Crop Nutrition

By Karl Czymmek and Quirine Ketterings

The ISNT and Late Season Stalk Nitrate Test, used together, help refine decisions for nitrogen on corn acres

A one-two punch for corn N management

As fertilizer prices increase, careful nitrogen (N) management becomes all the more valuable. Over the past several years, two new management tools have been tested and successfully calibrated for corn grown on New York soils and under New York growing conditions. Using the two tests together can help refine N decisions without the worry of losing yield or compromising forage quality.

1. Illinois Soil Nitrogen Test (ISNT). First developed in Illinois, the test evaluates the N that's expected to be released from soil organic matter – or a field's soil N supply potential.

The Late Season Stalk Nitrate Test is calibrated for an 8-inch section of stalk between 6 and 14 inches from the ground. The test reveals whether there was enough N in the plant just before harvest to assure optimum yield,

If the ISNT result is above a certain value, the corn crop isn't expected to respond to sidedress or preplant N from manure or fertilizer.

In our five years of research, conducted throughout New York on farms and at research stations, the ISNT did much better than the Presidedress Nitrogen Test (PSNT) or chlorophyll tests in predicting if a field needed additional N.

As with any management practice, there are scenarios where "external conditions" override the ISNT results. For example, in drought conditions corn grown on a soil with a low ISNT value may not respond to extra N. Water, not N, is limiting yield.

Also, poor weed control can throw off the ISNT results. Weeds compete with corn for N. So under heavy weed pressure a crop may respond to extra N even if the ISNT result indicates adequate N should be available.

Our studies didn't include strict no-till scenarios, and it's possible critical ISNT levels need to be higher for no-till. Additional work is needed.

Here is how to use the ISNT for decision making:

- There's no need to test before the first-year of corn following well-managed grass or grass-legume hay since these fields won't respond to N beyond starter.
- The timing of the ISNT is more flexible than the PSNT. Fall sampling after harvest is preferred, though samples can be taken anytime of year. There is one restriction: Don't take the ISNT within five weeks of manure or ammonium-N fertilizer application or sod plowdown since the test can pick up some of the ammonium being released and give a false high reading.
- Let's say you run the ISNT on a bunch of fields and have determined that eight of them don't need N. But you don't really trust the test yet. What to do? Pick a field or two and treat some parts with manure or sidedress N but leave some untreated check strips in a few places. Mark the treated areas and work with your consultant or Extension educator to measure yields and make comparisons.

FYI

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- Check out the agronomy fact sheet series at this website: http://nmsp.css.cornell.edu/publications/factsheets.asp.

■ What about the rest of your corn fields that do need N? If you are curious about how to credit sod and manure for N, go to this website: http://nmsp.css.cornell.edu. Click on nutrient guidelines and download one of several simple spreadsheet calculators to help you decide how much N is needed.

2. The Late Season Stalk Nitrate Test. This tells you if there was enough N in the plant just before harvest to assure optimum yield. It helps to check your work: How good were your N decisions?

Through many field studies in New York, Pennsylvania and Connecticut, among other states, we learned that optimum yields are obtained within a certain range of stalk nitrate levels. The test is calibrated for an 8-inch section of stalk taken between 6 and 14 inches from the ground. Sampling can be done within seven days before harvest. Or corn can be sampled one to two days after harvest if the corn was chopped more than 14 inches high.

Just as with soil and manure tests, you can make better decisions after collecting results from the same fields for two to three years. If the test consistently shows excessive nitrate – greater than 2,000 ppm – then you can reduce N fertilization. If the test consistently shows deficient nitrate – lower than 250 ppm – then increasing N fertilization will likely improve crop yields. Between 250 and 2,000 ppm, you're hitting N about right.

Don't use the results of the stalk nitrate test blindly and be aware that certain conditions, such as drought, can drive up stalk nitrate levels. Monitor stalk nitrates over a couple of years. One approach is to evaluate fields with stalk nitrates greater than 5,000 ppm first. Sample them for ISNT to see if your stalk nitrate levels are high because of a large soil N pool. If both the stalk nitrate and the ISNT are high, these might be fields where you can cut back on fertilizer and/or manure applications. Apply manure on needier fields.

