

# *The Land Stewardship*



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## *Letter*

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How one state became the king of the cover crops (page 24).

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# King of the Cover Crops

*An Indiana initiative has made the state a national leader in getting continuous living cover established on crop acres. Can it change the way farmers view soil?*

By Brian DeVore

Michael Werling is, literally, a card-carrying *connoisseur* of soil health.

"I call it, 'My ticket to a farm tour,'" says the northeastern Indiana crop producer, showing off his business card. The words on the "ticket" leave little doubt what is in store for the lucky holder who chooses to redeem it. Headings at the top say, "My soil is not dirt" and, "My residue is not trash." A third bold line of script across the middle reads, "For Healthier Soil and Cleaner Water Cover Crop Your Assets and 'NEVER TILL.'" Buried at the bottom as a bit of an afterthought is Werling's contact information. Given his excitement over the world beneath his feet and how to protect and improve it, maybe it makes sense the farmer's card relegates his address and phone number to footnote status—soil is his identity.

Spend enough time on a soil health tour in Indiana these days and one is likely to run into a lot of farmers like Werling. Perhaps that's no surprise, given that events like this tend to attract true believers in the power of healthy humus to do everything from create more resilient fields to clean up water.

But what sets Indiana apart is that it's home to an initiative that has found a way to take the passion of farmers like Werling and use it as an engine for driving change on a whole lot of farms whose owners may not be card-carrying soil sophisticates—they're just looking for ways to cut fertilizer costs and keep regulators off their backs, all the while remaining financially viable.

Werling is one of a dozen "Hub Farmers" located across Indiana who are at the core of one of the most successful soil health initiatives in the country. In just a few short years, a public-private partnership called the Conservation Cropping Systems Initiative (CCSI) has helped get around 8 percent of the Hoosier State's crop fields blanketed in rye and other soil-friendly plants throughout the fall, winter and early spring—times

when corn and soybean fields are normally bare. No other Corn Belt state is even close to having that high a percentage of its land protected with continuous living cover. Indiana's success has farmers, soil scientists and environmentalists across the country excited about the potential CCSI holds as a national model. But first, one key questions needs to be addressed: can a state parlay all of this interest in one conservation farming technique—in this case cover cropping—into a holistic embrace of a larger soil health system?

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### A Corn Belt Leader

As of this fall, just under one million acres of Indiana farmland is planted to cover crops, according to transect surveys done

acres of cover-cropped land, estimates Sarah Carlson, who works for Practical Farmers of Iowa and is a nationally recognized expert on cover cropping. That means around 2 percent of that state's cropland is protected outside the regular growing season. Updated, accurate estimates of cover cropped acres in other states are hard to nail down, but the latest U.S. Agriculture Census shows Minnesota, Illinois and Ohio have, respectively, around 400,000, 300,000 and 360,000 acres in cover crops. None of these states have more than 4 percent of their cropland cover cropped, which is half Indiana's 8 percent figure. In addition, the average Indiana farm growing cover crops has devoted 113 acres to the practice, while that figure is 72 acres in Minnesota and 53 acres in Iowa, according to the Agriculture Census.

The Ag Census figures are from three years ago, and a national cover crop survey coordinated by the USDA's Sustainable Agriculture Research and Education program during the past few years shows cover cropping is generally trending upwards from those 2012 levels. But no Corn Belt state is trending higher, or faster, than Indiana.

A decade ago, around 20,000 acres of the Hoosier State's farmland was cover-cropped, and as recently as 2013, that figure was around half-a-million acres. University of Maryland soil ecologist Ray Weil has visited



A recent CCSI field day included presentations by seed and implement dealers, as well as businesses that provide turn-key cover cropping services. "The farmers overwhelmingly get their information from the co-op and fertilizer dealers," says cover cropping expert Sarah Carlson. "You have to bring them into the picture." (LSP Photo)

by government agencies. There are approximately 12.5 million acres of cropland in Indiana and the state has a long ways to go before the majority of land is protected with continuous living cover, but it's already light years ahead of its compatriots in other parts of the Corn Belt.

Iowa, by contrast, has just over 500,000

the state numerous times to give presentations, tour farms and scramble around in soil pits. He recalls a drive he took in the state during the winter of 2012. "We must have passed a couple thousand fields and I counted two cover cropped fields," he says.

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On his most recent visit to the state this summer, Weil was impressed at how much progress had been made in the intervening years. “Indiana seems to be leading the change,” says the scientist. “On paper it doesn’t make any sense. It has nothing to do with climate and soils.”

But it does make sense when one takes a closer look at Indiana’s intensive team effort to get more of its land growing plants (and roots) for more than a few months out of the summer.

## Roots in No-Till

The Conservation Cropping Systems Initiative consists of federal, state and local natural resources agencies working with farmers and an array of private businesses, from fertilizer and seed companies to implement dealers. Barry Fisher, a soil health specialist for the USDA’s Natural Resources Conservation Service (NRCS), says CCSI is rooted in a statewide program that began in 2002 and focused on promoting and supporting no-till farming. What he and others discovered during that program’s run was that successfully making a major change like no-till is more complex than buying a new planter or modifying field work schedules. The transition years are critical, especially since a major deterrent to no-till adoption is its reputation for causing a drop in crop yields. Going cold turkey on tillage may produce conservation benefits on the surface, but the soil underneath is likely to be so biologically unhealthy that it lacks the ability to carry out basic functions like provide nutrients and minerals to plants while making good use of water.

