Cover Crops: Multiple Species Deliver Multiple Benefits

Jamie Scott - Pierceton, Indiana

Jamie Scott knows first-hand the importance of tracking the effects of conservation practices on the farm.

"We're 10 years into our no-till system, but we weren't taking good notes," admits the northeast Indiana farmer, who farms about 2,000 acres of corn, soybeans, wheat and cover crop seed with his family. He is determined to do a better job of documenting the impact of cover crops on his operation.

Scott is a huge proponent not only of cover crops, but of diverse "cocktail" mixes of cover crop species, which inject diversity into his farm's rotation.

"We are a big fan of diversity," he says. "We can get 15 or 16 different cover crop species into a three-year cycle and put a lot of root structure into the soil. You've got grass, legumes, brassicas, warm-season species and cool-season plants that hit that field in a three-year cycle. Add corn, beans and wheat, and that's three more species."

Scott says he sees huge improvements in soil health and tilth on his family's operation as a result of their conservation practices, but is eager to quantify as many of the changes as he can. He is one of 12 Indiana farmers who participated in the Conservation Cropping Systems Initiative (CCSI), a partnership of a wide range of universities and organizations in the state carrying out farm-scale agronomic and economic research on soil health.

Through CCSI, Scott conducted three trials—comparing wheat grown without a cover crop, a single-species cover crop of annual ryegrass, and a cover crop cocktail mix—each replicated four times. Each of the 12 strips on his trial field was 40 feet wide and 1,000 feet long to minimize the effects of varying soil types ("we have a bit of everything," he says).

Better Soil

"When you walk across the plots, you feel the difference," Scott says. "We had a visitor recently and where the cocktail mix was, the guy said, 'this is like walking with a shag carpet with a thick pad under it.' Where the single species was, he said, 'this is like Astroturf carpet.' On the bare ground, he said, 'this is like concrete.'"

Digging into the field gives even greater perspective.

"It's amazing how much it changes the soil—how rich it looks, the darkness of the soil," Scott points out. "People say, 'you've got good soil here.' But you could also go to

The Financial Challenge

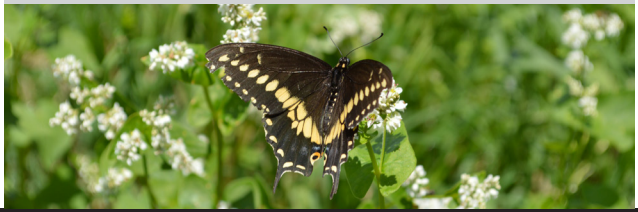
Jamie Scott recognizes that it's not easy to track the yield effects of rotations and cover crops over long periods, or to pinpoint the economic value of some of the most important benefits of cover crops.

"There are certain things that are hard to put a dollar value on," he says. "Organic matter is one of those."

Scott says cover crops have helped build organic matter levels in his fields.

"With a corn/bean rotation, even no-till, we were struggling to build organic matter," he says. "With cover crops, we were starting to move up. And when we started adding wheat and a cocktail mix, we were going from a two-percent level to a three-percent level."

Studies have attributed the nitrogen value of adding 1% soil organic matter at $15.70 to $40.00 per acre per year. Graduate student Joshua Leirer, working under Purdue University agricultural economist Wallace Tyner, found that one-species cover crops increase soil organic matter by 54 to 379 pounds per acre each year. He also determined that cover crops can reduce off-field nitrogen movement by four to 23 pounds per acre per year—which adds up if it helps farmers keep that N in the root zone for the next crop—depending on cash crop, soil type, and tillage regimen.



Mixing Cocktails

Jamie Scott is a master mixer of multi-species cover crop cocktails, but he's also the first to admit that it's not as easy as working from a simple recipe.

"There's no good seeding calculator for mixes," he explains. "For a pure stand of turnips, there's a recommended rate. But when you start mixing them with other species, we really don't have a good seeing chart. It took quite a while to narrow it down to get to what we like."

Cover crop mixes can be tailored to every farm to fit scheduling, growing conditions, desired benefits and whether the grower wants them to succumb to killing frosts or survive the winter for termination in the spring.

But the more species in the mix, the more compromise is needed at seeding time.

"We're putting it all in one box," Scott says. "It's a compromise on depth. We look at what needs to be the deepest and get pretty close to that. Some of the peas really should be two to three inches deep, but we're going an inch and a half. Some of the other stuff would normally be about a quarter-inch deep, but we've got enough seeds per acre that they'll push themselves up."

that bare strip in the same field and dig into it, and it's a lot lighter, it doesn't have the texture.

"When we change the color of the soil, we change the structure," he explains. "We bring more biological diversity. Things really start to happen."

Wheat: Great Rotation

Adding wheat to his family's corn/soybean rotation is a key tactic in Scott's campaign to increase diversity and build soil organic matter. Winter wheat acts like a cover crop during the season it's grown, and harvesting it in the summer leaves room for rich, productive cocktail mixes of cover crops that add diversity to the rotation.

"Not only do we have to learn how to introduce cover crops to the farm, we've had to re-learn how to grow wheat," he explains. "We don't want to raise 50-bushel wheat. We want to raise 90-to-100-bushel wheat. We plant good wheat varieties—some earlier wheat, some later wheat."

Treating wheat as a real cash crop in the rotation is part of Scott's long-term mindset, which governs his whole farm.

"We're all so hung up on 'today,'" he points out. "So putting wheat into the rotation looks like an economic hit. But what if, by putting wheat in the rotation, we could put 10 more bushels of corn and more beans in those other years? We need to look in 10-year cycles, not 'today.' Over 10 years, what did we gain or lose?"

This is part of a series of sheets on the economics of conservation systems developed as part of Indiana's Conservation Cropping Systems Initiative (CCSI) in cooperation with the Conservation Technology Information Center and Purdue University. For more information on the Conservation Cropping Systems Initiative, visit ccsin.iaswcd.org.

CCSI's Partners in Conservation:
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