

Optimizing cover crops



Goodhue County farmer experiments with seed mixes, spacing and row width to extract the most from soil health benefits, forage and fertilizer



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GOODHUE — What began as a cost-saving experiment in no-till for Goodhue County farmer Ed McNamara led to 25 years of fine-tuning practices to improve soil health, boost forage quality, maximize nutrients and improve water quality.

“We’ve got the agronomic side figured out. Now we’ve got to get the individual producers’ management styles to change,” McNamara said. “If you only use your field five months of the year, the other seven months of the year it could be growing one, maybe two crops. Isn’t that a more efficient use of the highest-priced asset that you have?”

McNamara has experimented on his own, with assistance from the USDA’s Natural Resources Conservation Service (NRCS), and as part of research projects.

He’s no-tilled soybeans into corn stubble every year since that first cost-saving

experiment in 1997. The oats-and-peas cover crop he seeded as a prevent-plant measure in 2013 fed the cattle that November and expanded the slate of soil health practices he’s made permanent on his 350-acre corn-and-soybean farm.

Early on, NRCS assistance allowed him to experiment with cover crops through the Conservation Stewardship Program (CSP), and with nitrogen application rates through the Environmental Quality Incentives Program (EQIP).

In a three-year research project that finished in fall 2021, McNamara interseeded cover crops between 30- 60- and 90-inch corn rows. A University of Minnesota agronomist and a Clean River Partners conservation program manager worked with him and three other farmers to determine how row width affected corn yield and cover crop biomass — and if it could be profitable.

Top: Turnips (left) and crimson clover (right) and are part of the cover crop mix growing amid corn stubble. Ed McNamara pulls up a turnip from the harvested corn field where it was part of a cover crop mix. “If we can eliminate runoff, then we can eliminate the movement of phosphorus attached to the soil particles that would infiltrate surface waters. We’ve been able to clean the water up by having cover crops trap sediment,” he said. **Bottom:** Cover crops grow between rows of harvested corn in mid-October in McNamara’s Goodhue County field. “When we’ve had a heavy rain event, the cover crops that would be greening up in the spring act as a dehumidifier for the soil. That helps get the soil in better shape when it comes time to plant,” he said. **Photo Credits:** Ann Wessel, BWSR



On his own, in 2021 McNamara planted twin-row corn 7.5 inches apart in east-west rows. The spacing made it possible to harvest with a 30-inch corn head. Staggering plants within the double rows exposed the cover crop to more sunlight.

This spring, he planned to alternate 10-foot-wide strips of four, 30-inch twin rows of corn with 10-foot-wide strips of cover crops. After each cover crop harvest, he planned to apply a different type of manure — beef, turkey and hog — and then plant corn on that strip the following year. The aim: maximize the cover crops' feed value, determine how much phosphorus intensively managed cover crops will take up, and potentially eliminate the need for commercial fertilizer next year.

McNamara's Belle Creek Township farm lies within three watersheds that drain to the Mississippi River: Hay Creek, a trout stream; and the Zumbro and Cannon rivers. The water table is high, the soil is a silty clay loam.

"That makes things interesting, but it also presents the opportunities for adopting tillage practices and cover crops to lessen the impact for the water below us," McNamara said.

A Goodhue County Soil & Water Conservation District Board supervisor for the past 24 years, McNamara is also a certified crop adviser.

While harvesting corn in mid-October, McNamara discussed what's worked for him, what hasn't, and how he's adjusted. The following excerpts are edited for length.

How do cover crops and no-till benefit you?

No-tilling soybeans into



McNamara combines corn on Oct. 17, 2021, in Belle Creek Township.

VIDEO: [Discussing soil health](#)

standing corn stalks has reduced our fuel requirements, our machinery requirements, and it's reduced soil erosion. We've maintained or increased our yields, and it's saved us time — and of course saving time on a farm means that you're saving money.

How do cover crops benefit the soil?

The benefits that we're seeing from the soil is water infiltration. We've been able to increase our microbial activity on the soil. We've seen an increase in earthworm activity, which helps the nutrients on the top of the soil to be pulled down deeper. We've also been able to make the soil somewhat more resilient with weather extremes. We've been able to get on the fields in the spring quicker. When we've had a heavy rain, the cover crops that would be greening up in the spring act as a dehumidifier. That helps get the soil in better shape when it comes time to plant.

How does water quality benefit?