“You’re going to struggle in any system if your soil fails to function,” says Fisher.

That’s when he and other soil conservation experts realized they were going to have to focus on soil health in general, and not just one tool or method, such as no-till.

So in 2009, CCSI was born. Under the leadership of Indiana NRCS state conservationist Jane Hardisty, the initiative used federal funding to develop a core group of specialists who were given advanced training in soil health development. They were even sent to Burleigh County, N. Dak., which has become the model for advancing soil health on farmland utilizing a teamwork approach (see the Land Stewardship Letter, No. 3 and No. 4, 2012).

Back in Indiana, these specialists then formed their own regional soil health teams, or Hubs, which consist of farmers, soil and water experts and Purdue University Extension educators, among others. At the heart

of CCSI’s work are the workshops and field days it puts on, many of them at working farms. It organizes around 60 such events across the state a year, drawing around 6,500 farmers and certified crop advisers.

Talking about the importance of protecting our soil is nothing new in farming. But the explosion in interest in the biological aspects of soil health in recent years has added a new wrinkle that CCSI has been able to take advantage of. By supercharging that biological activity, farmers can go beyond just putting in a terrace or a grassed waterway to cut surface erosion. They can actually have a positive impact on their entire field’s ecosystem using homegrown creativity—an affirming message that they are in the driver’s seat.

“That’s been a real game changer—the language we use to talk about this stuff,” says Ryan Stockwell, senior agriculture program manager for the National Wildlife Federation. Stockwell has been involved in soil health trainings in Indiana, and utilizes cover crops on his own Wisconsin farm. “Now that you talk about soil structure, all these benefits from soil health, it creates a lot of excitement. Indiana was just primed to take advantage of that.”

A major focus of CCSI, and it’s biggest source of success, has been one particular soil health tool: planting cover crops to protect fields during the “off-season” for corn and soybeans.

“In my 30 years in this job, very few practices have taken off so exponentially,” Fisher says of cover cropping.

Getting farmers excited about such things as soil bacteria, root interactions and organic matter is one way to avoid the trap of farmers seeing planting some rye after corn harvest as the end-all solution. Whenever CCSI team members get a chance, they emphasize it’s just one tool—albeit an important one.

“We almost never just talk about cover crops. You better be willing to adjust your pest management practices, your nutrient management practices,” says Fisher.

In other words, CCSI isn’t just laying out a menu of innovative practices producers can pick and choose from—it’s trying to change the very nature of how farmers view soil. “If you can’t trigger the ‘want-to’ in a farmer, all the data won’t do any good,” says

Fisher. “It’s almost an emotional response.”

But farmers have to start somewhere on the road to building their soil’s biology, and invariably that means experimenting with planting a few acres of small grains or some tillage radish. Like soil health initiatives in other states, CCSI has made extensive use of providing government cost share monies so farmers can establish cover crops. But Fisher says their experience with promoting no-till taught them an important lesson about the need for going beyond just subsidizing some seed or equipment.

“If we threw out cost-share money for 40 acres and didn’t help them in that transition to a new system, they would fail and say, ‘I’ll never do that again,’” he says, adding that even if the farmer was initially successful, the experimental practice has to be sustainable long after the government money is gone. “It can be a train wreck if you don’t provide technical support.”

## Customer Support

That’s why from day one, CCSI’s strategy was to create the same kind of support network farmers enjoy when they pursue more conventional farming practices. That meant not just having government technicians available in each region to help with the basics of bringing the soil back to life.



**Barry Fisher (right) shown with farmer Clint Arnholt, who has integrated cover crops into his no-till system. Fisher says he and other soil conservation experts realized that focusing narrowly on one practice such as no-till resulted in a soil ecosystem that wasn’t functioning properly. (LSP Photo)**

It also requires teaming up with the players that farmers are comfortable working with on a daily basis: fertilizer suppliers, seed dealers, co-ops, crop advisers and implement companies.

“The farmers overwhelmingly get their information from the co-op and fertilizer dealers,” says Iowa’s Carlson. “You have to

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# Continuous Living Cover

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bring them into the picture.”

Fisher and the other CCSI coordinators have done just that. At first it was a bit of a hard sale to get input suppliers on board with promoting cover cropping, since it's a technique that can eventually result in reducing demand for the fertilizer, chemicals and other products they are in the business of supplying. But in the early years of the initiative, Fisher visited businesses throughout the state and talked about how helping farmers build healthy soils can open up new markets—they need to purchase cover crop seed from someone, for example, and chemical applicators can be modified to spread seed.

Betsy Bower agrees. She's an agronomist for CERES Solutions, which provides everything from grain handling and agronomic services to fuel and crop insurance to farmers via 22 locations, mostly along the western edge of Indiana. She says her company started getting into the cover cropping business five or six years ago as a result of customer demand.