Remember, the greatest certainty comes from using both tools together and monitoring over a couple of years. ■

Calculate N for corn

Start by factoring in crop N demands and sources of N:

1. Corn yield potential. This varies depending on soil type and drainage. Yield potential helps set the gross N requirement for the crop.

2. Quantify N available from mineralization of soil organic matter. It depends on soil type and drainage.

3. Credit N available from killed sods. This depends upon the legume composition of the sod and the years since sod was tilled under.

4. Nutrient uptake efficiency, or fertilizer efficiency.

The equation looks like this:

$$\text{Corn N requirement (lbs. N/A)} = \frac{\text{(yield potentil (bu./A) *1.2)} - \text{Soil N (lbs.N/A)} - \text{Sod (lbs.N/A)}}{\text{Fertilizer efficiency/100 (\%)}} = ? \text{ (lbs.N/A)}$$

Use the result to calculate how much manure and/or fertilizer to apply in the upcoming growing season.

Sidedress manure? Yes you can

Given the price of nitrogen and the abundance of manure, injecting it at sidedress time can pay off for dairies

By Eleanor Jacobs

As with many practices on dairies, sidedressing manure on corn has advantages and disadvantages. Duane Allen learned that after using the practice for two years on his 950-cow dairy in Scipio Center, N.Y.

Allen sidedresses using a 4,000-gallon Husky manure spreader equipped with five injectors spaced at 30 inches to match corn-row spacing. He uses a 190 hp tractor, and knives in manure between the rows at a depth of 4 inches.

"The teeth are narrow – 5 inches on the tool bar," says Denny Ortel of Ortel Supply in Arcade, N.Y. He sold the equipment to Allen. "They're like cultivator teeth only 5 inches wide. The tires are narrow –18-4-26 – and the tanker is small."

Allen began sidedressing manure because of limited manure storage. "I had 10 days of storage and had to have a place to go with manure," he says.

The cost of nitrogen played a role in Allen's decision to try the novel practice. "I could either go over the corn ground and knife in N or knife in manure," he says.

The first year, Allen sidedressed manure on 250 acres of his 1,200 acres of corn. Last year, he increased that to 300 acres. He targets third-year corn. "You don't need it on first-year corn after alfalfa, and second-year doesn't need as much," he says about injecting 5,000 gallons per acre.

Allen has built more manure storage and may knife in more manure pre-plant this year, sidedressing manure on fewer acres of corn. He also grows 1,100 of hay/alfalfa and soybeans and 300 acres of wheat.

How-tos

Sidedressing manure has its challenges. First off, timing is critical. Sidedressing must be done when corn is 1.5 feet tall, Allen says. "If you do it sooner, the corn is too small and can be knocked over. You have a week to 10-day window to put the manure on – somewhere between too small or too tall."

Sidedressing is labor intensive and labor demanding. "We're using a small spreader so it takes a lot of loads," Allen says. The first year he didn't have a truck to transfer manure to the spreader so sidedressing required countless trips from field to storage and back again.

"The driver has to be good and has to go slow or run over corn," Allen says. Even at that, a lot of corn can get trampled on headlands. He tries to sidedress fields with long rows to avoid a lot of turning.

"Compaction is an issue – a big deal," Allen says. Narrow tires on the spreader exacerbate concerns about compaction, as does wet ground.

Sidedressing manure may work better on well-drained than poorly drained soils, says Mark Ochs, Allen's certified crop adviser from Trumansburg, N.Y. "It's important to pick fields carefully."

"We'll continue to sidedress manure but not on as many acres," Allen says. "The more we can inject in spring, the better."

Duane Allen, Scipio Center, N.Y., decided to sidedress manure as an answer to limited manure storage and high nitrogen cost.