One (way) is infiltration rather than runoff. If we can eliminate runoff, then we can eliminate the movement

of phosphorus attached to the soil particles that would infiltrate surface waters. We've been able to clean the water up by having cover crops trap sediment. I really feel that we're gaining the benefit of having (something) similar to a starter fertilizer effect. The root systems on the cover crops seem to remove the potassium and phosphorus that's attached to the clay particles and make that available for the next year's corn and soybean crop.

What advice do you have for someone who's considering cover crops?

I always say one cover crop mix is better than none. Two is better than one. So just move up the ladder as you gain the comfort zone of the management that's required to make cover crops work, because (you can't) just throw it out there and walk away from it. You must ratchet up your management because Mother Nature is still in control.

What do you need to manage more intensively with cover crops in corn?

If you're trying to (plant) into a standing, green cover crop in the spring, you need to have

some extra nitrogen available for that corn, otherwise the cover crop's roots tie up that excess nitrogen and it doesn't release it until late July or August.

What about cover crops in soybeans?

The cover crop makes those herbicide programs work a whole lot better because we're trying to control much smaller weeds. If you want to plant (the soybeans into the cover crop), you have to use a little bit more viable water, get good spray coverage. Most of the time when you get the biological system going within that soil, that (cover crop) residue will break down by harvest time.

How have you fine-tuned the cover crop seed mix for corn?

We started out at 18 pounds (an acre) of annual rye grass, we're up to 21 pounds now. We were at 2 pounds of red clover and crimson clover; we're up to 6 pounds. We were putting on a pound of purple-topped turnip and a pound of radish. The brassicas were taking over the stand. So we backed those down to a half a pound each. It looks pretty good now.

What effect have soil health practices had on yield?

Soybean yields have been trending higher — from 54-55 bushels an acre to 62-65 bushels an acre. Corn yields increased from about 175 bushels an acre to about 190 bushels an acre. I think having that fertility that is normally tied up on the clay particles getting shaken loose with the cereal crops ... basically shake that PNK (phosphorus, nitrogen and potassium) off of that clay particle. Once it makes that available in the soil solution, the crop can take it up.



Study considered corn cover crops' profitability

Ed McNamara was one of four farmers in Goodhue and Rice counties who participated in a three-year research project to determine if planting cover crops in corn could be profitable.

Specifically, the Clean River Partners and University of Minnesota study examined how corn row spacing affects not only yield but also the growth and profitability of forage cover crops. A Minnesota Department of Agriculture sustainable agriculture project grant supported the study, which ended in 2021. Clean River Partners published the final results on its [website](#) this spring.

“What we were really looking at was if we plant corn in wider rows ... can we grow more cover crops, and if we grow more cover

Above: For the previous two years, the field McNamara harvested on Oct. 17, 2021, had been enrolled in a wide-row corn study. McNamara has found that corn yields have generally increased as a result of the soil health practices he's put in place on his Goodhue County farm.

crops, then how does that impact the grain yield,” said Alan Kraus, conservation program manager at Northfield-based Clean River Partners.



Kraus

“It ultimately is a profitability study. If you grow more cover crop, you have that cover crop available to feed your cattle by grazing or machine harvesting. So the value of the cover crop can offset the loss of the grain yield, if there is a loss,” Kraus said.

Plots included 30-inch rows

without cover crops, 30-inch rows with cover crops, and 60-inch rows with cover crops. Results were based on three years of data from 45 test plots. One farm did not participate the third year.

Corn grown in 60-inch rows with an inter-seeded cover crop produced a 17% dip in grain yield compared with corn grown in 30-inch rows without a cover crop.

Grain yields across all plots averaged 194 bushels per acre for 30-inch rows without a cover crop. Yields averaged only slightly less — 191 bushels per acre — for 30-inch rows with a cover crop. Yields averaged 160 bushels per acre for 60-inch

rows with a cover crop.

A lab tested the quality and quantity of cover crops' dried biomass. Researchers considered market prices for forage to determine its value.

The break-even point: Consistently producing 1,000 pounds an acre of dried cover crop biomass that was harvested together with the corn stover and fed to cattle would offset a 13% an acre reduction in corn yield.

The study did not add the value of water quality or soil health benefits.

If funding were to become available, Kraus said future studies might experiment with different hybrids or plant density to boost grain yield, and with different cover crop seed mixes to boost biomass.



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