“They were coming to us as their trusted adviser,” she recalls. “What do you think we ought to do? What are the various rates? How do we control weeds? As cover crops become more popular, it's going to be in our best interest to learn along with them.”

Bower says the company now offers an array of cover cropping services, from soil tests and species selection advice to planting and termination. She estimates cover cropping now make up between 5 percent and 10 percent of the company's business, depending on the branch location. One thing cover cropping does is allow firms like CERES to keep their applicator drivers busy at a time when they would normally be idle or under-utilized. They can apply chemicals and fertilizer in the spring, and cover crop seed in the late summer and fall.

Another key player in CCSI's success is implement companies, which not only sell the planters to put on cover crop seed, but can offer custom field work or modify equipment for seeding. Adam Fennig with Fennig Equipment in Clearwater, Ohio, says

that the interest in modifying tillage equipment so that it could plant cover crops “exploded” around 2010. His family's company specializes in mounting seed boxes, drop tubes and deflectors on vertical tillage tools. He does some 60 modifications per year, mostly in Indiana, Ohio and Illinois, and the custom enterprise makes up about 30 percent to 40 percent of the firm's business.

“But that's about to change in a big way,”



**Soil pits are showcased at many CCSI field days. They not only provide a visual clue as to how key root systems are in building soil health, but can reveal what impacts above-ground farming practices are having deep down. (LSP Photo)**

Fennig says excitedly, estimating that perhaps as much as half of their business will be related to modifying equipment for cover crop seeding by the end of 2016. That's because more farmers are starting to report back major benefits from planting cover crops: everything from reduced soil compaction to yield increases. Many of those reports are emerging firsthand at CCSI field days and workshops.

Fennig says another factor is that there's a lot of buzz these days around modifying “high-boys” into cover crop seeders. These are the gangly, skinny-wheeled chemical applicators that can drive through standing corn late in the season without damaging the stalks. In a “swords into ploughshares” kind of trick, mechanics are tweaking high-boys so they can seed cover crops into corn in August, providing a jumpstart on fall growth.

“That's going to push things hard,” Fennig says of the expanded high-boy sprayer modification business. “I think 2016 will be our biggest year yet.”

Fennig and Bower credit CCSI for not

only providing them the information they need for providing the proper cover cropping support, but for creating the interest in this technique on the part of farmers.

“We keep in close contact with Barry Fisher and he lets us know of events in the area,” says Fennig. “We try to participate when we can, because Barry can always draw a crowd.”

Indeed, the agribusiness support arm of farming was on display at several well-attended CCSI field days held this past August across the state. At Moody Farms, a large cropping operation in northeastern Indiana near the Ohio and Michigan borders,

seed company representatives showed off an impressive array of miniature cover crop plots: crimson clover, Austrian winter peas, hairy vetch, radish, rape, turnips, kale, Ethiopian cabbage, sunflowers, annual ryegrass, cereal rye, oats, pearl millet, triticale and winter barley. As participants walked past each planting, their advantages and disadvantages were described in detail.

Nearby, Adam Fennig stood next to a tillage implement that had been modified into a cover crop seeder and described how the process works. A shiny red high-boy sat a few yards away and another implement expert described being able to use it to plant cover crop seed in corn that's “14 feet high.”

## Digging into the Science

An argument could be made that another form of support—an input supplier so to speak—farmers rely on is agricultural science. And helping farmers unearth some of the wonders beneath their feet can take them beyond just focusing on one tool like cover cropping. During a recent series of summer CCSI field days, soil ecologist Ray Weil repeatedly drove home the point that soil is more than a growth medium for corn, soybeans and a few small grains or brassicas.

“You can't just throw out cover crop seed and keep doing what you're doing,” he says at one point while standing in a four-foot pit that's been back-hoed out of a southern Indiana cornfield. As farmers and crop advisers gather around the trench, Weil uses a hunting knife to point out where fat corn roots are tracing their way through the profile. Roots are a key part of Weil's lesson today. It's Aug. 20, and just a few days before, the owners of the field, Clint and Dan

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Arnholt, had used a high-boy to seed radish and rye into this stand of corn, which is well above everyone's head. Weil estimates there can be a couple hundred pounds of unused nitrogen at the four-foot level, and corn is inefficient at making use of it. Within three or four weeks of planting the rye and radish, their roots will be soaking up the excess nitrogen while bringing other nutrients and minerals closer to the surface.

Fisher and the CCSI team had brought Weil to the state for a week of field days and presentations like this because of his reputation as one of the nation's leading soil ecologists, someone who can put cover cropping in perspective as just one tool for attaining soil health.

Soil pits play a major role in such field days. Seeing radish roots "bio-drill" through what was thought to be an impenetrable soil hardpan caused by years of plowing, wheel traffic and lack of biological activity can be a real eye-opener.

Michael Werling, the northeastern Indiana farmer, recalls when a soil pit dug in one of his more marginal fields revealed that his use of cover cropping, no-till and crop rotations had built up the organic matter to the point where a soil expert determined he had slightly modified his soil type.

"He said he would have to reclassify the soil," says Werling proudly while checking out a soil pit at another farm during a CCSI field day. "That's pretty encouraging."

