

The pre-sidedress soil nitrate test (PSNT) was developed with the idea that nitrate levels could be measured prior to corn side-dressing as an indicator of N mineralization or N carryover from the previous year. PSNT is an in-season N assessment tool for deciding whether additional N is needed. As soil nitrate levels increase, the need for supplemental fertilizer should decrease.

The PSNT is a soil test for nitrate-nitrogen ($\text{NO}_3\text{-N}$), and is utilized at the 4 to 6 leaf growth stage of corn (6" to 12" inch tall) to help improve accuracy of determining when additional nitrogen should be side-dressed. It was initially developed to identify fields that would not be expected to respond to additional nitrogen. PSNT measures the amount of "nitrate" nitrogen available to the plant through mineralization, plus the amount of carryover "nitrate" nitrogen still present in the top 12" inches of soil. It is available to the crop at the time when the corn crop is most likely to start needing/using it for a rapid growth surge and will require nitrogen to support this growth.

If the PSNT shows **adequate** nitrogen is present in the soil, it may be beneficial to forego an additional side-dress application, thus saving time and money. If the test shows nitrate levels are **low**, it may be beneficial to consider sidedressing additional nitrogen to avoid any potential compromise in yield. Timeliness is essential in sample collection and analysis to allow time to sidedress additional nitrogen before corn grows too tall, if test results indicate "low" nitrate levels.

Accurate collection of samples is critical to obtaining reliable information from PSNT. 12" inch deep soil samples should be collected when corn is in the 4-6 leaf stage, and each sample should be comprised of a composite of at least 10 cores (15 to 25 cores are recommended). Each composite sample should represent no more than 10 acres. Additional composite samples should be taken for each different management zone or practice and represent areas of the field that have similar soil properties.

Factors that affect mineralization should be considered when determining the sample area(s) include:

- Soil type and slope.
- Differences in management, including: intensity of artificial drainage, rates of manure application, and cropping history differences.
- If manure or fertilizers have been banded, "special sampling" protocol should be followed.

Composite samples should be placed in non-lined paper (not plastic) bags (keeping samples moist and warm causes mineralization to continue, inflating the nitrate test level and resulting in "low" side-dress nitrogen rates that could hinder crop yields). Individual core samples should be mixed as completely as possible before packaging the composite sample. If the samples will not be delivered to the lab immediately, they need to be quickly air dried (spread out flat on newspaper is sufficient), refrigerated 50 degrees F or less, or frozen to stop microbial activity. The quicker the samples reach the lab, the sooner the results are available to determine if additional side-dress nitrogen is needed.

According to the Illinois Agronomy Handbook, the general consensus is that no additional nitrogen is needed if the PSNT test levels are above 50#/A, where as a "full rate" of nitrogen should be applied if "nitrate" nitrogen levels are less than 20#/A. When the levels are between 20 and 50#/A, nitrogen rates should be adjusted proportionally.



USI Pre Side-dress Soil Nitrate Testing (PSNT) Information and Guidelines for Corn

There is a relationship between PSNT level and optimum N rate, and some universities make recommendations based upon PSNT level. Illinois does not specify nitrogen application rates when the PSNT test results are between 20 and 50#/A, but some other states give “guidelines” (like what is listed below). The PSNT is a useful tool for making N rate decisions and allows producers to “fine-tune” their nitrogen applications rates.

Indiana Suggestions:

Soil NO ₃ – N (ppm)	Corn Yield Potential (bu./acre)					
	80	100	120	140	160	180
	Pounds of Additional N/are to Sidedress					
<10	75	100	125	145	170	200
11-15	45	75	100	125	145	170
16-20	30	55	80	110	125	150
21-25	0	10	35	55	80	110
>25	0	0	0	0	0	0

Source: AY-314-W / The Pre-sidedress Soil Nitrate Test for Improving N Management in Corn, Purdue University

Iowa Suggestions:

Soybean-Corn and Corn-Corn Rotations:

Recommended N rate (lb. N/A) = (Critical N conc. - NO₃-N ppm) x 8 **(*1)**

Manured Soils and Alfalfa-Corn **(*2)**:

Grain & Fertilizer Prices	Soil NO ₃ – N (ppm)	Excess (*3) Rainfall	Normal Rainfall
		Recommended N Rate (lb/Acre)	
Unfavorable where 1 bu Corn buys 7 lbs N	<10	90	90
	11-15	0	60
	16-20	0	0 (*4)
	>20	0	0
Favorable where 1 bu Corn buys 15 lbs N	<10	90	60
	11-15	60	60
	16-25	0	30
	>25	0	0

Source: Pm-1714 / Nitrogen Fertilizer Recommendations for Corn in Iowa, Iowa State University

- (*1)** A critical concentration of 25 ppm NO₃-N is appropriate in absence of additional information. Reduce the critical concentration by 3 to 5 ppm if rainfall is more than 20% above normal between April 1 and time of soil sampling.
- (*2)** A field should be considered manured if animal manures were applied with a reasonable degree of uniformity since harvest of the previous crop or in 2 of the past 4 years.
- (*3)** Rainfall should be considered excess if rainfall in May exceeded 5” inches.
- (*4)** Addition of 30 lb/ N/A may have no detectable effects on profits, but producers could reasonably elect to apply this rate.