problem and plant covers, you should be very particular about which cover crop species you choose to plant in that field, selecting species that do not host nematodes.

PODCASTS

COVER CROP STRATEGIES PODCAST

Learning From Cover Crop Failures

Like all aspects of farming, growing cover crops doesn't always go as intended. Pennsylvania cover crop expert Steve Groff says that how cover croppers react to failure is critical for learning and doing better the next time. Groff shares ideas on how to deal with several areas where cover cropping can go awry, including weather, herbicides, equipment and management, and shares stories from his own cover crop failures.

Ask Your Cover Crop Seed Dealer the Tough Questions

Buying cover crop seed should be a transaction that benefits everyone involved — the grower and the seed dealer. That means asking the right questions to get the product you want and need for your operation.

SUMMIT

NATIONAL COVER CROP Summit©

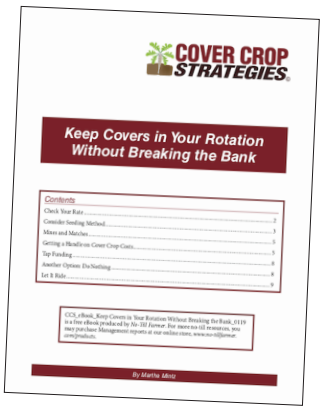
In March 2019, more than 3,000 attendees from all 50 states and 45 countries attended the first-ever National Cover Crop Summit, a free online event teaching farmers how to unlock the full potential of a cover crop system. Due to overwhelming attendee feedback, for 2 days only, March 18-19, 2020, the editors of *Cover Crop Strategies* are hosting the second National Cover Crop Summit.

During this free online event, 10-plus educational video presentations featuring top cover crop experts will be available for on-demand viewing, allowing attendees to choose speakers and sessions they are most interested in, ask questions and participate on their own schedule. Get more information and register at www.CoverCropStrategies.com

eGUIDE

Keep Covers in Your Rotation Without Breaking the Bank

Corn prices are down at the current time, which forces farmers to find ways to decrease input costs. Though cover crops are important and vital for the protection and improvement of soil, they also seem to get caught in the crosshairs of money-saving strategies.



Experts say some farmers have been overdoing the seeding rates for cover crops, spending entirely too much money without much of an outcome. So, what's the perfect balance? How does a farmer gauge whether or not enough seeds are being planted? What is the minimum amount of seeding needed so costs can be reduced?

How you seed your cover crops can greatly impact the rate that is needed to maintain them. The expense of equipment itself also greatly affects the rate, as any extra expense of a custom application can be detrimental to your pocketbook.

VIDEO

Testing Cover Crops' Ability to Hold and Release Nutrients

Trey Hill of Harborview Farms in Rockhall, Md., talks about the cover crop test plot they're working on with University of Maryland soil scientist Ray Weil.

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