During what was affectionately termed "Ray Days," Weil spent a lot of time in soil pits from one end of the state to the other, talking about the latest innovations in soil science. He should know: besides doing cutting-edge work on the impacts various farming techniques have on soil, Weil is the co-author of the seminal textbook, *The Nature and Properties of Soils*.

Whether standing in a hole or giving a PowerPoint presentation in a farm's cavernous machine shed, Weil has a consistent message: the science of soil is in flux, and farmers can be on the cutting edge of this exciting revolution. He describes how cover crop roots not only go vertical in search of moisture and nutrients, but send branches in a horizontal pattern. Weil has utilized the same cameras that are used in colonoscopies to trace root channels—it doesn't get any more cutting-edge than that. Of particular interest to soil scientists these days is the role mycorrhizae fungi can play in building soil health. By interacting with a plant's roots in

a symbiotic fashion, such fungi can create a diverse biological universe that's resilient and able to cook up its own fertility.

"We're finding out plants send out all sorts of signals underground," says Weil at one field day, citing a recent study that



**Soil scientist Ray Weil: "You can't just throw out cover crop seed and keep doing what you're doing. You need to change your system, you need to think flexibly." (LSP Photo)**

showed older corn hybrids were sending out a signal when besieged by corn rootworm to recruit nematodes to attack the pest. "That's pretty cool. That's the way nature works. We didn't really appreciate the role of roots in building soil until relatively recently."

His point, which is reiterated by the soil pits: it's not enough to look at the surface of the soil—take a peak underground as much as possible. In fact, more than once Weil admits to farmers with embarrassment that while revising the latest edition of his textbook he had to re-write the section on organic matter. It turns out farmers can have a bigger influence on their soil's organic matter than scientists once thought.

But Weil has another critical message: we don't need to understand the minutiae of how soil protozoa and bacteria interact in order to benefit from it. The key is diversity, which provides the habitat for these interactions to thrive.

"If we can encourage the diversity, we can encourage the workings of this system, even if we don't understand all of it," says Weil. "Nature will sort it out."

It's an effective message for a group that is a mix of veteran cover-croppers and newbies. At each field day and presentation, farmers nod their heads in agreement with Weil's point that we're all along for a ride on a train pulled by an exciting, if sometimes baffling, ecological engine. This conversation is going way beyond just providing tips on the best seeding rates for rye and turnips.

One of the farmers agreeing with Weil is Gordon Smiley, who farms 1,200 acres of

row crops with his brother Jeff in southern Indiana. For the past few years, the Smileys have been using cover crops, and despite a few hiccups along the way, now feel they are an important part of their farm. They have a farrow-to-finish hog operation and the cover crops offer a way to soak up excess nutrients and reduce runoff. Gordon says their soil has a crumbly, mellow texture and is full of earthworms.

"What convinced me was the shovel test—digging and seeing the soil underneath," he says while standing in the shade of a machine shed several yards from a soil pit where Weil has just finished one of his presentations.

So far the brothers have focused mostly on planting a single species like rye as a cover crop, but Smiley says he's excited to move to the next level of soil health and try cocktail mixes of as many as 10 species. He's been watching online soil health videos and attending CCSI field days.

"They're way out there," he says of the innovators in soil health he's been observing and interacting with. "We talk about mycorrhizae fungi, we talk about all the bacteria." Then he throws his hands in the air to symbolize lots of activity going on at once. "It's exciting." □

*The next issue of the Land Stewardship Letter will describe how the Conservation Cropping Systems Initiative is using "rock star" farmers, the threat of environmental regulation and economic reality to create a culture of cover cropping, and hopefully, soil health improvement, in Indiana.*

## Give it a Listen

Three recent episodes of the Land Stewardship Project's *Ear to the Ground* podcast ([www.landstewardshipproject.org/posts/podcast](http://www.landstewardshipproject.org/posts/podcast)) feature the voices of people involved with Indiana's Conservation Cropping Systems Initiative (CCSI):

- **Episode 173:** Soil health specialist Barry Fisher talks about the team approach that anchors CCSI.

- **Episode 174:** Soil scientist Ray Weil discusses why Indiana's "bottom up" approach to soil health is preferable to the "top down" strategy being used in his home state of Maryland.

- **Episode 175:** Indiana farmer Gordon Smiley describes his experience with cover cropping and why he's so excited about the latest science related to soil health.

# A Hub of Soil Health Activity

## Early Adopters Attempt to Take Their Message to the Next Level

By Brian DeVore

It's an overcast August morning in northeastern Indiana, and in a massive machine shed well stocked with the tools of a modern row crop operation, some 60 farmers are being reminded that growing corn and soybeans is about more than iron, oil and chemistry. The reminder comes in the form of a question from Dan DeSutter, who raises corn and soybeans in the west-central part of the state.

"How many of you raise crops with no livestock?"

The majority of hands in the room shoot up.

"So you say," responds DeSutter. "We're all livestock farmers when it comes to soil biology."

He is a key component in an integrated approach to saturate Indiana farmers with a simple, and yet in some ways radical notion: your soil is alive and all those microbes need to be fed with living roots and biomass 365-days-a-year, or it will starve, producing fields that are too sick to resist wind and water erosion, prone to drought and eventually unable to produce decent yields even when receiving heavy applications of petroleum based fertilizers.

