

Fine-Tuning Nitrogen Rates for Strip-Tilled Corn

By [Dan Zinkand](#) posted on November 29, 2012 | Posted in [Nutrient Management](#)

Ever since David Legvold began farming land owned by St. Olaf College, Northfield, Minn., about 9 years ago, he's worked with university professors and students to document the impacts of tillage and crop inputs on profitability, soil health and water quality.

In 2012, Legvold and St. Olaf senior Emma Cornwell, who is majoring in biology and environmental studies, worked to find the most profitable nitrogen rate for strip-tilled corn.

On the land that Legvold leases from St. Olaf, he isn't allowed to apply any nitrogen in the fall. That's due to the environmental risks of fall-applied nitrogen in the karst regions of Minnesota. He does apply a small amount of nitrogen with DAP and MAP when strip-tilling his own farmland in the fall.

This year, Legvold and Cornwell learned that the most profitable rate of sidedressed liquid 28% nitrogen was not the highest rate, which produced the highest yields. During the past growing season, they compared the following nitrogen rates in strip-tilled corn:

- No nitrogen sidedressed
- 77 pounds dribbled on at sidedress
- 40 pounds sidedressed
- 77 pounds sidedressed
- 90 pounds sidedressed
- 120 pounds sidedressed

Legvold uses a sidedress rig he built on a scrapped cultivator tool bar with Yetter fertilizer-insertion discs. Liquid 28% was carried in saddle tanks on his Deere 4430 tractor, with product delivered to the rows by a rebuilt sprayer pump. He was able to apply different rates by adjusting pressure and speed, and he's normally able to apply 28% liquid nitrogen at about 7.5 mph, or 24 acres per hour.

The Most Profitable Rate

As he looked at the 2012 corn yields filling the weigh wagon, and at his yield monitor, Legvold could see that skipping nitrogen hurt yields.



RESEARCHING 'N.' Since Northfield, Minn., strip-tiller David Legvold began farming land owned by St. Olaf College, in Northfield, he's conducted onfarm research with the college's students, including Emma Cornwell (left). In 2012, Cornwell and Legvold found that the most profitable rate for sidedressing nitrogen in corn wasn't the highest rate. *(Photo courtesy of St. Olaf College)*

"There was definitely an increase by sidedressing 40 pounds of nitrogen and there was a nice increase from 77 pounds of nitrogen," he says. "The yield increase was far less steep with 90 pounds of nitrogen, and at 120 pounds there was very little yield response."

Both Legvold and Cornwell caution that it's important to look at the results of onfarm research over a number of years because sometimes the results in a particular growing season just don't make sense.

That happened in 2012. The net return of \$1,453.88 for a fourth year of continuous corn with no nitrogen sidedressed topped the returns of the other nitrogen treatments.

Legvold calls the result a "1-year anomaly," while Cornwell calls the 2012 results with zero nitrogen and the dribble treatments "wonky."

The bottom line, Legvold says, is that it's important to keep doing onfarm research — something he's looking forward to continuing with St. Olaf College's students after Cornwell graduates in 2013.

Legvold and Cornwell plan on comparing the yields and the nitrogen rates with end-of-season stalk-nitrate tests, too. The stalk test will provide a more precise picture of the payback on nitrogen application, he says.

"Using yield results, stalk nitrate tests, flyover imaging, residual soil-nitrate tests and the economic number crunching supplied by Emma, I can get a pretty good picture of how I'm managing nutrients," Legvold says. "However, this is not a 1-year process. After 4 years of excellent onfarm research working with Emma, I'm beginning to get a clearer picture of what to do."

"Another important part of our project will be looking at the environmental effects of these different nitrogen rates," Cornwell says. "I'll look at the amounts of different nutrients in the soil to see if, for example, the high rates of nitrogen fertilizer lead to excess nitrogen in soil that can then travel into rivers and contribute to the dead zone in the Gulf of Mexico."

Cutting P And K

Legvold strip-tills with a 12-row Soil Warrior on 30-inch spacings, with money he received from a 5-year NRCS Conservation Stewardship Program contract. He pulls the machine with a Deere 4650 tractor with 180 horsepower.

He considered trading up to a newer model tractor just to get Deere's auto-steer, but instead went to his local Case IH dealer and had them install a Trimble system with cell phone bridge-correction signal technology.

"I could not justify trading for a Deere 8400 with 9,000 hours and quite a bit to boot when I had a great 4650 with less than 4,500 hours," Legvold says.

Since he began strip-tilling about 5 years ago, he's concluded that a full rate for phosphate and potash is a thing of the past.

"I've cut my phosphate and potash rates down to two-thirds and, more recently, to a half rate," Legvold says. As I've strip-tilled and soil health has improved, improved soil quality has boosted nutrient cycling. So I can use lower rates."

Legvold no-tilled before he began strip-tilling it. Back then he broadcasted dry fertilizer for the no-tilled corn. But when he started no-tilling he applied more fertilizer during the first few years because he was concerned about nutrient availability in cold, wet soils. That's also why he applied starter fertilizer with his planter.

