INFORMATION PROVIDED BY A GRANT FROM
THE HOWARD G. BUFFETT FOUNDATION

NO-TILL, COVER CROPS A WINNING COMBINATION

By Lynn Betts

RYE WILL MELT, STALKS WILL STAY: Drilled soybeans were just ready to emerge the last week of May in this terraced field on Steve Berger's farm. No-till, rye cover crops, terraces and contouring give complete protection to the soil.

Dennis and Steve Berger have been taking care of their soil since they began farming, but they're particularly happy with what they've done in recent years with their combination no-till and cover crop system.

The Bergers have a corn-soybean rotation on their flat to rolling Washington County land. Some of their land has been in no-till continuously for 33 years; they added cereal rye as a cover crop 10 years ago and plant it on about half of their acres now.

"You get the most benefit from a cover crop on hills, where it helps control soil erosion, but it helps all of your soils," Steve Berger says. "The root growth builds organic matter, adds oxygen to the soil, increases microbial activity and helps reduce soil compaction."

Their rolling land is well-protected with more than 14 miles of terraces, grassed waterways and field borders, as well as continuous no-till. So they were surprised and concerned to hear from a soils expert about 10 years ago that they weren't continuously building organic matter in their soils.

"We own a majority of our ground," Berger says. "Next to our families, our land is our biggest asset. Our land was called 'first rate' when Lime Creek Township was surveyed back in 1841 when Iowa was still a territory," he says. "It probably had 8% organic matter then, but with tillage and soil erosion over the years, less than half that organic matter remains.

"We thought we'd been doing a good job of soil conservation with no-till, but were disappointed to learn we were still losing organic matter with soybeans in the rotation. That's why we started putting a rye cover crop into the mix about 10 years ago," he says. Last fall, the Bergers drilled about 1,100 acres of rye after harvest. "It varies from year to year, depending on weather conditions," Berger says. "We just don't know how much time we'll have; time to seed and spray is a limiting factor on how much rye we have on the farm in any one year.

"Our goal is to have our land covered at all times, and we also like to have something growing on the land throughout the year as best we can," Berger says. "It's a challenge to increase organic matter, but I think we're doing that slowly. We soil-sample every four years on 2.5-acre grids to comply with the Iowa Phosphorus Index requirement for manure management plans. The average organic matter content for the whole farm in 2004 was 3.10%, but increased by 0.19 to 3.29% in 2008 on 1,000 samples, using the same company and sample locations. We think that's statistically significant."

NO-TILL AND COVER CROPS EASIER NOW

"We've got much better resources and advancements with technology for no-till than we did 30 years ago," Berger says. "Our planter is much better equipped; we have more herbicide choices; and more fungicides are available to control leaf diseases. Those things, along with much improved seed genetics with treatments, have benefited no-till. It's much easier to no-till now, whether it's into cornstalks, or rye and stalks."

He's aerial-seeded some rye, but drills most of it in a 10-inch spacing immediately after harvest in September. "We usually plant rye to about

Nov. 1, but you don't get enough beneficial growth after that," Berger says. "We have cereal rye in the rotation about seven months of the year, from about Sept. 20 until April 5. It greens up and grows in March, and we spray in April with glyphosate at about 6 to 10 inches of growth."

They let the rye decompose a week to 10 days after spraying before planting. "I like to see some of the rye leaves begin to turn brown before we plant to minimize any alleliopathic effect on the corn plant," Berger says.

RYE ROOTS ARE THE KEY

"You don't get the organic matter from the plant mass above the ground, because it oxidizes eventually, but the top growth is there to control erosion. You get organic matter from the extensive root system in the soil below," Berger says. "That root mass holds the soil in place, too. Rye has a prolific root system to improve water infiltration and for corn roots to follow. We want to create an ideal subsoil environment with deep-rooted cover crops and no-till to allow corn roots to grow deeper.

"If we can gain an additional 12 inches of root growth on corn, that's 2 more inches of available water in a dry year," Berger says. "And we think a long-term continuous system of no-till and cover crops will help reduce compaction and manage the weight of large machinery. We still get compaction from the manure spreaders, combines and grain carts."

The addition of a rye cover crop on Berger's operation reduces the erosion and runoff factors for the Natural Resources Conservation Service's RUSLE2 calculation, which lowers the P-Index. RUSLE2 is a computer program that calculates erosion using on-farm factors. Berger's rye cover mitigates erosion issues. To a limited extent, rye helps with nutrient cycling of nitrogen, phosphorus and other nutrients.

"Farmers often tell me no-till delays planting," Berger says. "I don't agree and find just the opposite with our planting dates over the years. In 2008, a wet April delayed planting in southeast Iowa to April 29 — the first three planters running that day were no-tillers. A no-till soil structure with the top inch 'grayed off' will support a tractor and planter, and a properly equipped planter can really dry out a wet soil surface."