DeSutter is one of a dozen "Hub Farmers" around which one of the most innovative soil health initiatives in the country revolves. Over the past seven years, the Conservation Cropping Systems Initiative (CCSI) has spread the gospel throughout the Hoosier State that soil health is integral to the long-term economic and environmental sustainability of agriculture. The clearest evidence that CCSI's message is hitting home is the amount of Indiana farmland planted to soil-friendly cover crops in just a few short years. According to transect surveys, by fall 2015 around one million acres of land in the state was planted to small grains, brassicas or other

non-cash crops as a way to protect (and feed) the soil before and after the regular corn-soybean growing season. A decade ago, around 20,000 acres of Indiana's farmland was cover-cropped, and as recently as 2013, that figure was roughly half-a-million acres. One million acres represents about 8 percent of Indiana's total crop acres, and is more than double the percentage of cover crops found in any other Corn Belt state. That's exciting: cover crops have shown they allow fields to make

better use of precipitation and build organic matter, producing resilient soils that reduce dramatically the amount of fertilizer runoff and sediment sent into our water. Research is also starting to show that cover cropping can increase yields in corn and soybeans, particularly during years when excessively

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NRCS soil health specialist Barry Fisher (left), shown with "Soil Hub" farmers Dan DeSutter and Michael Werling at a recent CCSI field day. "Presenting all the data in the world does no good unless a farmer you respect is sharing his own experience," says Fisher. (LSP Photo)

dry or wet weather predominates. Farmers utilizing no-till production also find cover crops reduce the "yield drag" that comes with converting from a tillage-based system.

Despite the multiple benefits produced by cover cropping, overall U.S. farmers have been reticent to adopt it on a widespread basis, citing everything from narrow planting windows and ignorance around how to handle the crops to lack of seed and equipment. One estimate is only around 2 percent to 3 percent of U.S. cropland is regularly cover cropped. That's a concern—although cover crops are only a single tool in the soil health

toolbox, they are considered a key "gateway practice" into a more holistic approach to managing soil biologically. Cover the land all year-round, and other ecologically-based arts will follow.

That's why Indiana's success with getting so many acres planted to continuous living cover in a relatively short amount of time is seen as a national model for replacing the philosophy of treating soil as simply a stand for holding up a plant, rather than as a living entity. As a sign of its potential to influence conservation on a national scale, Barry Fisher, who helped coordinate CCSI from its inception, was recently promoted to be the Central Region Leader for the Soil Health Division of the Natural Resources Conservation Service (NRCS), where he coordinates a soil health technical exchange for conservationists, farmers and partners throughout the Corn Belt and Northern Plains.

The arrival of the CCSI model onto the national farm conservation stage offers an opportunity to examine how exactly the initiative has succeeded in getting so many farmers to take a key step away from simply "feeding the plant" and toward "feeding the soil." At the core of the initiative are the Hubs, which are basically multidisciplinary teams spread across the Hoosier State. These Hubs are made up of local and state govern-

ment conservationists, Purdue University extension educators, soil scientists, agronomists, and, just as importantly, representatives of agribusiness firms: implement and seed dealers, crop services providers and crop advisers. The last issue of the *Land Stewardship Letter* examined the role partnerships with agribusinesses play in helping farmers act on new information they are gleaming from the exploding field of soil health science. But the key members of these Soil Health Hubs are farmers like DeSutter. They serve as models of what soil health can look like on the ground, as well as a reality check that improving soil biology isn't about throwing some rye seed on the ground—it's ultimately an integrated approach that can drive how decision-making is done on a farm.

### The Farmer Next Door

As a soil health specialist for the NRCS, Fisher is well aware of the importance of building soil biology. However, it's become evident in recent years that even when individual farmers acknowledge that fact, it's easy to get overwhelmed with all

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the information out there. Plus, much of the information on practices such as cover cropping is from parts of the country with different climate conditions, soils and crop mixes. North Dakota's Burleigh County, for example, has become the center of the soil health universe, with farmers like Gabe Brown becoming YouTube and lecture circuit stars talking about how they raise organic matter utilizing a combination of no-till, cover cropping and mob grazing. But the growing conditions in North Dakota are dramatically different from what's found in a state like Indiana.

"Presenting all the data in the world does no good unless a farmer you respect is sharing his own experience," says Fisher.

That's why when CCSI was created in 2009, one of the first things Fisher and the other organizers did was recruit farmers who had a particular interest in soil health and kept good records they were willing to share. These farmers had to agree to host field days and travel to events to talk about their own experiences. CCSI trained them in presentation skills and pays a stipend to cover transportation costs and other expenses. There are also "affiliate" farms that host field days, further helping tell the story.

The added component to the Hub concept is that member-farms are involved in an ongoing study where information is being collected from their operations on economics, fertilizer use, yields, and, of course, the health of their soil. Beyond that, CCSI is collecting information from affiliate farms, as well as research farms operated by Purdue University and local Soil and Water Conservation Districts.

