



## Soil Tests For Corn Nitrogen Needs

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With extreme weather in 2012 and 2013 many farmers and consultants are scratching their heads trying figure out what in the world to do for applying nitrogen for the 2014 corn crop. While soil testing in the fall is standard procedure for other nutrients, normal soil sampling and testing does not document the nitrogen available to corn. In dry years some nitrogen can carryover in the soil from fall to spring, but wet years have high levels of nitrogen loss. Nitrogen from manure and plowing down haylage are not available as quickly as nitrogen fertilizer. Normally a corn crop does not need any nitrogen beyond a small amount of starter in the first year plowing down a haylage field. Dairies can often meet their nitrogen needs with manure. However many corn fields after haylage or with lots of manure needed side-dress nitrogen in 2013 due to excessively high rainfall. Because of all these reasons the soil tests for nitrogen usually have different procedures than normal soil testing. Depending on the growing season some soil tests may be more useful than others, and other tools may be needed in addition to or in place of soil testing.

*Table 1: Soil Nitrate Carry Over Potential*

Soil Type	Precipitation Level		
	Below Normal	Normal	Above Normal
	<i>Nitrate carry-over potential</i>		
<i>Sandy</i>	Low	Low	Low
<i>Loam</i>	High	Medium	Low
<i>Silt Loams &amp; Clays</i>	High	High	Low

Source: Adapted from the [University of Wisconsin](#)

### Pre Plant Nitrate Test

The Pre Plant Nitrate Test (PPNT) is done 1-3 weeks prior to planting to measure the carry-over nitrate from the previous year. With the drought in 2012, taking PPNT samples might have been worthwhile in the spring of 2013, however high rainfall levels prior to planting washed out most of any carryover nitrogen. Carryover nitrate is highly dependent on soil type and precipitation, *Table 1*. The PPNT is not a good test for manure or legume nitrogen availability since it is too early in the growing season. If taking PPNT samples take 15 cores at 0-1 ft. and 1-2 ft. depths on up to 20 acres. Dry or freeze the samples immediately prior to shipping to a lab. Results are given as lb./acre of nitrate. As soil test nitrate levels increase, nitrogen recommendations decrease until the soil test nitrate level reaches 200 lb./acre. Few responses to fertilizer are observed above this soil test level.

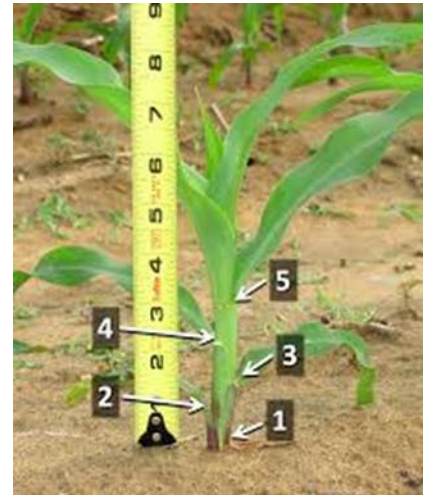
### Pre Side-dress Nitrate Test

The Pre Side-dress Nitrate Test was developed in Vermont specifically to try to quantify the nitrogen available to corn from manure and legumes. A [five year study](#) in 10 Midwestern states from 1988-1992 validated this test and the critical response level for corn of 25 PPM nitrate in the soil. However extremely dry years (2012) and extremely wet years (2013) can reduce it's accuracy because there is still a lag time between taking PSNT samples and when the corn has maximum nitrogen uptake. Under more normal weather conditions the PSNT is a very good test for determining corn side-dress nitrogen amounts. Sample when the corn is at V4 to V6 (6 to 12 inches tall, *Figure 1*) by taking 15 soil samples at the 0-1 ft. depth on every 10-15 acres. For cash grain farmers without manure or haylage the PSNT generally has little value. Continuous corn fields almost always test 5-9 PPM and corn-soybean fields are essentially always in the 11-15 PPM range which confirm most standard corn nitrogen calculations based on yield goals. Dairy farms should take PSNT samples when plowing down grassy haylage stands or to confirm manure nitrogen.

### Illinois Soil Nitrogen Test

The Illinois Soil Nitrogen Test (ISNT) was developed to identify corn fields that would not respond to nitrogen fertilizer. The PPNT and PSNT usually identify fields that need nitrogen, but they tend to [over predict the nitrogen needs of corn 30-40% of the time](#). In high fertility cropping systems (even with only commercial fertilizers) the more reactive portions of the soil organic matter can build up high levels of nitrogen that are bound to proteins and sugars which are not accounted for by the PPNT and PSNT. Soil sampling for ISNT is generally incorporated into the normal fall procedure for soil sampling at a 0-8 in. depth because this nitrogen is part of the organic matter. Work at [Cornell University](#) has found that accounting for soil organic matter levels improves the accuracy of the ISNT under NY conditions.

Figure 1: V5 Corn



Source: Mississippi State University

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