



# Can Manure Replace the Need for Starter N?

In New York, fertilizer nitrogen (N) use in corn is more efficient when some N is applied at or near planting and the remainder is applied at sidedress time, typically 4-8 weeks after planting. For this reason, Cornell guidelines suggest that producers apply 20-30 lbs N/acre of starter N at corn planting followed by sidedressing of N when the corn is 6-12 inches tall, if crop needs are not met with N from other sources such as a decomposing sod (first year corn after sod does not need any sidedress N); Agronomy Factsheet 21), or manure (Agronomy Factsheet 21 and 35).

Dairy and other types of manure contain readily available, inorganic N (ammonium-N) as well as less readily available, organic N (Agronomy Factsheet 4). Manure applications can increase nutrient cycling and build soil organic N levels over time. With a growing interest among farmers in reducing their farm's environmental footprint while also reducing the cost of production, farmers asked whether manure could be used to replace the need for starter N. Eliminating starter N fertilizer on corn fields with a manure history has the potential to deliver significant savings of time and money to dairy producers.

The results of 24 on-farm starter N trials conducted in New York in 2009-2011 showed that manure can replace the need for a banded starter N fertilizer application under certain management and field conditions. In this factsheet, we give a brief summary of the research and present guidance and a process that farmers can use to decide whether or to eliminate not starter N fertilizer for a particular corn field.

## Research Findings

Each trial included four replications or more of two treatments: 30 lbs N/acre versus no N in the starter. Trials were conducted in 2009 (seven sites), 2011 (ten sites) and 2012 (four sites). All sites across all years had an Illinois soil nitrogen test (ISNT) test conducted (see Agronomy Factsheet 36 for more information on the ISNT). Eleven sites were classified as

"deficient in soil N supply potential" according to their ISNT results, and were expected to be highly responsive to N. Five sites each were "marginal", and "optimal" in ISNT-N. Yield, forage quality, corn stalk nitrate test (CSNT) and soil test data were collected.

### *Fields with Optimal ISNT*

Of the five fields with optimal ISNT-N, the manure application alone was sufficient to meet the N needs of the crop; none of these three locations showed a yield increase with starter N use. The CSNT data from these fields confirmed N was not limiting yield.

### *Fields with Marginal ISNT*

Of the five sites that were classified by the ISNT as marginal in soil N supply potential, at only one site the corn responded to starter N. This was also the only site for which the CSNT-N results suggested a potential N deficiency (CSNT-N between 250 and 750 ppm) during that growing season. We conclude for these five sites that manure application can replace starter N for soils with a marginal soil N supply potential, as long as sufficient N is added with the manure as illustrated by a CSNT-N result between 750 and 2000 ppm.



Figure 1: We recommend producers analyze 2<sup>nd</sup> or higher year corn fields for both ISNT-N and CSNT-N, to identify sites where a starter N application can be omitted.

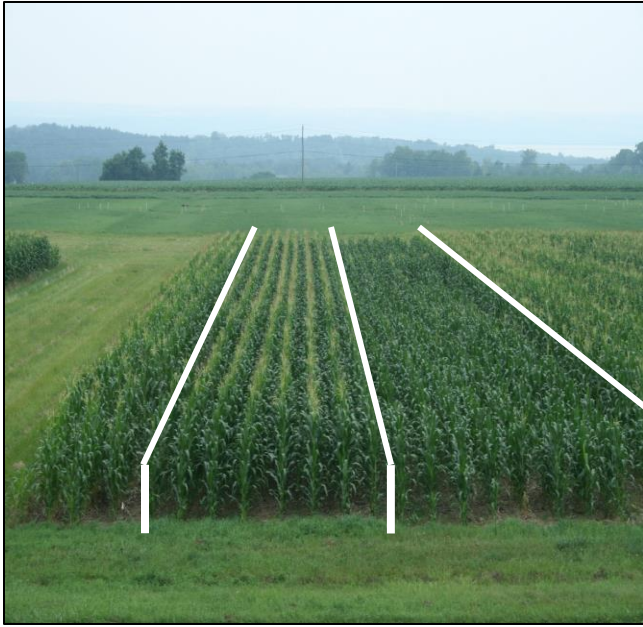


Figure 2: Corn responded to starter N application on non-manured fields deficient in ISNT-N. Manure can replace starter N if sufficient N is applied with the manure.

#### Fields with Deficient ISNT

The eleven sites classified as deficient in soil N supply potential (i.e., soil N alone is not expected to supply sufficient N for the corn crop that year) included fields with no or limited manure history. The results suggest that starter N *is* needed for fields that do not have an optimal soil N supply as measured by the ISNT and are managed without manure.

#### Guidance

- Starter N should be used for fields with no manure history or no current year manure application (deficient ISNT-N).
- If the ISNT-N is classified as optimal, manure can be used to replace starter N without a yield or quality decline.
- Manure can replace starter N for sites deficient or marginal in ISNT-N as well, but only if sufficient N from manure and other sources (cover crops, soil N, sidedress N) is available (shoot for CSNT-N between 750 and 2000 ppm); a yield response to starter N would have been likely if the ISNT-N was deficient and additional N applied was insufficient as well.

#### Decision Tree

We recommend producers analyze 2<sup>nd</sup> or higher year corn fields for both ISNT-N and CSNT-N, to identify sites where a starter N fertilizer application can be omitted.

### Starter N Fertilizer Decision Tree

#### Soil ISNT

- Optimal?  
Eliminate starter N, use manure
- Deficient?  
No manure?  
Use starter + sidedress N  
With manure?  
If previous year CSNT 750 ppm or higher  
Eliminate starter N, use manure  
If previous year CSNT <750 ppm  
Use starter and/or increase manure and/or sidedress fertilizer rate

Figure 3: Starter N fertilizer decision tree.

#### Summary

Starter N should be used for fields with no manure history, deficient in ISNT-N, and no current year manure application. Manure can replace the need for starter N fertilizer for corn, but rates should be adjusted to obtain CSNT-N values between 750 and 2000 ppm. For farm fields where manure is regularly applied, the ISNT and CSNT tests can be used to determine if starter N can be eliminated. This can be a one-year pay back.

#### Additional Resources

- Nutrient Management Spear Program Agronomy Fact Sheet Series: [nmsp.cals.cornell.edu/index.html](http://nmsp.cals.cornell.edu/index.html)
- Cornell Guide for Integrated Field Crop Management: <https://psep.cce.cornell.edu/store/guidelines/Item.aspx?Item=2>
- Nutrient Guidelines for Field Crops in New York: [nmsp.cals.cornell.edu/guidelines/nutrientguide.html](http://nmsp.cals.cornell.edu/guidelines/nutrientguide.html)

#### Disclaimer

This fact sheet reflects the current (and past) authors' best effort to interpret a complex body of scientific research, and to translate this into practical management options. Following the guidance provided in this fact sheet does not assure compliance with any applicable law, rule, regulation or standard, or the achievement of particular discharge levels from agricultural land.

For more information



Cornell University  
Cooperative Extension

Nutrient Management Spear Program  
<http://nmsp.cals.cornell.edu>

Quirine Ketterings, Greg Godwin, Sheryl Swink, Karl Czymmek

2012 revised 2013