The Hub Farmers represent a wide range of acreage, methods and growing conditions. DeSutter farms 5,000 acres near the Illinois border, so he has many of the conditions found throughout the middle of the Corn Belt. Michael Werling, on the other hand, raises 320 acres of corn and soybeans, as well as oats for the local Amish market, on the opposite side of the state near Ohio, putting him in the eastern Corn Belt.

But no matter where they are located, the Hub Farmers share a similar passion for improving soil health. To stay connected they usually meet face-to-face for two days every year. The first day is just the farmers; the second soil experts and agency people are invited to join the discussion.

"Somebody starts a topic and it goes onto something else, then those ideas go out to the wider world and other farmers," says Werling. "I love that."

The Hub network can serve as a sounding

board for proposals that might seem a little "out there" for the conventional ag community, a not-ready-for-prime-time safe place for ideas generation, according to Werling. One topic Hub Farmers are discussing these days is the idea of seeding cover crops at the same time that nitrogen fertilizer is applied as a side dress during the growing season.

Werling, who has been using a combination of cover cropping and no-till (he calls it "never-till") so successfully the past several years that he has actually changed the soil type on some of his more marginal fields, acknowledges that he is more fixated on the biology beneath his feet than the average Indiana farmer. That's why he appreciates the chance to throw new ideas around amongst a group of people who are as committed to soil health as he is.

Like a support group?

"That's a good way to put it," Werling says with a laugh.

### Agents of Change

In some ways, the Hub concept is similar to how farm innovations have been germinated and broadcast in farm country for generations. A famous 1941 study conducted in Greene County in central Iowa traced the adoption of hybrid seed corn during the 1930s. On the face of it, the adoption of this new technology appeared to be a relatively overnight success—in 1927 it was considered an experimental product not seen outside of college research plots; a decade later it was almost universally planted by Iowa farmers. But through extensive interviews, rural sociologists discovered that the majority of farmers did not accept the innovation immediately, but rather "...delayed acceptance for a considerable time after initial contact with innovation."

Awareness of an innovation does not always result in immediate adoption—many Iowa farmers who put off planting hybrid seed for years were first made aware of its existence at the same time as their early-adopting neighbors. Although the widespread acceptance of hybrid seed corn over a few year's time is impressive, it's striking that some farmers did not adopt it until a full 10 years after their innovative neighbors.

It turns out these early adopters served a key role: they were willing to jump in feet first and test this innovation on their own land almost as soon as they heard about it, and they shared the results with their neighbors in a kind of community laboratory setting. Seed salesman may have been "introductory mechanisms" for hybrid seed, but early adopting farmers were the "activating agents," according to the researchers.

Another important lesson from Greene County is that even after hybrid seed had

proven itself on a neighbor's farm, later adopters insisted on experimenting with it personally on just a few acres before making a full conversion.

CCSI's Hub Farmers are early adopters: people who are trying something new because of a love of innovation and personal goals they've set for their operations. But they don't necessarily have a vested interest in seeing their neighbors make a conversion.

"I talk about what I do as a farmer," says Werling of his presentations at workshops and field days. "I don't sell seed. I don't sell fertilizer. I don't work for the government. I think that's an advantage."

Werling's passion for soil health is palpable, and one can't help but catch his excitement when he talks about using crop rotations, no-till and cover cropping to make even his poorest fields productive.

But passion about the soil universe isn't enough, and he knows it. If the majority of Indiana's farmland is going to be planted in continuous living cover, CCSI needs to reach the bigger farmers out there. At one recent field day the farmers present represented control of some 300,000 acres, according to an impromptu survey. When the co-op agronomists and crop advisers attending were included, a total of 600,000 acres was represented.

"I don't know if they understand the soil health so much," says Werling of some of the larger farmers. "But there is a lot of excitement over cover crops."

Those bigger operators may not be watching YouTube videos on mycorrhizae fungi, but we all have to start somewhere, says Fisher. A farmer starts seeing that a cover cropped field requires less nitrogen or yields well in droughty conditions, and then maybe later takes other steps to avoid doing the kind of damage that impedes soil health. What CCSI is doing is not only supporting the early adopters out there, but providing an infrastructure for those later adopters who are being activated by those early examples and want to start experimenting on their own farms. Technical expertise, connections with agribusinesses that can provide the seeds, equipment and even planting services for cover cropping, on-farm monitoring, cost-share funds to get started on a small scale—these are all offered through the CCSI Hub system.

Ryan Stockwell, a senior agriculture program manager for the National Wildlife Federation who has been involved in soil health trainings in Indiana, says that larger acreage farmers showing up at field days is a sign that CCSI's "saturation coverage"—it puts on around 60 field days annually—is

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# Continuous Living Cover

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starting to change the culture.

“What the Hub Farmers do by bombarding farmers from every angle is make it impossible for them to ignore the message,” he says. “The late to middle adopters are being reached.”

## Unearthing Economics

Maybe those later adopters are being reached, but as Greene County’s hybrid corn example shows, awareness does not guarantee full adoption. Fisher says the majority of farmers agree a practice like cover cropping makes conservation sense, but it also has to pencil out financially. That’s why the Hub Farmers were chosen not only for innovative attitudes toward soil management, but also for their ability to track financials and willingness to talk about them.