These days, on his own farm ground — and not the land he farms for St. Olaf — Legvold bands nitrogen, phosphate, potash and micronutrients. Applying fertilizer during fall strip-till gives the soil time to de-salt during the winter, he explains.

"I really believe that this fertilizer program of banding with fall strip-till is much more environmentally friendly vs. no-tilling with 200 pounds of starter fertilizer placed 2-by-2," Legvold says. "If you're applying 9-23-30 or 10-34-10 as a starter, that's pretty salty — especially if you have the ability and opportunity to strip-till and band fertilizer in the fall."

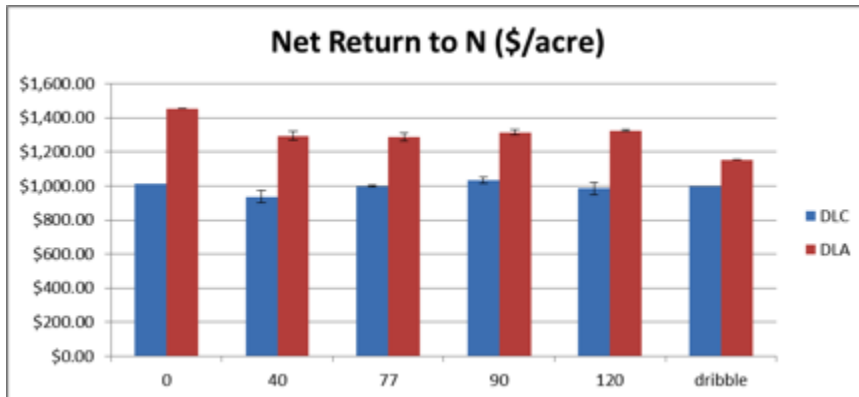
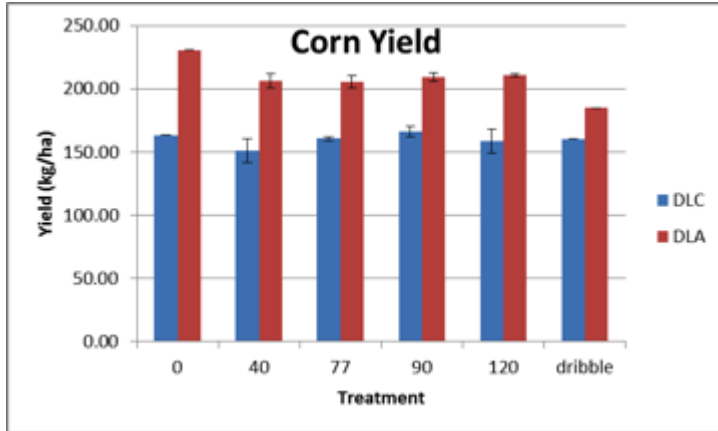
Legvold likes to band 8 to 10 pounds an acre of nitrogen per acre when he strip-tills in the fall with his Soil Warrior. The nitrogen is contained in the MAP and the DAP that he bands.

"I don't want to apply 200 pounds of nitrogen in anhydrous ammonia in the fall," he says. "The risk of nitrogen loss, and the potential environmental effects, aren't worth it."

"After banding MAP and DAP in the fall, I go back to these fields in the spring with my Soil Warrior and apply urea in the same band. I can return right to where I was in the fall because I use RTK and the file is stored."

But Legvold has two backup plans if he doesn't get urea banded in the spring before planting corn. He may choose to band 20 gallons per acre of 28% liquid nitrogen with the planter, or sidedress all of the nitrogen.

While Cornwell is a senior, Legvold looks forward to continuing onfarm research with St. Olaf’s professors and students. He believes strongly in the importance of farmers doing their own research and controlling the results. He frequently cites a saying a recently retired editor who said, “Unless farmers do their own onfarm research, they will be at the mercy of people who do.”



2012 Strip-Till Corn Yields And Nitrogen Rates / Net Return To Nitrogen *Field N Rate sidedressed Corn*
Yield (bu/acre) Net Return to N (\$/acre) Fourth year corn on corn Dribble (77 lbs) 160.21 \$1,155.04
 Fourth year corn on corn 0 163.20 \$1,453.88 Fourth year corn on corn 40 151.09 \$1,294.22 Fourth year
 corn on corn 77 (rate determined by Iowa State N calculator) 160.62 \$1,288.30 Fourth year corn on corn
 90 165.98 \$1,314.29 Fourth year corn on corn 120 158.51 \$1,324.00 Second year corn following 7 years
 alfalfa Dribble (77 lbs) 184.78 \$995.38 Second year corn following 7 years alfalfa 0 230.75 \$1,014.79
 Second year corn following 7 years alfalfa 40 260.19 \$936.08 Second year corn following 7 years alfalfa
 77 205.28 \$998.02 Second year corn following 7 years alfalfa 90 209.28 \$1,032.89 Second year corn
 following 7 years alfalfa 120 210.77 \$984.31

-See more at: <http://www.striptillfarmer.com/articles/361-fine-tuning-nitrogen-rates-for-strip-tilled-corn#sthash.sADK2tHb.dpuf>