Berger says an improved soil structure can be seen over time with no-till and cover crops. "Custom applicators, crops scouts and hired help have made comments on how mellow the soil is," he says.

One year of rye or no-till won't do it, though. "You need a long-term systems approach of using a cover crop and no-till," Berger says. "It takes time for soils to change. You just can't speed that process up too much."

APPLY N WHEN CORN NEEDS IT

"We've had a lot of variation in our nitrogen program for corn — everything from several sources of manure, anhydrous and liquid UAN to ammonium sulfate applied in the fall," Berger says. "We do a lot of sidedressing, too — a split application to provide corn nitrogen when it needs it most.

"We like to use 200 pounds of nitrogen per acre for continuous corn, and a 160-pound base of actual N for corn following beans," he says. "We've got enough hog manure for 30% of our acres, and have a source of turkey manure. We inject most of the hog manure in late November when the soils are cold." The Bergers have tried a nitrogen stabilizer. "Nitrogen is a very mobile nutrient in the soil and can be lost several ways before summer. It has to really be managed," adds Berger. "We just started surface-applying 140 pounds of ammonium sulfate (21-0-0-24) in the early fall to jump-start the carbon-nitrogen cycle," Berger says. "We surface-apply 2 to 3 tons per acre of turkey manure in the fall, which helps increase microbial activity.

MORE MELLOW: Steve Berger can see his soil has become more mellow and has more organic matter. Custom applicators and scouts have noticed the difference, too.

"When we plant, we apply 60 pounds nitrogen of 32% UAN in a 3-by-2-inch band away from the seed," Berger says. He also uses an in-furrow pop-up fertilizer, 6-24-6 with zinc, that's applied with the planter. "We add a pyrethroid insecticide in-furrow as well, along with our preemergence herbicide. Insecticide is an important ingredient with no-till because the residue and cover with the manure tends to attract a lot of different insects," he says.

NO YIELD SACRIFICE

"The real challenge in no-till systems is stand establishment. Corn yield is a product of ear count and ear size," Berger says. "We concentrate a lot on setting our planter to get uniform stands of 33,000 to 34,000 plants per acre. After corn emergence, a lot of the 'heavy lifting' is done and the advantage shifts to the no-till fields. There are fewer trips through the field to this point, less compaction and no plow layers. The corn canopy will be cooler during the summer months, with more available moisture, deeper rooting potential and residue cover to control erosion," he adds, "and now we have fungicides to control the leaf diseases."

Wet years can challenge any tillage system because corn needs oxygen as well as water, he says. "You want your field to be well-tiled anytime, but especially if you're using no-till," Berger says. "Tiling has really paid off well for us. We do a lot of our own tiling and have pattern-tiled most of the farm. I don't think there's any substitute for having good drainage."

Berger says they like to go above the county average by 30 bushels of corn per acre. That above-average yield comes on soils with a corn suitability rating of about 70, the county average.

"We're in it for the long haul. We're slowly but surely increasing organic matter and improving our soil from a combination of no-till, cover crops and manure — and the continuation of this system over time," he adds.

Betts writes from Johnston.

MILLIONS OF WORMS: After 10 years of cover crops with continuous no-till, earthworms abound on the Berger farm. Worms, no-till and the rye cover crop help corn roots go deeper.

SOILS LOSE ORGANIC MATTER WITH TILLAGE

STEVE BERGER has checked fencerows on his farm and finds 6% to 8% organic matter in those unfarmed soils, compared to half that on his soils that have been farmed. "When yield monitors came into use 15 years ago, we could see corn and bean yields jump when we crossed those old fencerows. Those jumps were from higher organic matter and better-quality soils. That's what we're trying to do with no-till and cover crops – come as close as we can to replicating that," Berger says.

The Berger farm isn't unique in organic matter loss over time. On average, about half the organic matter content of most soils in the Midwest has been lost since the land was first cultivated.

"If you look at the Morrow Plots, the oldest continual agricultural research fields in the United States on the Urbana-Champaign campus of the University of Illinois, you'll find the same thing," Berger says. The Morrow Plots were established in 1876. Unfarmed grass borders there indicate starting soil organic matter content in prairie grass was 5.5% to 6.5%. Organic matter had dropped to 4.1% on the continuous corn plot by 1904; the corn-oats rotation plot dropped to 4.5%; but the three-year rotation of corn, oats and hay still had an organic matter level of 5.9% in 1904.

Oxidation of organic matter from continuous tillage on the corn plot has reduced organic matter levels to between 2% and 3% today.