Dan DeSutter, the west-central Indiana farmer, fits the role perfectly. A former financial analyst and commodity broker, he knows how to track trends, talk numbers and sniff out inefficiencies.

One day while standing in a trench fixing a tile drainage line, DeSutter noticed that roots from the rye cover crop a Purdue University researcher was studying on his family’s farm were boring at least four feet deep into the soil. Such “bio-drilling” was impressive, given that over the years the DeSutters had been putting a lot of effort into using a ripper to break up compaction.

“That was my aha moment,” recalls DeSutter. “We were spending all this money on ripping when for a few dollars per acre worth of seed, this plant would be doing it for us. You tell me what’s going to do it better: the plant or the seed?”

To DeSutter, that was the “physical” economic argument for building soil health. As he has gotten deeper into cover cropping and talked to other leaders in the field (he traveled to Australia recently as an Eisenhower Fellow to study soil health building techniques there) DeSutter has also been convinced about the “biological” benefits. Namely, the conventional system of growing corn or soybeans, which covers the land only a few months out of the year with living plants, is actually very inefficient at

utilizing all the free sunlight above ground and biological activity below ground.

DeSutter provided a mini-soil economics lesson recently while giving a presentation at a CCSI field day at a cropping operation in northeastern Indiana. During the presentation, he explained to the gathered farmers that over the past two decades he has doubled his organic matter to 4 percent on many of his acres. DeSutter then went into a simple calculation showing that the nitrogen he is gaining from this increased organic matter is basically a source of fertility he doesn’t have to purchase.

“That’s like a \$40 per acre annuity that keeps paying us,” he said at one point.

DeSutter also pointed out that 1 percent



**Although cover-cropping is just one tool for building soil health, it is by far drawing the most attention at CCSI field days, like this one being held in northeastern Indiana last August. It’s hoped such a practice will serve as a “gateway” into a more holistic view of soil management. (LSP Photo)**

of organic matter in the top 12 inches of the soil profile is worth an inch of water storage. “How much is a two-inch rain worth in August?” DeSutter asked the farmers rhetorically, following up with an answer in the form of more math: “Let’s say it’s worth 20 bushels extra per acre. With corn going for \$4, that’s \$80 per acre added value. That’s resilience.”

At another CCSI meeting, central Indiana farmer Jack Maloney talked about how since he started using cover cropping and no-till together, his inputs of nitrogen fertilizer have gone down, but yields have continued to increase. He finds cover crops provide fertility to his fields at a more consistent level throughout the growing season—he

compared it to a steady sine wave. Applying petroleum-based fertilizer, on the other hand, provides roller coaster-like peaks and valleys, which don’t always match when the crop needs nutrients most. This kind of talk gets a farmer’s attention, particularly at a time when corn and soybean prices are in a slump.

Such financial lessons may be directed at conventional farmers, but they may be packaged in a way that isn’t recognizable to producers who automatically equate the highest yields with the highest profits. One of the biggest differences between early adopters like Michael Werling and Dan DeSutter and the next wave of farmers who are interested in improving soil health is the role yields play in their decision making. Werling makes it clear that he does not make a direct connection between high yields and profitability—if he has few bushels per acre less come fall, that’s more than made up for by the fact that he spent less money on inputs as a result of good soil health. DeSutter takes a similar holistic view.

“I think there’s way too much focus on per acre yield, and not enough on profit,” he says during an interview. “As a finance guy I look at what do I need to do to make a profit in the long term, to gain a long-term advantage. It’s the gift that keeps on giving.”

However, the bushels-per-acre trap is a hard one to escape. During a series of tours last August, more than one farmer expressed the goal of getting record-breaking yields while using cover crops.

“We’ve got to get back to science, fellas, if we’re going to get to 300-bushel corn,” said an Indiana farmer at one point during a CCSI presentation.

## New Lease on Life

It’s become evident in recent years that another critical demographic to reach with a soil health message is non-farming owners of agricultural lands. The fact is farmers are increasingly raising crops on land that’s not their own: in Indiana, 60 percent of farmland is rented, and more than half the crops in Minnesota and Iowa are produced on leased land. Farmers who rent land on a cash basis from year-to-year often don’t have an economic incentive to put in long-term practices that build soil health. But if

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non-farming landowners knew how much long-term value vibrant soil biology added to their property, they would be more than happy to seek out farmers who are utilizing good conservation, argues DeSutter.

The 2015 Iowa Farm and Rural Life Poll of 1,159 farmers found that just 22 percent believed landlords have a good understanding of soil health, and only 28 percent felt landlords know what farming practices can improve soil health.

DeSutter sees huge potential in this area. He says in some ways non-farming landlords are an easier audience for the soil health message, since they aren't always so invested financially and emotionally in doing things the same as they've always been done. Landowners have sought out DeSutter because of his reputation for taking care of the soil. If more landowners saw the value of building soil biology, a farmer who, for example, combines cover cropping and no-till would have a competitive edge as far as getting access to rental land.

"Why wouldn't landlords want a renter who isn't mining their soil?" DeSutter asks.

That's why Fisher was thrilled after one recent CCSI workshop when he took a look at the registration list and realized several landlords were present. "They will be part of this decision making as well," he says.

