



NITROGEN MANAGEMENT FOR 2008 CORN

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Now is the time to plan your nitrogen management for 2008. The first important question is how much nitrogen should I apply? University of Minnesota N guidelines listed in Table 1 should be a starting point. The amount of N to apply depends on four factors, 1) productivity of the growing environment, 2) previous crop, 3) price of fertilizer N to value of corn crop ratio, and 4) amount of risk a grower wants to assume.

Table 1. Guidelines for use of nitrogen fertilizer for corn grown on soils considered to be highly productive.

N Price/ Crop Value Ratio	corn/corn		corn/soybeans	
	MRTN	acceptable range	MRTN	acceptable range
	- - - - - lb. N /acre - - - - -			
0.05	155	130 to 180	120	100 to 140
0.10	140	120 to 165	110	90 to 125
0.15	130	110 to 150	100	80 to 115
0.20	120	100 to 140	85	70 to 100

MRTN = maximum return to nitrogen

This gives us a starting point. A large part of Minnesota suffered from drought this summer. Because of this, there is a good chance that larger than normal amounts of residual soil nitrate-N may be available for use by the 2008 corn crop. In those cases where increased residual nitrate-N is possible, a soil test for nitrate-N will be needed to adjust the N application rate.

Where would you expect increased soil nitrate-N?

In situations where you are going to put corn after corn and in corn after soybean where the soybean crop died or was extremely drought stressed during the cropping season.

In a corn/corn situation, the corn did not use as much N because of drought stress. In July, there was little nitrogen mineralized from the organic matter because of the droughty weather conditions. Some areas experienced good August rains. In those areas, there probably was an increased release of inorganic nitrogen from the organic

matter because of the more favorable soil moisture condition. This nitrate-N probably was not entirely used by the corn plant as corn takes up most of the nitrogen it needs for growth by pollination.

In the soybean/corn situation, if the soybean plants did not die during the growing season, they would have utilized soil nitrate-N up to mid-August and thus have left little excess nitrate in the soil. If the plants died prematurely, then there could be excess nitrate-N.

The best time to obtain a soil test for soil nitrate-N will depend on several factors. First, if the field is in western Minnesota (approximately west of Highway 71), a soil sample from the surface 2 feet can be taken either in the fall or spring. For the fall soil sample for nitrate-N to be accurate, it must be taken after the soil temperatures in the surface 6 inches have stabilized at 50 degrees F or less. A soil sample obtained before that time will in most cases under-estimate the amount of nitrate-N in the soil. The Nitrogen application for corn should be adjusted by subtracting 60% of the nitrate-N in the soil sample from the N application rate obtained from the corn/corn column in table 1. The corn/corn value is used in this case even if the corn to be fertilized is following soybean.

Thus, when using the soil nitrate test, the amount of fertilizer N required is determined from the following equation:

$$NG = (\text{Table 1 value for corn/corn}) - (0.60 * STN_{(0-24 \text{ in.})})$$

- NG = Amount of fertilizer N needed, lb./acre
- Table 1 value = the amount of fertilizer needed, adjusted for soil potential, value ratio, and risk.
- STN₍₀₋₂₄₎ = Amount of nitrate-N measured by using the soil nitrate test, lb/acre.

If the field is in eastern Minnesota, a soil sample to a depth of 2 feet should be obtained in the spring after the frost is out of the soil and before the corn is planted. This soil sample should be analyzed for nitrate-N. The amount of credit for the nitrate-N concentration in the sample can then be determined from Table 2. This amount will then

be subtracted from the N application determine in Table 1. More detail can be found in Fertilizing Corn in Minnesota FO-3790-C Revised 2006, available on-line at <http://www.extension.umn.edu/distribution/cropsystems/DC3790.html>

Table 2. Residual N credit values based on the concentration of nitrate-N measured before planting in the spring from the top two feet of soil.

Soil nitrate-N <i>ppm</i>	Residual N credit <i>lb. N per acre</i>
0.0 – 6.0	0
6.1 – 9.0	35
9.1 – 12.0	65
12.1 – 15.0	95
15.1 – 18.0	125
> 18.0	155

The above Nitrogen guidelines and credits are based on the use of Best Management Practices. In Southeastern Minnesota, fall applications of nitrogen is not recommended. In South Central Minnesota, late fall applications with a nitrification inhibitor are acceptable but with greater risk, while in Southwestern, West Central, and Northwestern Minnesota, late fall applications without a nitrification inhibitor are acceptable with greater risk. In late fall applications, the nitrogen fertilizer must be an ammonium type.

What is meant by late fall?

Late fall application should occur only after soil temperatures in the surface 6 inches are at or less than 50 degrees F. Applications made at temperatures greater than this (earlier in the fall) are suspect to conversion from ammonium to nitrate and thus possible losses in the spring to movement in the soil and/or denitrification. Therefore fall applied nitrogen should be planned so that it stays in the ammonium form throughout the fall, winter and early spring. Otherwise, when present in the nitrate form, there is a substantial risk for loss of nitrogen.