## A Conservation Ethic

One thing that can get lost in all this talk about making soil health pay economically is that for many early adopters the main motivation is care of the land itself. The 2015 Iowa Farm and Rural Life Poll showed that "stewardship ethics" was the most influential factor in farmers' decisions to change how they manage their soil—48 percent said it was a strong or very strong influence, with economics, at 43 percent, a close second.

And the agro-environmental stakes have been raised. There has been a flood of water quality problems associated with runoff from farmland in recent years. The "dead zone" in the Gulf of Mexico has long been linked to excessive fertilizer leaving Midwestern farm fields. In addition, algal blooms in Lake Erie during 2014 contaminated the water for 400,000 people in the Toledo, Ohio, area, forcing a shutdown of the city's drinking water system for three days. The agriculture community is awaiting with trepidation the results of a case in which the Des Moines Waterworks has sued three northwestern Iowa counties, claiming drainage districts there act as conduits for nitrates to move from farm fields into the Raccoon River, a major source of water

for 500,000 residents in the city (that case is slated to be heard by a federal judge in August).

Michael Werling, the northeastern Indiana farmer, is acutely aware of the impact his farming activities have on the environment. He farms along the St. Mary's River, which is one of biggest contributors of phosphorus to Lake Erie.

"I've been to Toledo Bay," he says. "I'm often the only farmer on those tours. It makes you aware of the algal bloom."

During a series of CCSI field days last summer, the often contentious relationship between production agriculture and water quality hung over the proceedings like a dark cloud. Numerous speakers—whether they be farmers, scientists or soil experts—made the point that building soil health is one way to be proactive on the issue of protecting the environment and perhaps dodging the inevitable hammer of stricter regulation and/or lawsuits.

"I hear you have a million acres of cover crops in this state, and you did that without someone putting a gun to your head," said University of Maryland soil scientist Ray Weil as an opening to his presentation at a restaurant in southwestern Indiana.

Maybe Indiana farmers don't have a gun to their head, but many conceded they felt some sort of regulation of farming practices to protect water quality is inevitable. Watersheds that supply drinking water for the Indianapolis metro area are contaminated with agrichemicals such as the corn herbicide atrazine.

"They want someone to pay for it," says hydrologist Robert Barr, referring to Indianapolis officials. Not surprisingly, farmers are working with Barr to show how building soil health can reduce runoff.

An argument could be made for the short-term effectiveness of a top-down approach to cleaning up water when one considers the example of Maryland, where agricultural runoff has decimated fisheries in the Chesapeake Bay. It was determined several years ago that cover crops were the cheapest, most efficient way to capture nutrients before they made it to the water. So state officials there instituted a "Flush Tax"—basically a fee all residents hooked up to public water works systems pay. Revenue from that tax is used to pay farmers outright to plant cover crops, usually in the form of a single species such as rye. Maryland farmers can receive as much as \$90 per acre to plant a cover crop, with other economic incentives added on for planting it earlier, etc. Maryland farmers have an added incentive to plant cover crops because the state requires nutrient management plans for any producer who generates more than \$2,500 in annual sales.

The result? Around half of Maryland's one millions acres of cropland is now regularly cover-cropped and nutrient runoff has been reduced. On the face of it, the program has been a resounding success.

But Weil, an internationally known soil ecologist who has worked with farmers in numerous states, is concerned that most Maryland farmers are narrowly focused on the minimum they can do to adhere to regulations and ways they can qualify for cover crop payments. He prefers what he calls the "rock star farmer" model, where leaders in soil health are driving innovation within their communities.

"The conversation is different in my state, which I think is sad," the scientist says. "At farmer meetings in Maryland, farmers talk about how they can qualify for higher payments—they don't talk about how they can improve their systems and build soil health."

When such a reductionist view boils soil health down to planting a minimum amount of a single cover crop, it becomes easy to drop that practice once it doesn't pay or it otherwise becomes too big a hassle. The key is for soil health to become the driver of all other farming decisions, rather than one side effect of a few isolated practices.

For example, DeSutter has added wheat to his corn-soybean rotation. The small grain long ago fell out of favor in much of the Corn Belt, but since it's harvested earlier than row crops, having it in the rotation gives DeSutter an opportunity to get cover crops planted earlier, providing a jumpstart on winter. Building soil health has to be put on the same level as other farming practices if it's going to weather mercurial markets, shifts in farm policy or the desire to return to old habits, according to DeSutter.

"It's all about priorities." □

## Give it a Listen

Three recent episodes of the Land Stewardship Project's *Ear to the Ground* podcast ([www.landstewardshipproject.org/posts/podcast](http://www.landstewardshipproject.org/posts/podcast)) feature the voices of people involved with Indiana's Conservation Cropping Systems Initiative (CCSI):

- **Episode 173:** Soil health specialist Barry Fisher talks about the team approach that anchors CCSI.

- **Episode 174:** Soil scientist Ray Weil discusses why Indiana's "bottom up" approach to soil health is preferable to the "top down" strategy being used in his home state of Maryland.

- **Episode 175:** Indiana farmer Gordon Smiley describes his experience with cover cropping and why he's so excited about the latest science related to soil health.